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Systematics of *Aloysia* (Verbenaceae)

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Dedication

I would like to dedicate this work to Dr. Billie L. Turner, without whom I would never have found botany.

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Systematics of *Aloysia* (Verbenaceae)

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A systematic treatment of the genus *Aloysia* is presented. It contains 30 species and 14 varieties distributed across North and South America. It is a member of the tribe Lantaneae and is most closely related to the genus *Lippia*. The history, chromosome numbers, secondary chemistry, generic and infrageneric relationships, morphology, cladistics, and taxonomy of *Aloysia* are all addressed. A complete index to all known names and a list of exsiccatae is provided for the approximately 6120 sheets examined from 25 herbaria. Four new species are described, *A. arequipensis, A. coalcomana, A. cordata*, and *A. velutina*, and three new combinations are proposed, *A. virgata* var. *urticoides, A. lycioides* var. *schulziana*, and *Lippia dodsoniorum*.

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Chapter 1: History

The genus *Aloysia* was first proposed in 1784 by Antonio Palau in the appendix of *Partes Practica de la Botanica de Carol von Linne*, a Spanish translation of Linnaeus' work which was meant to serve as an educational aid to Spanish-speaking students of botany. This obscure protologue was largely overlooked until 1832 when Chamisso brought the botanical community the first cohesive treatment of the group. Subsequently, numerous authors have contributed to the knowledge of *Aloysia*; some of the important workers include: Botta (1979), Briquet (1896, 1904a, 1904b), Philippi (1870), Small (1903), Standley (1924), Troncoso (1937, 1960, 1962, 1964, 1965, 1974, 1979), and Moldenke (1940-1983 inclusive).

Palau

Palau (1784) was the first author to recognize this generic entity or any of its species. His botanical background is somewhat poorly known but *Aloysia* is the only genus he authored. It's type species, *A. citrodora*, is the only species name he validly published and the only epithet with which he is necessarily associated. The illustration published with the protologue of *A. citrodora* by B. Salvador y Carmona was designated the type for the species by Armada and Barra (1992).

L'Heritier

In 1786, possibly late December 1785 (Stafleu and Cowan, 1981), L'Heritier de Brutelle proposed another name for *A. citrodora*, *Verbena triphylla* in his *Stirpes Novae*. Since Palau's epithet had priority this would appear to nullify his contribution, but such was not the case. L'Heritier's work was more widely known so his epithet remained in prominent usage until the priority of Palau's name was realized (Armada and Barra, 1992). The obscurity of Palau's work conspired with a misprint in L'Heritier's *Stirpes Novae* (1785) which stated the year of publication as 1784. The book did not come out until late December of 1785 or 1786; depending on which fascicle is referred to (Stafleu and Cowan, 1981). L'Heritier cited "*Aloysia citrodora* Ort. & Pal. *diss. mss.*" in his protologue indicating he knew of the 1779 handwritten manuscript by Ortega and Palau housed at the Monastery of Santo Domingo de Silos Library in Madrid (Armada and Barra, 1992).

Ruiz and Pavon

Ruíz and Pavon (1798) described the second valid species, *Verbena virgata*, to become a member of *Aloysia*. The protologue for *Verbena virgata* appeared in their *Flora Peruviana*. It was transferred to *Aloysia* by a later author, but not by Jussieu (1806), as often cited, but Jussieu did not definitely associate the genus name *Aloysia* with the epithet "*virgata,*" so his combination is not valid according to Article 33.1 of the Code (2000). The first person to make a definite association between these names was Moldenke (1940).

Cavanilles

Cavanilles (1802) transferred *Aloysia citrodora* to the genus *Verbena*. This is the second time knowledge of Palau's 1784 work can be verified in the botanical literature; it is also the first correct citation of *Aloysia citrodora* known. The fact that Cavanilles was at Madrid probably increased the odds he would come into contact with Palau's work. Cavanilles provided the correct combination for this species if treated in *Verbena*, though all modern authors treat the species in question as *Aloysia* or *Lippia*.

Ortega

Ortega has often been erroneously credited with naming the genus *Aloysia*, this typified by *A. citrodora* (L'Heritier, 1785; Persoon, 1807). L'Heritier cites Ortega and Palau as authors of *A. citrodora* in *Stirpes Novum* (1785), but goes on to credit Ortega alone for providing material for cultivation. Similarly, Persoon (1807) gives sole credit to Ortega and this is the reference most often used when citing authorship of *Aloysia*. In reality, the genus *Aloysia* was described in 1779 in an autographed manuscript attributed to Ortega and Palau. This predates Palau's solo publication by five years, however, only a single copy of this manuscript survives at the Monastery of Santo Domingo de Silos Library (Armada and Barra, 1992). Therefore, the 1779 description was not widely disseminated and is not considered effectively published according to Article 29.1 of the Code (2000).

Lagasca

Lagasca (1816) was the third contributor to the genus with his description of *Verbena ligustrina*. It has since been determined that this name refers to a legitimate species of *Verbena* which is..."exclusiva de la Patagonia y que no tiene nada en común con [*Aloysia gratissima*]" (Troncoso, 1962). Lagasca's epithet persisted for 64 years and, though relegated to *Verbena*, any discussion of *Aloysia* would be incomplete without mentioning it.

Kunth

Kunth (1818) contributed twice to *Aloysia* via the genus *Lippia*. The first name, *Lippia citrodora,* is a combination based on the illegitimate *Zapania citrodora*. Kunth gave priority for the epithet "*citrodora*" to Lamarck's 1791 "*Zapania citrodora.*" This is obvious from his protologue which lists Lamarck's name first and proceeds to cite *Aloysia citrodora* incorrectly, crediting it to Ortega (1807). Since Kunth made the combination based on Lamarck's (1791) name, itself a later homonym, instead of Palau's (1784), this combination is illegitimate. Kunth's other epithet, *Lippia scorodonioides*, was the third species of the genus to be described. Chamisso (1832) is often credited with transferring this name to *Aloysia,* but he makes no direct association between the genus and the epithet. Indeed, his reference is buried in another description and the epithet is only mentioned in passing. Moldenke (1940) was the first to associate the two names directly (ironically while citing Chamisso), and is credited with this combination. Kunth was the first author to place members of what would later be known as *Aloysia* into *Lippia*. This is a significant advancement over the prevailing view early on, which held these taxa to be members of *Verbena*. Kunth began the transition into the modern concept of *Aloysia*.

Hooker

Hooker collaborated with two different authors to describe two species of *Aloysia* during the same year (Hooker and Arnott, 1830; Gillies and Hooker, 1830). Hooker and Arnott (1830) published *Verbena salviifolia* in their account of the *Botany of Beechey's Voyage*. This species would be transferred to *Aloysia* by Moldenke in 1940 and has seldom been mentioned by other workers.

The second species was *Verbena gratissima*, its generic position obscure for so long largely because it was erroneously described as having four nutlets, this accounting for its relegation to *Verbena*. Inspection of type material by Troncoso (1962) and myself have confirmed a mistake on the part of the authors.

Chamisso

Chamisso (1832) was the first author to treat *Aloysia* as an independent genus in the modern sense. He described four new species: *A. chamaedryfolia*, *A. polygalifolia*, *A.*

urticoides, and *A. lycioides*. *Aloysia lycioides* was in usage from its publication in 1832 until 1898 when Kuntze made the erroneous determination that *Verbena ligustrina* (1816) was the same as *A. lycioides* and gave it priority over Chamisso's basionym. Kuntze (1898), in his protologue, merely states: "*Verbena ligustrina* Lag. 1816 = *Aloysia lycioides* Cham. 1832 = *Lippia lyc.* Steud." *Aloysia urticoides* is the same as *A. virgata* var. *platyphylla*, and if the former is treated as distinct from *A. virgata*, *A. urticoides* would be the correct name. *Aloysia chamaedryfolia* and *A. polygalifolia* are still in usage and accepted here.

Chamisso has further been credited with the combination, *Aloysia scorodonioides*, a transfer of Kunth's *Lippia scorodonioides* to *Aloysia*. In reality, Chamisso (1832) states, in reference to *Aloysia*: "Species princeps *Aloysia citriodora* O. (*Verbena triphylla* L.); accedunt *Verbena virgata* R. et P. et *Lippia scorodonioides* HBK." Hence, he never directly associates the epithet "*scorodonioides*" with the name *Aloysia*. It is clear he considered the quoted species to be related to *Aloysia*, but he cannot be credited with the combination according to Article 33.1 of the Code (2000). This name would later be validated by Moldenke (1940).

Philippi

Philippi (1891, 1895) contributed three names to *Aloysia*. The first was *Lippia floribunda* Phil. in his *Florula atacamensis* (1891). This name is a later homonym of *L. floribunda* Kunth and therefore illegitimate. Next, he simultaneously described *L. gracilis* and *L. fonckii* (Philippi, 1895). The former is a homonym of *Lippia gracilis* Schauer and, though illegitimate, was later transferred to *Aloysia* by Acevedo de Vargas (1951). All three names are considered synonymous with *Acantholippia trifida* though other workers have treated them under *Lippia* (Sanders, 2000).

Moldenke

Moldenke's contributions to the genus *Aloysia* are far too numerous to list here. He has authored 41 specific and/or varietal names. Many of these were published in *Phytologia* as contributions towards a proposed monograph, this never completed. The rest were part of smaller less inclusive floristic treatments, like those for Texas (1942, 1970). Also noteworthy is his vast collection of personal notes, literature, and citations housed at TEX, LL concerning all members of the Verbenaceae. These have proved to be a valuable resource in the current study, and excerpts from his unpublished personal notes have been reproduced herein when deemed appropriate. Moldenke contributions, while significant, consist of scattered protologues, regional treatments, and copious personal notes.

Troncoso

Troncoso (1960) made a significant contribution to the taxonomy of *Aloysia* with her description of the only genus to be segregated from its midst, *Xeroaloysia*. The latter is monotypic, containing only *X. ovatifolia*, and is accepted here as a legitimate generic segregate. She also published the combination *Aloysia gratissima* after examining type material for *Verbena ligustrina* (Troncoso, 1962). She determined *V. ligustrina* to be a legitimate species of *Verbena*, thus the name was not applicable to any *Aloysia*.

Botta

Botta (1979) published a significant paper on the Argentine species of *Aloysia*. This is one of the most complete treatments of *Aloysia* to date and has provided a sound basis for subsequent treatments.

Chapter 2: Generic and Infrageneric Relationships

GENERIC RELATIONSHIPS

As treated by Troncoso (1974), the genus *Aloysia* is a member of the tribe Lantaneae and is most closely related to *Lippia*. The New World Lantaneae is composed of four major groups distinguishable by fruit types (see table 2). Genera with drupaceous fruits, *Lantana* and *Nashia*, are in the first group. The second group, containing *Xeroaloysia, Neosparton,* and *Lampaya*, have fruit types somewhat intermediate between a drupe and a schizocarp. The third, containing *Lippia*, *Acantholippia*, *Diostea*, and *Aloysia*, have spheroid to obovoid schizocarps. The fourth, composed of the genera *Bouchea* and *Stachytarpheta*, is characterized by narrowly ellipsoid, rostrate schizocarps.

The *Lantana* group is distinguished by its drupaceous fruit which is indehiscent. These fruits lack a commissural fissure or suture and the two seeds remain coherent when mature. *Lantana* has a fleshy mesocarp, while the mesocarp of *Nashia* is sub-fleshy and reduced. The exocarp is thin and somewhat membranaceous in both groups.

The *Lampaya* group is somewhat enigmatic since it contains members with fruit types considered intermediate between the drupes of *Lantana* and the schizocarps of the *Lippia* group. *Lampaya* has a fleshy schizocarp while *Xeroaloysia* and *Neosparton* have drupaceous fruits with a dry, reduced mesocarp and a hard exocarp. The dry drupaceous fruits of *Xeroaloysia* resemble the dry schizocarps of *Lippia* rather than the drupes of the *Lantana* group, and are similarly difficult to place within the Lantaneae.

The *Lippia* group all have ellipsoid to obovoid schizocarps enclosed by an accrescent calyx and are readily dehiscent at maturity. This group will be discussed in more detail later.

Table 1: The genera of the Lantaneae with fruit type, calyx type, stigma morphology, habit, and base chromosome number for each.

Genus	**Fruit Type**	**Calyx**	**Stigma**	**Habit**	***x*=?**
Lantana	drupe, fleshy	truncate to 2-lobed	capitate, semi-lateral, or oblique	procumbent to erect shrubs	x=11, 12
Nashia	drupaceous, fleshy	annular	capitate	shrubs	
Xeroaloysia	drupaceous	4-lobed	capitate	sub-shrubs	
Neosparton	drupaceous	5-lobed	capitate or oblique	desert shrubs, leaves reduced or absent	x=8
Lampaya	sub-fleshy schizocarp	5-lobed	2-lobed, posterior lobe reduced	low, multi-branched shrubs, stems prostrate	
Diostea	sub-fleshy schizocarp	5-lobed	globose, papillate	desert shrubs, leaves reduced	x=9, 10
Acantholippia	schizocarp	4-lobed	capitate	xerophytic sub-shrubs, leaves reduced	x=9
Lippia	schizocarp	2-lobed or, at least, 2-parted, lobes entire, bidentate, or ciliate	semi-lateral or oblique	procumbent to erect perennial herbs, sub-shrubs, or shrubs	x=9, 12, 15
Aloysia	schizocarp	4-lobed; occasionally 2-lobed, lobes bidentate	capitate	sub-shrubs to small trees	x=9
Bouchea	rostrate schizocarp	4-5-lobed	oblique	perennial herbs with woody rootstock	x=10
Stachytarpheta	rostrate schizocarp	2-5-lobed or truncate	capitate	perennial herbs with woody rootstock or shrubs	x=14

The *Bouchea-Stachytarpheta* group is largely delimited by its mostly herbaceous habit, terminal elongated spikes and ellipsoid, rostrate schizocarps. The rest of the Lantaneae have a mostly woody or shrubby habit, variously arranged inflorescences of shortened, capitate to interrupted spicate-racemes, and an apically rounded to bilobed fruit.

There is an undeniably close tie between *Lippia* and *Aloysia*, and a suite of morphological characters, including those of the inflorescence, calyx, corolla, androecium, and gynoecium, have been used to delimit the two genera. The boundary between *Lippia* and *Lantana* is difficult and poorly understood, and I refer the reader to Sanders (2001) for a well reasoned discussion of their affinities.

The inflorescence is the most commonly utilized character to recognize *Aloysia*. Most species of *Aloysia* have an elongated rachis with flowers loosely arranged along the axis (ca. 0.5 to 2.0 mm between the clustered flowers). In *Lippia* the flowers are densely imbricated along the rachis with little, if any, nodal gaps between flowers. In the transitional species of *Aloysia*, the inflorescence varies from shortened spicate-racemes with loosely arranged flowers to compact spicate-racemes with tightly clustered flowers.

The calyx of *Lippia* is usually two-parted or two-lobed with each lobe being entire or bi-dentate. Most species of *Aloysia* have a four-lobed calyx. Some species, considered basal within the genus, have a two-lobed calyx, but inflorescence, androecium, gynoecium, and fruit characters like those of *Aloysia*. The 4-lobed calyx of *Aloysia* is roughly four-angled at the throat due to the weakly involute nature of its lobes (fig. 3, 4). These longitudinal folds correspond to costae, in some species, which form along the center line of each lobe and fade basally.

The corollas of both *Lippia* and *Aloysia* are mostly salverform, but there are several noteworthy differences between the two. In *Lippia*, the corolla tube is very slender, ca. 0.5-1.0 mm in diameter, and the limb is strongly zygomorphic and often bilabiate. In *Aloysia*, the tube is usually shorter, wider, (ca. 1-2 mm in diameter) and the limb varies from sub-actinomorphic to zygomorphic, rarely bilabiate.

Androecium morphology is of use in distinguishing *Aloysia* from *Acantholippia*. The anther stalk in *Aloysia* is simple and the thecae are apical. Those of *Acantholippia* are similar, with the exception of filament-like appendages on the superior anther stalks. This appendage, along with vegetative features (see generic key), distinguishes *Acantholippia* from the rest of the Lantaneae. *Burroughsia* was originally segregated from *Lippia* on the basis of very similar filament-like anther appendages (Moldenke, 1940). However, as noted by Henrickson (1985), such filaments are found in only one of its two species.

Gynoecium morphology has also been found to have generic relevance. In *Aloysia*, most stigmas are capitate with the lobes equal or somewhat oblique (fig. 7a). *Lippia* has a stigma which is apical on the style but the former is mounted laterally so that the stigmatic surface may not reach the apex of the style (fig. 7b). Some species of *Aloysia*, such as *A. barbata* and *A. polystachya*, have stigmas which are sub-capitate and laterally disposed approaching that of *Lippia* (i.e., the stigmatic surface reaches the apex of the style, but there is usually one apical lobe and one lateral lobe). Additionally, the style itself is generally 2-6 times the length of the ovary in *Aloysia*, while in *Lippia* the style is considerably shortened.

The fruit provides another suite of characters useful in delimiting these genera. The mature schizocarp is usually roughly spheroid to widely ellipsoid, thick-walled, and apically rounded in *Lippia*, while in *Aloysia* it is generally obovoid, thin-walled, and apically bilobed. There are some species of *Lippia* and *Aloysia* which have an elongated collar along the commissural fissure which results in an enlarged intermericarpal cavity.

I refer the reader to Sanders (2001) for more detailed insights into this character and its systematic implications in the Lantaneae as a whole.

INFRAGENERIC RELATIONSHIPS

During the course of this study several natural groupings became evident within the genus *Aloysia*. The patterns of diversity represented by these groupings have not been discussed by previous workers and are addressed here for the first time (table 3). These groups are recognized informally and formal nomenclature must await a more in-depth study of the tribe Lantaneae. The synapomorphies supporting these groups are discussed below, as well as arguments for the recognition of each.

The major morphological demarcation within the genus *Aloysia* is between the groups "*Aloysia*" and "*Pseudolippia*" (table 3). The members of the group "*Aloysia*" are characterized by four-lobed calyces with trullate to subulate lobes which are usually involute. This is in contrast to members of the group "*Pseudolippia*" which have two-lobed calyces with rounded to obscurely bi-dentate lobes which are essentially flat. It is believed that members of the "*Pseudolippia*" group are closely related to the genus *Lippia*, more so than members of the "*Aloysia*" group. This view is supported by the trees obtained from the cladistic analysis described in chapter five (fig. 9-10) which show this group as basal to the rest of *Aloysia*.

The largest and most diverse group is informally named "*Aloysia*" (table 3), which contains six subgroups representing a majority of the genus *Aloysia*. The typical subgroup, *Aloysia*, contains three species; *A. citrodora*, *A. fiebrigii*, and *A. herrerae*. These species are all characterized by determinate paniculiform inflorescences. This contrasts with other members of the genus which have indeterminate axillary inflorescences. The group "*Aloysia*" consistently comes out at the top of the trees obtained from the cladistic analysis in chapter five (figs. 9-10). Olmstead (pers. comm.) has shared preliminary genetic data using *ndh*F and *trn*L/F cpDNA sequences indicating this group is basal to most of the tribe Lantaneae. Such data suggest that *Aloysia* is polyphyletic with subgroup "*Aloysia*" forming a trichotomy with the genus *Coelocarpum* and the lineage ancestral to most Lantaneae including the remainder of *Aloysia,* and the genera *Lippia*, *Lantana*, *Phyla*, and *Nashia*. Another tree provided by Olmstead (pers. comm.), based on the waxy gene exons 10-13, suggests *Aloysia* is monophyletic and sister to a clade composed of *Lippia* and *Lantana*. These preliminary findings are interesting but additional studies are required in order to resolve more fully these generic and infrageneric relationships. Subgroup "*Aloysia*" is supported by cladistic analysis where it is monophyletic on the strict consensus tree (fig. 9) and on the bootstrap 50% majority-rule consensus tree (fig. 10) with a bootstrap value of 72%.

Subgroup "*Marginata*" is the numerically largest in the genus *Aloysia*. It contains all of the most widespread taxa including *A. gratissima*, *A. virgata*, *A. lycioides*, and *A. scorodonioides*. The synapomorphies uniting these species include membranaceous leaves, elongate inflorescences, lax flowers, campanulate to tubular calyces, and corollas which are sub-actinomorphic to zygomorphic. This group is somewhat poorly supported on the 50% majority-rule consensus tree (fig. 10) where it appears to be polyphyletic. The strict consensus tree (fig. 9) shows some support for this group but the large polytomy makes the results difficult to interpret.

Next is subgroup "*Sclerophylla*" in reference to the sclerophyllous leaves characteristic of most members. There are several synapomorphies unique to this group including glabrous to puberulent stems, sclerophyllous leaves which are usually 3-whorled, and a sub-tropical habitat often including marshes and swamps. It is noteworthy that all of these species are localized to a small region in southern Brazil and northeastern Argentina. The bootstrap 50% majority rule consensus tree (fig. 10) suggests this groups is composed of one monophyletic clade and one paraphyletic clade, despite the synapomorphies mentioned above. Both of these clades are poorly supported with bootstrap values of 41% and 12%, respectively. The strict consensus tree (fig. 9) suggests support for this group, however, both *A. hatschbachii* and *A. chamaedryfolia* are excluded from the main clade and originate from a large polytomy including several members of other subgroups.

Subgroup "*Longiflora*" is composed of only two species both of which are endemic to Peru. There are two synapomorphies uniting these species; a campanulate calyx with trullate, acute lobes and a corolla tube which is 3-5 times the length of the calyx. The strict consensus tree (fig. 9) suggests a relationship between members of this subgroup though there is no evidence for the monophyly of this group other than the synapomorphies mentioned above. There is rather weak cladistic support for this group on the bootstrap 50% majority rule consensus tree (fig. 10) with a bootstrap value of only 37% on the supporting branch.

Members of subgroup "*Densiflora*" occur in Peru and Chile and include *Aloysia salviifolia* and *A. minthiosa*. Synapomorphies common to these two species include leaves which are entire to coarsely dentate, an elongated inflorescence rachis (3-12(-15) cm long), congested flowers, a corolla tube which equals to or just exceeds the calyx in length, and a fruit which is broadly obovate (ca. 1:1, L:W). The strict consensus tree (fig. 9) suggests a relationship between members of subgroup "*Densiflora*" but the large polytomy makes interpretation difficult. The bootstrap 50% majority rule consensus tree (fig. 10) suggests a potential relationship with subgroup "*Longiflora*" for *A. minthiosa* and with subgroup "*Marginata*" for *A. salviifolia*; though the resulting clades are poorly supported.

Table 2: Phyletic arrangement of the species of *Aloysia*; informal names in " " are proposed here.

Group or Subgroup	Taxa
I. Group "*Aloysia*"	
A. Subgroup "*Aloysia*"	1. *Aloysia citrodora* Palau
	2. *Aloysia fiebrigii* (Hayek) Moldenke
B. Subgroup "*Marginata*"	3. *Aloysia herrerae* Moldenke
	4a. *Aloysia virgata* (Ruiz & Pav.) Moldenke var. *virgata*
	4b. *Aloysia virgata* var. *laxa* (Chod.) Moldenke
	4c. *Aloysia virgata* var. *urticoides* (Cham.) Siedo
	5a. *Aloysia castellanosii* Moldenke var. *castellanosii*
	5b. *Aloysia castellanosii* var. *magna* Moldenke
	6. *Aloysia velutina* Siedo
	7. *Aloysia macrostachya* (Torr.) Moldenke
	8a. *Aloysia scorodonioides* (Kunth) Moldenke var. *scorodonioides*
	8b. *Aloysia scorodonioides* var. *mathewsii* (Briq.) Moldenke
	8c. *Aloysia scorodonioides* var. *hypoleuca* (Briq.) Moldenke
	9. *Aloysia wrightii* (A. Gray) Heller
	10a. *Aloysia gratissima* (Gill. & Hook.) Troncoso var. *gratissima*
	10b. *Aloysia gratissima* var. *schulziae* (Standl.) Moldenke
	10c. *Aloysia gratissima* var. *angustifolia* (Troncoso) Botta
	10d. *Aloysia gratissima* var. *chacoensis* (Moldenke) Botta
	11a. *Aloysia lycioides* Cham. var. *lycioides*
	11b. *Aloysia lycioides* var. *schulziana* (Moldenke) Siedo
	12. *Aloysia oblanceolata* Moldenke
C. Subgroup "*Sclerophylla*"	13. *Aloysia cordata* Siedo
	14. *Aloysia brasiliensis* Moldenke
	15. *Aloysia polygalifolia* Cham.
	16. *Aloysia hatschbachii* Moldenke
	17. *Aloysia chamaedryfolia* Cham.
	18. *Aloysia crenata* Moldenke
D. Subgroup "*Longiflora*"	19. *Aloysia arequipensis* Siedo
	20. *Aloysia peruviana* (Turcz.) Moldenke
E. Subgroup "*Densiflora*"	21. *Aloysia minthiosa* Moldenke
	22. *Aloysia salviifolia* (Hook. & Arn.) Moldenke
F. Subgroup "*Microstachya*"	23. *Aloysia polystachya* (Griseb.) Moldenke
	24. *Aloysia catamarcensis* Moldenke
II. Group "*Pseudolippia*"	25. *Aloysia dusenii* Moldenke
G. Subgroup "*Ternifolia*"	26. *Aloysia sonorensis* Moldenke
H. Subgroup "*Pseudolippia*"	27. *Aloysia barbata* (Brandegee) Moldenke
	28. *Aloysia nahuire* Gentry & Moldenke
	29. *Aloysia coalcomana* Siedo
	30. *Aloysia chiapensis* Moldenke

The subgroup “*Microstachya*” is defined by several synapomorphies including alternate to opposite leaves, compact inflorescences (rachis less than 3 cm long), congested flowers, broadly obovate bracts, and a calyx which is often cleft abaxially. This clade is well supported on the strict consensus tree (fig. 9), although the lineage arises from a large and poorly resolved polytomy. This subgroup forms a monophyletic clade on the bootstrap 50% majority-rule tree but only has a bootstrap value of 53%.

Subgroup “*Ternifolia*” is monotypic and composed of *Aloysia dusenii*. This species has the two-lobed calyx typical of members of “*Pseudolippia*” but shares little else in common with the subgroup. It has a lax-flowered inflorescence, variably opposite to four-whorled leaves, leaf margins which are entire to obscurely serrate and basally entire, and a fruit which is shallowly lobed apically (lobes <0.1 mm long). Subgroup “*Ternifolia*” is sister to the group “*Aloysia*” on the bootstrap 50% majority-rule consensus tree (fig. 10) and arises from a large polytomy on the strict consensus tree (fig. 9). In either case, it does not form a monophyletic clade with other members of the group “*Pseudolippia*.” For this reason, it could be argued *A. dusenii* belongs within the group “*Aloysia.*” It is maintained within the group “*Pseudolippia*” based on the synapomorphies mentioned above.

The members of subgroup “*Pseudolippia*” have two-lobed calyces, typical of the group “*Pseudolippia*,” hop-like inflorescences, weakly congested flowers, showy and foliaceous bracts, and a zygomorphic corolla beset with sub-sessile glandular trichomes along the distal portion of the tube. There is good support for this group on both the strict consensus tree (fig. 9) and the bootstrap 50% majority-rule tree (fig. 10). The latter tree has a bootstrap value of 92% for this clade and suggests subgroup “*Pseudolippia*” is monophyletic and sister to the rest of *Aloysia*. Unfortunately, the resolution of relationships within this clade is less than optimal though it is clear *A. sonorensis* is distinct from the rest of the subgroup.

Chapter 3: Chromosome Numbers and Secondary Chemistry

Chromosome Numbers

The first chromosome number reported for *Aloysia* was a mitotic count of 2*n*=36 by Doulat (1943) for *A. citrodora*; Covas and Schnack (1946) subsequently reported a meiotic count of *n*=18 for cultivated material referred to as *A. ligustrina*; Diers (1961) provided a mitotic count of 2*n*=ca. 72 for *A. scorodonioides*; Coleman (1982) provided a meiotic count of *n*=18 for *A. lycioides*; and Andrada et al. (1998) reported mitotic counts of 2*n*=54 for *A. gratissima* and 2*n*=36 for *A. polystachya* (table 1). The relatively small size of the chromosomes apparently makes it difficult to obtain unequivocal counts for this genus (Andrada et al., 1998).

Counts for the closely related genera *Lippia* and *Phyla* are relatively limited and plagued by misidentifications. Choudhury and Bose (1956) made meiotic and mitotic counts for *Lippia geminata* of *n*=15 and 2*n*=30; Coleman (1982) reported a meiotic count of *n*=12 for *L. salviifolia*; Filippa (1984) reported a meiotic count of *n*=15 for *L. turbinata*; and Andrada et al. (1998) reported a mitotic count of 2*n*=60 for *L. fissicalyx*.

Lewis (1961) provided meiotic counts of *n*=18 for *Phyla incisa*, *P. strigulosa* and *P. lanceolata* (table 1).

Henderson (1969) reported a count of 2*n*=48 for *Lantana montevidensis*. Sanders (1987a, 1987b) provided several meiotic and mitotic counts for *Lantana* of *n*=11, 12, 24, 27 and 2*n*=22, 44 and 48 (table 1).

Other members of the Lantaneae with published counts include *Stachytarpheta angustifolia* with 2*n*=56, (Junell, 1934; Mangenot and Mangenot, 1962). Sharma and Mukhopadhyay (1963) published a mitotic count of 2*n*=160 for *S. indica*. Junell (1934) provided a mitotic count of 2*n*=36 for *Diostea juncea*, and Covas and Schnack(1946)

Table 3: Known chromosome counts for members of the Lantaneae, with references.

Genus	Species	Meiotic	Mitotic	Reference
Aloysia	*A. citrodora*		2*n*=36	Dolat, 1943
	A. gratissima var. *gratissima*		2*n*=54	Andrada et al., 1998
	A. gratissima var. *gratissima*	*n*=ca. 27		Powell, unpubl.
	A. gratissima var. *schulzae*	*n*=ca. 27		Powell, unpubl.
	A. ligustrina	*n*=18		Covas & Schnack, 1946
	A. lycioides	*n*=18		Coleman, 1982
	A. macrostachya	*n*=18		Powell, unpubl.
	A. polystachya		2*n*=36	Andrada et al., 1998
	A. scorodonioides		2*n*=ca. 72	Diers, 1961
Lippia	*L. alba*		2*n*=30	Federov, 1969
	L. fissicalyx		2*n*=60	Andrada et al., 1998
	L. salviifolia	*n*=12		Coleman, 1982
	L. turbinata	*n*=15		Filippa, 1984
Phyla	*P. incisa*	*n*=18		Lewis, 1961
	P. lanceolata	*n*=18		Lewis, 1961
	P. strigulosa	*n*=18		Lewis, 1961
Acantholippia	*A. seriphoides*		2*n*=36	Covas & Schnack, 1947
Diostea	*D. juncea*		2*n*=36	Junell, 1934
	D. scoparia		2*n*=20	Covas & Schnack, 1946
Lantana	*L. bahemsis*	*n*=11		Sanders, 1987b
	L. camara		2*n*=44	Sanders, 1987a
	L. depressa		2*n*=22	Sanders, 1987a
	L. involucrata	*n*=12, 24		Sanders, 1987b
	L. leonardiorum	*n*=11		Sanders, 1987b
	L. microcephala	*n*=12		Sanders, 1987b
	L. montevidensis		2*n*=48	Henderson, 1969
	L. odorata	*n*=12		Sanders, 1987b
	L. ovatifolia		2*n*=44	Sanders, 1987a
	L. trifolia	*n*=27		Sanders, 1987b
Neosparton	*N. ephedroides*		2*n*=32	Covas, 1950
Stachytarpheta	*S. angustifolia*		2*n*=56	Junell, 1934; Mangenot et al. 1962
	S. indica		2*n*=160	Sharma et al., 1963

reported $2n$=20 for *D. scoparia*. Covas (1950) counted $2n$=32 for *Neosparton ephedroides*, and Covas and Schnack (1947) reported $2n$=36 for *Acantholippia seriphoides* (table 1).

Aloysia would appear to have a base number of x=18 since this is the lowest observed count in the genus. However, the recent work of Powell (unpubl.) reports a count of n=ca. 27 for *A. gratissima* var. *gratissima* and *A. gratissima* var. *schulziae*. This count, if accurate, would suggest a base number of x=9.

The base chromosome number for *Lippia* and *Phyla* is probably x=9, the anomalous reports of x=15 or 16 are presumably aneuploid derivatives from this base (Sanders, 1987b; Munir, 1993).

Lantana is reported to have a base chromosome number of x=11 or 12 (Sanders, 1987b).

Chromosomal irregularities are reportedly common in *Aloysia*, *Lippia*, and *Lantana*. Specific abnormalities observed in *Aloysia gratissima* include precocious chromosome disjunction contributing to irregular chromosomal segregation (Pagliarini, 2000). This results in the formations of univalents, multiple diakinetic chromosomal associations, abnormal segregation during meiosis II, multiple spindle formation, and multi-polar spindle formation (Corazza-Nunes et al., 1993). These meiotic abnormalities are believed to be the cause of low pollen fertility and high seed sterility (Corazza-Nunes et al., 1993; Pagliarini, 2000). *Aloysia gratissima* reportedly produces approximately 7.59% normal and 92.41% abnormal pollen grains; *A. polystachya* produces 54.73% normal, 45.27% abnormal; while *Lippia fissicalyx* produces 17.6% normal and 82.4% abnormal (Andrada et al., 1998).

SECONDARY CHEMISTRY

Aloysia citrodora is widely cultivated in North and South America for its culinary and medicinal properties. The main components of its essential oil are: bicyclosesquiphellandrene, β-bourbonene, β-caryophyllene, cineole, citral (neral and geranial), citrol (nerol and geraniol), curcumene, limonene, linalool, nerolidol, α-pinene, and spathulenol (Carnat et al., 1999; Silva et al., 1979; Stashenko, 2003). Phenolic compounds include protocatechuic and caffeic acids (Mouhajir, 2001) verbascoside, luteolin 7-glucoside, and luteolin 7-diglucuronide (Carnat et al., 1999). Neral and geranial are the most prevalent compounds, 19-22% and 33-38% of the total extract, depending on extraction method (Stashenko, 2003). An infusion made from the leaves of this plant has been shown to inhibit cell damage to mouse bone-marrow cells induced by cisplatin (Zamorano-Ponce et al., 2004) and to prevent acrylamide-induced cell damage in mice (Zamorano-Ponce et al., 2006).

Extracts of other species in the genus contain a variety of secondary compounds. *Aloysia chamaedryfolia* is reported to contain globulol, spathulenol, and γ-elemene (Dellacassa et al., 1990). The major components of the essential oil of *A. gratissima* include caryophyllene, caryophyllene epoxide, 1,8-cineol, copaenol, copaenone, dihydrocarvone, globulol, α-pinene, β-pinene, sabinene, stapulenol (Bauer et al., 1969; Ricciardi, 1999; Soler, 1986a, 1986b). Crude extract of *A. gratissima* is reported to have activity against Junin virus and herpes simplex virus type 1 (Garcia et al., 2003). The closely related species, *A. lycioides*, is reported to contain essential oils with 1,8 cineole, germacrene, bicyclogermacrene, limonene, α-pinene, β-pinene, and sabinene (Simionatto et al., 2005; Rossato et al., 2006). The essential oil of *A. virgata* contains caryophyllene, elemene, germacrene, bicyclogermacrene, and sabinene (Ricciardi et al., 2000, 2005). Finally, the major essential oils of *A. polystachya* are carvacol, carvone, eucarvone, limonene, pinene, sabinene, α-thujone, β-thujone, isothujone (Hellión-Ibarrola et al., 2006). Hydroalcoholic extracts of *A. polystachya* reportedly relieves anxiety in mice and rats (Hellión-Ibarrola et al., 2006; Mora et al., 2005).

Chapter 4: Morphology

The most readily observed character separating *Aloysia* and *Lippia* is the length of the inflorescences. In *Aloysia* the rachis is usually elongated (ca. 2.5-25.0 cm) and uniform in diameter with flowers sparsely scattered along it. In *Lippia* the rachis is shortened (0.5-4.0 cm), often thickened, with flowers densely clustered together. However, these distinctions break down among several species. Additional characters, such as corolla and calyx morphology, floral sexuality, and inflorescence structure, have been used by a variety of authors (Moldenke, 1942c; Múlgura, 2002; Troncoso, 1974), to further delimit the two taxa.

The corollas in *Aloysia* are mostly salverform, sub-actinomorphic, four-lobed, with the adaxial lobe cleft. The lateral and superior lobes of the corolla are usually equal and vary in size relative to the inferior, often somewhat larger lobe. Some species have zygomorphic corollas, e.g., *A. macrostachya* (figs. 3-5), with the lateral lobes angled toward the lower lobe of the corolla. While the corollas of *Aloysia* are not as strongly bilabiate as those seen in *Lippia* or *Lantana*, they are noteworthy.

The calyx provides other useful taxonomic characters. It is usually four-lobed with trullate to subulate lobes or, occasionally, two-lobed with rounded lobes terminated by two apical teeth of varying length. Additionally, most four-lobed species are costate, with the costae extending to the lobes.

The fruits are ellipsoidal schizocarps which split into two, one-celled, one-seeded mericarps referred to as nutlets. The two halves articulate around a central, longitudinal suture, creating two transverse units of roughly equal size (fig. 8). The suture is impressed into the surface of the fruit leaving two free apical lobes. Occasionally, there may be an elongated collar formed by this suture creating an enlarged intermericarpal cavity (fig. 8).

The stigmas of *Aloysia* are usually capitate and apically oriented to sub-capitate and laterally oriented, approaching that of *Lippia* (figs. 6, 7). The stigma is essentially entire to bilobed and the lobes may be equal to oblique.

HABIT

The general habit of *Aloysia* is that of a shrub or small tree. Most taxa are medium sized shrubs 1-5 m tall. However, *A. virgata* has been reported as a tree up to 15 m high (*J. E. Montes 3434* [G], *R. Degen & M. Ortiz 838* [G]). In the present account, species are classified as sub-shrubs (e.g., *Xeroaloysia ovatifolia*), if they do not exceed 1 m in height. Height data were gathered from literature reports, label data, and field observations by the present author.

STEMS

The stems of *Aloysia* provide relatively few taxonomically useful characters. They are usually grey, longitudially multi-striate, and four to multi-angled. If large enough to be classified as a tree (e.g., in *A. virgata*), the stems may form deeply furrowed bark. The anatomy of the stems, while not investigated here, has been discussed by Bonzani et al. (2003) for *A. gratissima, A. polystachya*, and *A. citrodora*.

The pubescence of the stem can be of use in delimiting species. For example, *Aloysia peruviana* has hispidulous stems while *A. arequipensis* is puberulent. Several members of subgroup “*Sclerophylla*” have glabrous stems while the petioles, peduncles, and rachises are distinctly pilose.

PUBESCENCE

The nature, number, and placement of hairs on various surfaces of the plant can be taxonomically useful, as mentioned above. Glandular trichomes can be found in most species. The stalks of the glands are usually one-celled and sub-sessile, or rarely long-stalked and multi-cellular. Non-glandular hairs are present in all species and classified as villous, strigose, strigulose, scabrous, setose, or setulose. The setulose hairs on the apex of the ovary/schizocarp of *A. platyphylla* is a useful character distinguishing it from *A. virgata*. The long-stalked glandular trichomes on the rachis of *A. coalcomana* and A. *chiapensis*, are also distinctive.

LEAVES

Leaf morphology provides many utilitarian characters for distinguishing species within the genus. This includes variation in size, shape, margin, texture, pubescence, and petiole length. Length and width measurements were obtained from mature, midstem leaves and taken from base to apex of the laminae and across their widest points. Terms for leaf shapes are derived from Radford et al. (1974), and the Systematics Association Committee for Descriptive Terminology (1962).

The laminae or blades have margins that are entire to obscurely 1-4 toothed, dentate, crenate, crenulate, crenate-serrate, or serrate. Leaves classified as entire to obscurely 1-4 toothed (e.g., *Aloysia gratissima*), have 80-90% of the leaves entire, with a small percentage of leaves irregularly 1-4 toothed along the apical 2/3 of the blade. Species having entire margins (e.g., *A. polygalifolia* and *A. brasiliensis*) are usually entire throughout. Species with leaves classified as serrate, crenate, etc., are usually consistently toothed. Some taxa (e.g., *A. arequipensis* and *A. hatschbachii*), are basally entire and serrate along the distal 2/3.

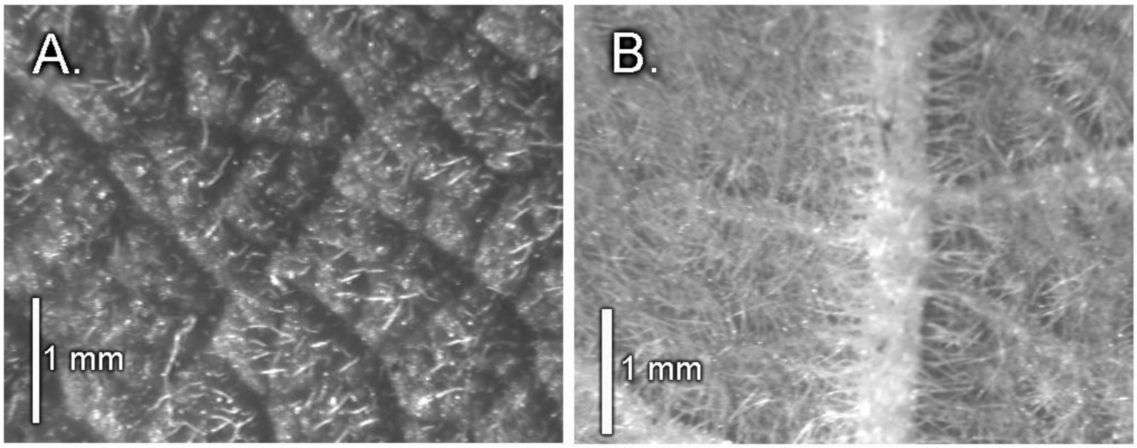

Figure 1: Light micrograph of *Aloysia macrostachya* leaf surfaces, 10x mag.: (A.) adaxial surface which is rugose and strigose with deeply impressed venation; and (B.) abaxial tomentose surface with prominent venation (*Siedo 1034* [TEX]).

Leaf surface morphology also provides useful taxonomic characters. The most common type of leaf blade is the thin, somewhat membranaceous, type found in *Aloysia gratissima*. Such leaves are essentially smooth and have little or no relief on the adaxial or abaxial surfaces. This is in contrast to species like *A. castellanosii* which has bullate leaves or *A. macrostachya* which has rugose leaves (fig. 1).

Leaf pubescence provides several useful taxonomic characters. Scabrous to strigose hairs adorn the adaxial surface of the leaves of most species (e.g., *A. virgata*), while the abaxial surface is usually tomentose. Strigulose hairs are present on *A. lycioides*, while *A. hatschbachii* has glabrous leaves. As already noted, glandular hairs also provide useful characters for species delimitation.

The presence or absence of a petiole and its length, when present, can also be informative. *Aloysia polygalifolia* has sessile leaves. Leaf dimensions vary considerably in this group, depending upon developmental stages. All measurements were generally taken from mature, midstem leaves. Leaf size in *Aloysia* varies from 0.5-11.0 cm in length and 0.2-6.0 cm in width.

INFLORESCENCES

The inflorescences in *Aloysia* are spicate racemes which may be solitary, 2-4 per axil, or ramified into panicles. The flowers are alternately arranged along the rachis and usually one of every 2-6 internodes is elongated resulting in clusters. In some species, like *A. polystachya*, the flowers are clustered tightly together and there are no apparent intervening internodes. In most species, the internodal regions are variable in length, depending upon the maturity of the developing spike.

The rachis is generally strigulose, setulose, or tomentose and may have an understory of short or, rarely, long-stalked glandular trichomes. The density and type of hairs varies and tends to be most dense in those species occupying arid regions, e.g., *A. sonorensis*. The individual flowers are sub-sessile (0.2-0.5 mm) to pedicellate (0.5-3.0 mm) and are always subtended by a floral bract. As already mentioned, the indeterminate rachis often continues to elongate after anthesis and through fruit maturation.

Compound inflorescence morphology has been studied and I refer the reader to Múlgura de Romero et al. (2002) for a complete discussion. There are two main patterns of compound inflorescence present in *Aloysia*. The most common pattern is a homothetic pleiobotryum with specialized long and short paracladia. Three species (*A. citrodora*, *A. fiebrigii*, and *A. herrerae*) have paniculiform heterothetic pleiobotrya (Múlgura de Romero et al., 2002).

Figure 2: Photograph of *Aloysia macrostachya* showing inflorescence morphology; note the arrow indicating the position of the floral bract subtending each flower in the inflorescence; ruler in cm (*Siedo 1034* [TEX]).

BRACTS

There are two types of bracts present in *Aloysia*: foliaceous bracts subtending panicles, and floral bracts subtending flowers in an inflorescence. For the few paniculate species (e.g., *A. citrodora*), there may be a pair of foliaceous bracts subtending the panicle, but the inconsistent presence of this character makes it of poor utility. All species of *Aloysia* have floral bracts subtending each flower of the inflorescence (fig. 2). They are usually reduced, narrowly lanceolate to ovate, or elliptic, 1-nerved, and approximately equivalent to the calyx in length. In a few species (e.g., *A. barbata* and *A. nahuire*), the bracts are foliaceous, elliptic, 3-nerved, and 2-5 times the calyx in length. The inflorescences of such species are said to be "hop-like," a notable divergence from the slender, gracile form found in most species of *Aloysia*.

CALYCES

The calyces of *Aloysia* are usually four-lobed (figs. 3, 5) or sometimes two-lobed. The latter are rare and considered to be basal lineages more closely related to *Lippia* than other taxa. The two-lobed calyces have divisions which are apically rounded to bidentate. The four-lobed calyces may be actinomorphic, sub-actinomorphic, or somewhat zygomorphic.

The actinomorphic species have a calyx which is regular with the lobes equivalent in length and the sinuses equivalent in depth. Zygomorphic species are at the other extreme with a calyx divided into lateral halves by sinuses which are deeper superiorly and inferiorly. Lateral sinuses are usually up to half as deep as the superior and inferior sinuses. Sub-actinomorphic calyces have nearly regular tubes but the superior and inferior sinuses are only slightly deeper than the lateral pair. For the purposes of this paper, a 4-lobed, weakly zygomorphic calyx refers to one in which the major plane of division runs vertically. The lobes are acute, acuminate, or subulate and usually somewhat conduplicate with longitudinal folds or costae extending along the lobes. This gives the calyx a roughly four-angled appearance in cross section. As the fruit develops, the basal portion of the calyx expands, becoming somewhat elliptic in cross section.

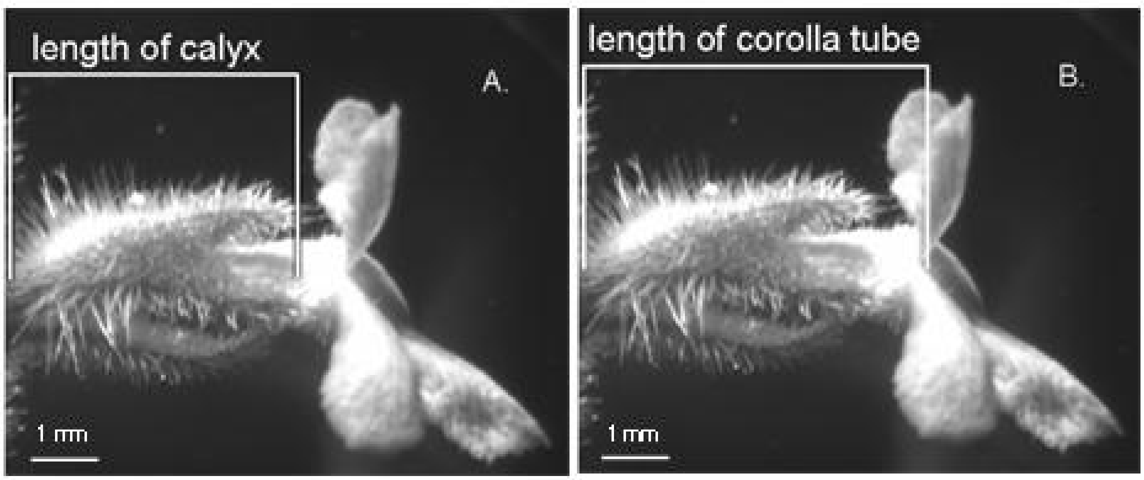

Figure 3: Photomicrographs of the flower of *Aloysia macrostachya* depicting the (A.) length of the calyx; and (B.) length of the corolla tube (*Siedo 1034* [TEX]).

The 2-lobed calyces are divided vertically into two halves. The lobes may be rounded, or ornamented with apical teeth. In *Aloysia chiapensis* the lobes are entire, while in *A. catamarcensis* the lobes are bidentate with teeth 0.5-1.0 mm long. The calyx is roughly circular in cross-section, expanding as the schizocarp develops.

COROLLAS

Corollas in *Aloysia* are usually salverform and variously sub-actinomorphic to zygomorphic (fig. 4). The tube is usually straight and more or less cylindrical or may be slightly a flared basally. The four lobes of the limb are at a 90° angle and curve inward until they are nearly parallel to the tube or, in the zygomorphic species, the superior lobe is at a 90° angle to the tube while the lower lobes assume an angle of ca. 130°.

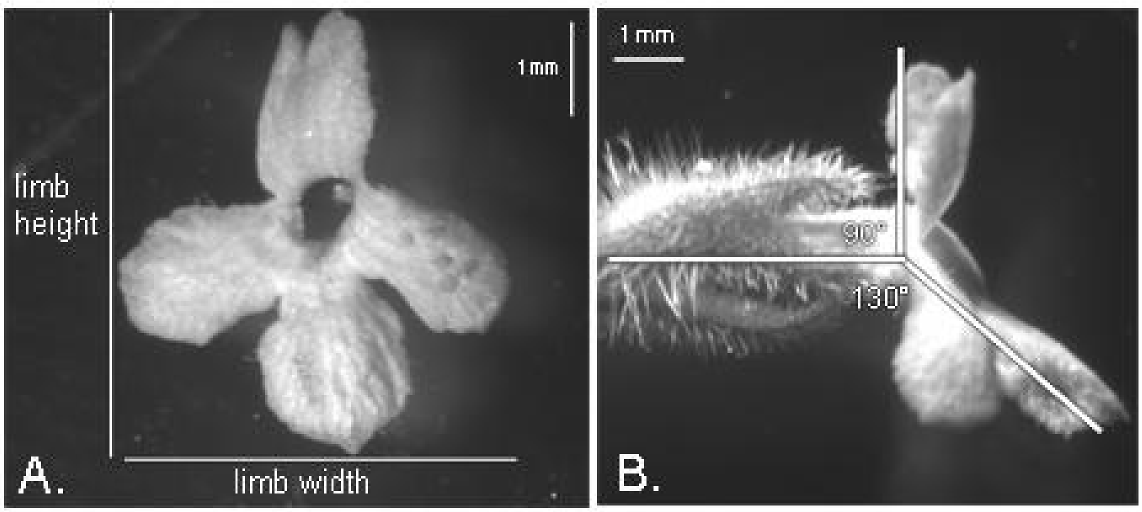

Figure 4: Light micrographs of the flower of *Aloysia macrostachya* showing (A.) limb height and width and (B.) lateral view showing the angle of the lobes (*Siedo 1034* [TEX]).

In the sub-actinomorphic species the lobes are essentially equal in length and the superior lobe is apically notched. In the species with zygomorphic corollas the two lateral lobes are oriented ca. 20 degrees below the horizontal (fig. 4). These two lobes, along with the inferior lobe, form the inferior lip of the corolla. In addition to being wider, the inferior lobe is slightly longer than the superior lobe.

The corolla is variably villous, pubescent, or puberulent along the tube and limb. The flowers in all species are villous within from 1/2 to 3/4 of the way up the tube to about the level of the throat; occasionally these hairs will extend onto the limb. The exterior of the corolla tube provides additionally useful characters. Some species have villous hairs along the apical 1/2 to 3/4 of the tube (e.g., *A. herrerae*), and the hairs may or may not extend onto the abaxial surface of the lobe. Most species are externally glabrous along the tube and limb.

ANDROECIUM

The stamens of *Aloysia* are epipetalous and inserted just below the level of the throat. They are often sub-equivalent or, in those species with bilabiate corollas, didynamous with the upper pair slightly exserted. The theca are longitudinally dehiscent, terminally mounted on the stalk, and adaxially oriented (fig. 6a). The stamens are usually surrounded by antrorse villous hairs arising from the corolla, these start at half to three-quarters of the way above the tube to about the level of the throat, or sometimes to the limb. The orientation of the anthers, combined with the presence of the villous hairs, reportedly prevents self-pollination of the flowers (Atkins, 2004).

POLLEN

The pollen of *Aloysia* is tricolporate, psilate, prolate, with a tectate, perforate exine (Raj, 1983; Jones et al., 1995). All pollen of the Verbenaceae are radially symmetrical, tricolporate (rarely 4-colporate), and isopolar (Jones et al., 1995; Atkins, 2004). Variation between genera does occur, however, Raj (1983) identified four novel

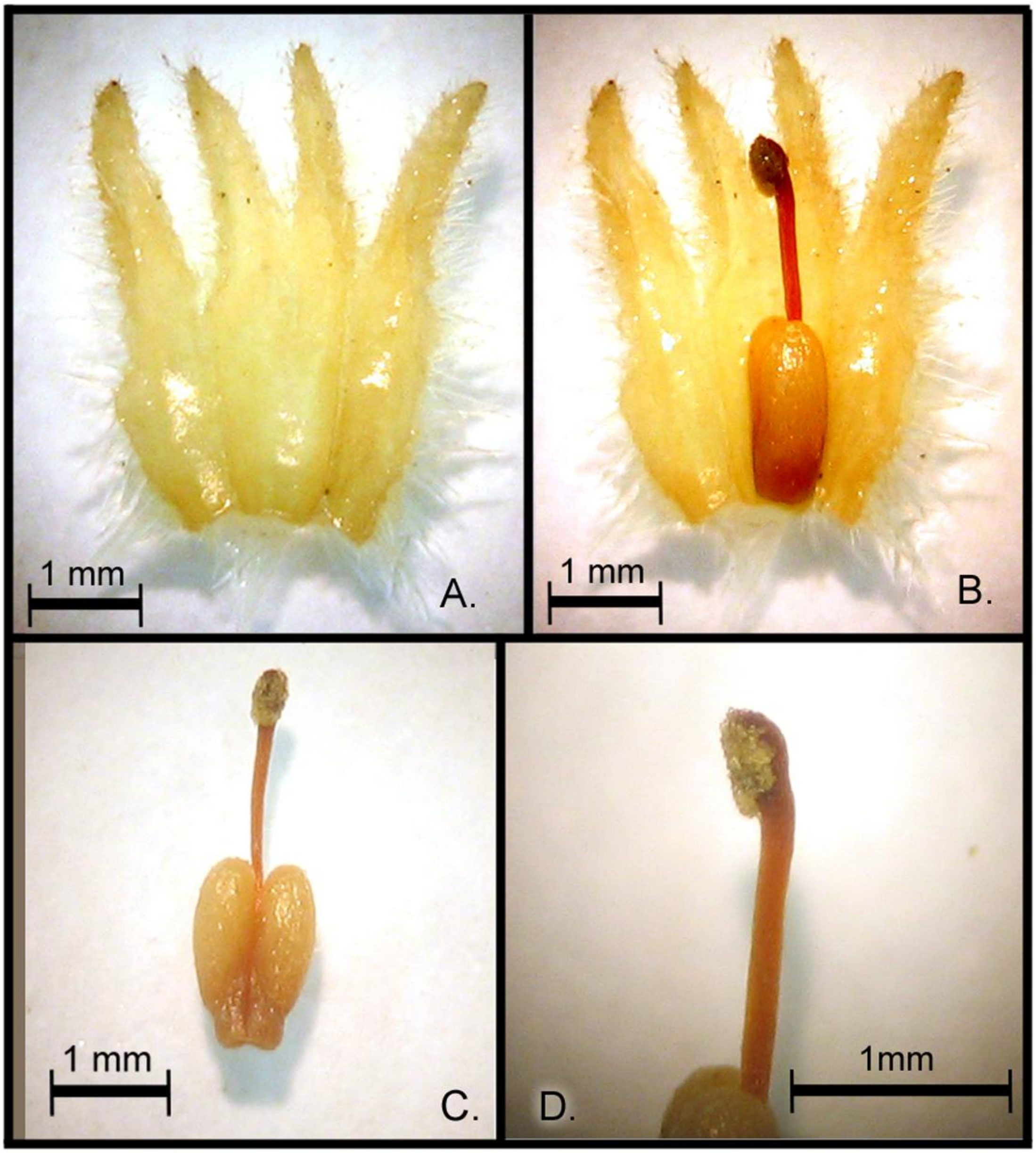

Figure 5. Light micrographs of *Aloysia macrostachya* showing (A.) interior of calyx, 10x mag.; (B.) calyx with gynoecium in place, 10x mag.; (C.) gynoecium, 10x mag.; (D.) close-up of sub-capitate stigma, 20x (*Siedo 1034* [TEX]).

pollen types within the tribe Lantaneae, these occurring in the genera *Bouchea*, *Chascanum*, *Phyla*, and *Stachytarpheta*.

GYNOECIUM

The stigmas of *Aloysia* are usually bilobed and erect. They are always contained within the corolla tube, generally below the level of the anthers. In *Lippia* and *Lantana*, the stigmas are mostly laterally disposed (fig. 6b) rather than apically (fig. 6a). Some species, e.g., *A. macrostachya*, have a stigma which is intermediate between these two conditions and are described as sub-capitate and laterally disposed (fig. 5d). Troncoso (1974), Munir (1993), and Atkins (2004) have pointed out the utility of using stigma morphology to separate the genera of the Lantaneae.

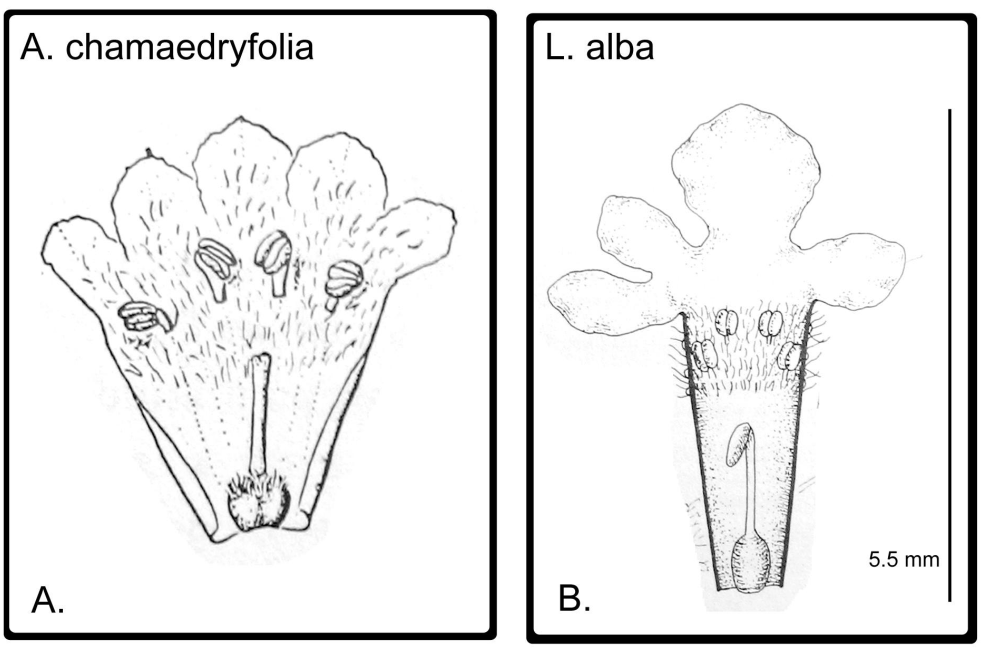

Figure 6: Illustrations showing stigma morphology of (A.) *Aloysia chamaedryfolia*, 6x mag.; and (B.) *Lippia alba*. Figure (6A) reproduced from Botta (1979); (6B) from Munir (1993).

Pollination is reported to occur via an insect proboscis which picks up pollen grains from the anthers after feeding on the nectaries at the base of the ovary (Atkins, 2004). The location of the stigmatic surface below the level of the anthers prevents self-pollination since grains are collected on exit. Reported and observed pollinators include several species of Lepidoptera, Hymenoptera, and Diptera (Atkins, 2004; pers. obs.).

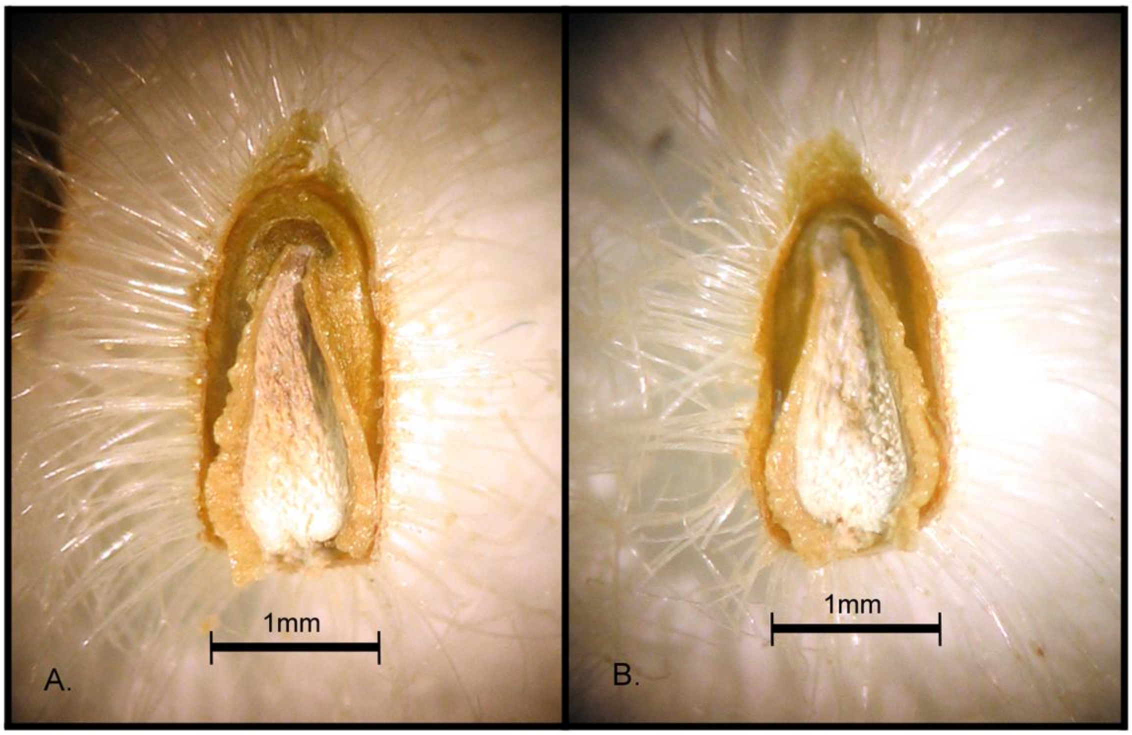

Figure 7: Light micrograph showing the opposing halves of a schizocarp of *Aloysia barbata*, 20x mag.; note the intermericarpal cavity and the setose hairs exceeding 1 mm in length (*Gentry 3755* [UC]).

FRUITS

The fruits of *Aloysia* are schizocarps composed of two mericarps which at dehiscence are referred to as nutlets (figs. 7-8). The schizocarp is attached basally and the two mericarps articulate along a longitudinal fissure which divides it into two transverse units. It is widely ellipsoid to obovoid in shape and somewhat flattened adaxially to abaxially, giving it a roughly elliptic cross section. The apex of the fruit is bilobed and the lobes range from 0.1 to 0.5 mm long. The seed germination of *A. lycioides* is reportedly positively photoblastic (Da Rosa et al., 2001). I refer the reader to Matesevach Becerra et al. (2000) for a detailed description of the fruit and seed of *A. polystachya*.

There is usually at least a small intermericarpal cavity, but in some species (e.g. *A. barbata*), the suture becomes enlarged, forming a collar (fig. 7). The width of this collar usually determines the size of the enclosed cavity. In the present treatment, the intermericarpal cavities are referred to as either reduced, or enlarged for those with an elongated collar. The intermericarpal walls may be whitish and papillate or smooth and lustrous.

Aloysia schizocarps are readily dehiscent at maturity. The accrescent calyx is usually adorned with setose hairs, ca. 1-2 mm long. Matesevach Becerra et al. (2000) reported wind as the agent of dispersal in *Aloysia polystachya*. The nutlets are easily dislodged from the rachis and often cling to fur, and perhaps other surfaces; the setose hairs probably serve as an effective means of dispersal (pers. obs.).

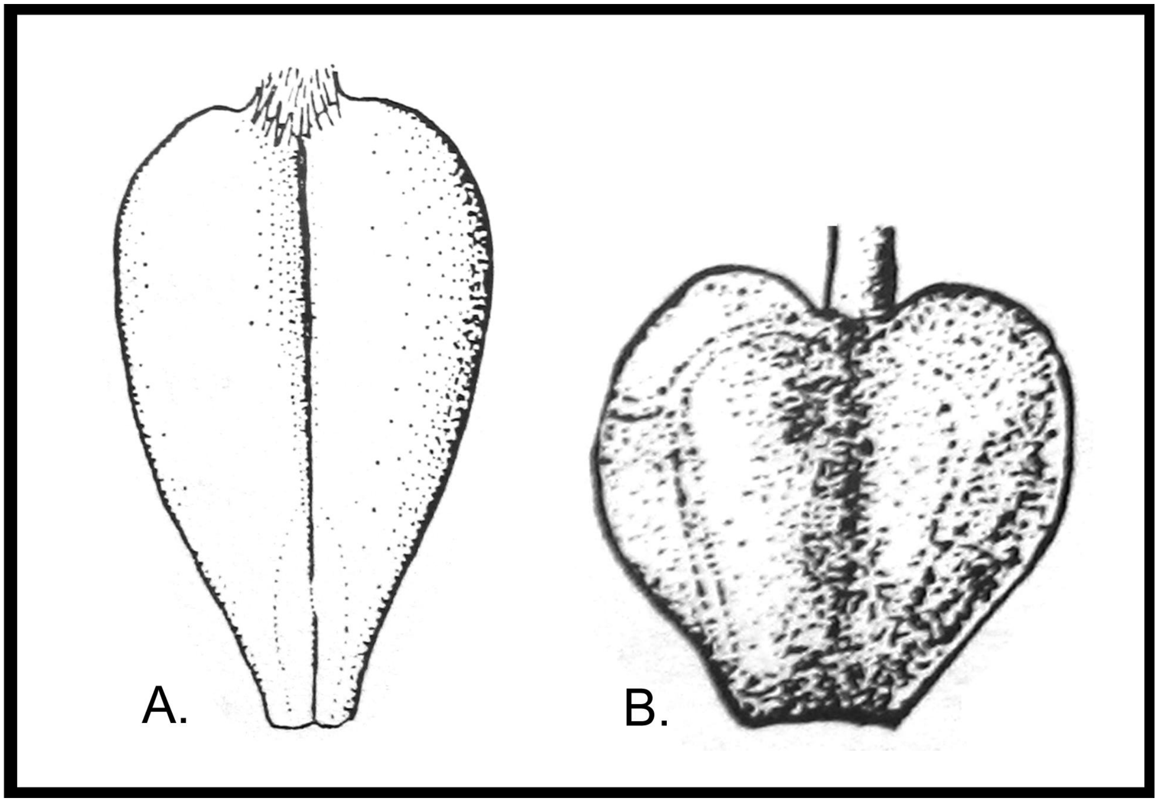

Figure 8: Illustrations showing the fruit morphology of (A.) *Aloysia. citrodora*, 12.5x mag (*Cabrera 16877*); and (B.) *A. fiebrigii*, 12.5x mag (*Fiebrig 3036*); reproduced from Botta (1979).

Chapter 5: Cladistic Analysis

A morphological cladistic analysis of *Aloysia* was performed primarily to study infrageneric relationships among the taxa involved. A secondary goal was to provide support for the monophyly of *Aloysia* and its segregation from *Lippia*. All 39 taxa of *Aloysia* were included and four representative members of *Lippia* were chosen as out-groups. Characters selected mirror those discussed in chapter four with the addition of character states necessary for out-group comparison. Morphological character state data were collected from herbarium specimens. A heuristic search was performed to find the most parsimonious trees and a strict consensus tree was computed and saved. In addition, a bootstrap analysis was conducted and a bootstrap 50% majority-rule tree was computed and stored. The character key (table 4), character matrix (table 5), a strict consensus tree (fig. 9), and a bootstrap 50% majority-rule tree (fig. 10) are presented below.

MATERIALS AND METHODS

All members of *Aloysia* were included in this analysis for a total of 39 in-group taxa. Four additional members of *Lippia* were selected as the out-group taxa for a total of 43 taxa. The members of *Lippia* included in the analysis were selected to be representative of the diversity within the genus, as well as being available to workers in many herbaria. All four sections of *Lippia* are represented in this analysis; *Rhodolippia*, *Goniostachyum*, *Dipterocalyx*, and *Zapania*.

The fifty morphological characters and character states were originally coded for this analysis and are discussed in detail below. Many characters have been discussed in chapter four so an effort has been made to minimize redundancy. Character state data were collected from herbarium specimens generously provided by the following institutions: ARIZ, BA, BM, CAS, CTES, F, G, GH, IEB, JEPS, K, LIL, MBM, MCNS, MERL, MEXU, MO, S, SGO, SI, UC, US, and W. Over 6120 sheets of *Aloysia* were examined in the course of this study along with ca. 200 sheets of *Lippia*.

Uninformative characters (characters 48-50) were excluded from the analysis for a total of 47 informative characters of the 50 initially selected. A simple heuristic search and a bootstrap analysis with a heuristic search were performed using PAUP* 4.0b10 (Swofford, 1998). All characters were unordered, equally weighted, and multi-state taxa were treated as polymorphic. The branch-swapping algorithm used was TBR (tree-bisection-reconnection) and the trees generated were un-rooted. Starting trees were obtained via stepwise addition with a random addition sequence started from a random seed. For the simple heuristic search, 100 addition sequence replicates were run, a maximum of 10,000 trees were saved per replicate, and one tree was held per step during stepwise addition. During the bootstrap analysis, 1000 bootstrap replicates were conducted with 5 addition sequence replicates per rearrangement. A maximum of 1000 tree were saved per addition sequence replicate and one tree was held per step during stepwise addition.

MORPHOLOGICAL CHARACTERS AND CHARACTER STATES

Leaves (48-31, 38)

The pubescence of the leaves proved to have great utility when distinguishing taxa. The margins were scored for presence or absence of minutely scabrous hairs (**48**). While this character was found to be parsimony uninformative it is included here as a taxonomically useful autapomorphy seen only in *Aloysia cordata*. The adaxial

Table 4: Character key used in cladistic analysis; parsimony uninformative characters are indicated in bold.

Char.	Description
1	bract apex acute=0; acute to short-acuminate=1; long acuminate=2
2	bract shape linear to lanceolate=0; bracts elliptic=1; bracts obovate=2; broadly ovate=3
3	bract midrib present to obscure=0; three-nerved=1
4	calyx 4-lobed=0; 2-lobed=1
5	calyx lobe margins involute; no=0, yes=1
6	calyx lobes trullate=0; subulate=1; rounded to obscurely bidentate=2; triangular=3
7	calyx setose=0; puberulent to hispidulous=1
8	calyx un-cleft=0; cleft abaxially=1
9	corolla tube 1-2 times the length of the calyx=0; 2-5 times the length of the calyx=1
10	corolla glabrous=0; pubescent=1
11	corolla sub-actinomorphic=0; zygomorphic=1
12	corolla white=0; pink to lavender=1; yellow=2
13	inflorescence: flowers alternate=0; essentially 4-ranked=1
14	inflorescence: rachis 3-15(-25) cm long=0; 1-5 cm long=1
15	inflorescence: axillary=0; terminal=1
16	inflorescence: bearing branches indeterminate=0; determinate=1
17	inflorescence: erect=0; lateral=1; pendant=2
18	inflorescence: lax flowered=0; congested=1; imbricate=2
19	inflorescence: paniculate to spicate=0; capitulate=1
20	inflorescence: solitary=0; >1 per axil=1
21	leaves adaxially scabrous/strigose=0; hispidulous=1; velutinous/incanous=2; glabrous=3
22	leaf blades apically acute to acuminate=0; sub-acute to obtuse=1; rounded=2
23	leaf blades basally acute=0; attenuate=1; rounded=2; truncate=3; cordate=4
24	leaf blades elliptic=0; leaves ovate to obovate=1; leaves lanceolate=2; linear=3
25	leaves entire to obscurely serrate to dentate distally=0; crenate=1; dentate=2; serrate=3
26	leaves essentially smooth, venation not impressed=0; leaves rugose=1; leaves bullate=2
27	leaves membranous=0; leaves sclerophyllous=1
28	leaves opposite=0; leaves 3(-4)-whorled=1; leaves alternate=2
29	leaves decussate=0; leaves not=1
30	leaves petiolate=0; leaves sessile=1
31	leaves variably disposed, not adpressed=0; leaves antrorsely adpressed=1
32	inflorescence: pedicels 0-0.5 mm=0; pedicels 0.5-2.0 mm long=1
33	schizocarp glabrous=0; schizocarp apically pilose to hispidulous=1
34	schizocarp: intermericarpal cavity reduced=0; cavity enlarged=1
35	schizocarp lobes up to 0.1 mm long=0; lobes 0.1-0.5 mm long=1; un-lobed=2
36	stigma apically disposed=0; stigma laterally disposed=1
37	stigma essentially un-lobed=0; stigma lobes oblique=1
38	leaf margins revolute; no=0, yes=1
39	inflorescence rachis with long-stalked glandular trichomes or not; absent=0, present=1
40	corolla tube flared basally; absent=0, present=1
41	inflorescence elongate=0; sub-compact=1; compact=2; capitulate=3
42	calyx sub-actinomorphic=0; weakly zygomorphic=1; strongly zygomorphic=2
43	calyx tubular=0, campanulate=1
44	inflorescence rachis equaling to exceeding peduncle in length=0, rachis shorter than peduncle=1
45	inflorescence rachis straight to gently curved=0; flexuous=1
46	calyx lobe margins ciliate; no=0, yes=1
47	corolla glandular; no=0, yes=1
48	**inflorescence rachis pilose to hispidulous=0; rachis velutinous to incanous=1**
49	**leaf margins minutely scabrous; no=0, yes=1**
50	**leaves basally free=0; leaves clasping the stem=1**

pubescence was also classified (**21**) and scored as scabrous to strigose, hispidulous, velutinous to incanous, or glabrous. The latter character demonstrates convergence but is of great utility in resolving taxa at the varietal level. The outline of the leaf was analyzed in several ways. The shape of the leaf apex (**22**) was scored as acute to acuminate, sub-acute to obtuse, or rounded. This character displays polymorphism in several species but does help to resolve taxa at the species level. The base of the blade was scored for two characters. The shape (**23**) was scored as acute, attenuate, rounded, truncate, or cordate. This character demonstrates convergence, since distantly related species in *Lippia* and *Aloysia* have similar character states, but it is useful in resolving species level relationships. The base of the was scored as free or clasping (**50**) in reference to the autapomorphy of clasping leaf bases seen only in *Aloysia salviifolia*. The outline of the blade (**24**) was scored as elliptic, ovate to obovate, lanceolate, or linear. The latter character displays considerable convergence between distantly related species, but is of great use in resolving varietal and species level relationships.

Two leaf margin characters were included in this analysis. The margins were classified by margin type (**25**) and scored as entire, crenate, dentate, or serrate. Several species are polymorphic with respect to the above character states and were scored appropriately. The margins of the leaves may also be essentially flat or revolute (**38**). This character appears to have evolved multiple times within *Aloysia* and *Lippia*.

Leaf texture and surface features were also included in this analysis due to their utility in resolving species level relationships. Adaxial surfaces (**26**) were scored as essentially flat, rugose, or bullate. The texture (**27**) was classified as membranous or sclerophyllous, the former character state is a synapomorphy seen only in subgroup *"Sclerophylla."*

Table 5: Character matrix used in the cladistic analysis; polymorphic character states are indicated with a "/" and parsimony uninformative and excluded characters (48, 49, & 50) are indicated in bold.

Taxa ↓ Characters →	**1----- -----10**	**11---------20**	**21---------30**	**31-----------40**	**41---------50**
A. citrodora	1000101001	0100110001	0002000110	00/100011000	0000000**000**
A. fiebrigii	1000101001	0100110001	0000000110	0000101000	0010000**000**
A. herrerae	1000101001	0100110001	0000000010	0010000000	0000000**000**
A. virgata var. *virgata*	1000110000	0000001001	0022310000	0100001000	0110100**000**
A. virgata var. *laxa*	1000110000	0000001001	0031310000	0110001000	0100100**000**
A. virgata var. *urticoides*	1000110000	0000001001	0022310000	0100001000	0110100**000**
A. castellanosii var. *castellanosii*	0/1110100000	1100002000	1131220000	0000110100	0000100**000**
A. castellanosii var. *magna*	2110100001	1100002000	1131220000	0000110100	0000100**000**
A. velutina	1000101001	0000110001	2121110000	0010110000	0000100**100**
A. macrostachya	1000101000	1100000000	112111/20000	0000110100	0000100**000**
A. scorodonioides var. *scorodonioides*	1000101001	1100000000	022111/20000	0000010000	0000100**000**
A. scorodonioides var. *mathewsii*	1000100001	1100000000	122111/20000	0000010000	0000100**000**
A. scorodonioides var. *hypoleuca*	1000100001	0100000000	120111/20000	0000010000	0000100**000**
A. wrightii	1000100001	0000000000	0221110000	0000000000	0000000**000**
A. gratissima var. *gratissima*	1000100000	0000000000	0000000000	0000000000	0000000**000**
A. gratissima var. *schulziae*	1000100001	0000000000	0000000000	0000000000	0000000**000**
A. gratissima var. *angustifolia*	1000101001	0000000000	0003000000	0000000000	0000000**000**
A. gratissima var. *chacoensis*	1000101001	0000000000	0000000000	0000000000	0000000**000**
A. lycioides var. *lycioides*	1000101000	0000001000	0211000000	0000000000	0100100**000**
A. lycioides var. *schulziana*	1000100000	0000001000	011100/10000	0000000000	0100100**000**
A. oblanceolata	1000100001	0000000000	0211001000	0000000000	0100000**000**
A. cordata	1000100001	0000000000	3041001111	1000011000	0100100**010**
A. brasiliensis	1000100001	0100000000	0000001110	0000011100	0100100**000**
A. polygalifolia	1000100001	0100000000	0031001111	1000011000	0100100**000**
A. hatschbachii	1000101001	0100000000	3211001000	0000000100	0100100**000**
A. chamaedryfolia	1000101001	0100000000	0131201000	0010000000	0100100**000**
A. crenata	1000101001	0000000000	2100111110	0000101000	0100100**000**
A. arequipensis	1000101011	0100000000	0201010000	0000100000	0010000**000**
A. peruviana	1000101010	0100000000	0131210000	0000010000	0010000**000**
A. minthiosa	1000101001	0100000100	0211100000	0000110000	0000000**000**
A. salviifolia	1000101000	0000000100	0131010001	0000110100	0000100**001**
A. polystachya	1200031101	0001000101	0000000211	0000110000	2000000**000**
A. catamarcensis	1200031101	0101000100	0121110000	0000110000	2000000**000**
A. dusenii	1001021001	0000000000	0000000000	0000010000	0200010**000**
A. sonorensis	0211020001	1201000000	0101110000	0001111001	1200011**000**
A. barbata	0111020001	1001001000	0101310000	0001110011	1200111**000**
A. nahuire	0111020001	1001001000	0002310000	0001110011	1200111**000**
A. coalcomana	0111020001	1001001000	0002310000	0101110011	1200111**000**
A. chiapensis	0111020001	1001001000	2101310000	0101110011	1200111**000**
Lippia graveolens	0301021011	1211000/1211	1120/10/310000	0000211001	3200011**000**
Lippia alba	1301021011	10/111000210	111/30/1310000	0000210001	3200/1011**000**
Lippia turnerifolia	1001021011	1211000210	10/1102/300000	0001211001	3201011**000**
Lippia myriocephala	1311021001	10/211000211	1010000000	00000/210001	3201011**000**

Leaf arrangement and disposition were scored for three characters. The arrangement of the leaves at the node (**28**) was scored as opposite, 3(-4)-whorled, or alternate. This character appears to display parallelism since 3(-4)-whorled leaves are only present in subgroup *Aloysia* and *"Sclerophylla"*. Leaf disposition between nodes (**29**) was scored as decussate or not. This may appear to be uninformative since all species in this genus with opposite leaves have decussate leaves. However, species with alternate or whorled leaves do not have decussate leaves. Taxa were also scored for the presence or absence of antrorsely adpressed leaves (**31**). This synapomorphy is seen only in *Aloysia cordata* and *A. polygalifolia*.

The presence or absence of petioles (**30**) was recorded for all taxa. This character appears to have evolved more than once since it is present in three unrelated species; *Aloysia salviifolia*, *A. cordata*, and *A. polygalifolia*.

Inflorescences (13-20, 32, 39, 41, 44-45)

The disposition of the flowers on the rachis (**13**) was scored as alternate or four-ranked. The former character state is seen only in subgroup "*Microstachya"* of the genus *Aloysia* and in the genus *Lippia*.

The length of the inflorescence (**14**) was scored as 3-15(-25) cm or less than 5 cm. Most species have the former condition, while shortened inflorescences, less than 5 cm, are seen in subgroup *"Microstachya," "Pseudolippia,*" and the out-group, *Lippia*.

Inflorescences were surveyed for two characters. The relative location of the inflorescence on the branch (**15**) was scored as axillary or terminal. Terminal inflorescences are present in all members of subgroup "*Aloysia*" and in *A. velutina*. The nature of the inflorescence-bearing branch (**16**) was scored as either determinate or indeterminate. The disposition of the inflorescence (**17**) was scored as erect, lateral, or pendant. Most species in *Aloysia* have erect inflorescences. The character state of lateral inflorescences appears to have evolved more than once and is seen in several distantly related species including *Aloysia virgata*, *A. lycioides*, and those of subgroup *"Pseudolippia"*. Pendant inflorescences are an autapomorphy seen only in *A. castellanosii*.

Flower density on the rachis (**18**) was classified as lax, congested, or imbricate. This character is informative at the generic and infrageneric level. A lax inflorescence is the most common character state in the genus *Aloysia*, while a congested inflorescence is seen in subgroup *"Microstachya"*. An imbricate inflorescence is seen only in the out-group genus, *Lippia*.

Inflorescence types (**19**) were scored as paniculiform, spicate, or capitulate. Most species in the study have spicate inflorescences while paniculiform inflorescence are seen only in subgroup *"Aloysia"* and *A. velutina*. Capitulate inflorescences are seen only in the genus *Lippia*.

The pubescence of the inflorescence rachis (**48**) was scored as pilose to hispidulous or velutinous to incanous. This character is parsimony uninformative since the former character state is an autapomorphy seen only in *Aloysia velutina*.

The number of inflorescences per leaf axil (**20**) was scored as solitary or >1 per axil. For species with terminal inflorescences, the inferior, axillary inflorescences were scored. This character displays some convergence since it is seen in members of subgroup *"Aloysia"*, e.g., *A. virgata* and *A. polystachya*, as well as many species of *Lippia*.

The length of the pedicels (**32**) was scored as <0.5 mm or 0.5-2.0 mm long. Most members of *Aloysia* display the former character state, as do most *Lippia*. The latter character state is rare but does appear to display convergence since it occurs in the distantly related taxa *A. virgata*, *A. coalcomana*, and *A. chiapensis*.

Taxa were scored for the presence or absence of long-stalked, glandular trichomes (**39**) along the peduncle and rachis of the inflorescence. This character is synapomorphic and seen in all members of subgroup "*Pseudolippia*," except *A. sonorensis*.

The overall shape of the inflorescence (**41**) was scored as elongate, sub-compact, compact, or capitulate. Elongate inflorescences are the most common type in the genus *Aloysia*. Sub-compact and compact inflorescences are synapomorphies seen only in subgroups *"Pseudolippia"* and *"Microstachya"* respectively. Capitulate inflorescences are only seen in the genus *Lippia*, the outgroup.

The length of the rachis relative to the length of the peduncle (**44**) was scored as equaling to exceeding the peduncle in length or shorter than the peduncle in length. The latter character state is confined to *Lippia* and is a common to most, but not all, members of this group.

The shape of the rachis and peduncle (**45**) was scored as straight to slightly curved or flexuous. The character appears to have evolved more than once but is informative at the species level.

Bracts (1-3)

The floral bracts were evaluated using three characters. The apex (**1**) was scored as acute, acute to short-acuminate, or long-acuminate. Most taxa have acute to short-acuminate bracts. Acute bracts are synapomorphic and seen only in subgroup *"Pseudolippia"*. Long-acuminate bracts are autapomorphic and seen only in *Aloysia castellanosii* var. *magna*.

The overall shape of the floral bracts (**2**) was scored as linear to lanceolate, elliptic, obovate, or broadly ovate. Most *Aloysia* have linear to lanceolate floral bracts. Elliptic bracts appear to have evolved more than once since they are present in *A. castellanosii* and in members of subgroup *"Pseudolippia"*. Obovate bracts display some parallelism since they are only seen in *A. sonorensis* and subgroup *"Microstachya."* Broadly ovate bracts are seen in some species of *Lippia* but are not present in *Aloysia*.

Finally, the venation of the bracts (**3**) was scored as a one-nerved (with a single midrib) or as three-nerved. Most taxa of *Aloysia* display the former character state while three-nerved bracts appear to have evolved more than once. All members of subgroup *"Pseudolippia"*, *A. castellanosii*, and some members of *Lippia* have three-nerved floral bracts.

Calyces (4-8, 42-43, 46)

The calyx lobes yielded four characters. The number of lobes (**4**) were scored as four-lobed or two-lobed. The latter character state is seen only in group *"Pseudolippia"* and the genus *Lippia*. The lobes were also scored for the presence or absence of an involute margin (**5**). Most taxa of *Aloysia* have involute margins on the calyx lobes while subgroups *"Microstachya," "Pseudolippia,"* and the genus *Lippia* all have essentially flat margins on their calyx lobes. The shape of the lobes (**6**) was scored as trullate, subulate, rounded to obscurely bidentate, or triangular. Most taxa of *Aloysia* have trullate calyx lobes, while members of the genus *Lippia* generally have rounded to bidentate lobes. The latter character state is also shared by the group *"Pseudolippia*." Subulate calyx lobes are autapomorphic and seen only in *A. virgata*, while triangular calyx lobes are synapomorphic and unique to subgroup *"Microstachya."* The presence or absence of ciliate hairs along the calyx lobe margins (**46**) was also recorded. Most taxa lack ciliate calyx margins and this character state is seen only in group *"Pseudolippia"* of the genus *Aloysia* and the genus *Lippia*.

The exterior pubescence of the calyx (**7**) was scored as setose or puberulent to hispidulous. This character appears to display a great deal of convergence but is of utility in resolving subgroup and species level relationships.

Taxa were scored for the presence of absence of an adaxial cleft in the calyx (**8**). This character is synapomorphic and present only in subgroup "*Microstachya*."

The morphology of the calyx was scored for two characters. Symmetry of the calyx (**42**) was scored as sub-actinomorphic, weakly zygomorphic, or strongly zygomorphic. A sub-actinomorphic calyx symmetry is the most common in the genus *Aloysia*, while weakly zygomorphic calyces are limited to a few related species, e.g., *A. virgata* and *A. lycioides*. A strongly zygomorphic symmetry is confined to members of the group "*Pseudolippia*," and the genus *Lippia*. The overall shape of the calyx (**43**) was scored as tubular or campanulate. Most taxa in this analysis have a tubular calyx and this state is considered symplesiomorphic. The latter character state appears to have evolved multiple times since it is present in *Aloysia fiebrigii*, *A. virgata*, *A. arequipensis*, and *A. peruviana*.

Corollas (9-12, 40, 47)

The length of the corolla tube relative to the length of the calyx (**9**) was scored as one to two times the length of the calyx or as two to five times the length of the calyx. Most taxa display the former character state while the latter is confined to *Aloysia arequipensis*, *A. peruviana*, and most species of *Lippia*.

The presence or absence of external pubescence on the corolla (**10**) is highly utilitarian at the specific and varietal level. The absence of pubescence on the exterior of the corolla appears to be symplesiomorphic since it is present in *Lippia* and most members of *Aloysia*. Within *Aloysia*, however, it displays a good deal of parallelism since it is present in several species from different clades.

The symmetry of the limb of the corolla (**11**) was scored as either sub-actinomorphic or zygomorphic. Most taxa display the former character state while the latter is confined to a few distantly related species. The character state of a zygomorphic corolla appears to have evolved more than once within the genus *Aloysia*.

The color of the corolla (**12**) was scored as white, pink to lavender, or yellow. Most *Aloysia* have a white corolla while the yellow corolla of *Aloysia sonorensis* is also seen in *Lippia*. Pink to lavender corollas are present in several distantly related members of *Lippia* and *Aloysia* and appear to have evolved more than once.

The shape of the corolla tube (**40**) was observed to be basally flared in most members of *Lippia* and in subgroup *"Pseudolippia"* of *Aloysia*. This character was scored as present or absent and appears to be symplesiomorphic.

The presence or absence of sub-sessile, glandular trichomes (**47**) along the distal portion of the corolla tube was scored for all taxa. This character state is commonly seen in *Lippia* and is only present in *Aloysia* in members of subgroup *"Pseudolippia."*

Stigmas (36-37)

The morphology of the stigmatic surface was scored for two characters. The disposition of the surface (**36**) was classified as either apically or laterally disposed. The latter character state is commonly seen in *Lippia* but is present in distantly related members of *Aloysia* such as *A. macrostachya* and the *"Pseudolippia"* group. Most members of *Aloysia* have an apically disposed stigmatic surface. The presence of lobes on the stigma (**37**) was scored as essentially un-lobed or as conspicuously lobed with the lobes oblique. The latter character state is seen in several members of *Aloysia* and *Lippia*. It appears this character evolved multiple times within both genera.

Fruits (33-35)

The schizocarps offer several relevant characters for the present analysis. The presence or absence of apical hairs (**33**) on the schizocarp was recorded. This character displays some polymorphism in species like *A. citrodora* and appears to have evolved multiple times since it is seen in several distantly related species. However, this character is of good utility is resolving specific and varietal level relationships. The size of the intermericarpal cavity (**34**) was scored as either reduced or enlarged. Most taxa have a reduced intermericarpal cavity, while only members of subgroup *"Pseudolippia"* and certain members of the genus *Lippia* display the alternative character state. The lobes on the apex of the schizocarp (**35**) were scored as <0.1 mm long, 0.1-0.5 mm long, or as essentially un-lobed. Most members of *Aloysia* display the former character state, while *Lippia* displays the latter character state. The taxa with lobes 0.1-0.5 mm long are present in several distantly related taxa so this character state is believed to have evolved more than once within *Aloysia*.

RESULTS

The simple heuristic search ran for approximately eighteen minutes, during which time 639,397,642 rearrangements were attempted. From the 1,409 resulting trees a strict consensus tree of with a score of 209 was computed and stored. The bootstrap analysis ran for approximately fourteen and a half hours producing approximately 5,000,000 trees.

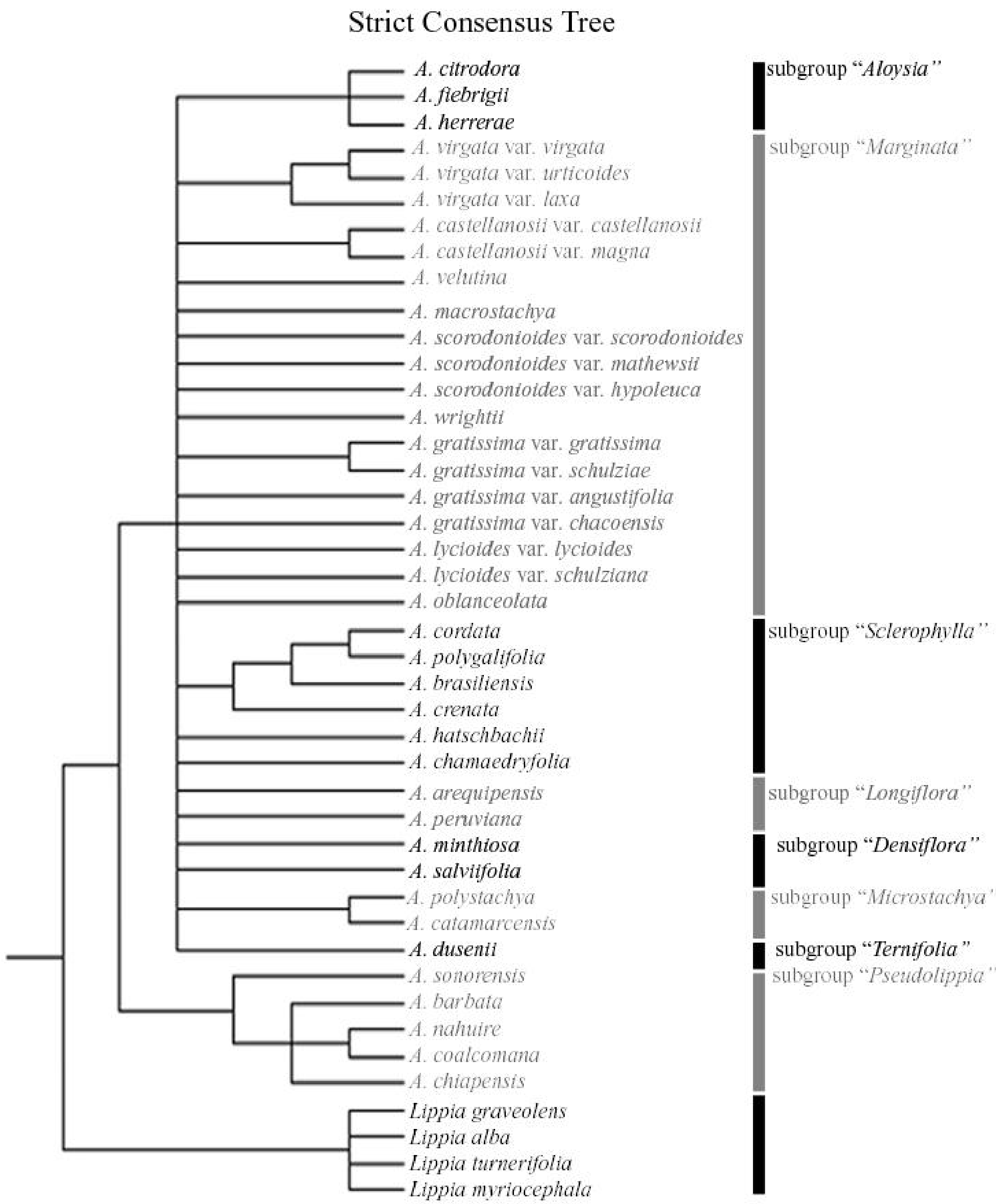

Figure 9: Strict consensus tree computed from heuristic search.

A 50% majority-rule tree was computed and bootstrap values were obtained for each clade.

The strict and 50% majority-rule consensus trees were viewed using MacClade 3.0 (Maddison & Maddison, 1992). The strict consensus tree resulting from the simple heuristic search (fig. 9) showed many polytomies and was somewhat poorly resolved. The tree length was 209, the consistency index was 0.31, the retention index was 0.52, and the re-scaled consistency index was 0.16. The 50% majority-rule tree resulting from the bootstrap analysis (fig. 10) shows good support for several clades. The tree length was 215, the consistency index was 0.43, the retention index was 0.72, the re-scaled consistency index was 0.31.

Morphological cladistic analysis supports the monophyly of *Aloysia* based on the characters described in chapter four (also table 4), but a large-scale analysis of the Lantaneae would be more informative. Olmstead (pers. comm.) has shared some of his results from a large-scale genetic study of the Verbenaceae. Preliminary cpDNA analysis based on *ndh*F and *trn*L/F with 3248 aligned nucleotides indicates *Aloysia* is part of a large clade containing members of *Lantana*, *Lippia*, *Nashia*, and *Phyla*. This cladogram suggests *Aloysia citrodora* and the genus *Coelocarpum* forms a polytomy with the lineage giving rise to *Aloysia*, *Lantana*, and *Lippia*. Within the Lantaneae, members of *Aloysia* form a clade sister to a large and complex clade composed of members of *Lantana*, *Lippia*, *Phyla*, and *Nashia*. This suggests *Aloysia* is polyphyletic and composed of two potentially monophyletic clades. Another tree communicated by Olmstead (pers. comm.), a tree based on the waxy gene exons 10-13 with 372 aligned nucleotides, indicates *A. citrodora*, *A. wrightii*, and *A. chamaedryfolia* form a monophyletic clade sister to the rest of the Lantaneae. In the same tree, *Coelocarpum* is far removed to a monotypic clade basal to *Verbena*, *Glandularia*, and the tribe Lantaneae. More

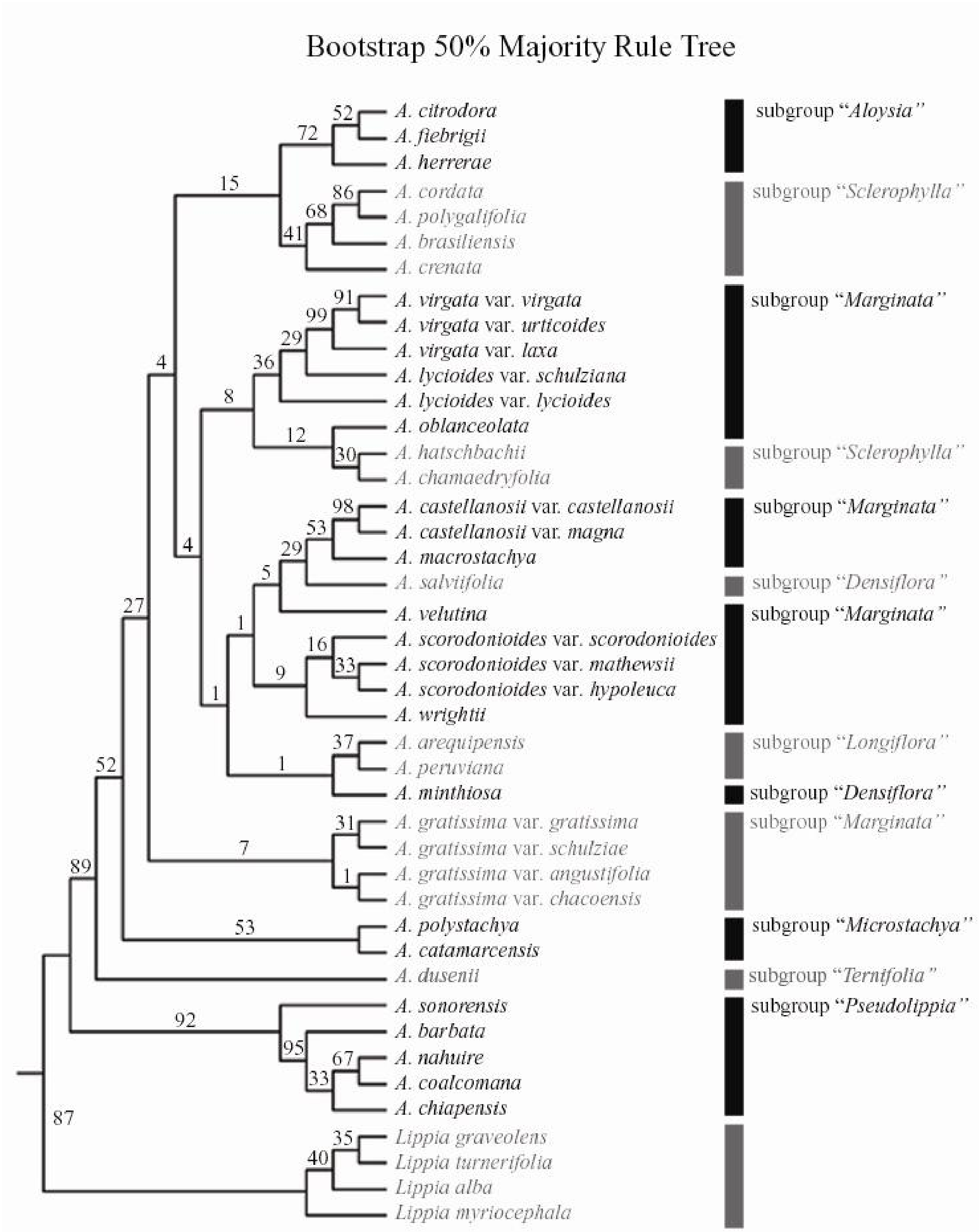

Figure 10: Bootstrap 50% majority-rule consensus tree; note bootstrap values for each clade along the supporting branch.

investigation into generic and infrageneric relationships within the Lantaneae is needed. However, there is morphological and genetic evidence to support the monophyly of *Aloysia*.

Chapter 6: Species Concepts

There is much disagreement between biologists on how to define a species and it is not my aim to enter this controversy. Several authors are considered highly influential in the debate over species concepts and I refer the reader to Grant (1994) for a review of the historical evolution of this area. The biological species concept espoused by Mayr (1942) and Dobzhansky (1935, 1937a) and the gene-combination species concept of Dobzhansky (1937b, 1941, 1951) are logical arguments. Grant (1971, 1977) provides well written accounts of species and speciation. Levin (2000) incorporates ecological and genetic issues in his ecogenetic species concept. Finally, de Quieroz (2005) reconciles multiple species definitions with his general metapopulation lineage species concept.

The above concepts have many merits yet all have relevant criticisms. Mayr (1942) is thought to over-emphasize the “reality” of species, the importance of allopatric speciation, and the need for reproductive isolation (Coyne, 1994; Mallet, 2001c). Givinish (2000) makes several compelling arguments against the species concepts as discussed by Levin (2000).

Taxa recognized herein are delimited via morphological criteria. As a result, my concept is best described as a morphological species concept since potential taxa are difficult to recognize in the absence of observable morphological divergence.

The use of infraspecific categories has been historically inconsistent among workers and I refer the reader to Kapadia (1963), Hamilton and Reichard (1992), Turner and Nesom (2000), and Mallet (2001) for arguments on the implementation and use of infraspecific ranks.

In the present account, varieties are considered closely related allopatric populations which intergrade, over short distances if at all, when contiguous. Populations which show gradual clinal variation over a large geographic area are not considered worthy of infraspecific rank. My concept of the subspecies is the same as Turner and Nesom (2002): a clustering category for varieties, or as a rank designed to show unusual varietal divergence. The category of subspecies is generally not utilized unless varieties are observed to exhibit patterns of variation uniting one or more of the varietal elements.

Chapter 7: Taxonomic Treatment

ARTIFICIAL KEY TO THE NEW WORLD GENERA OF THE LANTANEAE

1. Essentially leafless xerophytic sub-shrub to shrubs, sometime leaves reduced; stems branching from base, stiffly erect, multi-angled, essentially smooth

    2. Fruit drupaceous *Neosparton*

    2. Fruit schizocarpic *Diostea*

1. Leafy xerophytic to mesophytic perennial herbs, sub-shrubs to trees; stems prostrate to ascending; leaves reduced to prominent

    3. Fruits rostrate, ellipsoid schizocarps, exceeding calyx tube in length; calyx 5-merous

        4. Fertile stamens 2, plus 2 staminodes; stigmas capitate; flowers partially embedded in excavations in rachis *Stachytarpheta*

        4. Fertile stamens 4; stigmas geniculate, flattened; flowers not embedded in rachis *Bouchea*

    3. Fruits not rostrate, ellipsoid to spheroid schizocarps or drupes, usually included within accrescent calyx; calyx 2- or 4-merous

        5. Fruit a fleshy schizocarp; leaves fleshy, succulent; stems peeling, reddish *Lampaya*

        5. Fruit a dry schizocarp, or drupaceous; leaves sclerophyllous to membranous, not fleshy or succulent; stems variably brownish to grey

            6. Fruit drupaceous and indehiscent, composed of a single 2-seeded pyrene; mesocarp indurate or fleshy

                7. Inflorescences capitellate, sessile or sub-sessile, axillary; fruit coherent *Nashia*

7. Inflorescence capitate to spicate, pedunculate, terminal to axillary; fruit coherent or dehiscent

8. Inflorescences capitate spikes; peduncle exceeding rachis in length; mesocarp usually fleshy *Lantana*

8. Inflorescences elongated, sub-verticillate, spicate-racemes; rachis exceeding peduncle in length; mesocarp indurate, not fleshy *Xeroaloysia*

6. Fruit a readily dehiscent schizocarps, composed of 2, 1-seeded mericarps; mesocarp dry, membranous

9. Xerophytic sub-shrubs; leaves entire to three-lobed, reduced, fleshy *Acantholippia*

9. Xerophytic to mesophytic sub-shrubs to small trees; leaves un-lobed, margins entire to variably dentate, serrate, or crenate; membranceous to sub-coriaceous, not fleshy

10. Inflorescence a shortened spike at anthesis, usually capitulate with an elongate peduncle and a shortened rachis; floral internodes essentially absent, <1 mm long; floral bracts multi-ranked; stigmas lateral *Lippia*

10. Inflorescence an interrupted spicate raceme at anthesis, the rachis mostly longer than the peduncle; floral internodes 1.0-9.0 mm long; floral bracts alternate to opposite; stigmas apical to lateral ***Aloysia***

ALOYSIA Palau, Parte Prac. Bot. 1: 767. 1784.

TYPE: *Aloysia citrodora* Palau

Verbena L. sect. *Aloysioides* Walp., Rep. Sp. Nov. 4: 13. 1845.

Lippia L. sect. *Aloysia* Schau. in DC., Prodr. 11: 572. 1847.

Lippia L. subgen. *Aloysia* Schau. in Engler and Prantl, Die Naturlich. Pflanzenfam. 4(3A): 151. 1897.

Zapania Lam., Tabl. Encycl. 1: 59. 1791, *nom. illeg.* This name was superfluous when proposed by Lamarck and is therefore illegitimate.

Perennial, phanerophytic **sub-shrubs to trees**, narrowly upright to ascending, 0.5-15.0 m high. **Stems** 4-angled in cross section becoming multi-angular to rounded with age, variously pubescent, glabrate with age, surface smooth, becoming furrowed or longitudinally multi-striated. **Leaves** evergreen or dry-season deciduous, simple, exstipulate, mostly opposite or 3(-4)-whorled, rarely alternate; laminae linear, elliptic, lanceolate, spathulate, obovate, ovate, orbicular to cordate, basally attenuate to cordate, apically retuse to acuminate; margins entire, crenate, crenulate, crenate-serrate, dentate, to serrate; adaxially scabrous, hispidulous, strigulose, to glabrous; abaxially strigulose to incanous, often with sub-sessile, single-celled glandular trichomes. I**nflorescences** spicate racemes, occasionally spicate-paniculate; multiple flowers often in clusters of 3-6 with elongated internodes in between; rachis rounded to tetragonal, adpressed-villous to incanous, occasionally bearing long-stalked, glandular trichomes; usually elongating through anthesis and maturation of fruit. **Pedicels** absent to present, up to 3 mm long. **Bracts** inferior to flowers, linear, lanceolate, elliptic, to ovate; abaxially strigulose to setose; apically acute to acuminate, the scar falcate. **Calyces** 2 or 4 lobed, actinomorphic to weakly zygomorphic, externally strigulose, setose, or velutinous, often sub-sessile glandular, internally glabrous; fully accrescent in fruit and persistently enclosing mature schizocarp. **Corollas** sub-actinomorphic to zygomorphic, mostly salverform, white, lavender, purple, pink, or blue; tube cylindrical to infundibuliform, glabrous to variously pubescent externally, internally villous along apical half; limb 4-lobed, superior lobe often cleft, glabrous to villulous; internally villous around throat; externally glabrous to strigulose. **Style** glabrous, occasionally villous along base. **Stigmas** capitate to sub-capitate, bilobed; lobes about equal, or one of these oblique, apically or laterally disposed. **Stamens** 4, epipetalous, sub-equal to didynamous, superior pair sometimes weakly exserted; theca longitudinally dehiscent, 0.15-0.50 mm long. **Fruits** ellipsoid to obovoid schizocarps, more or less cordate, basally truncate, apically rounded to bilobed, glabrous or sometimes setose; mericarps two, readily dehiscent at maturity; intermericarpal cavity present or absent, the surface smooth to papillate. Base chromosome number, x=9.

Distribution and habitat: Confined to the New World in an amphitropical distribution in temperate to sub-tropical regions of North and South America. Found at elevations ranging from near sea level up to ca. 4000 m.

Etymology: The genus name *Aloysia* is apparently derived from the common name applied to the type species, *A. citrodora*, of “hierba a Luisa” or “hierba Luisa.” This name was proposed in order to honor of Maria Luisa (1751–1819) queen of Spain, daughter of Duke Philip of Parma, wife of Charles IV, and mother of Ferdinand VII (Wittstein, 1852).

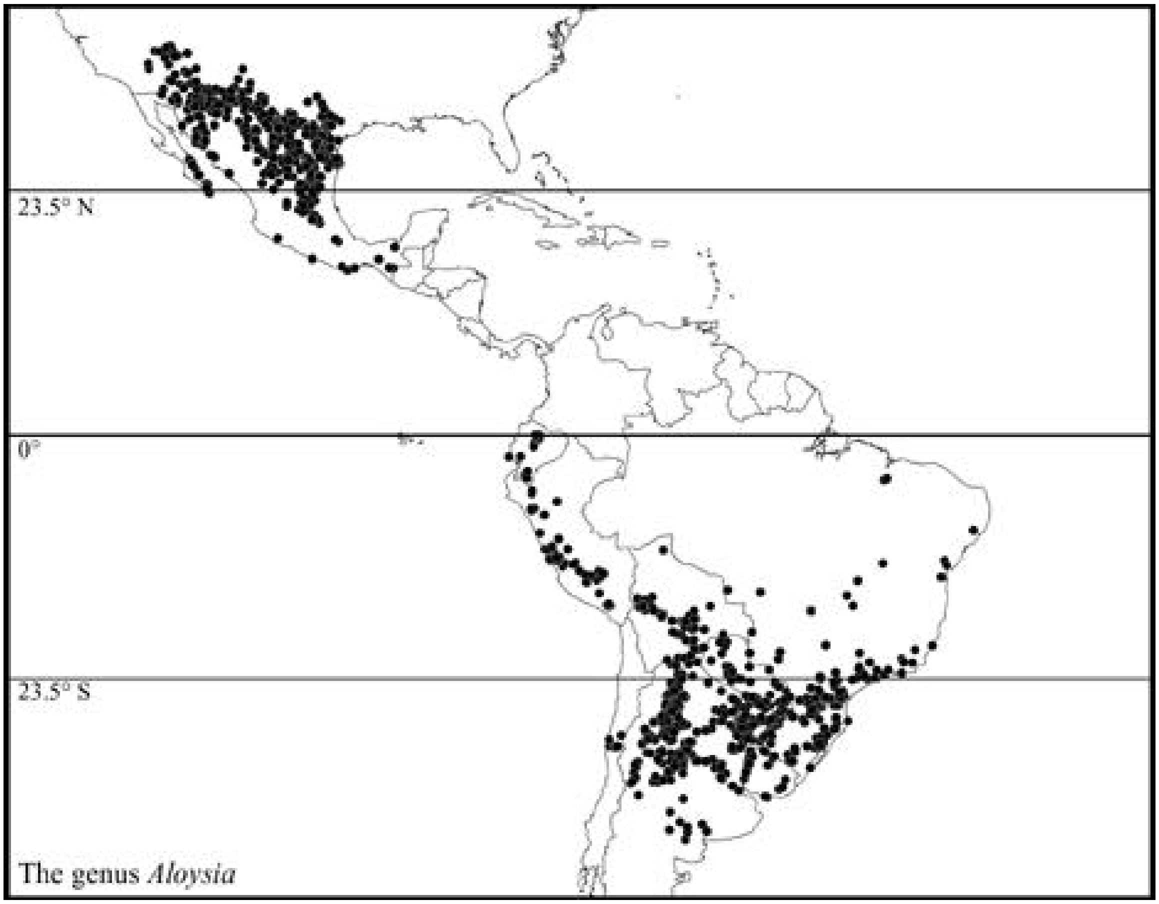

Figure 11: Distribution of the genus *Aloysia*.

ARTIFICIAL KEY TO THE SPECIES OF *ALOYSIA*

1. Calyx 2-lobed, lobes rounded to bi-dentate; stigma sub-capitate, laterally disposed **Group *"Pseudolippia"***

    2. South American 25. *A. dusenii*

    2. North American subgroup *"Pseudolippia"*

        3. Floral bracts reduced, shorter than or equal to corolla in length 26. *A. sonorensis*

3. Floral bracts showy, exceeding the corolla in length

4. Leaves narrowly lanceolate-elliptic (5:1-3:1, L:W)

5. Shrub 1-4 m tall; pedicels 0.5-1.0 mm long; floral bracts lanceolate-ovate, 8-10 mm long 28. *A. nahuire*

5. Small tree up to 6 m tall; pedicels 2-3 mm long; floral bracts elliptic, 4-6 mm long 29. *A. coalcomana*

4. Leaves ovate to elliptic (2:1-6:5, L:W)

6. Leaves adaxially scabrous; pedicels 0.5-1.0 mm long 27. *A. barbata*

6. Leaves adaxially velutinous; pedicels 1-2 mm long 30. *A. chiapensis*

1. Calyx 4-lobed, lobes triangular to subulate; stigma capitate to sub-capitate, apically to laterally disposed **Group *"Aloysia"***

7. Native to North America subgroup *"Marginata"*

8. Leaf margins entire to obscurely 2-4 toothed along apical 2/3 10. *A. gratissima*

8. Leaf margins crenate to dentate from base to apex

9. Inflorescence compact, flowers congested, corollas white; leaves orbicular to elliptic 9. *A. wrightii*

9. Inflorescence elongated, loosely flowered, corollas lavender; leaves ovate 7. *A. macrostachya*

7. Native to South America

10. Inflorescence paniculiform, composed of a terminal spike and multiple axillary spikes; flowering branches determinate

11. Leaves ovate, velutinous, margins crenate 6. *A. velutina*

11. Leaves lanceolate to elliptic, strigose to puberulent, margins entire to obscurely serrate medially subgroup *“Aloysia”*

12. Leaves mostly opposite, rarely 3-whorled, margins entire 3. *A. herrerae*

12. Leaves 3-4-whorled, margins entire to obscurely serrate medially

13. Calyx campanulate, 1-2 mm long; corolla tube 2.5-3.5 mm long; leaves entire 2. *A. fiebrigii*

13. Calyx tubular, 2.5-3.5 mm long; corolla tube 3.5-5.0 mm long; leaves entire to serrate medially 1. *A. citrodora*

10. Inflorescence spicate, axillary, 1-5 per leaf axil; flowering branches indeterminate

14. Leaves mostly 3(-4)-whorled subgroup *“Sclerophylla”*

15. Leaves incanous, margins crenate 18. *A. crenata*

15. Leaves glabrous to scabrous, margins entire, occasionally serrate medially

16. Leaves petiolate, lax; laminae elliptic to lanceolate, basally rounded to acute, apically rounded to acuminate 14. *A. brasiliensis*

16. Leaves sessile, antrorsely adpressed along stem; laminae ovate to cordate, basally truncate to cordate, apically mucronate to acute

17. Leaves adaxially scabrous; basally truncate to sub-cordate, margins revolute 15. *A. polygalifolia*

17. Leaves glabrous, basally cordate, margins ciliate 13. *A. cordata*

14. Leaves mostly opposite, sometimes alternate, rarely 3-whorled

18. Leaves sclerophyllous, firm-textured, margins serrate-dentate to prominently dentate, venation prominently reddish to brownish abaxially subgroup *"Sclerophylla"*

19. Leaves obovate, margins basally entire, serrate dentate to dentate medially to distally 16. *A. hatschbachii*

19. Leaves ovate to orbicular, prominently dentate with spreading teeth 17. *A. chamaedryfolia*

18. Leaves membranous, margins entire to serrate, crenate or dentate, venation obscure

20 Inflorescence compact, flowers congested; leaves alternate or opposite subgroup *"Microstachya"*

21. Leaves alternate, margins entire, laminae narrowly lanceolate-elliptic (2:1-3:2, L:W); calyx obscurely bidentate 23. *A. polystachya*

21. Leaves opposite, margins serrate-dentate, laminae elliptic to ovate (6:1-3:1, L:W); calyx bidentate, teeth long-acuminate 24. *A. catamarcensis*

20. Inflorescence elongated, flowers lax; leaves opposite, rarely 3-whorled

22. Leaf margins entire to irregularly 1-5 toothed along apical 2/3

23. Floral bracts elliptic to lanceolate, conspicuous, at least 2 times the length of the calyx; calyx densely incanous; flowers congested along rachis 22. *A. salviifolia*

23. Floral bracts lanceolate, reduced, roughly equal to less than 2 times as long as the calyx; calyx villous to setose; flowers loosely arranged.

subgroup *"Marginata"*

24. Leaves linear to narrowly elliptic (8:1-3:1, L:W), basally acute, apically acute to acuminate

10. *A. gratissima*

24. Leaves obovate to elliptic (2:1-3:2, L:W), basally attenuate, apically rounded to sub-acute

25. Leaves elliptic, obovate, or spathulate, more or less solitary; calyx zygomorphic, ca. 1/4 to 1/2 the length of the corolla tube 11. *A. lycioides*

25. Leaves spathulate, clustered into fascicles; calyx sub-actinomorphic, ca. 1/2 to 3/4 the length of the corolla tube 12. *A. oblanceolata*

22. Leaf margins regularly serrate, crenate, or dentate

26. Calyx lobes linear to acuminate, equaling to exceeding calyx tube in length; leaves lanceolate to ovate, apically acute to acuminate 4. *A virgata*

26. Calyx lobes acute, <1/2 the calyx tube in length; leaves ovate to elliptic, apically more or less rounded

27. Leaves bullate, margins prominently dentate, revolute, teeth spreading; bracts foliaceous ovate to obovate.

5. *A. castellanosii*

27. Leaves flat to rugose, margins crenate, dentate, or serrate; bracts reduced, linear, lanceolate, or lance-ovate

28. Leaves rugose to sub-bullate, margins crenate to crenate-dentate 8. *A. scorodonioides*

28. Leaves essentially flat, if somewhat rugose then basally entire

29. Calyx tubular; corolla tube <2 times as long as calyx; stems strigulose 21. *A. minthiosa*

29. Calyx campanulate; corolla tube 2-4 times the calyx in length; stems puberulent or setose subgroup *"Longiflora"*

30. Leaves elliptic, margins basally entire, serrate medially to distally 19. *A. arequipensis*

30. Leaves ovate, margins dentate from base to apex 20. *A. peruviana*

1. ALOYSIA CITRODORA Palau, Partes Prac. Bot. 1: 768. 1784. Verbena citrodora (Palau) Cav., Descript. 68. 1802. TYPE: Un-numbered illustration by B. Salvador y Carmona in appendix of Parte Practica de la Botanica de Linnaeus. 1784. (LECTOTYPE: MA [designated by Armada and Barra, 1992]). The origin of the cultivated material which was the basis for this illustration is unknown. Specimens of possible type material (Stockholm [S], photocopy [LL], without collector or date, "Ortega scripsit") which may have been used to produce the original 1779 autographed manuscript attributed to Palau and Ortega housed at the Monastery of Santo Domingo de Silos Library in Madrid (Armada and Barra, 1992). While the specimen appears to have been examined by Ortega, there is no evidence of Palau's having seen it.

Verbena triphylla L'Her., Stirp. Nov. 1: 21, pl. 11. 1785. *Lippia triphylla* (L'Her.) Kuntze, Rev. Gen. Pl. 3: 253. 1898. *Aloysia triphylla* (L'Her.) Britton, Sci. Surv. Porto Rico and Virgin Islands 6: 140. 1925. TYPE: FRANCE. ILE DE FRANCE. cultivated plant in the Jardin de Plantes, Paris, without date, *C. L. L'Heritier s.n.* (LECTOTYPE: P [designated by Moldenke & Moldenke, 1983]). Moldenke and Moldenke (1983) report this species was "grown from seed sent by Commerson from Montevideo, Uruguay" but this appears to be in error. L'Heritier (1785) reports the "habitat in Chile. Dombey. in Bonaria: Monti-Video. Philib. Commerson" but goes on to state "viviam necnon semina bunigne communicavit praedictus Ortega" which indicates the seeds were sent by Ortega and probably from the same source as *Aloysia citrodora*. In any case, they are described from different elements and examination of the plates by Redouté and Salvador y Carmona leaves little doubt these are the same species. Indeed, L'Heritier even cited, in synonymy, "*Aloysia citrodora* Ort. & Pal. *diss. mss.*"

Aloysia sleumeri Moldenke, Phytologia 10: 170. 1964. TYPE: ARGENTINA. CATAMARCA: Mpio. Belen; Pozo de Piedra and vicinity, 1900 m, 25-31 Jan 1952, *H. Sleumer 2370* (HOLOTYPE: US!; TYPE FRAGMENT: LL!).

Aloysia triphylla f. *serrulata* Moldenke, Phytologia 50: 308. 1982. TYPE: UNITED STATES. INDIANA: Floyd Co.; New Albany, Cornell University Experimental Garden, material for cultivation provided by E. Walker, location and date of origin unknown, *L. H. Bailey 160* (HOLOTYPE: CU!).

Shrubs to small trees 1-7 m in height. **Leaves** 3(-4)-whorled; petioles 0.5-1.5 mm long; laminae 2.5-10.0 cm long, 0.5-2.5 cm wide, narrowly elliptic to lanceolate, apically acute, basally acute to acuminate, margins entire, occasionally serrate medially, adaxially scabrous, abaxially strigulose with an understory of sub-sessile, glandular trichomes. **Inflorescence** paniculiform, terminal, flowers lax; peduncle 0.2-0.5 cm long, strigulose with an understory of sub-sessile, glandular trichomes; rachis 0.5-4.0 cm long, strigulose with an understory of sub-sessile, glandular trichomes; pedicels 0.2-0.5 mm long. **Bracts** reduced, lance-ovate, midrib present, 1.0-1.5 mm long, 0.5-1.0 mm wide, apically acute to acuminate, pubescent, at least along midrib. **Calyx** sub-actinomorphic, tubular, 2.5-3.0 mm long, 4-costate, pubescent, with an understory of sub-sessile, glandular trichomes; lobes 4, trullate, acute. **Corolla** salverform, sub-actinomorphic, white to pale lavender; tube 3.5-5.0 mm long, pubescent with an understory of sub-sessile, glandular trichomes; limb 2.5-4.5 mm long, pubescent with an understory of sub-sessile, glandular trichomes. **Stigma** sub-capitate, laterally disposed, lobes oblique. **Fruit** obovoid, 2-3 mm long, 1.0-1.5 mm wide, apically setose, at least around chalaza, rarely glabrous, bilobed, the lobes ca. 0.1 mm long; intermericarpal cavity reduced, surface smooth. **Chromosome** number, $2n=36$ (Dolat, 1943).

Discussion: A common citation error includes Ortega as co-author or sole author of this species, sometimes to the exclusion of Palau. This likely roots back to a handwritten manuscript attributed to Palau and Ortega dated 1779. This autograph does not meet the standard for effective publication according to article 29.1 of the Code (2000). Their manuscript was not distributed and the only known copy survives at the Monastery of Santo Domingo de Silos Library in Madrid (Armada and Barra, 1992).

L'Heritier (1786) cited this autograph in his description of *Verbena triphylla* L'Her. as "*Aloysia citrodora* Ort. & Pal. *diss. mss.*" Cited thusly, with no reference to Palau's (1784) solo publication, this binomial is not a *nomen novum* but a new species considered independent of Palau's.

Cavanilles (1802) inexplicably transferred this taxon to the genus *Verbena* as *Verbena citriodora* (Palau) Cav. It is the second time knowledge of Palau's 1784 work can be verified in the botanical literature and the first complete and correct citation known. The fact that Cavanilles was at Madrid increased the odds he would come into contact with Palau's protologue. Cavanilles' transfer is puzzling, but his combination is the correct name for this species if treated in *Verbena*.

Kunth (1818) made the combination *Lippia citrodora* in his transfer of this entity into *Lippia*. Unfortunately, he based his epithet on an illegitimate name by Lamarck (1791). Kunth (1818) cites "*Zapania citrodora* Lam....*Aloysia citrodora* Ortega. Juss. Pers....*Verbena triphylla* L'Herit." He attributed *Aloysia citrodora* to Ortega based on an entry in Persoon's (1807) *Synopsis Plantarum*. Persoon (1807) cited "*Aloysia*...*citriodora*...Orteg. *Verb. triphylla*. l'Herit." Therefore Kunth naturally assigned priority to Lamarck's (1791) epithet rather than Persoon's (1807). The redundancy in epithets which is the basis for this confusion (*Aloysia citrodora* Palau and *Zapania citrodora* Lam.) is apparently coincidental. Lamarck (1791) cites "*Verb. triphylla. l'herit.* [*sic*]" and there is no evidence Lamarck knew of Palau's epithet. Kunth's (1818) name is illegitimate under article 52.1 of the *Code* (2000) because it was based on a later epithet than the one which had priority.

Kuntze transferred this entity to *Lippia* in 1898 based on L'Heritier's 1785 epithet *Verbena triphylla*, not Palau's 1784 *Aloysia citrodora*. Kuntze cited "*Verbena tr.* L'Her., 1784; *Zapania citriodora* Lam. 1791; *Lippia citr.* HBK [1818]" and naturally assigned priority to L'Heritier believing his name to be the earliest. This combination turns out to be correct since the name "*citrodora*" is unavailable for use in *Lippia* due to the earlier error by Kunth (1818) noted above.

Britton (1925) made the combination *Aloysia triphylla* and cited "*Verbena trifolia* L'Her. [*sic*]...1784" and "*Aloysia citriodora* Ortega...1807". He assigned priority to L'Heritier basing his attribution for the epithet "*Aloysia citrodora*" to Ortega in Persoon (1807). He mistakenly refers to L'Heritier's epithet as "trifolia" which amounts to a *nomen nudum pro synonymo*.

The following account is transcribed from H. N. Moldenke's personal notes housed at TEX, LL under "*Aloysia triphylla*". It is a well written account of the species.

> [*Aloysia triphylla*] was apparently based by L'Heritier on an unnumbered collection of Joseph Dombey from Chile and one of Philibert Commerson from Montevideo, Uruguay. This very well known garden plant is widely cultivated all over Europe, North America, South America, the West Indies, Madeira, and Mauritius. It has become naturalized in North Carolina, Mexico, Cuba, Puerto Rico, Martinique, Colombia, Venezuela, Brazil, and Spain. Although H. F. MacMillan in Trop. Plant. & Gard., ed. 5, 434 (1934) says "Native of Chile," it is my opinion that this species is originally from and native to northwestern Argentina and Uruguay. L. R. Parodi in Rev. Argent. Agron. 1: 201 (1934) says "Arbusto de hojas aromáticas y caducas, originario de la región montañosa del noroeste argentino (Salta, Catamarca, La Rioja), es muy abundante en ciertos valles de las sierras de Velazco y Famatina, entre los 1000 y 2000 m s m. Es cultivado en la Argentina u otras países, por el aroma de sus hojas y flores y por el sabor agradable de la unfusión que se prepara con

sus órganos herbáceos. Su cultivo es muy común en Buenos Aires, en donde, probablemente fué coleccionado el ejemplar tipo. Se multiplica por estacas." The type specimen to which Parodi here refers is that of *A. citrodora*, a name based on an unnumbered specimen in the Swartz herbarium at Stockholm, collected at Buenos Aires, Argentina.

The species is listed by Parodi in his "Las plantas indigenas no alimenticias cultivadas en la Argentina" 1: 201 (1934). It is said to inhabit river banks, especially rocky ones, and quebrados in its native haunts, and has been collected in anthesis in every month of the year, in fruit in August. It ascends to 2000 m in Catamarca, and has been successfully cultivated at 2670 m in Ecuador and at 9000 feet [2743 m] in Peru.

An essence is distilled from its leaves and this is used in perfumery and in the manufacture of soap. It is used as a substitute for tea. According to Emrich and Irmão Augusto it is cultivated as a remedy in southern Brazil; Monetti refers to it as medicinal. Steyermark says that in Ecuador the leaves are boiled and the resulting liquid is drunk with bicarbonate of soda to alleviate pains in the lower abdomen. Rosengurtt, in Uruguay, reports "se toma la infusión de los hojas, como estomacal, al final de los comidos." In Mexico it is used in the treatment of diarrhea. H. Daniel in his Verbenac. Centro Antioquia, p. 4, says "lo que apunte Cortés Sarmiento en su Flora de Colombia que se usa en bebidas otisanes, las que tienen propriedades diaforéticas, estomáquicas y tónicas, corrigo los vómitos incoercibles." Perez Arbelex in his Plant. Med. Colomb. 240 (1937) says it is used in Colombia as an expectorant and antispasmodic.

G. A. Sweetser in Horticulture 15: 177 (1937) says its oil is a repellant and antiseptic under the name of “herba aloysiae”. Roig y Mesa in his Plant. Medic. 718-719 (1945) says “Partes empleadas.—Las hojas. Aplicaciones.—Se usan en la medicina casera para los dolores de estómago y en los resfriados con vómitos y diahrrea, en cocimiento, tres tacitas el día.” Gómez Pamo in his Materia Farmacéutica Vegetal 1: 814 says “se emplea en infusión teiforme como estomacal y antispasmódica.” P. E. Alessandri in his Plante o Droghe Medicinali, p. 514, says “hojas sudorificias”. Roig y Mesa continues: “Según Hieronymous [Plantas Diafóreticas 223-224. 1882] la infusión teiforme de la Yerba Luisa, llamada Cedrón en la Argentina, se usa como remedio estimulante suave en enfermedades nerviosas, melancolías, hipocondria, dolores y espasmos del estómago, flojedad de los intestinos. Destilando aguardiente con las hojas, se fabrica un licor que se use para las fiebres intermitentes. Según A. Murillo, la infusión del Cedrón con trozos de limón produce buenos resultados cuando existen vómitos sanguíneos. Segun J. B. Gutiérrez [Cura con Yuyos], la Yerba Luisa se usa en infusión al 2% para combatir atacues cardíacos y epilépticos.”

The morphology of the species in discussed in Svensk Bot. Tidsk. 32: 231 (1938) and the gynoecium morphology by Junell in Symb. Bot. Upsal. 4: 31-33, 35, & 177 (1934). The length of the pistil in relation to the pollen grain size is discussed by C. Covas and B. Schnack in Darwiniana 7: 86 (1945). I have personally seen shrubs of this plant 5 feet tall in Buenos Aires and 10 feet tall in Santiago, Chile.

A plant as widely cultivated as this one can be expected to have many vernacular names. In Rev. It. della Essenze 18: 356 (1936) the names "cedrina," "erba Luigia," and "verbena" are recorded; in Gardening 1: 195 & 617 (1879) the name "scented verbena". C. Gay in his Hist. Fis. Chil. Bot. 5: [31] (1849) lists "cedron", Irmão Augusto in his Flora do Rio Grande do Sul 234 (1946) lists "cidró" and "cidrilha", H. F. MacMillan in his Trop. Plant. & Gard., ed. 5, 178, 180, 181, & 434 (1934) lists "lemon-scented verbena", and A. K. Bedevian in his Illustr. Polyglott. Dict. Pl. Names 365-366 (1936) records "cedrina", "cetrina", "citronen-kraut", "citronnelle", "erba cedrine", "erba limoncina", "erba luigia", "lemonekraut", "lipia", "lippie", "lûwayzah", and numerous names in Arabic script. Perez Arbelez in his Plant. Med. Colomb. 40, 240, & 241 (1937) records "ben-kess-boss", "cidrón", "saca ojo", "yerba luisa", and "zorrillo", while "lemon verbena" is recorded by E. V. Lucas in Mr. Ingleside, ed. 17, 77 (1925) and by H. H. Webster in his Herbs 103 (1942).

Distribution and habitat (fig. 12): Native to arid and temperate regions of northwestern Argentina in the states of Catamarca, Jujuy, La Rioja, Salta, and Tucumán; calcareous to granitic outcrops; 1400-4000 m; flowering November to May.

Etymology: This species is named for its citrus or lemon-like odor.

Common names and uses: Cedron, cedron Paraguay, cidrão, cidrinha, erva-cidreira, hierba luisa, lemon verbena, luisa, romero, salva limão, te cedron, toronjil, and yerba luisa.

This species is widely used for teas and has been reported to have a variety of medicinal properties by several collectors' label data (*A. Schinini 6767* [CTES, NY]; *H.*

Vázquez 57 [CTES]; *P. Lamy et al. 161* [MICH, US]; *I. G. Vargas C. 17* [NY]; *H.E. Stork & O. B. Horton 10797* [F, UC]) and by first-hand interviews conducted by the author in the field. Uses involve the production of tea from the leaves or stems and include as a treatment for indigestion, heart conditions, fatigue, diarrhea, and for throat and sinus ailments (Salud-Perez, 1997; Rotman and Múlgura, 1999). It has also been reported to treat insomnia and anxiety in an ethnopharmacological survey conducted in Brazil, where the plant is prepared as a tea of 5-7 leaves or 1-3 branches in 250 or 500 ml of water (Wannmacher, 1990). This tea is widely used in South America and Africa and is a favorite drink after meals due to its sedative, stomachic, and spasmolytic properties (Zamorano-Ponce, 2006). Moldenke and Moldenke (1983) additionally report several medicinal uses for the tea including: aromatic, digestive, nervine, diaphoretic, stomachic, carminative, expectorant, antispasmodic, and tonic. They go on to report a number of ailments treated by the tea: intermittent fevers, stomach-ache, constipation, nervous diseases, melancholia, hypochondria, insomnia, stomach bleeding, colds, vomiting, and diahrrea. An infusion made from the leaves of this plant has been shown to be antigenotoxic by inhibiting cispaltin-induced cell damage to mouse bone-marrow cells (Zamorano-Ponce et al., 2004) and by preventing acrylamide-induced cell damage in live mice (Zamorano-Ponce et al., 2006). Experiments have shown that the oil, at 1-2% concentration, may be sprayed as an insecticide to kill mites and aphids (Moldenke & Moldenke, 1983).

Representative specimens: ARGENTINA. CATAMARCA: Mpio. Ambato; Sierra de Ambato, Falda E, Las Juntas, 22 Feb 1964, *A. T. Hunziker & T. E. Di Fulvio 17070* (BA). **Mpio. Andalgalá**; Común, El Candado, 10 Feb 1916, *P. Jorgensen 1023* (BA, GH, MO, NY-2, UC, US). **Mpio. Belén**; Pozo de Piedra and vicinity, 25-31 Jan

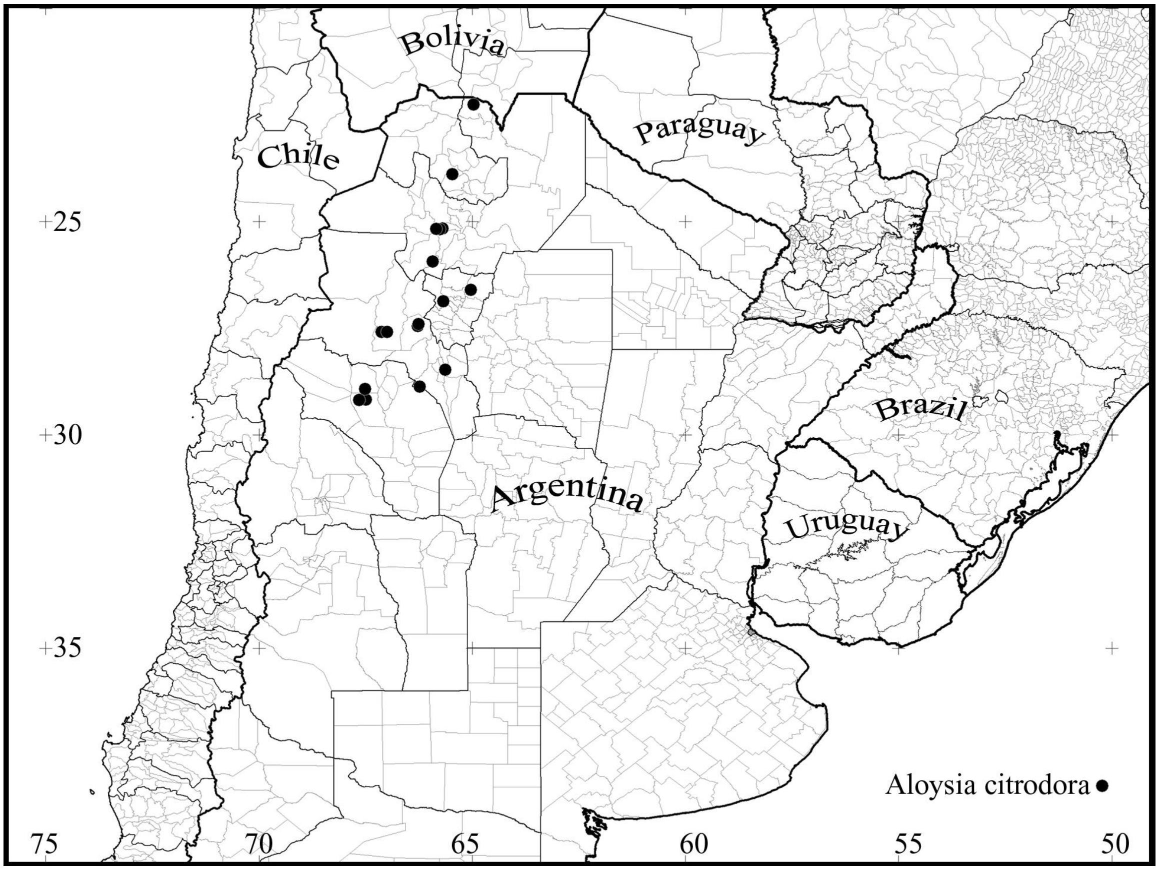

Figure 12: Distribution of natural populations of *Aloysia citrodora*.

1952, *H. Sleumer 2370* (LL, US); Cóndor Huasi., 20 Feb 1978, *P. Arenas, D. Herrera, & G. Gilberti 276* (NY); Pozo de Piedra, Jan 1955, *M. Sayago s.n.* (NY); Las Faldas, Sierra de Belén, Mar 1939, *R. Schreiter 37997* (NY-2, UC, US). **Mpio. Capayán**; Sierra de Ambato, Falda E, Quebrada de San Jerónimo, unos 5 km al NW de Chumbicha, 19 Feb 1975, *A. T. Hunziker, R. Subils, & N. Dottori 22803* (BA, MO, NY). **Mpio. Pomán**; in a sm[all] canyon above Poman via the Road to Colana, nearly to Colana, 3 Mar 1973, *P. Cantino 714* (GH). **Mpio. Valle Viejo**; Ruta 64, Cuesta del Portzuelo, entre los 1300 m y la cumbre, 1680 m, 23 Mar 1960, *A. T. Hunziker, A. E. Cocucci, & T. E. Di Fulvio 15321*

(MBM). **JUJUY:** **Mpio. Tumbaya**; Alrededores Laguna Volcán, 23 Mar 1992, *A. L. Cabrera et al. 34745* (SI); Volcán, camino a Tiracsi, 28 Feb 1937, *A. Castellanos s.n. [20165]* (NY). **LA RIOJA:** **Mpio. Famatina**; Famatina, 6 Nov 1942, *T. Meyer 4248* (GH, NY, US). **Mpio. General Lavalle**; Chilecito, Cuesta de Miranda, 30 Jan 1927, *L. R. Parodi 7822* (GH). **Mpio. General Sarmiento**; Sierra Famatina, Luonchuz, 24 Jan 1928, *A. Castellanos, s.n. [28/327]* (NY). **SALTA:** **Mpio. Cafayate**; Cafayate, Sierra de los Quilmes, 9 Jan 1943, *A. Castellanos s.n. [46957]* (BA). **Mpio. Chicoana**; camino a Cachi, Cuesta del Obispo, 27 Mar 1979, *A. L. Cabrera et al. 30716* (MICH, SI); (CTES, LL, UC); Ruta Provincial 33 between Pulares and San Fernando de Escoipe, 20 km W of Pulares, 0.5 km E of Quebrada Agua Negra, 29 km from Ruta Nacional 68 at El Carril, 67.8 road km and 49.8 air km from Salta centro, 29 Dec 2001, *S. J. Siedo 1109* (TEX); Pulares to Escoipe along Ruta Provincial 33, at the turn-off for La Zanja, 29 km W of Pulares, 38 km W of Ruta Nacional 68 at El Carril, 76.8 road km and 55.5 air km from Salta centro, 29 Dec 2001, *S. J. Siedo 1111* (TEX). **Mpio. Chilecito**; Los Talas, al W de Chilecito, 25 Feb 1965, *A. L. Cabrera et al. 16695* (GH, NY, TEX); Guanchín, 21 Nov 1927, *A. Castellanos s.n. [27/2028]* (BA). **Mpio. Iruya**; Alrededores de Iruya, 15 Mar 1982, *R. Kiesling 3578* (SI). **Mpio. San Carlos**; Río San Carlos; pedregales del rio, 15 Mar 1927, *S. Venturi 6973* (US). **Mpio. Santa Victoria**; Santa Victoria, 27 Jan 1943, *T. Meyer 4866* (UC). **TUCUMÁN:** **Mpio. Burruyacú**; Río del Nio , 6 Feb 1914, *Moretti 1925 [32112]* (GH-2, NY). **Mpio. Tafi del Valle**; Tafi, San Aucajulió, 14 Dec 1944, *D. Olea 78* (NY-2, W); El Chorro, Cumbres Calchaquies, 30 Dec 1913, *D. Rodriguez 1214* (G, NY-3, SI).

2. **ALOYSIA FIEBRIGII** (Hayek) Moldenke, Rev. Sudamer. Bot. 4: 15. 1937. *Lippia fiebrigii* Hayek, Bot. Jahrb. Syst. 42: 165. 1908. TYPE: BOLIVIA. TARIJA:

Cercado, Tarija, 4 Feb 1904, *K. Fiebrig 3036* (LECTOTYPE [here designated]: US!; ISOLECTOTYPES: BM!, F!, G-2!, GH-2!, IBI, S-2!, W!; TYPE FRAGMENT: NY!). The holotype was destroyed at B and, though photographs are available (F!, LL!, NY!), it was deemed prudent to select a lectotype from the surviving isotypes for comparative purposes. The specimen from US was chosen due to its superior representation of the taxon.

Aloysia arcuifolia Nesom, Phytologia 70: 145. 1991. TYPE: BOLIVIA. POTOSÍ: Vallea de Palqui, suelo limo-arenoso, 3000 m, 7 Feb 1987, *R. Ehrich 339* (HOLOTYPE: TEX!; ISOTYPE: LPB).

Shrubs 1-3 m in height. **Leaves** 3(-4)-whorled; petioles 0.5-1.5 mm long; laminae lance-linear to narrowly elliptic (6:1-4:1, L:W), conduplicate and somewhat falcate, 1.5-3.0 cm long, 0.2-0.5 cm wide, margins entire, basally rounded, apically acute, adaxially scabrous, abaxially sparsely strigulose with an understory of sub-sessile, glandular trichomes. **Inflorescence** paniculiform, terminal, flowers congested; peduncle 0.1-1.0 cm long, strigulose with an understory of sub-sessile, glandular trichomes; rachis 1-2 cm long, strigulose with an understory of sub-sessile, glandular trichomes; pedicels 0.2-0.5 mm long. **Bracts** lance-ovate, reduced, midrib present, 2.0-2.5 mm long, 0.8-1.2 mm wide, apically acuminate, sparsely strigulose. **Calyx** sub-actinomorphic, campanulate, 1-2 mm long, four costate, strigulose with an understory of sub-sessile, glandular trichomes; lobes 4, trullate, apically acute, tinged blue. **Corolla** sub-actinomorphic, white to light blue; tube 2.5-3.5 mm long, pubescent with an understory of sub-sessile, glandular trichomes present distally; limb 2.0-2.5 mm wide, pubescent. **Stigma** capitate, lobes oblique. **Fruit** broadly obovoid, 1.5-2.0 mm long, 1.0-1.5 mm wide, apically glabrous, bilobed, lobes 0.1-0.2 mm long; intermericarpal cavity reduced, surface smooth.

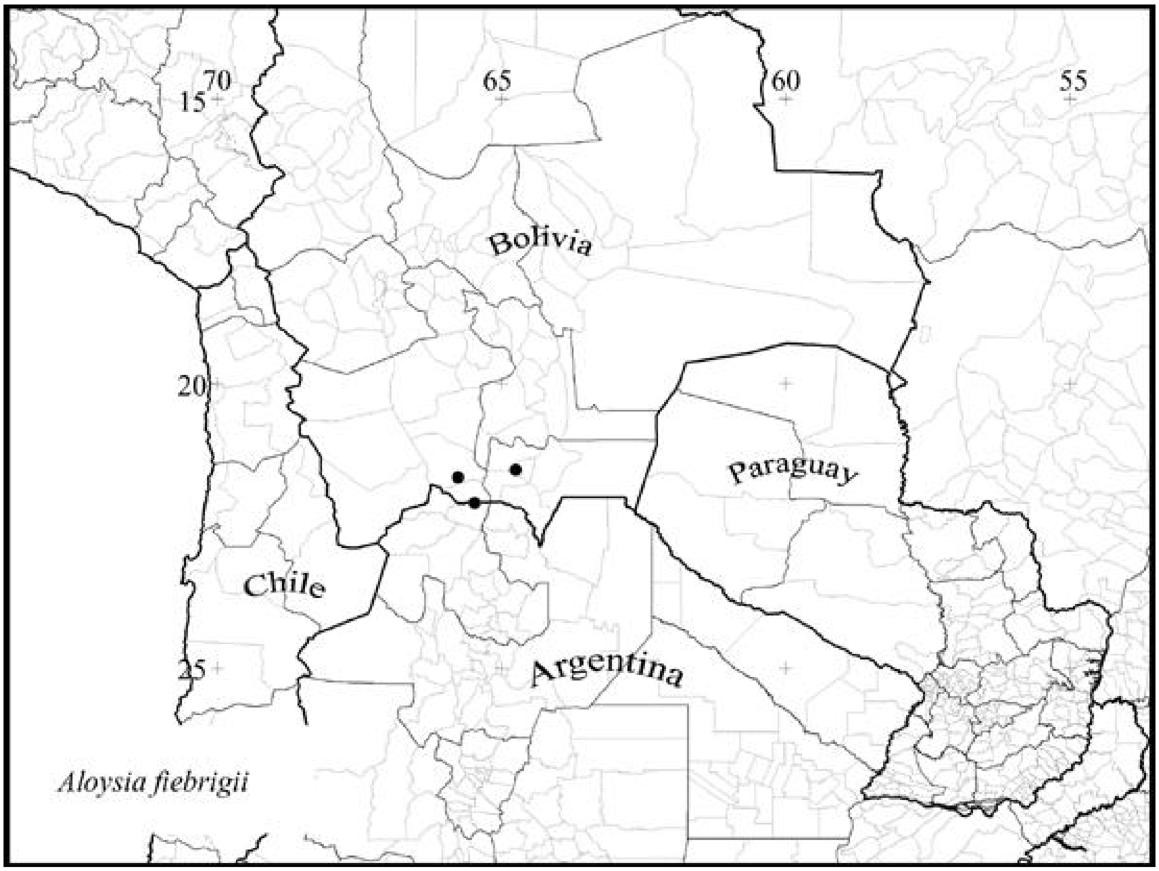

Figure 13: Distribution of *Aloysia fiebrigii*.

Discussion: *Aloysia fiebrigii* is known from only a few collections in Bolivia and Argentina. It is believed to be related to *A. citrodora* and *A. herrerae* on the basis of its terminal, paniculiform inflorescences, sub-actinomorphic calyces with acute lobes, and membranaceous leaves with mostly entire margins. These taxa are allopatric with the possible exception of *A. citrodora* and *A. fiebrigii* in the state of Jujuy, Argentina.

Nesom described *A. arcuifolia* from Bolivia believing it to be a different species than *A. fiebrigii*. However, he reported in his protologue that the latter species is found in Peru; even though the type is from Bolivia. Nesom's concept of *A. fiebrigii* is apparently based on material of *A. herrerae*, a species native to Peru, which is only superficially similar to *A. fiebrigii*.

Distribution and habitat (fig. 13): High elevations of northern Argentina and southern Bolivia; calcareous soils; 3000-3500 m; flowering January to February.

Etymology: *Lippia fiebrigii* was named in honor of Karl Fiebrig (1869-1951) who collected in Bolivia and Paraguay.

Additional specimens:. **ARGENTINA. JUJUY**: **Mpio Yavi**; Yavi chica, loco agrico.[sic] saxoso, 2 Jan 1902, *R. E. Fries 1711* (G).

3. ALOYSIA HERRERAE Moldenke, Phytologia 2: 10. 1941. TYPE: PERU. URUBAMBA: Urubamba Valley, 3000 m, Jul 1927, *F. L. Herrera 1534* (HOLOTYPE: F!; PHOTOHOLOTYPE: LL!, NY!; TYPE FRAGMENT: NY!).

Aloysia ayacuchensis Moldenke, Phytologia 6: 323. 1958. TYPE: PERU. AYACUCHO: Huamanga; Ayacucho, 2407 m, without date, *R. Loy s.n.* [*Soukup Herb. 4187*] (HOLOTYPE: NY!).

Shrubs 1-3 m in height. **Leaves** opposite; petioles 0.5-2.0 mm long; laminae narrowly elliptic to elliptic (6:1-3:1, L:W), 0.6-4.5 cm long, 0.3-1.0 cm wide, margins entire, basally acute, apically acute to rounded, adaxially scabrous, abaxially sparsely strigulose, with an understory of sub-sessile, glandular trichomes. **Inflorescence**

paniculiform, terminal, flowers congested; peduncle 0.1-1.2 cm long, pubescent; rachis 0.7-3.5 cm long, pubescent; pedicels 0.2-0.5 mm long. **Bracts** reduced, midrib present, lance-ovate, 2.0-2.5 mm long, 1.0-1.5 mm wide, apically acute, abaxially pubescent. **Calyx** sub-actinomorphic, campanulate, four-costate, 1.0-2.5 mm long, pubescent, with an understory of sub-sessile, glandular trichomes; lobes 4, triangular, apically acute. **Corolla** weakly zygomorphic, white, violet, to blue; tube 3.5-5.0 mm long, pubescent; limb 2.5-4.0 mm wide, pubescent. **Stigma** capitate, apically disposed. **Fruit** obovoid, 1.0-1.5 mm long, 1.0-1.5 mm wide, apically setose to glandular-setose, often densely villous below, bilobed, lobes ca. 0.1 mm long; intermericarpal cavity reduced, the surface smooth to weakly papillate.

Discussion: This species is believed to be related to *Aloysia fiebrigii* and *A. citrodora*, as suggested by characters of the inflorescence, calyx, and leaves. These several taxa are allopatric and no intergradation between them has been detected. Moldenke (1958) described *A. ayacuchensis* from Ayacucho, which is near Urubamba, the type locality for *A. herrerae*, which he described 17 years earlier. He did not mention any relationship between the two taxa but merely stated the species concerned to be "distinctive."

Distribution and habitat (fig. 14): Mountainous regions of southern Peru; rocky slopes; 2500-3500 m; flowering November to April.

Etymology: *Aloysia herrerae* was named in honor the collector of the type, Fortunato L. Herrera y Garmendia (1875-1945).

Common names and uses: Cedrón, cendroncillo, and cidron del campo.

This species has been reported as being used for tea (*P. C. Hutchison et al. 4199* [MICH, MO, NY]) and to treat head pain (*E. W. Davis et al. 1757* [F, GH, K, MO, NY]).

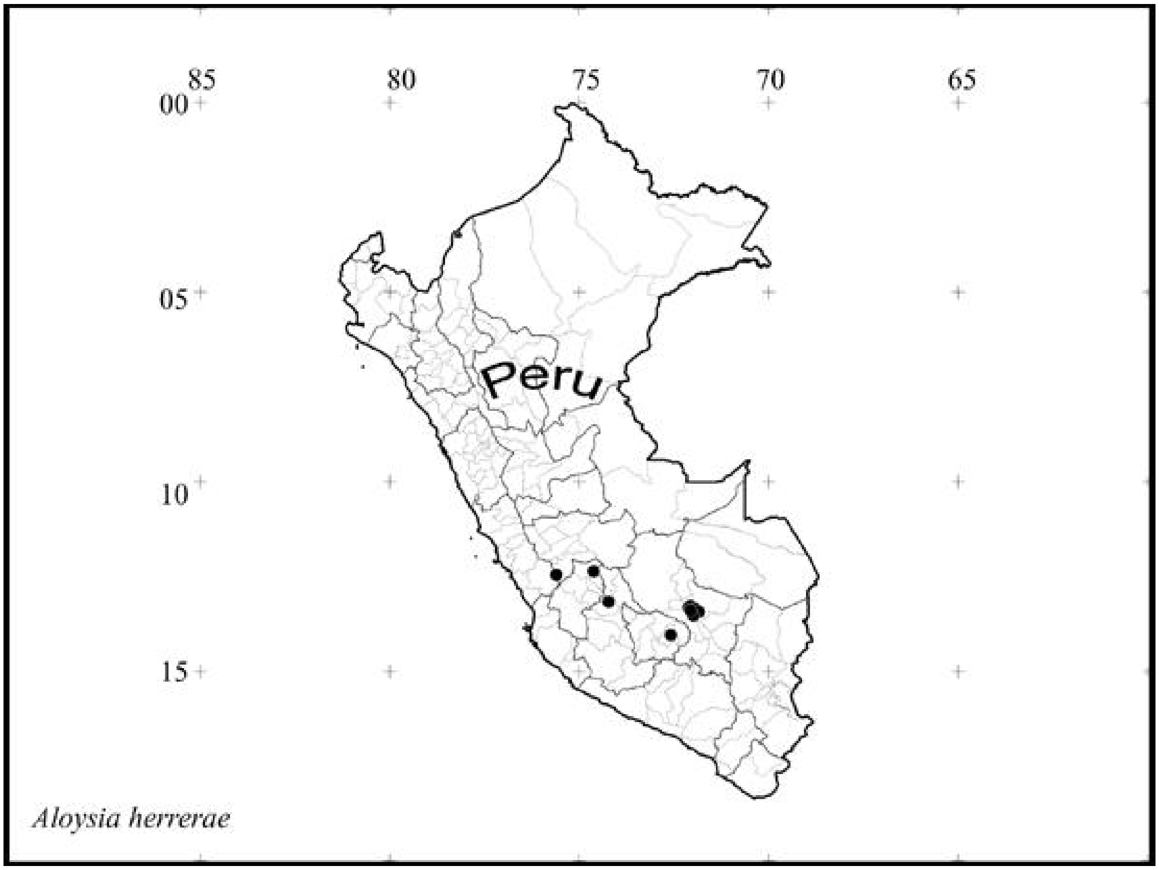

Figure 14: Distribution of *Aloysia herrerae*.

Representative specimens: PERÚ. APURÍMAC: Mpio. Grau; Hacienda Lucre, Oropeza Valley; on rocky, sandy slopes; the Oropeza River and its Valley drain into the Apurimac River from the L, 18 Jan 1939, *C. Vargas C. 9777* (UC). **AYACUCHO**: **Mpio. Huamanga**; Ayacucho, 7 Feb 1968, *J. Soukup 5467* (US). **CÚZCO**: **Mpio. Calca**; Calca, Pisac, ladera rocosa, 12 Mar 1948, *A. Lopez 669* (LL); Calca, alrededores, rocosas, 26 Jan 1938, *C. Vargas C. 248* (CAS, MO, NY). **Mpio. Quispicanchis**; Zona Arquelógica, 5 km N from Cuzco, 6 Nov 1986, *P. Nuñez 6463* (MO). **Mpio. Urubamba**; Chincheros, low trail from Chinchero center to Urquillos, below K'enti[sic] Capilla, growing on hillside, 25 Jan 1982, *E. W. Davis et al. 1757* (F, GH, K, MO, NY); Huayoccari to Yanacocha, Urubamba, NW from Cusco, on top of the mountain, 14 Feb 1987, *P. Nuñez et al. 7018* (F, MO); Huayllabamba, Quebrada de Huayoccari, Laguna de Yanaccocha, hemicriptófito, en parte baja de camino, 20 Dec 1988, *A. Tupayachi H. & W. Galiano 782* (MO). **HUANCAVELICA**: **Mpio. Tayacaja**; between Izcuchaca and Acostambo, S of Huancayo and N of La Mejorada, km. 372 on Carretera Central, 28 Feb 1964, *P. C. Hutchison & O. Tovar 4199* (MICH, MO, NY); Hacienda Tocas, entre Colcabamba y Paucarbamba, monte pluviifolio, 23 Apr 1954, *O. Tovar 2069* (LL).

4. ALOYSIA VIRGATA (Ruiz & Pav.) A. L. Juss. ex Moldenke

Shrub to tree 1-15 m in height. **Leaves** opposite; petioles 0.5-1.0 cm long; laminae lanceolate-elliptic to widely ovate, 4-9 cm long, 1.5-4.0 cm wide, margins crenate-serrate to serrate, basally rounded to truncate, apically acute to acuminate, adaxially scabrous, abaxially tomentose to strigulose, with an understory of sub-sessile, glandular trichomes. **Inflorescences** loosely spicate, sometimes paniculiform, 1-3(-5) inflorescences per leaf axil; peduncle 1.5-3.0 cm long, strigulose; rachis 10-15 cm long, strigulose; pedicels 0.5-2.5 mm long. **Bracts** linear to narrowly elliptic, 2-3 mm long, 0.5-1.0 mm wide, acuminate, strigulose. **Calyx** weakly zygomorphic, campanulate to tubular, 2.0-3.5 mm long, setose with an understory of sub-sessile, glandular trichomes; lobes 4, trullate to subulate, acuminate. **Corolla** zygomorphic, white; tube 2.5-3.5 mm long, glabrous; limb 2-3 mm wide, glabrous. **Stigma** capitate, lobes oblique. **Fruit** narrowly obovoid, 1.5-2.0 mm long, 1.0-1.5 mm wide, apically setose to glabrous, bilobed, lobes ca. 0.1 mm long; intermericarpal cavity reduced, the surface papillate.

Key to the varieties of *A. virgata*

1. Leaves lance-elliptic to ovate (3:2-6:5, L:W), apically acute, basally rounded to truncate; calyx tubular, the lobes acuminate, ca. equal to the calyx tube in length; ovaries and mericarps setose or glabrous.

    2. Leaves lance-elliptic to ovate, basally rounded; ovaries and mericarps glabrous. 4a. var. *virgata*

    2. Leaves ovate, basally truncate; ovaries and mericarps setose. 4b. var. *laxa*

1. Leaves lanceolate to lance-elliptic (ca. 2:1, L:W), apically acuminate, basally rounded; calyx campanulate, the lobes subulate, exceeding the calyx tube in length; ovaries and mericarps glabrous. 4c. var. *urticoides*

4A. ALOYSIA VIRGATA (Ruiz & Pav.) A. L. Juss. ex Moldenke var. **VIRGATA**, Lilloa 5: 384. 1940. *Verbena virgata* Ruiz & Pav., Fl. Peruv. 1: 20. 1798. *Lippia virgata* (Ruiz & Pavon) Steud., Nomencl. Bot. ed. 2, 2: 751. 1841. TYPE: PERU. PASCO: Mpio. Oxapampa; Pozuzo, 23 Jul-20 Sep 1784, *J. A. Pavon s.n.* (HOLOTYPE: ; ISOTYPES: G-2!, BM-2!). The type contains no label data other than the autograph "*Verbena virgata*" followed by "sp. nov." or "Fl. Per." Ruiz and Pavon, however, apparently collected *"Verbena virgata"* in the region around Pozuzo between July 23 and September 20, 1784 (Dahlgren, 1940).

Leaves lanceolate-elliptic; laminae 4-9 cm long, 1.5-4.0 cm wide, margins serrate, apically acuminate, basally rounded, abaxially strigulose. **Inflorescences** loosely spicate, sometimes paniculiform, 1-3(-5) inflorescences per leaf axil; peduncle 1.5-3.0 cm long, strigulose; rachis 10-15 cm long, strigulose; pedicels 1.0-2.5 mm long. **Bracts** linear to narrowly elliptic, 2-3 mm long, apically acuminate, abaxially strigulose. **Calyx** campanulate, 2.5-3.5 mm long, setose with an understory of sub-sessile, glandular trichomes; lobes 4, trullate, acuminate, approximately equaling calyx tube in length. **Corolla** weakly zygomorphic, white; tube 2.5-3.5 mm long, glabrous; limb 2-3 mm wide, glabrous. **Fruit** narrowly obovoid, 1.5-2.0 mm long, 1.0-1.5 mm wide, glabrous.

Discussion: *Aloysia virgata* is a widespread, variable, species. Three allopatric varieties can be delimited which demonstrate short-distance intergradation when contiguous. The var. *virgata* occupies the montane regions of Peru and Bolivia and intergrades with var. *laxa* where they make contact in southern Bolivia (fig. 13).

Distribution and habitat (fig. 15): Temperate to sub-tropical regions of Argentina, Bolivia, and Peru; calcareous or clay soils; 200-1800 m; flowering year round, depending on rainfall.

Etymology: The epithet "*virgata*" refers to the long, slender branches characteristic of this species.

Common Names: Arbol poleo, arbusto delgado, cambara, cambara de lixa, candeia-branca, chicharra caspi, favorita, guasi, lixa, lixeira, niño-rupá, niña rupá grande, niño rupa guazú, rupá-chico, paira ibóty, pau-lixa, and lixa.

Representative specimens: PERÚ. **CÚZCO**: **Mpio. La Convencion**; Hacienda Pobrero, Río Chuyape, affluent of rio Urubamba entering at Quillabamba, 7 km above Quillabamba, 1 Aug 1947, *F. R. Fosberg 28271* (LL, MO, NY). **JUNÍN**: **Mpio. Chanchamayo**; San Ramon, Hacienda La Victoria, 29 Jul 1966, *La Rosa & Riccio 1445* (LL). **SAN MARTÍN**: **Mpio. San Martin**; Valley of San Martín, along Río Shilcayo

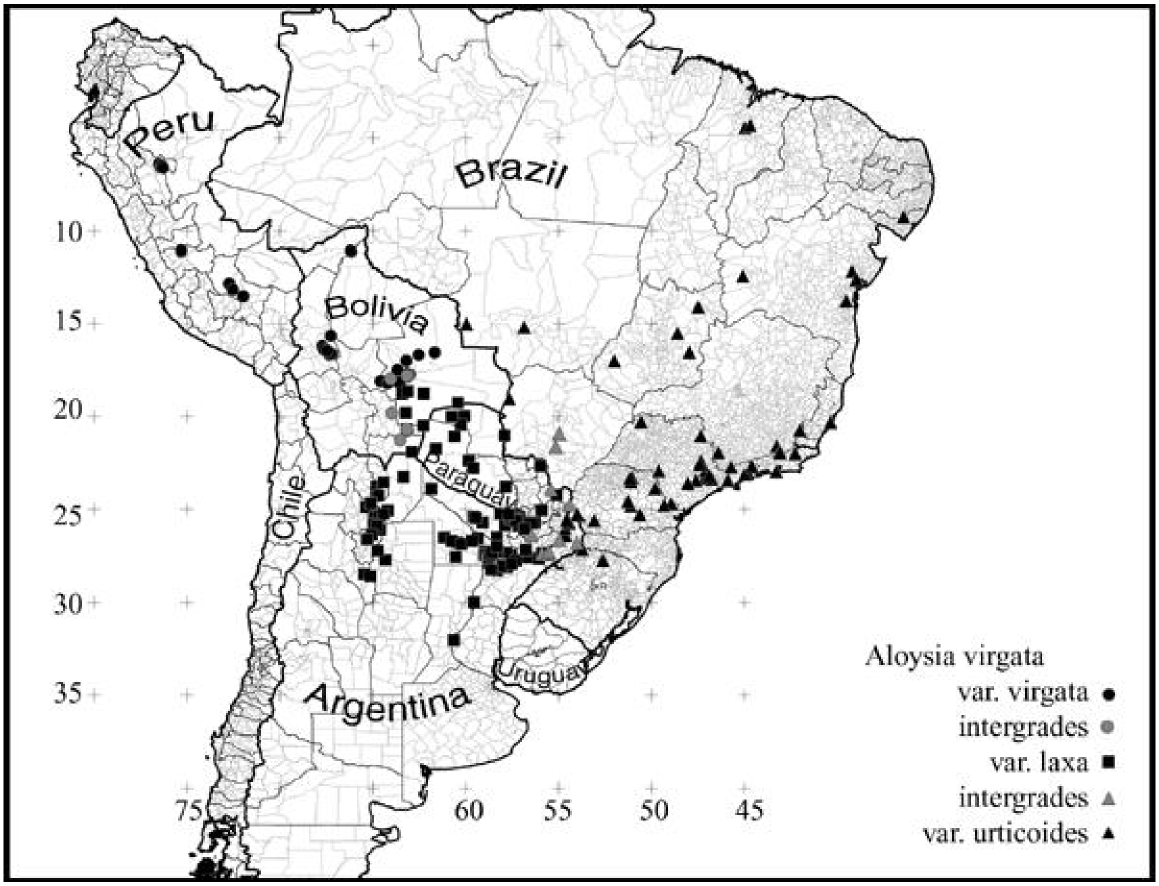

Figure 15: Distribution of *Aloysia virgata*.

1-4 km NE of Tarapoto, 21-22 Aug 1937, *C. M. Belshaw 3290* (F, K, LL-2, MO, MICH, NY, UC, US).

BOLIVIA. BENÍ: **Mpio. Vaca Diez**; Tumi Chucua 30 km S of Riberalta, flood plain forest, secondary forest; 11º 8' W, 66º 10' S, 29 Sep 1981, *J. C. Solomon 6506* (LL, MO, NY). **CHUQUISACA**: **Mpio. Hdo. Siles**; Monteagudo 50 km hacia Sucre, 1 Oct 1983, *S. G. Beck & M. Liberman 9364* (LL). **LA PAZ**: **Mpio. Inquisivi**; Lakachaka, this is our famous camp at the mouth of the Río Aguilani, 21 km N of Choquetanga, 21 Sep 1991, *M. Lewis 40408* (F, NY); Amazon Basin, vicinity Canamina, 20 Jul 1921, *H.*

H. Rusby 98 (MICH, NY). **Mpio. Sud Yungas**; Puente Villa, al borde del Río Unduavi, 13 Sep 1981, *S. G. Beck 4791* (NY); Huachi, head of Beni River, 22 Sep 1921, *H. H. Rusby 687* (GH, MICH, NY-2, US). **SANTA CRUZ**: **Mpio. Florida**; localidad "Volcanes", a 10 km al N de Bermejo, bosque ribereno, frecuente por las abejas, 4 Aug 1996, *J. Balcazar & E. Lijeron 962* (NY, TEX). **Mpio. Nuflo de Chavez**; Río San Julian, on road from Santa Cruz to San Ramon, 1985, *M. Lewis s.n.* (F-2, NY).

4B. ALOYSIA VIRGATA var. **LAXA** (Chod.) Moldenke, Phytologia 1: 95. 1934. *Lippia urticoides* var. *laxa* Chod., Bull. Herb. Boiss., ser. 2, 2: 819. 1902. *Lippia virgata* var. *laxa* (Chod.) Briq., Ann. Conserv. Jard. Bot. Genéve 7-8: 304. 1904. TYPE: PARAGUAY. in altoplanitie et decliviis, Sierra de Mbaracayu, Oct 1898 or 1899, *E. Hassler 5206* (HOLOTYPE: G!; ISOTYPES: GH!, NY!, UC!, W!).

Aloysia virgata var. *platyphylla* (Briq.) Moldenke, Phytologia 2: 408. 1948. *Lippia virgata* var. *platyphylla* Briq., Ann. Conserv. Jard. Bot. Genéve 7-8: 304. 1904. TYPE: PARAGUAY. Paraguari, Mar 1881, *B. Balansa 3116* (LECTOTYPE [here designated]: F!; ISOLECTOTYPE: GH!). Briquet (1904) mentions two collections in the protologue for *Lippia virgata var. platyphylla*, *Balansa 1016 pro parte* and *Balansa 3116*. He goes on to cite the rest of the *Balansa 1016* collection as the type for *L virgata* var. *elliptica*. *Balansa 3116* is chosen as the lectotype for *L. platyphylla* in order to eliminate confusion with the type for *L. virgata* var. *elliptica*.

Lippia virgata var. *elliptica* Briq., Ann. Conserv. Jard. Bot. Genéve 7-8: 304. 1904. *Aloysia virgata* var. *elliptica* (Briq.) Moldenke, Phytologia 13: 441. 1940. TYPE:

PARAGUAY. L'Assomption, 4 Oct 1875, *B. Balansa 1016, pro parte* (HOLOTYPE: BR; PHOTOHOLOTYPE: NY!; ISOTYPE: S!).

Aloysia looseri Moldenke, Lilloa 5: 377. 1940. *Lippia looseri* (Moldenke) Looser, Revista Univ. Santiago 26: 141. 1941. TYPE: CHILE. SANTIAGO: small shrub cultivated in gardens in Santiago, 15 Dec 1925, *G. Looser 4008* (HOLOTYPE: NY!).

Aloysia lycioides var. *revoluta* Moldenke, Phytologia 9: 500. 1949. *Aloysia gratissima* var. *revoluta* (Moldenke) Moldenke, Phytologia 3: 108. 1964. TYPE: URUGUAY. without locality, without date, *J. Arechavaleta s.n.* (HOLOTYPE: MVM; PHOTOHOLOTYPES: LL!, NY!; ISOTYPES: G!, NY!). There is no location data on the specimen, but Moldenke (1940) states the specimen was "probably collected by José Arechavaleta somewhere in Uruguay".

Aloysia scorodonioides var. *lopez-palacii* Moldenke, Phytologia 36: 437. 1977. TYPE: ECUADOR. PICHINCHA: Mpio. Quito, in cultivation in Quito, material from Ibarra to Tungurahua, 2800 m, 4 Feb 1977, *S. López-Palacios 4249* (HOLOTYPE: LL!; ISOTYPE: F!; PHOTOISOTYPES: LL!, NY!).

Aloysia virgata var. *argutedentata* Moldenke, Phytologia 55: 232. 1984. TYPE: ARGENTINA. SANTIAGO DEL ESTERO: Mpio. C. Pellegrini; Cerro del Remote, 550 m, 14 Jan 1928, *S. Venturi 5764* (HOLOTYPE: US!; PHOTOHOLOTYPE: LL!; ISOTYPES: CAS!, F!, GH-2!, NY!).

Leaves ovate, rugose; laminae 4-6 cm long, 1.5-4.0 cm wide, margins crenate-serrate, basally rounded to truncate, apically acute, abaxially tomentose. **Inflorescences** loosely spicate; peduncle 1.5-3.0 cm long, pilose; rachis 10-15 cm long, pilose; pedicels 0.5-1.5 mm long. **Bracts** linear to narrowly elliptic, 2-3 mm long, 0.5-1.0 mm wide, acuminate, strigulose. **Calyx** tubular, 2-3 mm long, setose with an understory of sub-sessile, glandular trichomes; lobes trullate, acuminate, approximately equaling calyx tube in length. **Corolla** weakly zygomorphic, white; tube 2.5-3.5 mm long; limb 2-3 mm wide. **Fruit** narrowly obovoid, 1.5-2.0 mm long, 1.0-1.5 mm wide, apically setulose.

Discussion: The var. *laxa* occupies northern Argentina, Paraguay, and Bolivia and intergrades with both varieties on opposite ends of its range. As mentioned above, var. *laxa* intergrades with var. *virgata*, but also with var. *urticoides* along the northeastern edge of its range. Botta (1979) recognized this taxon as *A. virgata* var. *platyphylla*, though she admits "no he podido estudiar el tipo de *A. virgata* var. *laxa*" and she based her assessment on Chodat's (1902) protologue.

It should be noted that *Aloysia looseri*, *A. gratissima* var. *revoluta*, and *A. scorodonioides* var. *lopez-palacii* were described from cultivated material and none occur as native elements anywhere. It is apparent from the multiplicity of names that Moldenke was uncertain how to deal with the variation found in *A. platyphylla*. I have observed *A. looseri* in the gardens of the Universidad Nacional de Chile in Santiago (SGO), the source of the type material.

Distribution and habitat (fig. 15): Arid, temperate, and sub-tropical regions of Bolivia, Paraguay, and Argentina; calcareous soils; 350-2000 m; flowering year round, depending on rainfall.

Etymology: The varietal name "*laxa*" refers to the loose inflorescence branches; the synonymous *Aloysia looseri* was named in honor of Dr. Gualterio Looser (1898-1982), in recognition of his work on the Flora of Chile.

Common names: Arbol poleo, guasi, ilan-ilan, paira ibóty, and niña rupá.

Representative specimens: ARGENTINA. CORRIENTES: **Mpio. Capital**; Riachuelo, 28 Dec 1976, *R. Martínez Crovetto & A. Schinini 10799* (CTES, F, G); Corrientes, 11 Jun 1972, *A. Schinini & H. Pueyo 4765* (CTES, GH). **Mpio. Itatí**; Itatí, orilla del Río Paraná, 16 Apr 1972, *A. Schinini & L. Mroginski 4508* (CTES). **Mpio. Ituzaingó**; 17 km NW de San Carlos, Ea. Rincon Chico; borde isleta de selva, 14 Feb 1991, *S. G.Tressens, S. Ferucci, & A. Radovancich 3881* (CTES, GH). **Mpio. Mburucuyá**; Estancia Santa Teresa, 5 Feb 1951, *T. M. Pedersen 1074* (G, GH, MO, NY, US). **FORMOSA: Mpio. Patiño**; Bartolomé de las Casas, monte albo, 8 May 1969, *A. G. Schulz 16945* (CTES). **MISIONES: Mpio. Capital**; Posadas, in ripa fluminis Alto Parana, 7 Dec 1907, *E. L. Ekman 2003* (F, GH, MICH, NY). **Mpio. San Ignacio**; San Ignacio, camino a Puerto Nuevo, selva, 24 Sep 1993, *C. L. Cristóbal, D. Wasshausen, & V. Marunak 2266* (TEX, US).

BOLIVIA. CHUQUISACA: **Mpio. Azero**; 5 km N de Carandaytí, 12 Apr 1977, *A. Krapovickas & A. Schinini 31228* (CTES, F). **Mpio. Luis Calvo**; 1-2 km S del Centro El Salvador-Cimboc, clausura El Huare; en quebrachal, 7 Apr 1993, *C. Saravia Toledo et al. 11429* (CTES). **SANTA CRUZ**: Las Juntas, 29 Jan 1947, *I. Peredo s.n.* (LIL, NY-2); Santa Cruz, alrededores de la ciudad, 23 May 1946, *I. Peredo s.n.* (NY). **Mpio. Andres Ibanez**; 12 km E of center of Santa Cruz, on road to Cotuca; subtropical, semi-deciduous “Chaco” forest, 4-8 m tall, dense, spiny, briefly inundated in rainy season, the soil silty and fine sandy, 9 Jul 1987, *M. Nee 35082* (F, G, NY, TEX). **Mpio. Cordillera;** Parque Nacional Kaa-Iya del Gran Chaco, Paleodunas 25 km al NE de Palmar de las Islas; bosque chaqueño seco de transicion a chiquitano, Gochnatio-Anadenantheretum, y etapas seriales producidas por fuego, suelos arenosos, 12 Feb 1998, *A. Fuentes & G. Navarro 2289* (CTES); La Morita, Cabezas, 27 Jan 1945, *I. Peredo 102*

(GH-2, NY). **Mpio. Florida**; Hierba Buena, frecuente, 12 Jun 1966, *R. F. Steinbach 285* (F, GH, MICH, NY, UC, US).

PARAGUAY. ALTO PARAGUAY: **Mpio. Fuerte Olimpo**; Chaco Paraguay, F. Olimpo; pendiente del cerro, 23 Dec 1946, *T. Rojas 13879* (NY-2). Mpio. Mayor Pablo La Gerenza; Cerro León, 24 Aug 1981, *A. Schinini et al. 21139* (CTES). **ALTO PARANÁ**: **Mpio. San Alberto**; Santa Teresa, 1 Aug 1945, *Bertoni 1720* (NY). **AMAMBAY**: **Mpio. Pedro Juan Caballero**; Parque Nacional Cerro Corá, roadside secondary growth, 18 Mar 1983, *J. E. Simonis et al. 112* (MO, NY). **BOQUERÓN**: **Mpio. Mcal. Estigarribia**; Colonia Menno, Río Verde, Colonia Lolita; en bosque xerofito, 10 Sep 1990, *R. Vanni, A. Radovancich, & A. Schinini 1858* (CTES). **Mpio. Pedro P. Peña**; Mission Santa Rosa, Nov 1981, *P. Arenas 1715* (NY). **CAAGUAZÚ**: **Mpio. Yhu**; salida de Caaguazú hacia Yhu, bordes de la pista con cultivos, 20 Feb 1982, *J. F. Casas 6357* (LL). **CENTRAL**: **Mpio. San Lorenzo**; San Lorenzo, Capilla del Monte, en campo cultivo abandonado, entre hierbas y sufrútices, 28 Feb 1985, *E. Bordas 3644* (CTES). **Mpio. Villa Elisa**; Ñemby, hacia Salinas, al costado del camino a media sombra, suelo arenoso, 20 Jun 1981, *I. M. Vavrek 242* (NY). **CORDILLERA**: **Mpio. Piribebuy**; Colonia Ojopoi, entre Piribebuy e Itacarubi, 12 Jul 1982, *P. Arenas 2421* (NY). **GUAIRÁ**: **Mpio. Villarica**; Jatatu, 8 km N of Villarrica, 16 Dec 1936, *W. A. Archer 4677* (GH, NY-2, US); Mpio. Villarica; Villarrica, very common, 20 Jan 1929, *P. Jörgensen 3779* (CAS, F, GH-2, K, MO, NY). **ITAPÚA**: **Mpio. San Rafael del Parana**; cerca e Pto.[sic] San Rafael, en bosquete claro, 18 Sep 1980, *J. F. Casas 3726* (NY). **MISIONES**: **Mpio. Santiago**; Ea. La Soledad, 3 km S de Santiago, en isleta de selva; 56º 46' W, 27º 10' S, 3 Feb 1988, *A. Schinini & R. Vanni 26018* (CTES, GH, K). **PARAGUARÍ**: **Mpio. Paraguari**; Cerro Mbatovi, in secondary vegetation, 2 Jul 1988, *E. Zardini 5400* (NY, US); **Mpio. Yaguarón**; Yaguarón, orilla del Arroyo Yaguarón, 31

Jan 1966, *A. Krapovickas, C. L. Cristóbal, & R. A. Palacios 12255* (CTES, UC). **Mpio. Ybycui**; Parque Nacional Ybycui, sandy soil, disturbed secondary vegetation in abandoned fields between La Rosada and park headquarters, 8 Mar 1983, *W. Hahn 1146* (NY). **PRESIDENTE HAYES**: Estancia Yrenda, sabana arbolada, espartillar; estrato arboreo, hasta 12 m, 15 Feb 1993, *L. Perez et al. 3034* (CTES).

4C. ALOYSIA VIRGATA var. **URTICOIDES** (Cham.) Siedo, comb. et stat. nov. *Aloysia urticoides* Cham., Linnaea 7: 238. 1832. *Lippia urticoides* (Cham.) Steud., Nomencl. Bot. ed. 2, 2: 54. 1841. TYPE: BRAZIL. without specific locality, without date, *F. Sellow s.n.* (LECTOTYPE [here designated]: G!; ISOLECTOTYPES: G!, GH!, US!). The holotype was housed at B until its destruction during WWII. A specimen from G is designated the lectotype for comparative purposes.

Leaves lanceolate-elliptic; laminae 4-9 cm long, 1.5-4.0 cm wide, margins serrate, apically acuminate, basally rounded, abaxially strigulose. **Inflorescences** loosely spicate, sometimes paniculiform, 1-3(-5) inflorescences per leaf axil; peduncle 1.5-3.0 cm long, strigulose; rachis 10-15 cm long, strigulose; pedicels 1.0-2.5 mm long. **Bracts** linear to narrowly elliptic, 2-3 mm long, apically acuminate, abaxially strigulose. **Calyx** campanulate, 2.5-3.5 mm long; lobes subulate, exceeding calyx tube in length. **Corolla** weakly zygomorphic, white; tube 2.5-3.5 mm long; limb 2-3 mm wide. **Fruit** narrowly obovoid, 1.5-2.0 mm long, 1.0-1.5 mm wide, glabrous.

Discussion: The var. *urticoides* makes contact and intergrades with var. *laxa* in northeastern Argentina, Paraguay, and southwestern Brazil. There are no known intergrades between var. *urticoides* and var. *virgata* but intermediates may be expected in the region of Mato Grosso, Brazil or eastern Bolivia, where the taxa approach each other.

Distribution and habitat (fig. 15): Temperate to sub-tropical regions of southern Brazil; calcareous to clay soils; up to 1000m; flowering year round, depending on rainfall.

Etymology: This variety is presumably named for its superficial resemblance to the genus *Urtica*.

Common Names: Arbol poleo, arbusto delgado, cambara, cambara de lixa, candeia-branca, chicharra caspi, favorita, guasi, lixa, lixeira, niño-rupá, niña rupá grande, niño rupa guazú, rupá-chico, paira ibóty, pau-lixa, and lixa.

Representative specimens: ARGENTINA. MISIONES: Mpio. Candelaria; Loreto, 23 Jan 1945, *J. E. Montes 512* (F, NY-4). **Mpio. Iguazú**; Esperanza, 30 Jun 1951, *Buchinger s.n. [59096]* (BA); Cataratas del Iguazú, 21 Feb 1945, *Descole 3330* (GH, NY); Puerto Iguazú, 4 Sep 1910, *Rodríguez 478* (F, GH, NY).

BRAZIL. **BAHIA**: Feira de Santana, BA 052, 25 km NW de F. Santana, Mata decidua de encosta, Faz. Retiro, 13 Nov 1986, *L. P. Quieroz & M. J. Lemos 1004* (F, NY); Cachoeira/Bahia, Vale dos Ríos, Paraguaçu e Jacuire, Mata a Ne da B. Bananeiras, Sep 1980, *G. P. Cavalo 783* (NY). **ESPÍRITU SANTO**: **Mpio. Vitoria**; Vitoria, capital, Rod BR-262 a Realeza; mata, 21 Jul 1970, *T. S. Santos 991* (LL-2). **GOIÁS**: **Mpio. Caiaponia**; Serra do Caiapo, 50 km S of Caiaponia; beside small creek, 23 Oct 1964, *G. T. Prance & N. T. Silva 59578* (F, GH, NY, US). **MARANHÃO**: Fazenda Bacaba, Doctor Haroldo, 5 km S of MA 119 from entrance of Lago do Junco; hillside vegetation by trail & little distrubed hilltop forest, community, 6 Oct 1980, *D. C.Daly et al. D528* (K, NY, US). **Mpio. Ipixuna**; Road from São Luiz Gonzaga to Santo Antonio, 53 to 35 km from Bacabal, Capoeira, 1 Oct 1980, *D. C.Daly et al. D417* (F, LL, MO, NY). **MATO GROSSO**: **Mpio. Mato Grosso**; Mato Grosso, Aug 1892, *O. Kuntze s.n*. (NY, US). **Mpio. Corumba**; coletado na parte seca calcaria, 8 Sep 1984, *C. A. Conceição 1564* (LL). **Mpio. Maracaju**; Maracaju, arredores, cerrado semi-devastado, 14 May 1976, *G. Hatschbach 38661* (LL, UC, US). **Mpio. Caldas**; Caldas, 20 Oct 1873, *H. Mosen 638* (NY). **Mpio. Coronel Pacheco**; Coronel Pacheco, Minas Gera[i]s, Estacao Experimental de Cafe, 8 Sep 1940, *E. P. Heringer 327* (NY). **Mpio. Mar de Espanha**; Fazenda de Aguada, overgrown slope above stream, in open, frequent, used for firewood, 13 Sep 1930, *Y. Mexia 5046* (BH, CAS, F, G, GH-2, MICH, NY, UC, US). **PARANÁ**: **Mpio. Candido de Abreu**; Plantae Brasiliensis, Therezina in "capoeira", 27 Jan 1911, *P. Dusén 11133* (G, GH, NY, US). **Mpio. Cerro Azul**; Río Turvo, capoiera, xiloteca, 5 Oct 1977, *G. Hatschbach 40339* (NY). **Mpio. Dos Vizinhos**; Río Chopim, capoeira, 15 Sep 1972, *G. Hatschbach 30322* (LL-2, UC, US). **Mpio. Ibipora**; BR entre Londrina e Ibipora, 10 Aug 1994, *F. C. Silva 1721* (G, NY). **Mpio. Londrina**; Irere, 29 Sep 1970, *G. Hatschbach & O. Guimarães 24845* (NY, MO, UC). **Mpio. Matelándia**; Matelándia, margens rochosas da estrada, a beira da matão ha capoeira, 18 Jun 1967, *G. Hatschbach & H. Hass 16572* (TEX, UC, US). **RÍO DE JANEIRO:** **Mpio. Cordeiro**; 5 km de Macuco em direção a Santa Maria Madalena, na divisão do Sitio Laranjais com o Sitio Poleiro, 20 Aug 1972, *D. Araújo 95* (CTES, F). **SÃO PAULO**: **Mpio. Altinopolis**; Río Claro, divisa de municipio con Araras, Fazenda Sao Jose; mata mesofila, beira de mata, frequente na regiao toda, 2 Sep 1984, *J. R. Pirani et al. 833* (NY). **Mpio. Araras**; Loreto, São Paulo, Dec 1917, *O. Vecchi 1189* (NY). **Mpio. Cabreuva**; Cabreuva, 4 Oct 1933, *Hoehne 31005* (F, G, K, NY). **Mpio. Caieiras**; Caieiras, São Paulo, 19 Oct 1942, *M. Kuhlman & P. Goncalves* (NY). **Mpio. Cunha**; Cunha, São Paulo, 18 Oct 1939, *J. Kiehl & C. M. Franco 5171* (NY). **Mpio. Jales**; Jales,

Pastos do Retiro, 23 Oct 1951, *W. Hoehne SPF 13942* (G, NY). **Mpio. Limeira**; Limeira, edge of jungle forest, 27 Sep 1948, *A. L. & H. N. Moldenke 19656* (NY). **Mpio. Santa Branca**; Villa de Santa Branca, Nov 1897, *A. Puttemans 4361* (NY). **Mpio. Santa Cruz do Río**; Río Pardo, 6 Sep 1959, *Valio, I. M. 45* (NY). **Mpio. São Jose do Barreiro**; São Jose do Barreiro, Sao Paulo, 1 May 1926, *A. Gehrt & F. C. Hoehne s.n.* (NY). **Mpio. Varzea Paulista**; Jundiahy, 6 Oct 1931, *F. C. Hoehne s.n.* [28330] (NY).

5. ALOYSIA CASTELLANOSII Moldenke

Shrubs 0.3-2.0 m in height. **Leaves** opposite; petioles 0.5-3.0 mm long; laminae linear to oblong, bullate, 1-3 cm long, 0.3-1.2 cm wide, margins prominently crenate-dentate, revolute, basally truncate, apically obtuse to somewhat rounded, adaxially setose, abaxially densely setose with an understory of sub-sessile, glandular trichomes. **Inflorescence** compactly to loosely spicate, hop-like; peduncle 0.5-2.0 cm long, setulose with an understory of sub-sessile, glandular trichomes; rachis 1-9 cm long, setulose with an understory of sub-sessile, glandular trichomes; pedicels 0.2-0.5 mm long. **Bracts** foliaceous, showy, 3-6 mm long, 1.5-4.0 mm wide, setulose, acute to long-acuminate. **Calyx** sub-actinomorphic, tubular, 2.0-4.5 mm long, setose with an understory of sub-sessile, glandular trichomes; lobes 4, trullate to subulate, acute to acuminate. **Corolla** zygomorphic, white, pink, to pale lavender; tube 3.0-5.5 mm long, glabrous; limb 3.5-5.5 mm long, glabrous. **Stigma** sub-capitate, laterally disposed. **Fruit** narrowly obovoid, 1.5-2.0 mm long, 0.8-1.2 mm wide, glabrous, bilobed, lobes ca. 0.5 mm; intermericarpal cavity reduced, the surface smooth to papillate.

Discussion: *Aloysia castellanosii* is readily separated from the rest of the genus by virtue of its hop-like loosely spicate inflorescences, showy, foliaceous bracts, and bullate leaves. It occurs across the deserts of northwestern Argentina and can be separated into two varieties, as noted in the following key.

Key to the varieties of *A. castellanosii*

1. Bracts elliptic to ovate, apically acute to short-acuminate; calyx 2-3 mm long, lobes acuminate 5a. var. *castellanosii*

1. Bracts obovate, apically long-acuminate; calyx 3.0-4.5 mm long, lobes subulate 5b. var. *magna*

5A. ALOYSIA CASTELLANOSII Moldenke var. **CASTELLANOSII**, Lilloa 5: 372. 1940. TYPE: ARGENTINA. SAN JUAN: Mpio. San Juan, Quebrada del Zonda, 28 Feb 1926, *A. Castellanos s.n. [26/602]* (HOLOTYPE: BA!; ISOTYPE: NY!).

Leaves 1.5-3.0 cm long, 0.3-1.0 cm long; petioles 0.5-1.5 mm long. **Inflorescence** compactly to loosely spicate; peduncle 0.5-1.5 cm long; rachis 1-7 cm long. **Bracts** elliptic to ovate, 3-5 mm long, 1.5-2.5 mm wide, apically acute to short-acuminate. **Calyx** 2-3 mm, lobes acuminate. **Corolla** white, pink, to pale lavender; tube 4.5-5.5 mm long, glabrous; limb 3.5-5 mm long, glabrous.

Discussion: The var. *castellanosii* occurs on granitic or limestone outcrops, while var. *magna* prefers sandstone. There are some intergrades along the southern edge of the range of var. *magna* (*Hunziker 9751* and *Castillón 85*; see map). Botta (1979) did not recognize var. *magna* in her treatment of the genus in Argentina. She reportedly based her analysis on quantitative characters like bract and leaf dimensions. However, she did not address the relative geographic isolation of these taxa or account for qualitative differences such as bract and calyx shape.

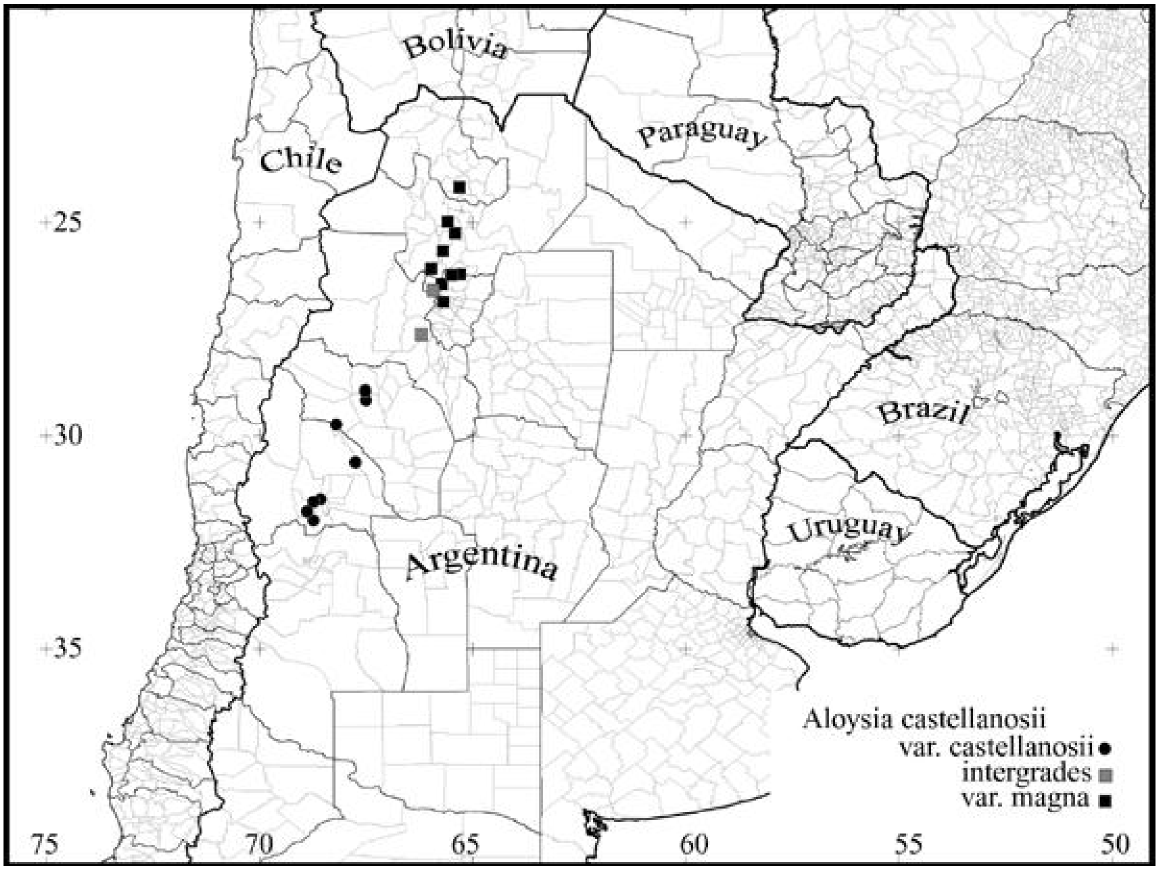

Figure 16: Distribution of *Aloysia castellanosii*.

Distribution and habitat (fig. 16): Arid regions of northwestern Argentina in the states of La Rioja, San Juan, and Catamarca; limestone and granite outcrops; 1000-1700 m; flowering October to June.

Etymology: This species is named in honor of Alberto Castellanos (1896-1968), prominent collector from Argentina.

Representative specimens: ARGENTINA. CATAMARCA: Mpio. Andalgalá; 18 km de Andalgalá a Central de la Chilca, 19 Mar 1980, *J. Hunziker 9751* (SI). **LA RIOJA: Mpio. Famatina**; Famatina, en cerros, 9 Jan 1949, *Krapovickas & Hunzicker 5058* (NY); ca. 2 km S of Famatiná on Ruta Provincial 11, granite road-cut above small roadside shrine; S facing slopes, 1 Jan 2002, *S. J. Siedo 1118* (TEX). **Mpio. General Lavalle**; Parque de Talampaya, 29 Mar 1989, *J. H. Hunziker & J. C. Gamerro 11661* (SI). **SAN JUAN: Mpio. Sarmiento**; El Pedernal, 4 Dec 1945, *A. R. Cuezzo 1656* (NY).

5B. ALOYSIA CASTELLANOSII var. **MAGNA** Moldenke, Known Geogr. Distrib. Verb. Avicenn. 76. 1942. TYPE: ARGENTINA. TUCUMÁN: Amaicha, 2300 m, 4 Feb 1917, *Castillón 85* (HOLOTYPE: NY!; ISOTYPE: LIL!).

Leaves 1-3 cm long, 0.3-0.8 cm long; petioles 0.5-3.0 mm long. **Inflorescence** loosely spicate, rarely compact; peduncle 0.5-2.0 cm long; rachis 1-9 cm long. **Bracts** obovate, midvein prominent, at least apically, 3.5-6.0 mm long, 1.5-4.0 mm wide, apically long-acuminate. **Calyx** 3.0-4.5 mm long, lobes subulate. **Corolla** pale lavender, pink, to light blue; tube 4.0-5.5 mm long, sparsely pubescent distally; limb 3.0-5.5 mm long, sparsely pubescent.

Discussion: As discussed above, the var. *magna* intergrades along its boundary with var. *castellanosii*. I encountered var. *magna* on sandstone outcrops (*Siedo et al. 1116* [TEX]), while var. *castellanosii* was found on granite outcrops (*Siedo et al. 1118* [TEX]). Moldenke (1942) emphasized leaf and inflorescence characters in his protologue which may explain why some authors have not recognized the variety (Botta, 1979). The leaves and inflorescences can be slightly longer in var. *magna*, but these characters overlap a great deal and display little geographic or ecological integrity.

Distribution and habitat (fig. 16): Arid regions of northwestern Argentina in the states of Salta and Tucumán; sandstone outcrops; 1300-3000 m; flowering December to March.

Etymology: The var. *magna* was named for its somewhat larger leaves, especially notable on the type.

Additional specimens examined: **ARGENTINA. SALTA: Mpio. La Viña**; Quebrada de Guachipas, 23 Jan 1943, *A. Castellanos s.n. [46961]* (BA); La Viña to Cafayate along Ruta Nacional 68, Quebrada del Rio de las Conchas, between Alemania and Morales at Las Arbitas, ca. km 456, 21 km N of Garganta del Diablo and 32 km N of Santa Barbara, 30 Dec 2001, *S. J. Siedo 1116* (TEX). **Mpio. Rosario de Lerma**; Route 68, Cafayate a Alemania, en quebrada seca, suelo pedregoso, 31 Jan 1947, *A. G. Schulz 6635* (CTES, LL); Rosario de Lerma, Nevado del Castillo, Jan 1929, *S. Venturi 8566* (GH). **JUJUY: Mpio. Capital**; Jujuy, Feb 1931, *Budin 6226* (NY). **TUCUMÁN: Mpio. Tafi del Valle**; in rock barren hillside, Tafi del Valle, 18 Oct 1948, *A. L. & H. N Moldenke s. n.* (NY); Julipao, Cumbres Calchaquies, 5 Jun 1949, *J. Morello 1252* (SI). **Mpio. Trancas**; San Pedro de Colalao, Jan 1940, *T. Meyer 3370* (NY).

6. ALOYSIA VELUTINA Siedo, **sp. nov.** (figs. 17-20)

Aloysia scorodonioides *similis, ramulis velutinis; foliis ovatis vel ellipticis, 3.5-6.0 cm longis, 1.7-5.0 cm latis, supra velutinis, infra incanis; inflorescentiis paniculiformibus terminalibus, rachidibus incanis; schizocarpis bilobis, apicem setulosis.*

TYPE: PERU. CAJAMARCA: sobre el km 156 de la carretera Pacasmayo-Cajamarca, bosque espinoso, 2000 m, 5 Apr 1982, *I. Sanchez Vega 2763* (HOLOTYPE: F!; ISOTYPES: MO!, SI!).

Shrub 1.0-1.5 m in height. **Leaves** opposite; petioles 0.3-1.0 cm long; laminae ovate to elliptic, 3.5-6.0 cm long, 1.7-5.0 cm wide, margins crenate, basally truncate to rounded, apically rounded, obtuse, to sub-acute, adaxially velutinous, abaxially incanous. **Inflorescence** loosely paniculate, terminal; peduncle 1-3 cm long, incanous; rachis 8-15(-25) cm long, incanous; pedicels 0.2-0.5 mm long. **Bracts** reduced, lanceolate, midrib present, 2.0-2.5 mm long, 0.3-0.5 mm wide, acuminate, strigulose, margins prominently ciliate. **Calyx** weakly zygomorphic, tubular, 2.0-2.5 mm long, densely setose with an understory of sub-sessile, glandular trichomes; lobes 4, trullate, acute to short acuminate. **Corolla** sub-actinomorphic, white; tube 2.5-3.0 mm long, pubescent with understory of sub-sessile, glandular trichomes, at least distally; limb 2.5-3.5 mm wide, basally pubescent with an understory of sub-sessile, glandular trichomes. **Stigma** sub-capitate, laterally disposed. **Fruit** obovoid, 1.5-2.0 mm long, 1.0-1.5 mm wide, apically setulose, bilobed, lobes 0.1-0.3 mm long; intermericarpal cavity reduced, the surface papillate.

Discussion: *Aloysia velutina* has determinate terminal inflorescences, a character seen in only a few species in the genus; e.g., *A. citrodora*, *A. fiebrigii*, and *A. herrerae*. Most *Aloysia* have indeterminate axillary inflorescences (fig. 20). *Aloysia velutina* is believed to be closely related to *A. scorodonioides* but is easily separated by its inflorescence, pubescent mericarps, and velutinous to incanous vestiture (fig. 19). It is notable that all known collections of *A. velutina* are relatively recent, after 1980 or so, and were probably never viewed by Moldenke.

Distribution and habitat (fig. 17): Arid regions of Cajamarca, Peru; rocky slopes; 2000-2800 m; flowering April to July.

Etymology: This species is named for its velutinous to incanous vestiture.

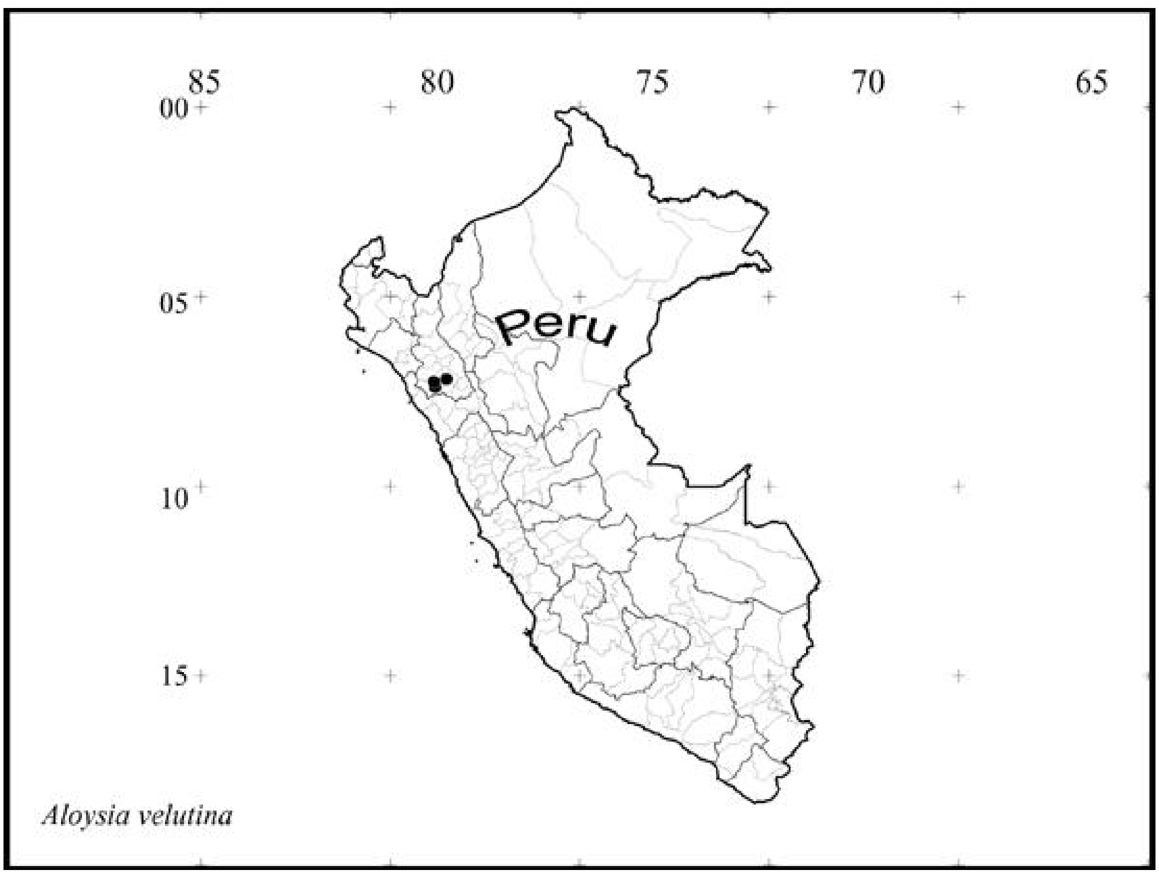

Figure 17: Distribution of *Aloysia velutina*.

Figure 18: Holotype of *Aloysia velutina* (*Sanchez Vega 2763* [F]).

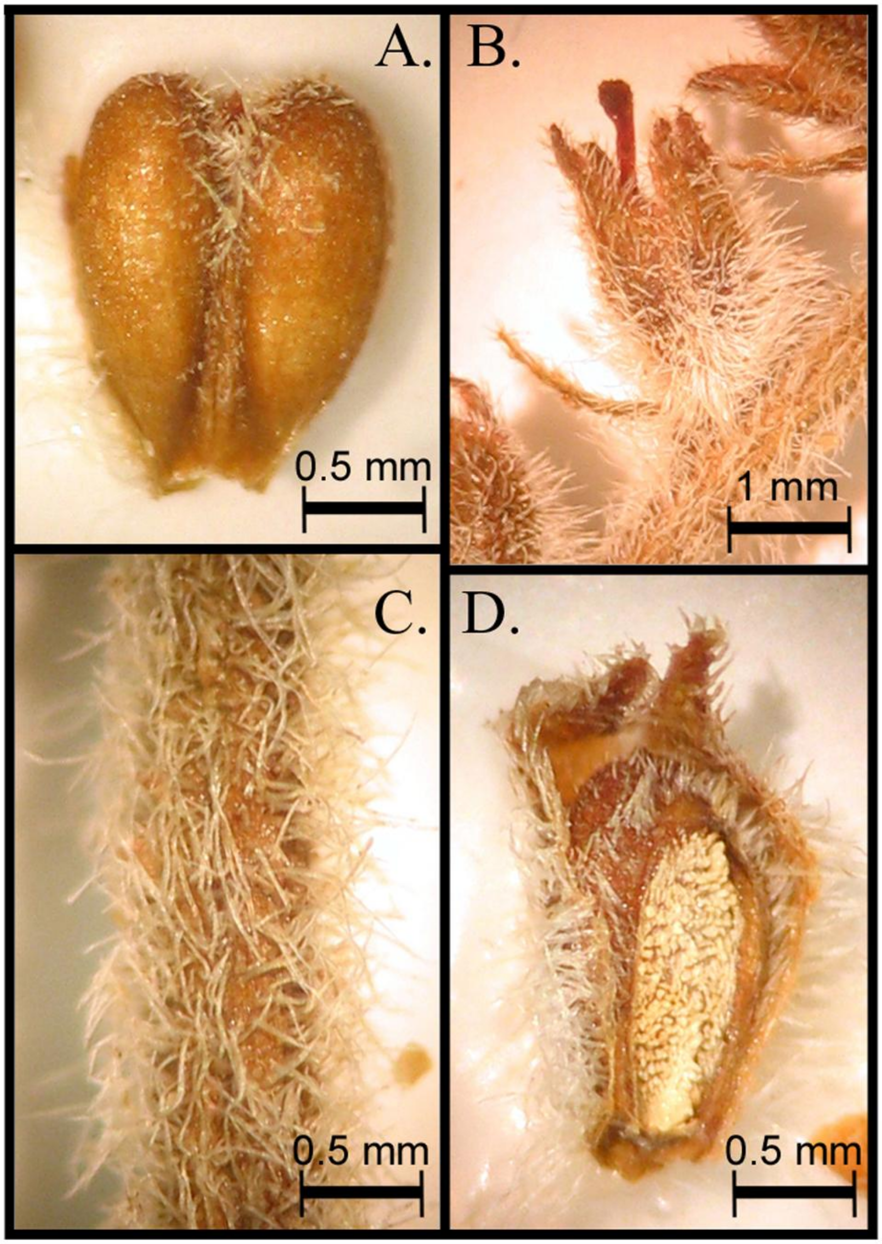

Figure 19: Light micrographs of *Aloysia velutina* showing (A) schizocarp, 20x mag.; (B) lateral view of rachis, bract, calyx, and stigma; 10x mag.; (C) inflorescence rachis, 20 x mag.; and (D) mericarp with calyx attached showing intermericarpal cavity, 20x mag. (*Sanchez Vega 2763* [F]).

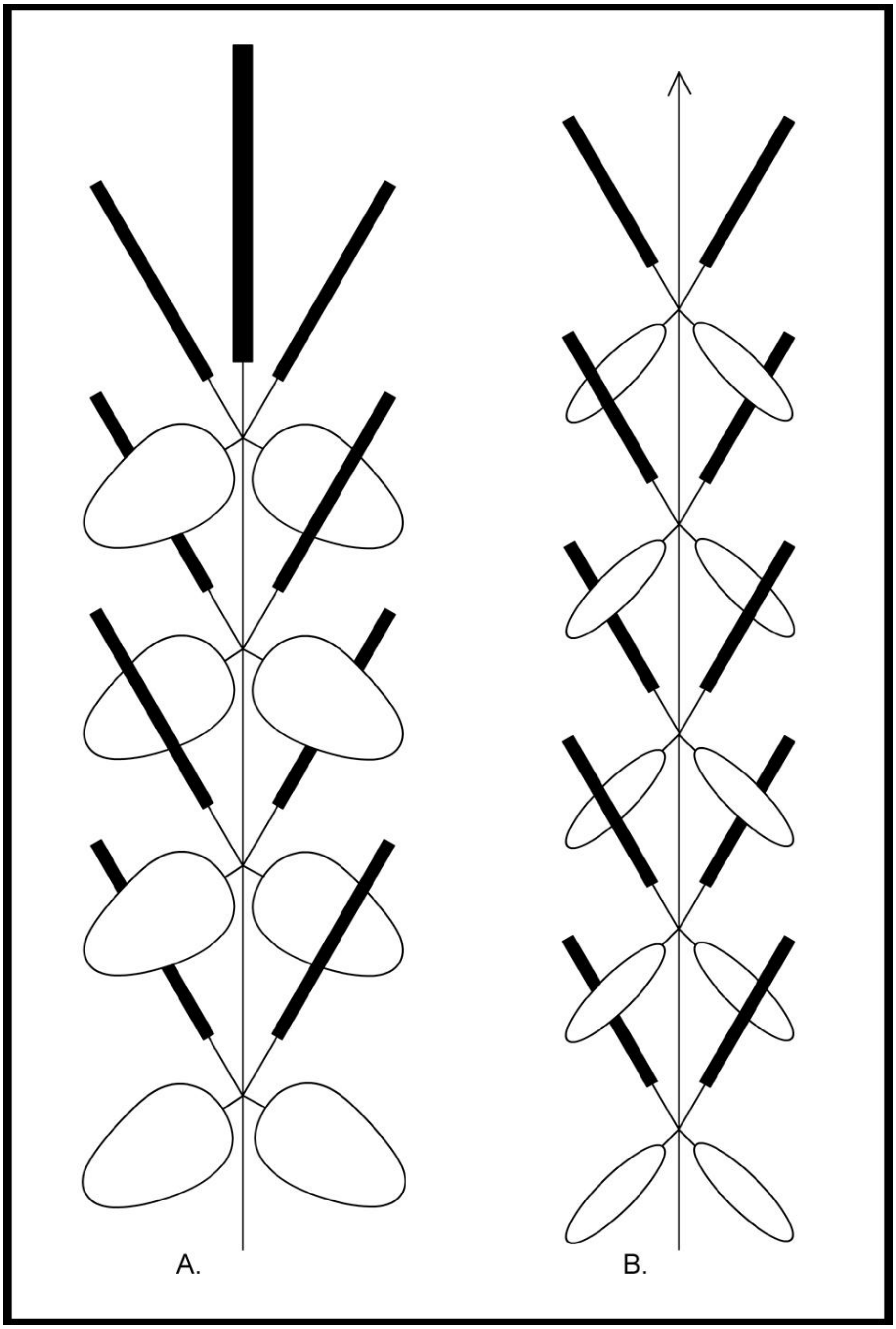

Figure 20: Diagrammatic representation of (A.) *Aloysia velutina* and (B.) *Aloysia scorodonioides* inflorescence arrangement (after Múlgura et al. 2002).

Additional specimens examined: **PERU**. **CAJAMARCA**: **Mpio. Cajamarca**: km 131 on Highway from near Pacasmayo to Cajamarca, low dense forest on steep limestone slopes, 1000-1500 m, 4 Jan 1983, *W. D. Stevens 22046* (K, MO). **Mpio. Contumazá**; ca. 2 km from Contumazá on route to Cascas, 2620 m, 15 Apr 1986, *M. O. Dillon et al. 4544* (F); alrededores de Contumazá, ladera, 2600 m, 25 May 1981, *A. Sagástegui A. et al. 9843* (GH, MBM, MO, SI); alrededores de Contumazá, ladera, 2650 m, 15 Apr 1994, *A. Sagástegui A. et al. 15634* (F); alrededores de Contumazá, salida a Chilete, ladera, 2700 m, 5 Apr 1996, *A. Sagástegui A. et al. 15867* (F); sobre la ruta Contumazá-Chilete, cerca a la Fila de las Pencas, ladera de arbustos, frequent, 2700-2750 m, 3 Jul 1983, *I. Sánchez Vega 3170* (F).

7. ALOYSIA MACROSTACHYA (Torr.) Moldenke, Phytologia 1: 95. 1934. *Lippia wrightii* var. *macrostachya* Torr., in Emory, Rep. U.S. & Mex. Bound. Surv. 2: 126-127. 1859. TYPE: MEXICO. NUEVO LEON: W of Cerralbo, 28 May 1847, *J. Gregg 822* (LECTOTYPE [here designated]: NY!; ISOLECTOTYPE: MO!). Torrey mentioned two collections in his protologue, those by Gregg and Schott. Gregg's collection was chosen as the lectotype since it bears the appropriate annotation by Torrey and has a duplicate. Schott's collection is an inferior representative and is apparently unicate.

Shrub 1-2 m in height. **Leaves** opposite; petioles 2-5 mm long; laminae ovate (ca. 3:2, L:W), rugose, 0.8-3.0 cm long, 0.5-2.0 cm wide, margins crenate, weakly revolute, adaxially scabrous, abaxially tomentose with an understory of sub-sessile, glandular trichomes. **Inflorescence** loosely spicate; peduncle 1.0-3.5 cm long, strigulose; rachis 5-12 cm long, strigulose; pedicels 0.5-1.5 mm long. **Bracts** reduced, lanceolate, 2-

3 mm long, acuminate, strigulose. **Calyx** weakly zygomorphic, tubular, 3-4 mm long, setose with and understory of sub-sessile, glandular trichomes; lobes 4, trullate, apically acuminate. **Corolla** zygomorphic, pink, lavender to light purple; tube 4-5 mm long, glabrous; limb 3.5-4.5 mm wide, glabrous. **Stigma** sub-capitate, laterally disposed. **Fruit** obovoid, 3-5 mm long, 2-3 mm wide, glabrous, apically bilobed, lobes 0.3-0.5 mm long; intermericarpal cavity reduced, the surface papillate. **Chromosome** number, n=18 (Powell, unpubl.).

Discussion: This species is believed to be most closely related to the South American *Aloysia scorodonioides*, based on its crenate, sub-bullate leaves, loosely spicate inflorescences, and zygomorphic corollas. *A. castellanosii* shares the bullate leaves and zygomorphic corollas of *A. macrostachya*, but has inflorescences which are hop-like (due to enlarged, foliaceous bracts).

Distribution and habitat (fig. 21): Arid regions of southern Texas and northern Mexico; clay, sandy loam, limestone outcrops, and gypsum hills; ca. 50-2500 m; flowering year round, depending on rainfall.

Etymology: This species was named for its elongated inflorescence rachises.

Common names: Vara dulce, sweet stem, wooly bee brush, and cabradora simarona.

Representative specimens: MÉXICO. COAHUILA: **Mpio. Candela**; Sierra de la Rata, matorral, E slope and alluvial fan, soil of calcareous loam, 14 Mar 1973, *M. C. Johnston, T. L. Wendt, & F. Chiang 10158* (CAS, NY, MEXU, TEX); Caracol Mts., 21 mi. [33.8 km] SE of Monclova, Aug 1880, *E. J. Palmer 1033* (GH). **Mpio. Castaños**; alrededores de cabecera municipal; matorral xerofilo, 10 Sep 1996, *M. González 2711*

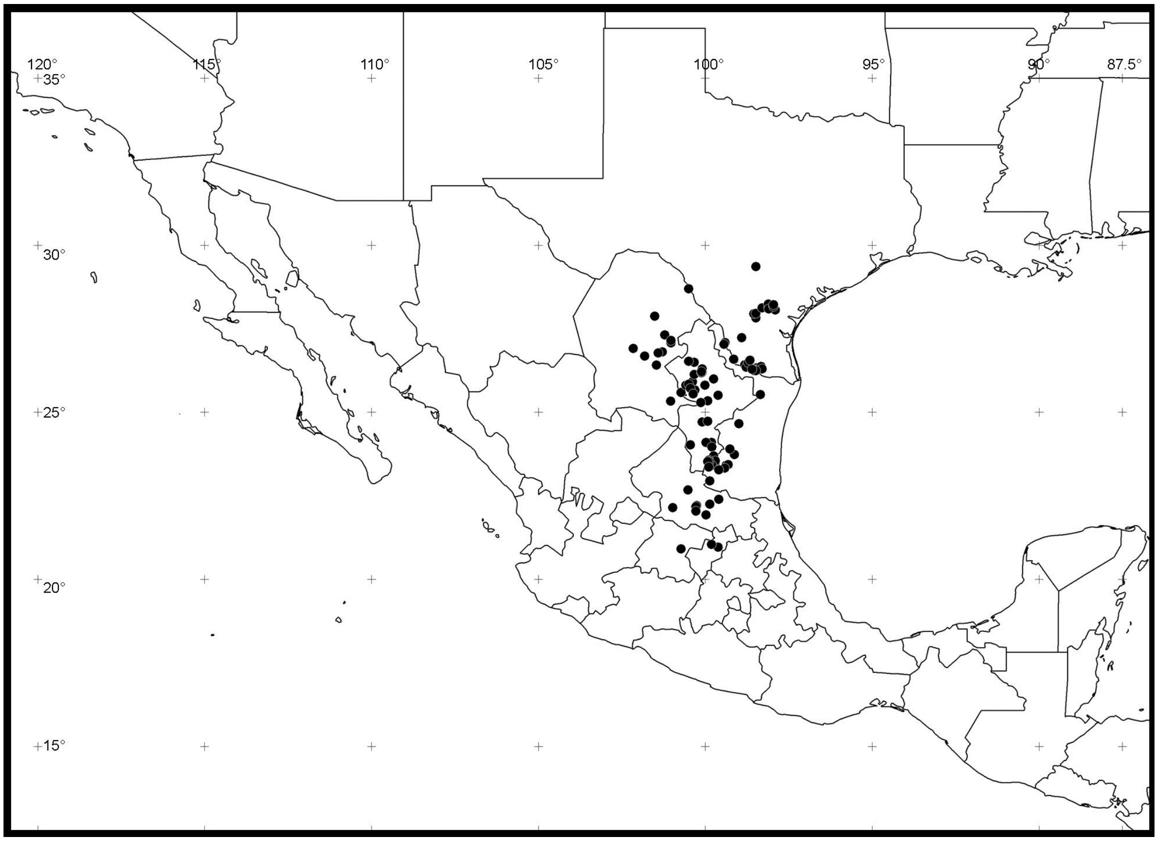

Figure 21: Distribution of *Aloysia macrostachya*.

(IEB); Sierra de la Gloria, Cañon El Cono, a side cyn[sic] of C. Chilpitin, draining in from N near El Chilpitin, in lowest part of cyn[sic], only several hundred m. up from junction with main cyn[sic], in palm-dominated limestone cyn[sic], 6 Sep 1976, *T. L. Wendt & D. Riskind 1672* (MEXU, TEX). **Mpio. Cuatrociénegas**; Ladera baja de la Sierra de San Marcos, frente a las Dunas de Cuatrociénegas; matorral rosetofilo de Agave, Yucca, y cactaceas, 24 Jun 1989, *R. Andres, M. Martinez, & J. M. Sosa 1117* (IEB); La Favorita Ranch on N slope of the Canyon Bonanza, SE end of Sierra de la Purisima, matorral con espinas laterales, limestone mountains and alluvial fan; calcareous, gravelly soil, 19 Mar 1973, *M. C. Johnston, T. L. Wendt, & F. Chiang*

10300E (TEX); ca. 1 km NE of Mina La Reforma at top of alluvial fan on SW side of the Sierra de la Purisima; matorral microfilo, top of alluvial fan and adjacent canyon, gravelly limestone soil, 21 Mar 1973, *M. C. Johnston, T. L. Wendt, & F. Chiang 10323A* (MEXU, TEX). **Mpio. Melchior Muzquiz**; Muzquiz, 12 Apr 1936, *E. M. Marsh 2112* (TEX). **[Mpio. Progreso]**; 38 road mi. [61.2 km] N of Monclova along Highway 57, small hill w/ limestone plates, N of Colonia Menonita at km 58, 12 May 1977, *J. Henrickson et al. 16053* (TEX). **Mpio. Ramos Arizpe**; Sierra San Jose de los Nuncios, 19 Jul 1991, *Hinton et al. 21054* (TEX); Las Imagenes, 16 km al N de Saltillo, carretera 57 Saltillo-Monclova, 4 May 1989, *J. A. Villareal & R. Vasquez 4815* (TEX). **GUANAJUATO**: **[Mpio. Xichu]**; Mina La Aurora, 6 km al E de Xichu; matorral submontano sobre ladera de lutita, 30 Oct 1986, *J. Rzedowski 41470* (IEB, MEXU). **NUEVO LEÓN: Mpio. Aramberri**; near Aramberri, rocky hillside, frequent, 26 Oct 1978, *Hinton et al. 17482* (IEB-2, MEXU); E of Aramberri, gypsum hillside, 14 May 1991, *Hinton et al. 20936* (TEX); La Escondida to Aramberri to Dolores, gypsum hills, 9 Nov 1993, *Hinton et al. 23852* (CAS, MEXU, TEX); Cerro Viejo, bushy hillside, frequent, 2 May 1994, *Hinton et al. 24066* (MEXU, NY, TEX). **Mpio. Bustamante**; Grutas de Bustamante, ca. 5 km al SW de Bustamante; matorral submontano, suelo de grosor variable, sumamente pedregoso, rendzinas, 1 Jun 1982, *R. S. Silva 208* (MEXU). **Mpio. Cerralbo**; W of Cerralbo, 28 May 1847, *J. Gregg 822* (NY, MO). **Mpio. Galeana**; Sta. Rita, proximidades al poblado de Galeana, suelos yesosos, 12 May 1991, *M. A. Carranza & A. Rodriguez G. 1468* (TEX). **[Mpio. Garza]**; cerca de la entrada a las Grutas de Garcia, habitat seco, pedregoso, 17 Mar 1957, *I. K. Langman 4146A* (MEXU). **Mpio. Guadalupe**; Guadalupe, Monterrey, Jul 1911, *G. Arséne 6241* (BM, GH, NY, US). **Mpio. Higueras**; Higueras, km 65 de la carretera de cuota Monterrey-Nuevo Laredo, occasional in chapparal, 30 Jan 1998, *J. L. Panero et al. 7357* (IEB, MEXU, TEX); Sabinas Hidalgo to Monterrey, on Highway Libre 85, ca. 65 km N of Monterrey, in road cut; 26 12.424' N, 100 6.031' W, 23 May 2001, *S. J. Siedo 1049* (TEX). **Mpio. Iturbide**; E slope of Sierra Madre Oriental, along Highway 58 just W of Iturbide, 53 km W of Linares, 13 km E of Puerto de Pastores, matorral on dry, rocky, slopes, 27 Jun 1978, *T. S. Cochrane 8448* (LL). **Mpio. Los Ramones**; camino a la Hacienda El Carrizo, 3 km al S del entronque, Los Ramones, 20 Jul 1983, *J. A. Villareal 2101* (TEX). **Mpio. Mier y Noriega**; 4 km al E de El Fraile, S de Nuevo Leon el los limites con San Luis Potosi; matorral xerofilo crasicaule con, suelo regosoles son buen drenaje interno y superficial, pedregoso, muy somero caliza, predominando rojo, 19 May 1982, *R. S. Silva 28* (MEXU). **Mpio. Montemorelos**; Las Adjuntas in oak-pine riparian associates along the Río Ramos, 5 Sep 1992, *T. F. Patterson, A. LeDuc, & J. Soule 7097* (TEX). **Mpio. Monterrey**; lower slopes of mt.[sic] road to Chipinque Mesa S of Monterrey, Tamaulipan scrub, 24 Apr 1960, *M. C. Johnston & J. Crutchfield 5300* (MICH, TEX); banks of streams, Monterrey, 7 Jun 1888, *C. G. Pringle 1935* (G-2, GH-3, MICH, MO, NY-2, S, US, W); Mt. Mitras, 11 Oct 1945, *J. Roybal 32* (TEX). **Mpio. Rayones**; road from Highway 85, near Montemorelos, to Rayones, roadcut at beginning of steep descent, in rock face, S exposure, 27 Jun 2001, *S. J. Siedo 1057* (TEX). **Mpio. Sabinas Hidalgo**; Sabinas Hidalgo, 16 Sep 1937, *L. A. Kenoyer s.n.* (ARIZ, MO); between Sabinas Hidalgo and Villaldama, 21.5 km E of Villaldama sq.[sic], W end of canyon just before crossing Sabinas River; dry rocky hillside in shade of small trees, 16 Oct 1992, *A. Prather & A. Hempel 1279* (CAS, MEXU, MICH, TEX). **Mpio. Salinas Victoria**; Cuesta de Mamulique, limestone hills, arid scrub, 3 Nov 1942, *H. S. Gentry 6765* (ARIZ); Microwave Station Mamulique, 5 mi. [8 km] off Highway 85, 49 mi. [78.9 km] N from Monterrey, limestone rockland, infrequent shrub, 10 Nov 1976, *J. M. Smith, B. L. Turner, & M. A. Whalen 752* (LL, TEX). **Mpio. Santa Catarina**; Rancho of Dr.

Aguirre Requeno, Canon de Huasteca, near Monterrey, 10 Aug 1959, *A. R. Kruckeberg 4852* (MICH, NY). **Mpio. Villa de Garcia**; Villa de Garcia, 19 Sep 1959, *D. Fuentes C. s.n.* (MICH). **Mpio. Zaragoza**; along road from Rancho La Encantada to Zaragoza, 4 Jul 1988, *T. F. Patterson 5996* (TEX). **QUERÉTARO**: **Mpio. Peñamiller**; Peñamiller, matorral submontano, 29 Aug 1978, *S. Zamudio R. 3266* (IEB, TEX); **Mpio. San Joaquín**; San Joaquín, El Platano, Rives et alentours du rio Estorax pres de El Platano, 3 Oct 1994, *J. N. Labat & E. C. Gonzalez 2606* (IEB). **SAN LUIS POTOSÍ**: **Mpio. Ciudad del Maíz**; 6 road mi. [9.7 km] W of Ciudad del Maíz, limestone hills, short brush, 23 Oct 1959, *M. C. Johnston & J. Graham 4452* (TEX); Las Tablas, Sierra Madre Oriental; rocky hill, igneous rock, 9-10 Aug 1934, *F. W. Pennell 18031* (GH, NY-2, US). **Mpio. Guadalcázar**; al E de Nunez, km 84 carretera Sn.[sic] Luis-A.[sic] Morelos, ladera caliza, 18 Nov 1954, *J. Rzedowski, 5537* (MO). **Mpio. Río Verde**; immediately N of the Minas de San Rafael; highly mineralized soil, 30 Jun 1972, *F. C. Chiang, T. Wendt, & M. C. Johnston 8178A* (MEXU, TEX); Río Verde, 2-8 Jun 1904, *E. J. Palmer 14* (GH, NY, MO, US); Minas de San Rafael, Nov 1910, *C. A. Purpus 4872* (BM, GH, MO, US); 5 km de Buenavista Rumbo Paraiso, o 40 km al N de Mojarras de Arriba, borde el camino, matorral subinerme, 25 May 1979, *S. Zarate 335* (MEXU, TEX). **Mpio. San Luis Potosí**; chiefly in the region of San Luis Potosí, 1878, *C. C. Parry & E. Palmer 712 1/2* (BM, GH, MO, NY-2). **TAMAULIPAS**: **Mpio. Bustamante**; 3 km al N de La Joya de Herrera; crassirrosulifolios espinosos, 24 May 1976, *F. González-Medrano, P. Hiriart, J. Protomastro 9100* (MEXU-2, MO); ca. 37 air km W of Jaumave, ca. 8-9 km E of Bustamante on trail to Miquihana, limestone mountain, 8 Oct 1982, *J. Henrickson & W. Hess 19123* (TEX). **Mpio. Ciudad Victoria**; vicinity of Victoria, 1 Feb-9 Apr 1907, *E. J. Palmer 197* (GH, NY). **Mpio. Jaumave**; Reserva de la Biosfera "El Cielo", en canada, 0.5 km al N de Padron y Juarez, matorral espinoso, 19 Aug 1994, *L. Hernandez 3202* (MEXU); Nogales, Jaumave, Mar 1931, *H. W. Von Rozynski 289* (G, MICH); Jaumave, May 1930, *H. W. Viereck, 559* (US). **Mpio. Miquihana**; Sierra de Las Vacas, 4 km al NE de San Jose del Llano, crassirosulifolios espinosos, 13 Apr 1976, *F. Gonzáles-Medrano, F. Guevara, & P. Zavaleta 8537* (MEXU); La Perdida, matorral de Crassirosulifolios, 14 Apr 1976, *F. González-Medrano 8576* (MEXU); 3 km al NE de San Jose del Llano, vert. W de sierra de Las Vacas; matorral med. subinerme con Yucca, 12 Apr 1976, *F. González-Medrano et al. 8500* (MEXU); 4 km W of Miquihana, on Mt. side w/ sparse vegetation, 7 Aug 1941, *L. R. Stanford, K. L. Retherford, & R. D. Northcraft 746* (CAS, ARIZ, GH, MO, NY). **Mpio. Palmillas**; 4.4 mi. NE of turnoff to Bustamante on Highway 101, Junction at 3.2 mi. [5.1 km] SW of Junction to Palmillas, 15 Jun 1987, *G. Nesom et al. 5955* (TEX). **Mpio. San Carlos**; Sierra de San Carlos, Cerro Parrena, vicinity of San Jose, 13 Jul 1930, *H. H. Bartlett 10306* (GH, MICH, US). **Mpio. Soto la Marina**; Penita, near Soto la Marina River, 23 Jun 1919, *E. O. Wooton s. n.* (US). **Mpio. Tula**; 5 km al W del Ejido El Saltillo, matorral subinerme, 3 Jul 1985, *P. Hiriart, V. Juarez, & J. Molczadzki 802* (ARIZ, MEXU); Barranca de los Coyotes, 3 km al E de La Presita, matorral esclerofilo, ladera con suelo cafe obscuro, pedregoso, derivado de calizas, 9 May 1986, *A. G. Mendoza 2229* (MEXU, TEX); La Antonias, matorral bajo espinoso, 26 Jul 1985, *M. Yanez 283* (MEXU).

UNITED STATES. TEXAS: **Bexar Co.**; Mission San Jose [cultivated?], San Antonio, 10 Dec 1939, *E. D. Schulz s.n.* (F). **Duval Co.**; 21 mi. [33.8 km] NW of San Diego, 9 Oct 1935, *V. L. Cory 17214* (GH); 4 mi. [6.4 km] NE of Freer and E of Road #202, caliche outlier of Goliad formation, 8 Oct 1954, *B. C. Tharp & M. C. Johnston 541792* (TEX); 9.5 mi. [15.3 km] NE of Freer on Road #202, brush on sandstone ridge, Oakville outcrop, 10 Oct 1954, *B. C. Tharp & M. C. Johnston 542027* (TEX). **Hidalgo Co.**; La Joya, Road 5 mi. [8 km] N of La Joya, limestone hill, 20 Jan 1934, *E. U. Clover*

1664 (CAS, ARIZ, MICH, NY); Sullivan City, dense thicket on E edge, 15 Jul 1957, *D. S. Correll & I. M. Johnston 18040* (LL-2); 11 mi. [17.7 km] N of Mission, in scrub on sand, 4 Apr 1941, *C. L. & A. A. Lundell 9950* (LL, MICH, NY, US); 5 mi. [8 km] N of Mission, 14 Mar 1936, *H. B. Parks 18032* (GH); Samfordyce, on clay and gravel hills, 22 May 1929, *R. Runyon 3577* (TEX); La Joya, 2 Feb 1942, *E. J. Walker 20* (GH, NY, TEX). **Jim Hogg Co.**; Thompsonville, on breaks along arroyo Baluarte, 15 Mar 1964, *D. S. Correll 29005* (LL). **Live Oak Co.**; 7 mi. [11.3 km] S of George West, 27 Dec 1946, *C. C. Albers 46376* (NY, TEX-2); 14 mi. [22.5 km] SW of George West, limy ridge , 17 Jul 1958, *D. S. Correll & I. M. Johnston 19721* (GH, LL, MO); 3 mi. [4.8 km] E of Highway 534, Caliche bluffs near Lake Corpus Christi at Fiesta Marina, 26 Jul 1981, *S. R. Hill 10641* (GH, MICH, MO, NY); 12.9 mi. [20.8 km] S of George West, caliche ridge, 9 Jul 1954, *M. C. Johnston 541223* (TEX); 7.6 mi. [12.2 km] S of George West, abundant on the caliche hills in the short brush-Calliandra eriophylla association, 23 Nov 1954, *M. C. Johnston 542058* (TEX); 15 mi. [24.1 km] S of George West; rolling, grazed brushland along Highway 281, 28 Sep 1986, *M. Nee 33224* (NY, TEX); 6 mi. [9.7 km] S of Dinero, 20 Jun 1940, *E. F. Owens 1717* (TEX); Dinero, 18 Sep 1941, *H. B. Parks 2043* (TEX). **Maverick Co.**; Eagle Pass, 8 Mar 1852, *A. Schott s.n.* (F); Starr Co.; 4 mi. [6.4 km] N of Río Grande City, Lower Río Grande Valley, 11 Jun 1933, *E. U. Clover 1268* (CAS, MICH, NY). **Starr Co.**; 5.5 mi. [8.9 km] SE of Río Grande City; brush covered, rocky gravelly hills just SE of La Porta, 14 Dec 1967, *D. S. Correll 35467* (LL); 10.7 mi. [17.2 km] NE of Río Grande City on Route 755, thicket surrounding wet-weather pond, 20 Mar 1969, *D. S. Correll 36810* (GH, LL); 3 mi. [4.8 km] W of Sullivan City, shallow depression in caliche [reported as Hidalgo Co.], 30 Mar 1959, *M. C. Johnston 3777* (CAS, NY, TEX); 17 mi. [27.4 km] NE of Río Grande Ctiy, in sandy area, 3 Apr 1941, *C. L. & A. A. Lundell 9917* (LL-2, MICH, NY); Falcon S.P., near lake &

Zapata Co. line, 7 Mar 1965, *J. L. Strother 98* (TEX). **Zapata Co.**; ca. 400 ft. NW of Recreation Hall, Falcon S. R. A., uncommon in shallow fine sandy loam on somewhat eroded, gently sloping upland, mixed thorny shrubland, 20 Mar 1990, *W. R. Carr 10320* (TEX); ca. 500 ft. SW of Park H.Q., Falcon S. R. A., occasional in shallow fine sandy loam on somewhat eroded, gently sloping upland, mixed thorny shrubland, 20 Mar 1990, *W. R. Carr 10327* (TEX); ca. 3 mi. [4.8 km] N of San [I]gnacio, Route 83, rocky hills near roadside park, 5 Apr 1959, *D. S. Correll 20776* (LL); San [I]gnacio, 20 Jul 1925, *B. C. Tharp 3696* (TEX, US).

8. ALOYSIA SCORODONIOIDES (Kunth) Moldenke

Shrub 0.5-4.0 m in height. **Leaves** opposite or 3(-4)-whorled; petioles 0.3-1.0 mm long; laminae elliptic to orbicular, rugose to sub-bullate, 1-5 cm long, 0.5-4.5 cm wide, margins crenate to crenulate, sometimes weakly revolute, basally rounded to truncate, apically rounded to sub-acute, adaxially scabrous, hispidulous, or somewhat velutinous, abaxially tomentose to velutinous with an understory of sub-sessile, glandular trichomes. **Inflorescence** compactly to loosely spicate; peduncle 1-5 cm long, pilose; rachis 2-12 cm long, pilose; pedicels 0.2-0.5 mm long. **Bracts** reduced, scale-like to sub-foliaceous, linear to lanceolate, 0.5-3.0 mm long, 0.2-0.6 mm wide, acuminate, strigulose to hispidulous, margins ciliate. **Calyx** weakly zygomorphic, tubular to campanulate, 1.5-3.0 mm long, setose with an understory of sub-sessile, glandular trichomes; lobes 4, trullate, acute to short-acuminate. **Corolla** weakly zygomorphic to sub-actinomorphic, white, pinkish-white to violet-red; tube 2-5 mm long, pubescent medially to distally with an understory of sub-sessile, glandular trichomes present distally; limb 2-5 mm long, pubescent with an understory of sub-sessile, glandular hairs. **Stigma** sub-capitate, laterally disposed. **Fruit** obovoid, 1-2 mm long, 0.5-1.5 mm wide, glabrous, apically bilobed, lobes ca. 0.1-0.5 mm long; intermericarpal cavity reduced, the surface papillate.

Key to the varieties of *A. scorodonioides*

1. Laminae ovate to orbicular (2:1-3:2, L:W), margins crenate, revolute or not; inflorescence elongated, loosely flowered, rachis 2-5 times the peduncle in length, flexuous.

    2. Laminae ovate to orbicular, adaxially scabrous, bracts 2-3 mm long.

        8a. var. *scorodonioides*

    2. Laminae ovate, adaxially hispidulous, bracts scale-like, 0.5-1.5 mm long.

        8b. var. *mathewsii*

1. Laminae elliptic to ovate (2:1-3:1, L:W), margins crenulate and revolute; inflorescence compact, flowers congested, rachis approximately equaling peduncle in length, straight.

    8c. var. *hypoleuca*

8A. ALOYSIA SCORODONIOIDES (Kunth) Cham. ex Moldenke var. **SCORODONIOIDES** Lilloa 5: 382. 1940. *Lippia scorodonioides* Kunth in Humbolt & Bonpland, Nov. Gen. et Sp. 2: 269. 1818. TYPE: ECUADOR. PICHINCHA: Mpio. Quito, crescit locis aridis as fluvium Mira Quitensium, 1350 m, 1800-1802, *Bonpland s.n.* (HOLOTYPE: B[destroyed]; PHOTOHOLOTYPES: F!, MO!, NY!). The date of collection was not given on the specimen but a consultation of Hamy (1906) revealed it was made between 1800 and 1802. The holotype was destroyed in WWII and no isotypes are known but their presence seems probable at P. I am hesitant to designate a neotype when the absence of original material cannot be confirmed. Photographs of the original holotype have been consulted for comparative purposes.

Lippia scorodonioides var. *detonsa* Briq., Bull. Herb. Boiss. 4: 339. 1896. *Aloysia scorodonioides* var. *detonsa* (Briq.) Moldenke, Phytologia 1: 95. 1934. TYPE: ECUADOR. PICHINCHA: Mpio. Quito; vicinibus Quito, Oct 1843, *M. Hartweg 1349* (HOLOTYPE: G!; ISOTYPES: B [destroyed], BR, G-2!, W-2!; PHOTOISOTYPE: NY!).

Aloysia scorodonioides var. *orbicularis* Moldenke, Phytologia 3: 406. 1951. TYPE: COLOMBIA. NARIÑO: Yauco, near Pasto, without date, *K. W. H. Karsten s.n.* (HOLOTYPE: W!; PHOTOHOLOTYPES: LL!, NY!). This likely represents a cultivar rather than a natural population since Colombia is far out of the normal range of this genus. Moldenke does not address its native status in his protologue and Karsten makes no mention of it on the specimen.

Shrub 1-2 m in height. **Leaves** opposite or 3(-4)-whorled; petioles 0.3-0.8 mm long; laminae ovate to orbicular, rugose to sub-bullate, 2.5-5.0 cm long, 1.5-4.5 cm wide, margins crenate, somewhat revolute, basally rounded, usually oblique, apically rounded to obtuse, adaxially scabrous, abaxially tomentose with an understory of sub-sessile, glandular trichomes. **Inflorescence** loosely spicate; peduncle 2-3 cm long, pilose; rachis 4-12 cm long, pilose; pedicels 0.2-0.5 mm long. **Bracts** reduced, linear to lanceolate, 2-3 mm long, 0.3-0.6 mm wide, acuminate, strigulose, margins ciliate. **Calyx** tubular, 2-3 mm long; lobes trullate, acuminate. **Corolla** weakly zygomorphic, pinkish-white to violet-red; tube 3-5 mm long, pubescent medially to distally with an understory of sub-sessile, glandular trichomes present distally; limb 3-5 mm long, pubescent with an understory of sub-sessile, glandular hairs. **Fruit** 1.0-1.5 mm long, 1.0-1.5 mm wide, bilobed, lobes ca. 0.1 mm long.

Discussion: *Aloysia scorodonioides* is believed to be closely related to the North American *A. macrostachya*, based on its zygomorphic corollas, laterally disposed stigmas, flexuous inflorescences, somewhat scrubby habit, and rugose to sub-bullate leaves with crenate margins. It is divisible into three geographic races, recognized here as varieties; they are allopatric and there is little, if any, intergradation between them. The typical var. *scorodonioides* is restricted to the mountains of Pichincha, Ecuador and the surrounding area (fig. 20).

Kunth (1818) first described this taxon as *Lippia scorodonioides* and there is little doubt as to its merit as a distinct species. Chamisso (1832) is often credited with transferring this name to *Aloysia*. In reality, he merely noted: "Species princeps *Aloysia citriodora* O. (*Verbena triphylla* L.); accedunt *Verbena virgata* R. et P. et *Lippia scorodonioides* HBK." (1832). This reference is buried in the protologue for a different species and is mentioned merely in passing. Moldenke (1940) was the first author to directly associate the genus name and epithet.

The following is transcribed from H. N. Moldenke's personal notes housed at TEX, LL under *Aloysia scorodonioides*.

> The type of this species was collected by Humbolt and Bonpland at the Rio Mira in the Andes Mountains near Quito, Ecuador. The so-called variety *hypoleuca* was based by Briquet on a collection by Joseph Dombey (no. 259) from Peru and is deposited in the Delessert Herbarium at Geneva, but is admitted by Briquet to be identical with the typical element of *A. scorodonioides*. Briquet differentiates the typical form of

the species from its several named varieties by describing its essential characteristics as follows: "the floriferous branches elongate, minutely pubescent or puberulent; leaves elliptic, exquisitely obtuse at the apex, slightly convex along the margins, slightly prolonged into the petiole at the base, rugose above and green, pubescent, and not or only slightly scabrous, white-tomentose between the reticulation beneath, 1.5-3.0 cm. long, 1.2-1.8 cm. wide, the serration constant, of regular rounded or parallelogram-like teeth of which the top is less than 1 mm. high; spikes very crowded, short, 1.5-2.5 cm. long; calyx long-pilose throughout, whitish." Schauer in A. DC., Prodr. 11: 573 (1847) states that the spikes are up to 3 inches (7.5 cm.) long, but specimens with such long spikes are now usually regarded as belonging to one of the named varieties.

The species in its typical form is found in Ecuador, Peru, and Bolivia. It is included with great misgivings in this treatment of the Brazilian flora. It has been recorded from Amazonas, Brazil [Moldenke, Known Geogr. Distrib. Verbenac., ed. 1, 36 (1942) and ed. 2, 75 (1949)], but the source of this record has been lost. It seems possible that the record was based on the same specimens as cited in Bol. Mus. Hist. Nat. Hav. Prado 7: 241 (1943), which, however, are from Amazonas, <u>Peru</u>, not <u>Brazil</u>.

A. scorodonioides grows at altitudes of from 1800 to 3450 m. in Bolivia, and has been collected in anthesis from January to April and [again] in October and November. Sandeman reports it as growing in full exposure to the sunlight in Ancache[sic] Peru; Haught found it in open xerophytic bush, composed mainly of cacti, in Pichincha, Ecuador;

Macbride and Featherstone found it growing among rocks on mountainsides in Lima, Peru. In La Paz, Bolivia, Mandon found it growing in hedges; in Loja, Ecuador, Espinosa collected it on calcareous soil in dry places; and Ferreyra also describes it as growing in stony ground at Lima, Peru. Specimens have been misidentified[sic] as *A. virgata* (Ruiz & Pav.) A. L. Juss. and even as *Hyptis* sp. and *Stachys* sp. Herrera, Sinop. Fl. Cuzco 1: 352 (1927) records the vernacular name of "lauraimana". The Index Kewensis amazingly reduces it to synonymy under "*Lippia polygalafolia.*"

Distribution and habitat (fig. 22): Arid regions in the states of Pichincha, Tungurahua, and Imbadura, Ecuador; calcareous soils, rocky slopes; 1600-3000 m; flowering December to January.

Etymology: This species was named for its superficial resemblance to the genus *Scorodonia* of the Lamiaceae.

Common Names: Cedron del campo, cendroncillo, and lauraimana.

Representative specimens: ECUADOR. **PICHINCHA**: 21.5 km W of Tabacundo, Canton Tabacundo, near bridge across Río Pisque, lower slopes of Loma de Asuajato, 1 Jul 1996, *G. L. Webster 32027* (LL). **Mpio. Cayambe**; Río Guaillabamba; dry slopes around the bridge, 21 Dec 1966, *B. Sparre 13646* (LL, MBM, US); Guaillabamba Valley at Quito, Otovalo Highway crossing; open xerophytic bush, 8 Mar 1942, *O. Haught 3155* (GH, NY, US). **Mpio. Pedro Moncayo**; Río Guaillabamba, 1 km from the Pan-American Highway upstream; interandine[sic] dry thorn scrub, 4 Apr 1979, *L. Holm-Nielsen 16654* (NY). **Mpio. Quito**; Reserva Geobotánica Pululahua, camino del hospital, Sincholahua; bosque humedo Montano Bajo, Bosque Seco Montano Bajo y

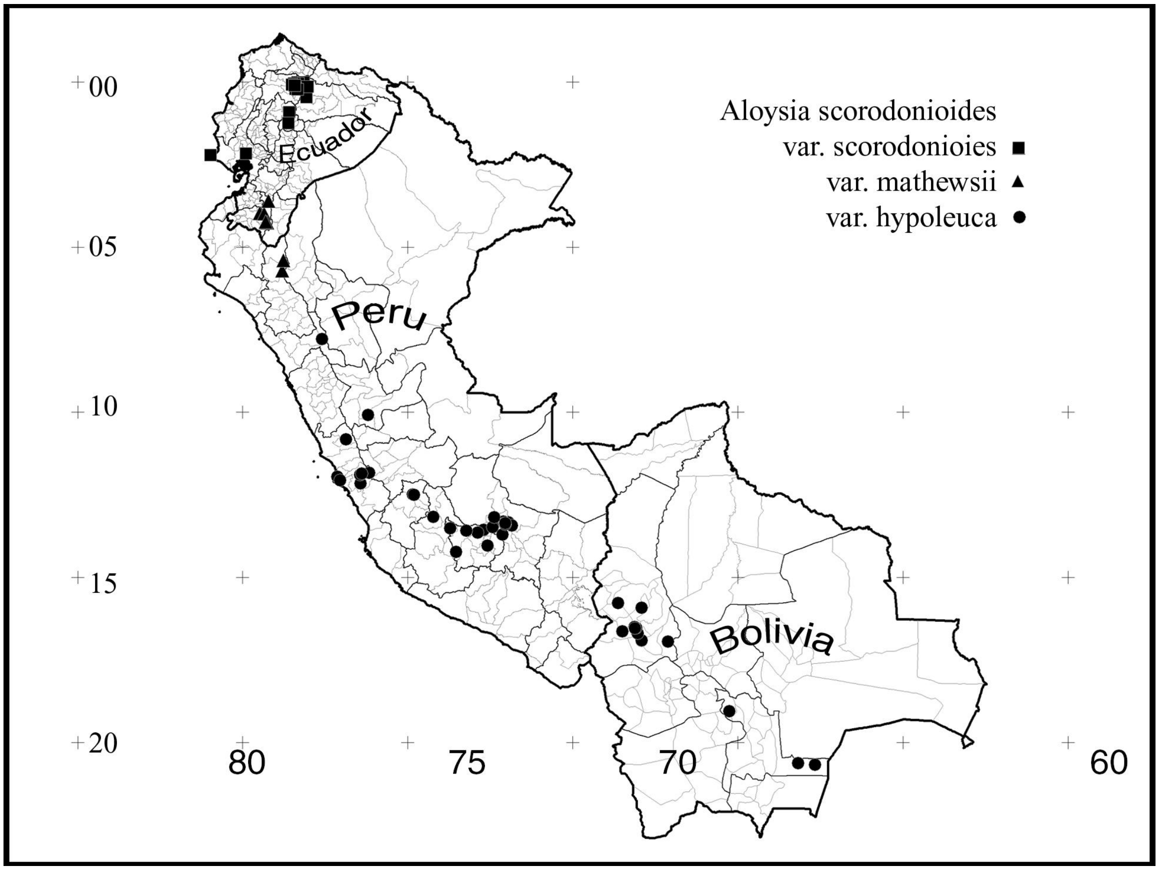

Figure 22: Distribution of *Aloysia scorodonioides*.

Bosque Humedo Premontano, 13 May 1987, *C. E. Cerón M. 1384* (MO, NY); Pifo, between the village and Los Corrales, 17 Jun 1939, *E. Asplund 7010* (CAS, G, K, NY-2, US). **TUNGURAHUA**: **Mpio. Ambato**; vicinity of Ambato,Tilulín, Feb 1919, *A. Pachano 120* (NY, US).

8B. ALOYSIA SCORODONIOIDES var. **MATHEWSII** (Briq.) Moldenke, Phytologia 1: 95. 1934. *Lippia scorodonioides* var. *mathewsii* Briq., Bull. Herb. Boiss. 4: 339. 1896. TYPE: PERU. "Pérou", 1840, *Mathews 3160* (HOLOTYPE: G!;

PHOTOHOLOTYPES: F!, MO!, NY!; ISOTYPES: G!, S!; TYPE FRAGMENT: F!).

Leaves opposite; petioles 0.5-1.0 cm long; laminae ovate, 2-5 cm long, 1.5-4.0 cm wide, margins crenate to crenulate, basally truncate to rounded, apically rounded, obtuse to sub-acute, adaxially densely hispidulous, abaxially velutinous. **Inflorescence** loosely spicate; peduncle 1.0-1.5 cm long, pilose; rachis 3.5-7.0 cm long, pilose; pedicels 0.2-0.5 mm long. **Bracts** reduced, midrib obscure, linear to somewhat triangular, scale-like, 0.5-1.5 mm long, 0.2-0.5 mm wide, acute to short-acuminate, somewhat hispidulous, margins ciliate. **Calyx** tubular, 1.5-2.5 mm long; lobes trullate, acute to short-acuminate. **Corolla** weakly zygomorphic, white to pinkish-white; tube 2.5-5.0 mm long, pubescent with an understory of sub-sessile, glandular trichomes present distally; limb 2.5-5.0 mm wide, pubescent with an understory of sub-sessile, glandular trichomes. **Fruit** 1.5-2.0 mm long, 0.5-1.0 mm wide, bilobed, lobes ca. 0.1 mm long.

Discussion: The var. *mathewsii* is native to the mountainous region of southern Ecuador and northern Peru (fig. 20) and is most closely related to var. *scorodonioides*. The potential for intergradation between these taxa seems high in southern Ecuador; though none has been detected. In Peru, this variety is limited to the state of Cajamarca and is relatively isolated from var. *hypoleuca*. *Aloysia velutina* is also native to Cajamarca, Peru but, so far as known, is not sympatric with var. *mathewsii*.

Distribution and habitat (fig. 22): Arid regions of southern Ecuador and northern Peru, in the states of Loja and Cajamarca respectively; calcareous soils along rocky slopes; 1600-2000 m; flowering January to May.

Etymology: This variety was named after the collector of the type, Andrew Mathews.

Representative specimens: ECUADOR. LOJA: Catamayo-Chinchas, 52 km W of Loja, 16.5 km W of Catamayo, 4.3 km past military checkpoint at San Pedro de la Bendita, semi-deciduous thorn scrub and gully woodland on gritty calcareous soil, 23 Feb 1997, *G. P. Lewis & B. B. Klitgaard 2985* (NY). **Mpio. Catamayo**; Catamayo Valley, grade E of Catamayo, La Toma, dry brushy slope w/ mostly legumes and Croton, 14 Feb 1945, *F. R. Fosberg, & M. A. Giler 23018* (F, GH, MICH, NY-2, UC, US); entre San Pedro y Chinchas, unos 55 km O. Loja, arbusto que crece en lugares secos y suelos calcareos, 9 Feb 1947, *R. Espinosa 1288* (NY).

PERU. CAJAMARCA: **Mpio. Cajamarca**; Cajamarca, 23 Feb 1967, *J. L. Guillen & Chumpitaz 3387* (LL); km 131 on Highway from near Pacasmayo to Cajamarca; low dense forest on steep limestone slopes, 4 Jan 1983, *W. D. Stevens 22046* (K).

8C. ALOYSIA SCORODONIOIDES var. **HYPOLEUCA** (Briq.) Moldenke, Phytologia 36: 437. 1977. *Lippia scorodonioides* var. *hypoleuca* Briq., Bull. Herb. Boiss. 4: 338. 1896. TYPE: PERU. without date, *Dombey 259* (LECTOTYPE [here designated]: G!; PHOTOLECTOTYPE: F!, MO!, NY!). Briquet lists two collections in his protologue for *Lippia scorodonioides* var. *hypoleuca*, *Dombey 259* and *Mandon 522*. Briquet considered the Dombey material more typical of the taxon, hence its designation as the lectotype.

Lippia spathulata Hayek, Bot. Jahrb. 42: 165. 1908. *Aloysia spathulata* (Hayek) Moldenke, Phytologia 1: 95. 1934. TYPE: PERU. CUZCO: Mpio. Urubamba; Urubamba, 3000 m *Weberbauer 4911* (HOLOTYPE: BR; PHOTOHOLOTYPE: F!; ISOTYPE: B[destroyed]; PHOTOISOTYPES: GH!, NY!).

Aloysia scorodonioides var. *parvifolia* Moldenke, Phytologia 36: 437. 1977. TYPE: BOLIVIA. LA PAZ: near La Paz, 10,000 ft., Oct 1885, *H. H. Rusby 920* (HOLOTYPE: NY!; ISOTYPES: F!, G!, MO!, NY-2!, US!, W!).

Aloysia boliviensis Moldenke, Phytologia 53: 460. 1983. TYPE: BOLIVIA. LA PAZ: 2 km E of Mecapaca, thorn scrub, 2900 m, 29 Mar 1982, *J. C. Solomon 7410* (HOLOTYPE: LL!; ISOTYPE: MO!).

Leaves opposite or 3-whorled; petioles 0.3-0.5 mm long; laminae mostly elliptic, sometimes ovate, sub-bullate, 1.0-5.5 cm long, 0.5-3.5 cm wide, margins crenate, weakly revolute, basally rounded, apically rounded to sub-acute, adaxially somewhat velutinous, abaxially densely velutinous to incanous. **Inflorescence** compactly spicate; peduncle 2-5 cm, pilose; rachis 2-4 cm long, pilose; pedicels 0.1-0.3 mm long. **Bracts** reduced, lanceolate, 2.0-2.5 mm long, 0.3-0.5 mm wide, acuminate, strigulose. **Calyx** campanulate, often blue-tinged, 2.0-2.5 mm long; lobes trullate, acute to short-acuminate. **Corolla** sub-actinomorphic, white to pale lavender or pink; tube 4-5 mm long, distally pubescent with an understory of sub-sessile, glandular trichomes; limb 3-4 mm, pubescent with an understory of sub-sessile, glandular trichomes. **Fruit** 1-2 mm long, 1.0-1.5 mm wide, prominently bilobed, lobes ca. 0.5 mm long. **Chromosome** number, $2n$=ca. 72 (Diers, 1961).

Discussion: The var. *hypoleuca* was initially reported as "*L. scorodonioides* Kunth, sensu stricto" by Briquet (1896), thus equating it to var. *scorodonioides*. This taxon is quite distinct and is readily identified by its elongated peduncles, approximately equal to the rachis in length, and congested flowers. Intermediates with var. *mathewsii* have not been detected but may be expected in the region from central to northern Peru. With further investigation, this variety may be found to be deserving of specific rank based on its morphological divergence and geographic isolation from var. *scorodonioides* and var. *mathewsii*.

Distribution and habitat (fig. 22): Arid regions of southern Peru and Bolivia; dry, rocky soils; 2000-4000 m; flowering October to June.

Etymology: This variety was named for the somewhat whitish appearance of the abaxial leaf surfaces.

Representative specimens: BOLIVIA. CHUQUISACA: **Mpio. Luis Calvo**; Boyuibe, 104 km hacia el E, via F. Villazon, bosque deciduo bajo, con pocas especies siempre verdes, 4 Oct 1983, *S. G. Beck & M. Liberman 9428* (LL, MO); 4 km al N del Puesto Militar Guaraní, frontera entre Paraguay y Bolivia, y 4-5 km al W del Puesto Iyoe, Pampa con vegetacion muy abierta con arbustos achaparrados, predominado por gramineas, 19 Jun 1992, *B. Mostacedo, T. Killen, & I. Vargas 396* (MO, NY). **Mpio. Oropeza**; Sucre 34 km hacia Aiquile, valle seco del Río Chico, 16 Oct 1984, *S. G. Beck 8894* (LL). **LA PAZ**: **Mpio. Inquisivi**; between Yamora and Micayani, 4 air km SE of Inquisivi, dry sub-tropical deciduous forest and scrub, on steep SE facing slopes of Río Khokhoni, 14 Jan 1989, *M. Nee 37593* (NY, TEX). **Mpio. Larecaja**; SW de Sorata; pradera disturbada en la pendiente con malezas, 1 Jan 1994, *A. Jardim 319* (F, MO, NY). **Mpio. Loayza**; La Paz 75 km hacia el S y 27 km del desvio hacia Sapahaqui, ladera escarpada, relativamente seca con arbustos de 3 m, 18 Jan 1981, *S. G. Beck 6039* (LL); La Paz 75 km hacia el S 7 27 km del desvio hacia Sapahaqui, ladera escarpada, relativamente seca con arbustos, 18 Jan 1981, *S. G. Beck 6040* (LL); de Sapahaqui subiendo haci[a] Kuri; subpuna de arbustos, 7 Apr 1990, *S. G. Beck 17542* (US). **Mpio. Murillo**; La Paz 22 km rio abajo, Mecapaca, fin del camino, ladera con arbustos y Bromeliaceae, raro, 25 Apr 1980, *S. G. Beck 3530* (LL); de La Paz-Calacoto 7 km hacia Abajo, cerca al puente Lipari en Jupapina, subiendo las laderas, al W; Badlands, 13 Apr 1986, *S. G. Beck 14000* (MO, SI); Canyon Río Choqueyapu, S edge of city of La Paz, unconsolidated conglomerate and gravel, 10 Feb 1980, *J. C. Solomon & M. Crosby 4834* (LL, MO); Hacienda Huajchilla, 18 km SE of La Florida, La Paz, along Río de La Paz, disturbed thorn woodland, 8 Feb 1984, *J. C. Solomon & J. Kuijt 11491* (G, MO, NY, TEX); Haciendo Huajchilla, 18 km al SE de La Paz, La Florida, a lo largo del Río La Paz; vegetación arbustiva, abierta, espinosa, 14 Feb 1987, *J. C. Solomon & M. Nee 16060* (US).

PERÚ. CÚZCO: **Mpio. Calca**; 2 km NW of Pisac on road to Calca, nearby Mt. slope, 22 Feb 1963, *D. & V. Ugent 3871* (LL). **Mpio. Urubamba**; Dpto. Huayllabamba, Huayaccari-Yanaccocha, camino a Yanaccocha, en suelos secos rocosos, 3 Mar 1986, *A. Tupayachi H. 127* (MO, TEX). **LIMA**: **Mpio. Huarochiri**; Matucana; steep S slope, 12-3 Apr-May 1922, *J. F. Macbride & W. Featherstone 133* (F, US); vicinity of Matucana, habitat stony, 25 Mar 1950, *R. Ferreyra 7021* (NY, US); Surco, Feb 1948, *J. Soukup 3718* (NY, US). **Mpio. Lima**; Lima, 23 May 1959, *L. K. Diers 1068* (SI); along Río Chillón, near Viscas; rocky stream banks, 10-15 Jun 1925, *F. W. Pennell 14438* (F, NY, US).

9. ALOYSIA WRIGHTII (A. Gray) Heller, Muhlenbergia 1: 147. 1906. *Lippia wrightii* A. Gray, Amer. J. Sci., ser. 2, 16: 98. 1853. TYPE: UNITED STATES. NEW MEXICO-ARIZONA: Sep-Oct 1851, *C. Wright 1506* (HOLOTYPE: GH!; ISOTYPES: F!, G!, NY!).

Examination of the holotype reveals Gray combined the field numbered sets *Wright 406* and *708* to form the distribution set *Wright 1506*. Gray routinely combined collector's field sets to form distribution sets large enough to fill subscription demands (Shaw, 1987). It is unknown from examination of the material how much of *Wright 1506* comes from which collection. All the material appears to belong to the same taxon and I can see no reason to attempt to separate it. Below are the localities listed in Wright's notes corresponding to his field numbers, not Gray's distribution numbers (Shaw, 1987; Johnston, 1940).

"Boraginaceae": UNITED STATES. ARIZONA: Cochise Co.; valley from Sauz de Cienega towards Chiricahua Mountains, 4 Sep 1851, *C. Wright 406.*

"Labiatae": UNITED STATES. NEW MEXICO: Hidalgo Co.; Las Animas Valley, Guadalupe Pass, on mountains, 4 Oct 1851, *C. Wright 708.*

Shrub 0.5-1.5 m in height. **Leaves** opposite; petioles 1-4 mm long; laminae elliptic to orbicular (ca. 6:5, L:W), rugose, 0.5-1.5 cm long, 0.5-1.5 wide, margins crenulate, adaxially strigose, abaxially tomentose with an understory of sub-sessile, glandular trichomes. **Inflorescence** compactly spicate, flowers somewhat congested; peduncle 0.2-1.0 cm long, puberulent; rachis 1-4 cm long, puberulent; pedicels 0.2-0.5 mm long. **Bracts** lanceolate, 1.5-2.0 mm long, apically acuminate, strigulose with an understory of sub-sessile, glandular trichomes. **Calyx** sub-actinomorphic, tubular, 2-3 mm long, setose, with an understory of sub-sessile, glandular trichomes; lobes 4, acute to short-acuminate. **Corolla** sub-actinomorphic, white; tube 2.0-3.5 mm long, pubescent; limb 2-3 mm wide, glabrous. **Stigma** capitate, apically disposed. **Fruit** obovoid, 0.8-1.2 mm long, 0.5-1.0 mm wide, glabrous, apically bilobed, lobes less than 0.1 mm long; intermericarpal cavity reduced, the surface papillate.

Discussion: This species is believed to be related to *Aloysia scorodonioides* by virtue of similarities in calyx, fruit, and inflorescence characters. It is readily distinguished by its lateral branching habit, orbicular leaves, and sub-actinomorphic corollas. *Aloysia scorodonioides* has an ascending branching habit, orbicular, ovate to elliptic leaves, and zygomorphic corollas.

Distribution and habitat (fig. 23): Arid regions of southwestern U.S.A. and northern Mexico; limestone or volcanic soils; 500-2600 m; flowering year round depending on rainfall.

Etymology: *Lippia wrightii* was named in honor of Charles Wright (1811-1885), prominent botanist of the southwestern United States, and collector of the type.

Common names and uses: Alta misa, desert oregano, high mass, oreganillo, vara dulce, Wright's bee brush, and Wright's lippia.

Uses for this plant reportedly include the production of tea (*E. U. Clover 5035* [MICH]) and fodder for honey bees (*L. C Hinckley s.n.* [ARIZ, GH]).

Representative specimens: MÉXICO. CHIHUAHUA: Mpio. Aldama; Pueblito, matorral mediano subinerme, 30 Aug 1978, *Baray, Rodriguez, & Molinar 90* (IEB); 26.6 road mi. [42.8 km] NE of Aldama along Highway 16 ca. 0.5 mi. [0.8 km] N of El Morrion, infrequent shrub along moist low areas in open Chihuahuan desert flats, sandy soil with scattered limestone rocks, 15 Sep 1972, *J. Henrickson 7571* (LL); ca. 39

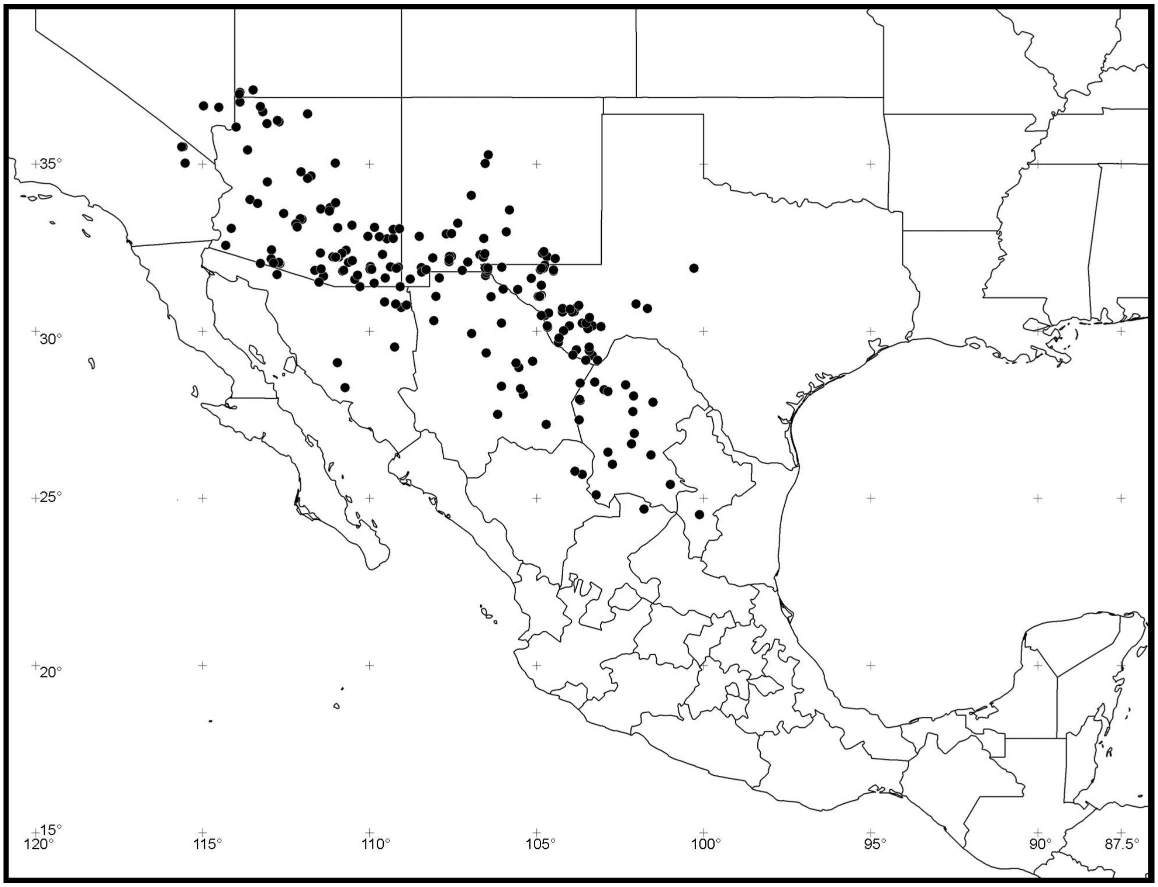

Figure 23: Distribution of *Aloysia wrightii*.

air mi. [62.8 km] NE of Cd. Chihuahua on E side of limestone Sierra El Morrion near Mina La Nueva Esperanza, 10 Sep 1980, *J. Henrickson, & P. Bekey 18476a* (TEX). **[Mpio. Ascención]**; a few km S of Rancho El Norteno and due E of the S end of Sierra de Moscos; arroyo and fan area, gravelly calcareous sandy loam, 18 Aug 1972, *F. C. Chiang, T. Wendt, & M. C. Johnston 8695B* (MEXU, TEX). **Mpio. Buenaventura**; N of Ricardo Flores Magon, 0.8 mi. [1.3 km] N of Junction Hwy 10 on Hwy 195, at a sharp bend in road; gravelly, sandy colluvium, 28 Aug 1989, *M. H. Mayfield, D. C. Severinson, & B. L. Westlund 78* (ARIZ, TEX). **[Mpio. Delicias]**; 7 mi. [11.3 km] S of Cd. Delicias along Highway 45 in open, sandy loam, Chihuahuan Desert, 24 Sep 1972, *J. Henrickson 8000* (LL). **Mpio. Casas Grandes**; Colonia Juarez, Sierra Madre Occidental, rocky draw, 21 Sep 1934, *F. W. Pennell 19051* (GH-2, US). **Mpio. Chihuahua**; hills and plains near Chihuahua, 2 Sep 1886, *C. G. Pringle 995* (BM, MEXU, NY-2); Canon de Santa Clara, 90 km al N de Chihuahua, pastizal con encinos, 19 Oct 1974, *J. Rzedowski 32373* (MEXU). **Mpio. Ciudad Camargo**; 2 mi. [3.2 km] W of Pozo de Villa, margen of savanetta; along Road from Ojinaga to Castillon, COA[sic] via La Mula, Trincheras, Piramide, and San Salvador, 10-12 Aug 1941, *I. M. Johnston 8172* (GH, MO). **Mpio. Ciudad Juarez**; Sierra Juarez, S side of Sierra Juarez on small limestone hill, Chihuahuan desert shrub community on rocky slope, 2 Aug 1986, *R. D. Worthington 14489* (NY). **[Mpio. Janos]**; 3 mi. [4.8 km] S of La Ascension, ca. 100 mi. [160.9 km] SE of Cd. Juarez, rocky volcanic hillside with clay soil, 18 Aug 1971, *J. Henrickson 5742* (LL). **Mpio. Jiménez**; Cerro de Chupaderos prope Jimenez, 15 Nov 1925, *G. Woronow & S. Juzepczuk 622* (F). **Mpio. Meoqui**; Meoqui, 10-19 Oct 1935, *H. Le Sueur s.n.* (MO). **Mpio. Praxedis de Guererro**; Sierra San Ignacio, including and in the Sierra Esperanza, canyon 6.4 km SSW of Esperanza, desert shrub community, 26 Aug 1984, *R. D. Worthington & R. D. Corral 12503* (NY). **[Mpio. Villa Palacios]**; Canyons of Rancharia Mt., in rocky soil, common on mesas, Oct 1911, *E. Stearns 2* (F-2, GH, US). **Mpio. Valle de Zaragoza**; Arroyo Sauces, Sierra Campana, 4 mi. [6.4 km] W of Hwy 45; oak woodland, rocky arroyo margin, 30 Sep 1972, *H. S. Gentry & R. G. Engard 23080* (ARIZ, MEXU). **Mpio. Villa Ahumada**; ca. 58 mi. [93.3 km] S [of] Juarez, NNW base of Rancho de la Rancheria Mt., 18 Jul 1977, *E. Lehto et al. L21498* (MEXU); 23 mi. [37 km] N of El Sueco Junction, creosote scrub, 14 Sep 1976, *G. L. Webster 21262* (LL, MEXU). **COAHUILA: Mpio. Cuatrociénegas**; Cuatro Cienegas[sic], Canon de Cienegas, 18-20 Jul 1939, *White, S.S. 1905* (MICH, S, US). **Mpio. Gral.**

Zepeda; Sierra de la Paila, areas cercanas al las minas la Casa Colorada y el Aguirreno, 6 Sep 1988, *Villareal, J. A. & M. A. Carranza 4493* (TEX). **Mpio. Melchior Muzquiz**; Muzquiz, 12 Apr 1936, *Marsh, E.G. 2112* (GH); 1 km NW of Puerto del Aire, the pass at the S end of the Sierra de la Encantada; bank of arroyo, fairly common, 1 Sep 1941, *R. M. Stewart 1314* (F, GH, LL). **Mpio. Ocampo**; Sierra del Pino, ejido Acebuches, canon La Vaca, 12 Oct 1991, *M. A. Carranza, M. Vasquez, & J. Noriega P. C-885* (MEXU, TEX); 2 km NE of El Pino, common on dry hillside, 20 Sep 1941, *R. M. Stewart 1774* (GH); Sierra del Pino, S canyon; below the oak and pine belts, gravelly floor of canyon, 26 Aug 1940, *I. M. Johntson & C. H. Muller 715* (GH); Canon de Ybarra, the principal canyon at the NW end of the calcareous Sierra del Pino, common shrub on arroyo banks, 22-23 Sep 1941, *R. M. Stewart 1910* (GH, TEX). **[Mpio. Ocampo]**; Rancho Puerto del Aire, faldas de la Sierra la Colorada, 8 Sep 1990, *R. Vasquez A., O. Meza, & P. A. Fryxell 176* (IEB). **Mpio. Saltillo**; Saltillo and vicinity, 1898, *E. J. Palmer 359* (BM, G, GH, MO, NY, S, US). **Mpio. San Pedro de las Colonias;** Puerto de Ventanillas, limestone slopes on N end of Cerro Masamitote, NW end of Sierra el Clarin, mosaic of xerophytic shrubs, 14 Aug 1978, *T. L. Burgess et al. s.n.* (ARIZ); ca. 23 air mi. [37 km] NW of Las Delicias, in a valley N of Sierra de las Delicias, near old mine, rocky limestone NE facing slope, common, 29 Aug 1971, *J. Henrickson 6147* (LL); small barrel cactus desert, Santa Teresa Pass at km 124 of Cuatro Cienegas-Torreon Highway, MX 30, where it crosses E end of Sierra de la Fragua, 34 km SSW of Cuatro Cienegas[sic], 13 Sep 1978, *H. H. Iltis & A. Lasseigne 60* (LL). **Mpio. Sierra Mojada**; Sierra de Cruces, ca. 14 air mi. [22.5 km] E of Jaco, ca. 45 air mi. [72.4 km] N of Esmaralda, on limestone slopes, common, 19 Sep 1971, *J. Henrickson 6905* (LL); E foothills of the Sierra de las Cruces, vicinity of Santa Elena Mines, 1 km N, hillsides, rather abundant; ca. 27-50" N lat., 12 Oct 1940, *R. M. Stewart 277* (CAS, GH); NW end of the Sierra Planchada, near the CHI boundary, ca.

25 km NW of Esmeralda; dry open hillside, fairly common, 2 Aug 1941, *R. M. Stewart 1011* (BM, F, GH, LL, MEXU). **Mpio. Torreon**; Sierra de Jimulco, Mina San Jose, ca. 10 km al NE de La Flor de Jimulco, 25 Aug 1988, *J. A. Villareal & M. A. Carranza 4442* (MEXU). **DURANGO: Mpio. Gomez Palacios**; Bajada of Sierra Sarnoso, SE of Dinamita, limestone, slender shrub among rocks & scattered along arroyo, 5 Oct 1972, *H. S. Gentry & R. G. Engard 23097* (ARIZ, MEXU, MICH). **Mpio. Mapimi**; Mapimi and vicinity, 21-23 Oct 1898, *E. J. Palmer 534* (GH, MO, NY, US). **NUEVO LEON: Mpio. Galeana**; El Potosi, desert, 29 Sep 1983, *Hinton et al. 18596* (TEX). **SONORA: Mpio. Agua Prieta**; hills about mouth of Canon Pulpito, sparse on canyon slopes, 11 Oct 1939, *C. H. Muller 3733* (GH, LL, MICH, MO). **[Mpio. Bavispe]**; 2 mi. [3.2 km] E of Colonia Oaxaca, canyon cut through conglomerate, 3 Oct 1965, *J. R. Hastings & R. M. Turner 65-38* (CAS, ARIZ). **Mpio. Fronteras**; Fronteras, 24 Sep 1890, *C. V. Hartman 45* (GH). **Mpio. Hermosillo**; Hermosillo, 10 Jun 1897, *F. S. Maltby 237* (US). **Mpio. Nacozari**; Region of the Río de Bavispe, Colonia Morelos, 15 Sep-4 Oct 1941, *S. S. White 4588* (ARIZ, CAS, MICH, NY, US); Region de Río Bavispe, Canon de la Mescalera, Sierra de la Cabellera, 8-9 Oct 1941, *S. S. White 4733* (CAS, MICH). **Mpio. Sonoyta**; slope of Sierra Cubabi, 11.3 mi. [29 km] by road, Mex. 2, S of Sonoyta granitic mountain slope, desert scrub, 25 Dec 1967, *R. S. Felger & G. K. Harris 16732* (ARIZ). **ZACATECAS: Mpio. Mazapil**; Arroyos, Cedros, N part of state, Jun 1908, *J. E. Kirkwood 79* (GH).

UNITED STATES. ARIZONA: Cochise Co.; Chiricahua Mts., Mt. Desert, near upper limit, SW aspect, 12 Sep 1907, *J. C. Blumer 1307* (ARIZ, CAS, F, GH, NY, US, W); vicinity of Yaqui Spring, limestone colluvium, 24 Aug 1991, *J. E. Bowers & S. P. McLaughlin 3588* (ARIZ); Dragoon Mts., W slopes along road between Sorin Camp and Abril Mine; granitic slopes and quartzite canyon in oak scrubland, 8 Sep 1983, *T. F.*

Daniel, 3107 (NY); Creek bottom, Sala Ranch, Dragoon Mts., 6 Sep 1954, *L. N. Goodding 70-54* (ARIZ, S); rocky draws, Mule Mts., 8 Oct 1910, *L. N. Goodding, 931* (G, GH, NY); Chiricahua Mts., Cave Creek Canyon, 24-26 Aug 1927, *J. A. Kusche, s.n.* (CAS, F, GH, NY); Ft. Huachuca Military Reservation, Manila Mine Area, on limestone, 8 Aug 1993, *S. P. McLaughlin, & J. E. Bowers 6865* (ARIZ); Whetstone Mts., Chihuahuan Desert-scrub, Dry Canyon Road, 1.8 mi. [2.9 km] W of Hwy 90, 26 Aug 1988, *S. P. McLaughlin 4939* (ARIZ); steep, dry Mountainside, Portal, 16 Jul 1962, *A. R. Moldenke* 135 (LL); rocky SW facing slope, quartzite, open oak woodland, talus community, W facing slope of Black Diamond Peak, S end of Dragoon Mts., 7 Sep 1983, *F. W. Reichenbacher 1505* (ARIZ); Leslie Canyon, Swisshelm Mts., hillsides above stream near W bridge, 23 Oct 1978, *L. J. Toolin, J. B. Urry, & T. R. VanDevender 103* (ARIZ); small hill located ca. 150 m NW of the South Western Research Station in the Chiricahua Mts., S of Portal; rare in W and E exposures of the hill only, 20 Oct 1973, *J. L. Vivaldi 318* (MO, NY); Mule Mts., Chihuahuan desert scrub, xeric phase, Horquilla limestone, 14 Aug 1973, *T. R. Wentworth 1748* (BH). **Cococino Co**.; Meteor Crater, 19 Sep 1938, *A. Eastwood & J. T. Howell 6922* (CAS, US); Canyon of the Colorado, Havasupai Canyon, near Mooney Falls, Apr 1940, *E. U. Clover 42* (ARIZ, MICH); rocky limestone crevices, Hualpai Hilltop, Kaibab National Forest, 4 Sep 1945, *R. A. Darrow 3124* (ARIZ); Colorado River, CRM 31.5, South Canyon, above Stanton's Cave, ca. 30 m above river's edge, in cobble wash above sandy beach, 16 Oct 1990, *R. W. Scott 833* (NY); Havasu Canyon, ca. 1 mi. [1.6 km] above Supai Village, 18-25 Oct 1940, *A. F. Whiting 1047/4544* (ARIZ). **Gila Co.**; Coolidge Dam, shade of N exposure, 2 Jun 1943, *R. A. Darrow s.n.* (ARIZ); E exposure along Mills Wash, 5 mi. [8 km] NW of Roosevelt, 3 Nov 1951, *R. W. Dickerman 87* (ARIZ); quartzite cliffs, partial shade, end of Road through Natural Drainages Experimental Area, lower Park Creek Canyon, Sierra Ancha

Mts., 5 Sep 1946, *F. W. Gould 3890* (ARIZ, NY). **Graham Co**.; 15 mi. [24.1 km] E of Safford, dry slopes in associates, 21 Oct 1946, *F. W. Gould & H. S. Haskell 4005* (ARIZ); slopes and foothills of Gila Mts., near Safford, Jan 1938, *W. L. McCart 540* (TEX); Pinaleno Mts., Tripp Canyon, canyon bottom near old homestead, 12 Sep 1989, S. P. McLaughlin 5775 (ARIZ); 11 mi. [17.7 km] W Duncan on US 180, 21 Aug 1935, *Moeller 392* (NY); Safford, 15 Oct 1935, *W. L. McCart 2010* (TEX). **Greenlee Co**.; Clifton, 19 Aug 1914, *E. A. Goldman 2390* (US); Big Lue Range, near Hwy 78 ca. 7 mi. [11.3 km] from state line, rocky exposed N slopes, 21 Oct 1946, *F. W. Gould & H. S. Haskell 4107* (ARIZ, NY). **Maricopa Co**.; South Mts., Mormon Trail from S end of 24th St. to base of Two Peaks, Sonoran desert scrub, locally frequent, 29 Sep without year, *T. F. Daniel, & M. Butterwick 4369* (CAS, NY); South Mts., South Mt. Park, rocky wash along trail, SSE-facing drainage, 28 Nov 1987, *W. Hodgson 4823* (NY); White Tank Mts. Regional Park, Ford Canyon; rocky desert slopes and canyon, 24 Sep 1969, *Pinkava, Pase, & Keil 5673* (MICH, NY); 5.6 mi. [9 km] E of AZ 87 on Four Peaks Road, W base of Mazatzal Mts., Tonto National Forest; AZ Upland Sonoran desertscrub w/ chaparral spp.;, 23 Sep 1996, *A. L. Reina, & T. R. VanDevender 96-564* (ARIZ); Apache Gap, along Apache Trail, 11 Oct 1931, *without collector 8539.5* (CAS, BH). **Mohave Co**.; Hedricks Canyon, scarce on rocky N slope, 10 Oct 1979, *R. K. Gierisch 4692* (ARIZ); Base of Hurricane Rim, AZ Strip District; rocky, gravelly, loam-limestone, 23 Nov 1987, *R. K. Gierisch 5025* (ARIZ); Grand Canyon National Monument, inner gorge of canyon, on level area below rim, just E of Vulcan's Throne, 30 Apr 1952, *E. McClintock 52-289* (CAS, ARIZ); Grapevine Wash, Meadview Villiage, small cliffs along tributary, 4 Oct 1976, *A. M. Phillips 76-260* (ARIZ); Crozier, between Peach Spring and Hackberry, 1 Oct 1927, *S. Braem s.n.* (CAS, GH). **Pima Co.**; Box Carry, Santa Rita Mts., 1 Sep 1936, *J. Arnold s.n.* (GH); Box Canyon, Santa Rita Mts., 15 Aug

1936, *R. A. Darrow s.n.* (ARIZ); Tucson, 29 Aug 1931, *D. Demaree 8016* (NY); Organ Pipe National Monument, small side canyon immediately below W side of the Arch in Arch Canyon, Ajo Mts., common on N facing slope at base of cliff, 2 Dec 1990, *R. S. Felger & M. A. Baker 90-536* (ARIZ); Cabeza Prieta National Wildlife Refuge, Childs Mt.; rocky, N-facing slope below large bench area, basalt w/ calcium carbonate caliche, 25 Feb 1993, *R. S. Felger & B. Broyles 93-39* (ARIZ); Fresnal Canyon, Baboquivari Mts., 7 Sep 1931, *M. F. Gilman 117* (CAS, ARIZ, F, GH, NY); Rincon Mts., 7 Oct 1900, *D. Griffiths 1799* (NY); Bates Well, 18 Nov 1939, *C. F. Harbison s.n.* (NY); Santa Catalina Mts., May 1880, *J. G. Lemmon s.n.* (BM, G-3, US); Las Guija[s] Mts., rocky slope above wash below Mesquite Root Dam, 27 Aug 1988, *S. P. McLaughlin & J. E. Bowers 4975* (ARIZ); steep W facing slope of Alamo Canyon, Organ Pipe Cactus National Monument, 20 Oct 1969, *T. W. Mulroy s.n.* (LL); Organ Pipe Cactus National Monument, along E loop, 3.3 mi. [5.3 km] from Route 87, Peaks encircled by E loop, 24 Nov 1972, *T. Nash et al. 9990* (ARIZ, NY, US); NE of Tucson, S of Santa Catalina Mts., near mouth of Esperero Canyon, canyon bottom, 13 May 1981, *T. Plowman 10416* (F, NY); Davidson's Can[y]on, limestone hills, 7 Sep 1884, *C. G. Pringle s.n.* (F, G-3, MICH, NY-2, S, US); Sabino Canyon, Santa Catalina Mt., 1 Sep 1916, *A. Rehder 495* (GH); Tuscon Mts., Tumamoc Hill just W of U of AZ Geochronology lab; small N-S oriented drainage and desertscrub, 7 Oct 1995, *V. W. Steinmann 805* (CAS, MO, NY, TEX, US); Tucson Mts., Tucson, common, 8 Sep 1903, *J. J. Thornber 21* (ARIZ, CAS-3, NY, S, US); Waterman Mts., along old Road to Silver Hill Mine, limestone, 11 Aug 1988, *T. R. VanDevender 88-434* (ARIZ). **Pinal Co.**; Dripping Springs Mts., Kane Spring Canyon, 12 Aug 1982, *M. Mittleman 205* (ARIZ); Sierra Estrella, 17 Oct 1926, *R. H. Peebles et al. 3286* (ARIZ); S end of Sierra Estrella, Upper Basin, 25 Jan 1986, *A. Rea 927* (ARIZ). **Santa Cruz Co.**; Santa Rita Mts., Procter's Ranch, rocky slopes, 31 Aug

1907, *L. N. Goodding 2434* (GH, NY, S); Coronado National Forest, Mt. Hopkins, Santa Rita Mts., 6.3 mi. [10.1 km] by Mt. Hopkins Road, E of R.R. tracks at Amado; dominant shrub on slopes, semi-desert grassland, 27 Oct 1982, *F. Reichenbacher 1387* (ARIZ). **Yavapai Co.**; foothills on S side of Harcuvar Mts.; granite gneiss, uncommon in rocky areas, 16 May 1979, *P. C. Fischer 6485* (ARIZ); Montezuma Castle National Monument, E slope limestone hill, 22 Aug 1938, *M. L. Jackson s.n.* (ARIZ); Clarkdale, 17 Sep 1921, *W. W. Jones 374* (GH, US); Montezuma Castle National Monument; dry, rocky hillside, 13 Aug 1946, *K. F. Parker, E. McClintock, & G. T. Robbins 6136* (ARIZ); Beaver Creek, rocks, Sep 1903, *C. A. Purpus 8286* (US); Tributary of Little Ship Wash, ca. 14.5 km SE Bagdad, ca. 5.6 km W Santa Maria River, 2.4 km N AZ 96; granite boulder area in AZ Upland Sonoran Desert scrub with many Mohave and desert grassland associated species, 5 Apr 1996, *A. L. Reina-Guerrero & T. R. VanDevender 96-183* (ARIZ). **Yuma Co.**; W base of Gila Mts., 1 Aug 1914, *E. A. Goldman 2346* (US); Castle Dome Mts., 16 Nov 1937, *A. A. Nichol 7145* (ARIZ); Upper De La Osa Wash, Kofa, S.H., 13 Sep 1938, *A. A. Nichol s.n.* (ARIZ); 1 mi. [1.6 km] N of summit of Harquahala Mts., canyon bottom, N slope, frequent, 28 Oct 1972, *J. H. Weber s.n.* (NY). **CALIFORNIA: San Bernadino Co.**; E Mojave Desert, Providence Mts., Bonanza King Mine area, rocky limestone slopes above mine, 29 Oct 1977, *R. F. Thorne et al. 50754* (NY); Mojave Desert, Clark Mt., 1/8 mi. [0.2 km] E of Pachalka Spr., in 1st canyon to the E; Upper Sonoran Zone, W slope, dry wash, limestone rocks, sun, common, 5 Oct 1935, *C. B. Wolf 7592* (CAS-2, GH, NY, US); E Mojave Desert, Clark Mt. Range, above Pachalka Spring, on exposed limestone of rocky slopes, blackbush scrub, 26 May 1977, *R. F. Thorne, W. Wisura, & C. Davidson 49135* (NY). **NEVADA: Clark Co.**; Desert National Wildlife Range, Elbow Canyon, S & E slopes, Las Vegas Range, locally common, 11 Aug 1976, *T. Ackerman 9210* (NY); **Lincoln Co.**; ca. 7 mi. [11.3 km] NW of junction of Carp and Mormon Mts., Hackberry Spring, Rds., S end of the Mormon Mts., at base of a N-facing limestone cliff, pinyon/juniper woodland, 28 Sep 1991, *F. Landau & W. E. Niles 3698* (NY). **NEW MEXICO: Bernalillo Co.**; Tijeras Canyon, among boulders on granite, 9 Oct 1939, *R. C. Barneby 2421* (NY). **Don Ana Co.**; San Andreas Mts., near Mayberry Spring, Jornada Range Reserve, 17 Aug 1929, *S. Ellison 826* (GH); Mesilla Valley, Pyramid Peak, NE slope near top, limestone talus, Lower Sonoran Zone, 21 Aug 1930, *F. R. Fosberg S3809* (CAS, GH, S); Aden Crater, ca. 17 mi. [27.4 km] SW of Las Cruces, 17 Aug 1974, *T. R. VanDevender & P. S. Martin s.n.* (ARIZ); Mesa W of the Organ Mts., Tortugas Mt., 19 Aug 1906, *E. O. Wooton & P. C. Standley s.n.* (US); Organ Mts., 9 Jul 1897, *E. O. Wooton 118* (CAS, G-2, GH, NY-2, US); Potrillo Mts., West Potrillo Mts., Guzman's Lookout Mt., S side, volcanic cinders and/or basalt w/ windblown silicon sand, 23 Aug 1986, *R. D. Worthington 14704* (NY); Bishop Cap, 2 air mi. [3.2 km] NNW of the top of Bishop Cap, limestone slopes, 5 Sep 1988, *R. D. Worthington 17236* (NY). **Eddy Co.**; foothills of Guadalupe Mts., 18 Sep 1935, *L. Cutak & A. Christ 73* (MO); Sitting Bull Falls, Guadalupe Mts., 10 Oct 1980, *L. C. Higgins 12959* (NY); mouth of Carlsbad Cavern, 5 Aug 1928, *E. D. Schulz 2006* (F); Lincoln National Forest, Guadalupe Mts., North Rocky Arroyo, 56 km air W of Carlsbad, in arroyo, 24 May 1997, *J. B. Walker & S. Baker 2120* (NY). **Grant Co.**; Mangas Springs, 18 mi. [29 km] NW of Silver City, 5 Sep 1903, *O. B. Metcalfe 832* (NY); 1.5 mi. [2.4 km] N of Howell's Ridge, Little Hatchet Mts., 11-12 Aug 1973, *T. R. VanDevender & W. G. Spaulding s.n.* (ARIZ). **Hidalgo Co.**; Guadalupe Canyon, 6 Oct 1944, *A. L. Hershey 3386* (GH); Little Hatchet Mts., Granite Pass, granite outcrops w/ scattered oaks at base, 9 Sep 1984, *R. D. Worthington 12635* (NY); Apache Hills, slopes about the Apache Mine, 2 Sep 1985, *R. D. Worthington 13469* (NY); Animas Mts. ca. 7 air mi. [11.3 km] SE of Animas, 28 Aug 1986, *R. D. Worthington 14784* (NY). **Lincoln Co.**; along Highway 380 ca. 5 mi. [8 km]

W of Carrizozo, Roadcut through lava beds, disjunct population nurtured in crevices of exposed late Holocene lava flow, 16 Oct 1998, *S. J. Siedo 718* (TEX). **Luna Co.**; Little Florida Mts., 5 Sep 1908, *E. A. Goldman 1468* (US); Florida Mts., 27 Aug 1895, *A. I. Mulford 1042* (NY, US); ca. 12 mi. [19.3 km] S of Deming on Hwy 11 and 4 mi. [6.4 km] E of N end of Florida Mts., dry sandy slopes w/ NW exposure, locally abundant, 31 Aug 1974, *L. M. & J. S. Schultz 1354* (GH, NY); N end of Florida Mts., SE of Deming, on steep S-facing rhyolite slopes, at base of cliffs, 24 Aug 1981, *R. & M. Spellenberg 6207* (NY); Victoria Mts., 3 mi. [4.8 km] S Gage exit on I-10 at old mining town along limestone ridge, 25 Aug 1984, *R. D. Worthington 12413* (NY); Florida Mts., Spring Canyon State Park, Lovers Leap Canyon, 21 Aug 1988, *R. D. Worthington 17006* (NY). **Otero Co.**; Fresnal Canyon, Sacramento Mts., ca. 6 mi. [9.7 km] NE of Alamogordo, rocky limestone derived soil, S exposure, sunny slope of grasses and shrubs, 18 Aug 1971, *V. L. Bohrer 1411* (ARIZ). **Sierra Co.**; Cuchillo, 21 Oct 1909, *E. A. Goldman 1784* (US); Kingston, Box, S end of the Black Range, dry hillside, 27 Aug 1904, *O. B. Metcalfe 1261* (CAS, BM, F, G, GH-2, NY, US); Gila National Forest, Black Range, along Mineral Creek 0.75 mi. [1.2 km] downstream from confluence of Carbonate Creek, calcareous soil on S facing slope, 22 Sep 1987, *M. G. Shelton 182* (NY, TEX). **Socorro Co.**; Socorro Mt., 11 Jul 1897, *C. L. Herrick 723* (US). **TEXAS: Brewster Co.**; Del Norte Mts., 8 Aug 1925, *Berkman 3693* (TEX); 5 mi. [8 km] SW of Marathon, hill opposite Pena Colorado Peak, 3900 ft., 27 Sep 1958, *M. C. Johnston 3313* (TEX); Chisos Mts., Green Gulch, upper slopes, 27 Aug 1944, *C. L. Lundell 13245* (LL, MICH, NY); Hidden Valley, near Alpine; steep igneous slopes among rocks, 20 Jun 1941, *R. Rose-Innes & B. Moon 1267* (GH, NY, TEX, US); 6 mi. [9.7 km] S of Alpine on Highway 118, W side of Highway, on gravel road, 11 Sep 1991, *C. Sherman, R. D. Noyes, & A. Brant 101* (MO); Terlingua Ranch Estates, USGS White Hills Quadrangle, ca. 70 mi. [112.7

km] S of Alpine, then ca. 8 mi. [12.9 km] E of main highway on dirt road to Terlingua Lodge, then ca. 1 mi. N on dirt road below a conspicuous ridge, 19 Jul 1999, *M. Turner & B. L. Turner 99-481* (TEX); abundant on N side of Bissett Hill, Glass Mts., 3 Jul 1941, *B. H. Warnock 21272* (TEX, NY); Mt. Ord, 22 Jul 1941, *B. H. Warnock 20051* (LL, TEX); infrequent on Pena Blanca Hill, Noviculite formation, 3.5 mi. [5.6 km] S of Marathon, 21 Oct 1946, *B. H. Warnock 46593* (NY, S, TEX); infrequent in arroyos at Bissett Hill, Glass Mts., 6 Aug 1940, *B. H. Warnock W286* (NY). **Coke Co.**; Bronte; dry, rocky hillsides, 27 Oct 1916, *E. J. Palmer 11164* (CAS, GH, S, US). **Crockett Co.**; Lancaster Hill, 30 mi. [48.3 km] W of Ozona on Highway 290, cedar-shin oak woods below rim-rock, 10 Aug 1949, *D. J. Edson 15* (TEX). **Culberson Co.**; Guadalupe Mts. National Park, E Patterson Hills at the gap, ca. 5.1 km S 2.8 km W of Guadalupe Peak summit, limestone crevices, 21 Oct 1973, *T. L. Burgess 1712* (ARIZ-2); N slope of Beach Mt., 10 mi. [16.1 km] N of Van Horn, rocky draw, 19 Aug 1946, *D. S. Correll 13977* (MICH); limestone area above marble quarry, 30 mi. [48.3 km] N of Van Horn, Sierra Diablo Mts., 9 Sep 1965, *D. S. Correll 31618* (LL, NY-2); Guadalupe Mts. National Park, McKittrick Ridge, oak-pinus-mixed shrub community, 10 Sep 1988, *L. C. Higgins 17953* (NY); along hill and adjacent flat area behind Highway rest stop/scenic overlook along IH-10, 3.8 mi. [6.1 km] W of Van Horn., 22 Aug 1998, *S. J. Siedo 667* (TEX); Guadalupe Mts., 1 mi. [1.6 km] S of Pine Spring Camp in Guadalupe Canyon, low shrub along canyon, 21 Sep 1946, *E. Whitehouse 16982* (MICH, NY); Guadalupe Mts., in gullies, not abundant, 2 Sep 1916, *M. S. Young s.n.* (TEX). **El Paso Co.**; Hueco Tanks, 20 Jul 1946, *A. Lee, A. H. Berkman, & B. C. Tharp 46174* (GH, NY-2, S-2, TEX); Franklin Mts., infrequent in McKellington Canyon, 28 Aug 1951, *B. H. Warnock 10015* (LL); 5 mi. [8 km] W of El Paso, foothills of the Franklin Mts., frequent along sandstone limestone arroyos, 7 Sep 1947, *B. H. Warnock 7281* (TEX); Franklin Mts., 1.2 air mi.

[1.9 km] WNW junction Trans-Mountain Road with Gateway South; steep rocky canyon draining N, desert shrub community, 7 Nov 1982, *Worthington, R.D. 9206* (NY). **Hudspeth Co.**; Black Mt. of the Cornudas Range, lava rock slopes, 8 Sep 1961, *D. S. Correll, & M. C. Johnston 24321* (LL); 6.8 mi. [10.9 km] W of Van Horn along IH-10 at road-cut, 22 Aug 1998, *S. J. Siedo 677* (TEX); along Highway 5 mi. [8 km] W of Van Horn, Beach Mts., infrequent perennial shrub in gravelly soil, 7 Sep 1955, *B. H. Warnock, 13609* (LL, TEX); Malone Mts., N tip of Mts. 2.3 km [3.7 km] W of Small, 14 air mi. [22.5 km] NW Sierra Blanca, 19 Oct 1985, *R. D. Worthington 13808* (NY). **Jeff Davis Co.**; Fort Davis, 19 Sep 1920, *W. W. Eggleston 17442* (BM, NY); Davis Mts., Goat Canyon, Mt. Livermore, 30 Jul 1935, *L. C. Hinckley 229* (F, NY); Limpia Canyon, 11 mi. [17.7 km] NE of Ft. Davis, in granite area on Mountainside, 23 Aug 1944, *C. L. & A. A. Lundell 13134* (LL-2, MICH, NY); Davis Mts., near Indian Lodge, on grassy mtside[sic], 25 Aug 1944, *C. L. Lundell 13179* (LL-3, MICH, NY-2, US); Davis Mts., S slope of Mt. Locke, frequent in igneous soil, along Highway, 28 Jul 1947, *B. H. Warnock 6558* (LL, TEX-2). **Pecos Co.**; 14 mi. [22.5 km] W of Pecos River along IH-10, along the base of prominent mesas, S side of Highway, calcareous soils., 6 Oct 1997, *B. L. Turner 97-438* (TEX). **Presidio Co.**; Sierra Tierra Vieja, Bracks Canyon, numerous specimens here, not plentiful over area for too dry, 11 Jun 1941, *L. C. Hinckley 1686* (NY); Marfa, San Esteban Lake, breaks in canyon below dam, 18 Aug 1940, *L. C. Hinckley s.n.* (ARIZ, GH); Big Bend Ranch, E rim of the Solitario, locally common shrub on W facing chert talus slope along the, 22 Sep 1975, *M. Butterwick & J. Lamb 1550* (TEX); Madera Canyon, N of Highway 170 and Colorado Canyon on the Río Grande River, 28 Jun 1975, *M. Butterwick & S. Strong B-1041* (TEX); widespread and infrequent in Tigna Canyon, N side of Chinati Mts., old Woods Ranch 18 mi. [29 km] NW of Shafter, 10 Nov 1946, *L. C. Hinckley & B. H. Warnock 46880* (NY, TEX); 8 mi. [12.9

km] N of Presidio, Highway 67, growing on gravel with, 5 Aug 1945, *C. L. & A. A. Lundell 14293* (LL, MICH, NY); 8 mi. [12.9 km] N of Ruidosa, foothills SW of Chinati Mts., abundant on rocky slopes in shrubby grassland transition, 28 Jul 1945, *C. H. Muller 8428* (LL, MICH); Capote Canyon, 8 mi. [12.9 km] NE of Candelaria, common, growing on steep talus slope, 30 Aug 1967, *H. M. Ohlendorf 799* (TEX); Cibolo Creek at the town of Shafter, streamside and rocky limestone slopes above, 23 Oct 1983, *A. C. Sanders, J. West & M. Aregullin 4166* (TEX); C. E. Miller Ranch, alluvial deposit at old Ft. site, 6 Jul 1948, *C. L. York 48181* (TEX); ca. 5 mi. [8 km] NW of Porvenir, gravelly hills overlooking Río Grande food plain, 7 Jul 1948, *C. L. York 48254* (TEX). **UTAH: Washington Co.**; W Beaver Dam Slope, Aloysia Spring, warm desert scrub, limestone, 29 Sep 1985, *B. Franklin, K. Thorne, & B. Holdaway 2633* (GH, NY); Bitter Spring, limestone, warm desert common, 12 Oct 1991, *R. L. Johnson 140* (NY); limestone knolls W of Welcome Spring, limestone outcrops and gravel in a mixed, warm desert shrub community, 28 Sep 1985, *S. L. Welsh 23679* (GH, NY).

10. ALOYSIA GRATISSIMA (Gill. & Hook.) Troncoso

Shrubs 1.5-5.0 m in height. **Leaves** opposite; petioles absent to 3 mm long; laminae narrowly elliptic to elliptic (8:1-3:2, L:W), 0.5-3.0 cm long, 0.1-2.5 cm wide, margins entire to obscurely toothed along distal 2/3, basally acute to short-attenuate, apically acute, adaxially strigose, abaxially villous, with an understory of sub-sessile, glandular trichomes. **Inflorescence** loosely spicate; peduncle 0.5-2.0 cm long, pilose; rachis 2-7 cm long, pilose; pedicels 0.3-1.0 mm long. **Bracts** lanceolate, 1-2 mm long, acuminate, setulose, with an understory of sub-sessile, glandular trichomes, margins ciliate. **Calyx** sub-actinomorphic, tubular, 2-4 mm long, setose, with an understory of sub-sessile, glandular trichomes; lobes 4, trullate to subulate, acuminate. **Corolla** sub-actinomorphic, white; tube 1.5-5.0 mm long, glabrous to pubescent medially to distally; limb 1.0-3.5 mm wide, glabrous to pubescent. **Stigma** capitate, apically disposed. **Fruit** obovoid, 1.5-2.5 mm long, 1-2 mm wide, glabrous, apically bilobed, lobes ca. 0.1 mm; intermericarpal cavity reduced, the surface papillate.

Key to the varieties of *A. gratissima*

1. Corolla tube glabrous to pubescent along distal portion, limb glabrous; midstem leaf margins entire. 10a. var. *gratissima*

1. Corolla pubescent from the medial portion of the tube to the distal portion of the limb; midstem leaf margins entire to irregularly toothed along apical 2/3.

 2. Laminae linear, sometimes narrowly elliptic, margins entire. 10c. var. *angustifolia*

 2. Laminae elliptic, margins often irregularly toothed along apical 2/3.

  3. Petioles 1 mm long or less; laminae abaxially villous to incanous; North American. 10b. var. schulziae

  3. Petioles 1-6 mm long; laminae abaxially puberulent; South American. 10d. var. *chacoensis*

10A. ALOYSIA GRATISSIMA (Gill. & Hook.) Troncoso var. **GRATISSIMA,** Darwiniana 12: 527. 1962. *Verbena gratissima* Gill. & Hook., Bot. Misc. 1: 160. 1830. *Lippia gratissima* (Gill. & Hook.) L. Benson, Trees & Shrubs of the Southwest Deserts, ed. 3: 202. University of Arizona Press: Tucson. 1981. TYPE: ARGENTINA. MENDOZA: Mendoza, 21 Oct 1829, *J. Gillies s.n.* (HOLOTYPE: K; ISOTYPES: BM-2!, G!, GL).

Aloysia floribunda M. Martens & Galeotti, Bull. Acad. Brux. 11, 2: 320. 1844. TYPE: MEXICO. PUEBLA: Mpio. Tehuacan; Tehuacan, Cordillera [state reported as Oaxaca], Jun-Oct 1840, *H. Galeotti 114* (HOLOTYPE: BR; ISOTYPES: B[destroyed], G!, W!; PHOTOHOLOTYPE: NY!; PHOTOISOTYPES: MO!, NY!).

Aloysia gratissima f. *macrophylla* Moldenke, Phytologia 29: 75. 1974. TYPE: UNITED STATES. TEXAS: Presidio Co.; in "mountain tracks," Presidio del Norte, 4 Aug 1852, *C. C. Parry et al., s.n.* (HOLOTYPE: NY!).

Aloysia beckii Moldenke, Phytologia 52: 18. 1982. TYPE: BOLIVIA. COCHABAMBA: Mpio. Carrasco; 185 km from Santa Cruz, rocky hillsides with, 2370 m, 27 Sep 1981, *S. G. Beck 7036* (HOLOTYPE: LL!).

Leaves opposite; petioles 0.2-1.2 mm long; laminae elliptic to (3:1, L:W), 1-3 cm long, 0.3-1.0 cm wide, margins entire, basally acute to short attenuate, apically acute, adaxially strigose, abaxially pilose to puberulent. **Calyx** sub-actinomorphic, tubular, 1.0-1.5 mm long, setose with an understory of sub-sessile, glandular trichomes; lobes 4, trullate, acuminate. **Corolla** tube 1.5-2.0 mm long, glabrous to sparsely pubescent distally; limb 1-2 mm wide, glabrous. **Chromosome** number, 2*n*=54, North American populations (Andrada et al., 1998), and *n*=ca. 27, South American populations (M. Powell, unpubl.).

Discussion: Gillies and Hooker (1830) originally described this species in *Verbena* where it languished for 132 years. This description was overlooked because it referred to a plant with four nutlets, like *Verbena*, rather than two, like *Aloysia*. The name was properly transferred to *Aloysia* by Troncoso in 1962.

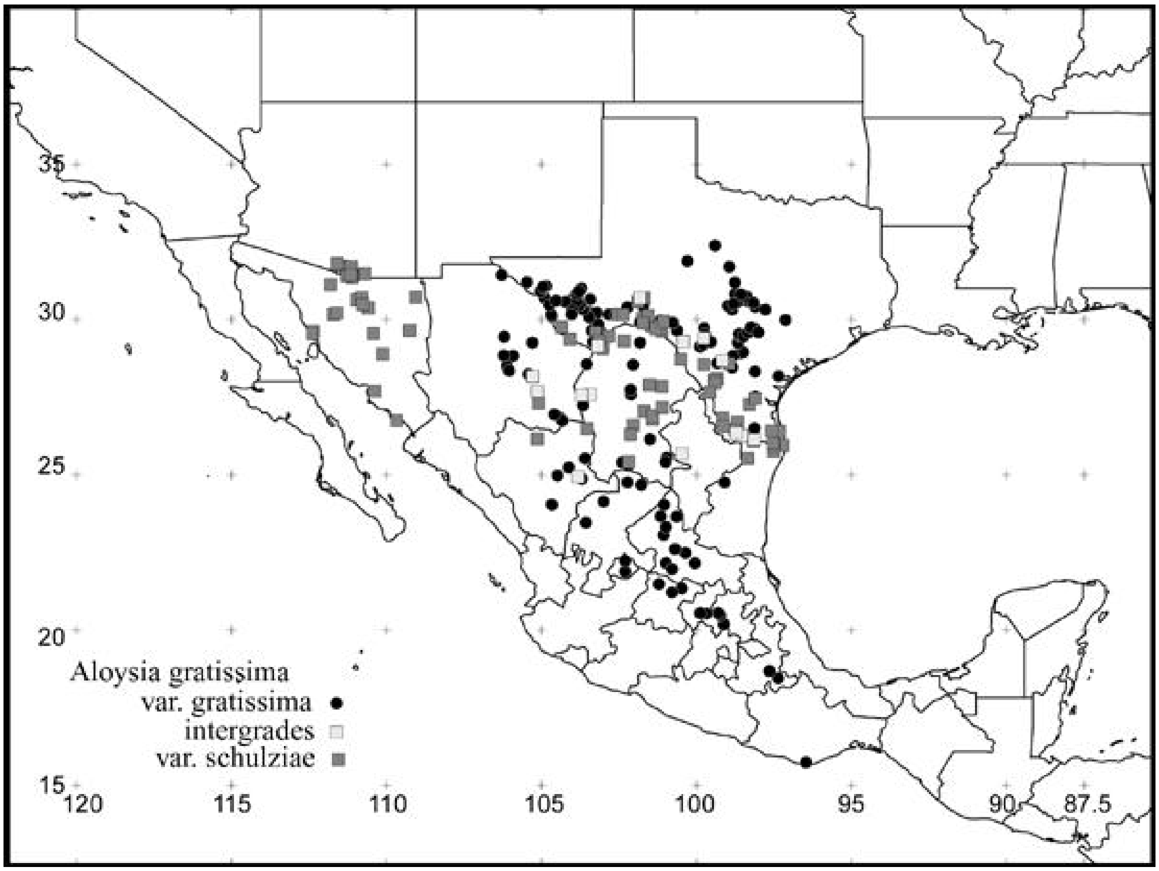

Figure 24: Distribution of *Aloysia gratissima* in North America.

As treated here, *A. gratissima* is the most widespread species in the genus. It occurs in diverse habitats on two continents and has an amphitropical distribution. It is currently treated as having four varieties; two in South America, one in North America, and one which occurs on both continents. The typical var. *gratissima* is believed to occur on both continents, although having received the name *A. floribunda* in North America. While some workers might recognize the two continental populational systems as belonging to different taxa, I have been unable to find morphological evidence for this. There is notable intergradation between these taxa in Argentina; var. *gratissima* intergrades with var. *angustifolia* in the states of Santiago del Estero and Cordoba and with var. *chacoensis* in the states of Santiago del Estero and Santa Fe (fig. 23). This is also true in North America where var. *gratissima* intergrades with var. *schulziae* in several regions in Coahuila, Chihuahua, and southern and western Texas (fig. 22).

Aloysia lycioides has been treated as synonymous with *A. gratissima* by several authors (Moldenke, 1940; Troncoso, 1965; Botta, 1979). However, I believe these taxa to be distinct based on morphological features and cytological data. Chromosome counts suggest *A. gratissima* to be triploid, with a mitotic count $2n$=54, while *A. lycioides* reportedly has a meiotic count of n=18. These taxa are known to be sympatric and do not appear to hybridize (pers. obs.).

Distribution and habitat (figs. 22-25): Widely distributed in arid regions of both North and South America; calcareous, granitic, and igneous outcrops, sandy and gravelly alluvia, sandstone and shale deposits; 25-3500 m; flowering year round in both hemispheres, depending on rainfall.

Common names and uses: Ángel, arrayán, arrayán del campo, azahar del campo, cedrón del monte, chá da India, common bee-brush, cuna del niño, favorita, jasmin, jasmin del monte, hapsx iti coca, ilang ilang, la muña, muña del monte, niña rupá, niño rupá, oreganillo, palo amarillo, poleo, poleo-í, poleo del monte, privet Lippia, puha akú, quebradora, usillo, and whitebrush.

This species has been reported as a treatment for diabetes, a source of nectar for honey-producing bees, and for ritual uses (*R. Ocampo 13* [IEB]). Rotman and Múlgura (1999) report this species is a popular home remedy for rheumatism and stomach pains.

Etymology: This species was named for its very pleasing or agreeable odor of the flowers; the synonymous *Aloysia beckii* was named in honor of Dr. Stephan G. Beck, collector of the type.

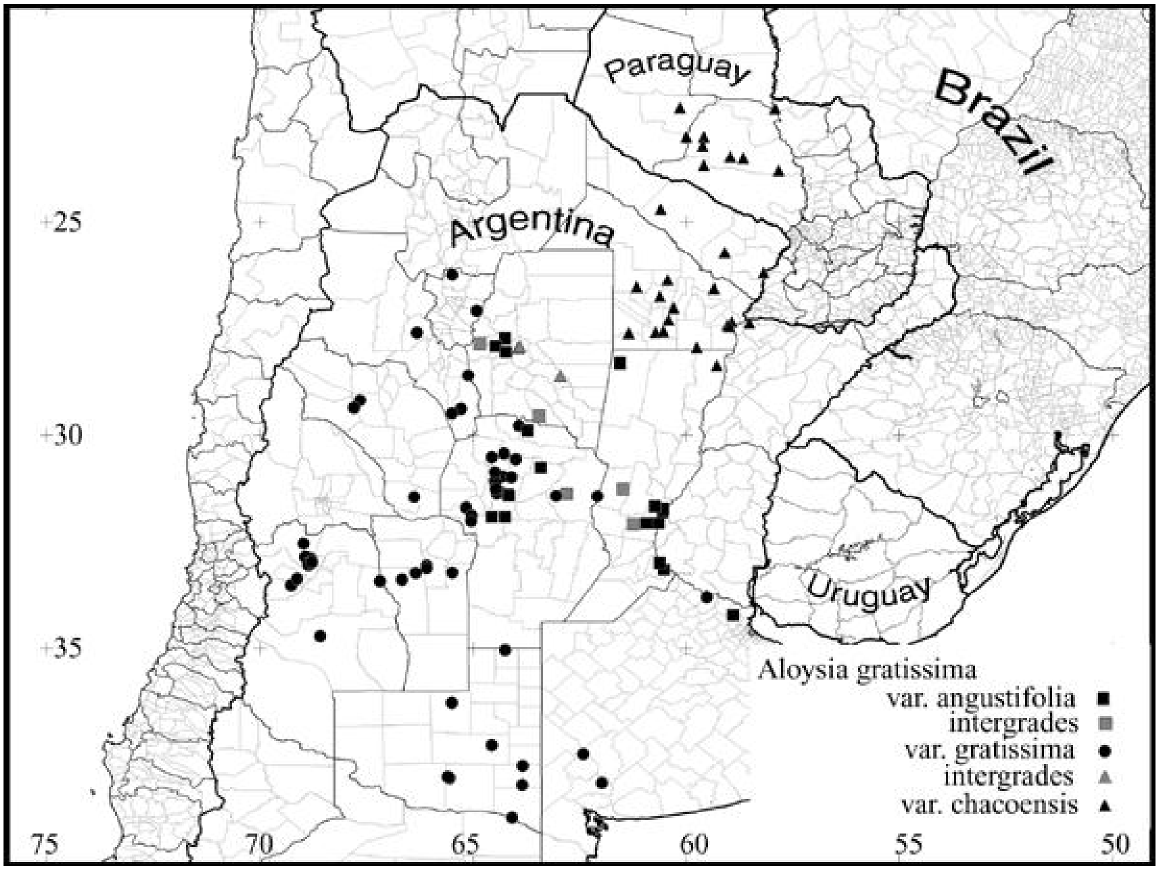

Figure 25: Distribution of *Aloysia gratissima* in South America.

Representative specimens: ARGENTINA. BUENOS AIRES: **Mpio. Baradero**; Baradero, barranca, 19 Nov 1937, *A. Burkart 8486* (F, NY). **Mpio. Campana**; Campana, 28 Oct 1945, *J. Hunziker 1042* (MO, NY); Campana, en la barranca del Río Paraná, 14 Oct 1945, *A. Krapovickas 2597* (MO, NY); Otamendi, 26 Oct 1928, *P. Moreau s.n. [13577]* (BA, NY). **Mpio. Saavedra**; Curmalan Hill, Hacienda

Ducos, 15 km N of Pigue, igneous rock outcropping, 14 Dec 1938, *W. J. Eyerdam, A. A. Beetle & E. Grondona 23408* (G, GH, MO). **Mpio. Tornquist**; Sierra Ventana, Dec 1936, *A. Castellanos s.n. [19062]* (NY). **CATAMARCA: Mpio. Andalgala**; Andalgala, 2 Sep 1915, *P. Jörgensen 1020* (BA, GH, US). **Mpio. La Paz**; Esquiú, 9 Dec 1946, Brizuela, A. 386 (NY); Las Peñas, 26 Dec 1946, *A. Brizuela 550* (NY, W). **CÓRDOBA: Mpio. Capital**; Córdoba, Dec 1891, *O. Kuntze s.n.* (NY, US). **Mpio. Colon**; La Calera, 10 Mar 1944, *C. A. O'Donell & J. M. Rodriguez 470* (F, GH-2); Ascochinga, 14 Mar 1944, *C. A. O'Donell & J. M. Rodriguez 897* (F, GH); Jesus Maria, 21 12 1947, *B. Balegno 1465* (NY). **Mpio. Ischilin**; Los Tartagos, 31 Mar 1944, *C. A. O'Donell & J. M. Rodriguez 653* (GH-2). **Mpio. Punilla**; near Cassaffousth, 9 Sep 1915, *J. N. Rose, & P. G. Russell 21056 (NY, US)*; La Falda, 7 Feb 1947, *M. Villafañe 751* (NY); Valle Hermoso, 8 Feb 1947, *M. Villafañe 776* (NY); Cosquín, avenida cortanera, 1 Feb 1936, *A. P. Rodrigo 240* (NY, US). **Mpio. San Alberto**; Monte at San Jose, 13 km W of Villa Dolores, 8 Jul 1943, *H. H. Bartlett 20601* (MICH, US). **Mpio. San Javier**; La Vina; on rocks, 9 Jul 1943, *H. H. Bartlett 20613* (GH, MICH, NY). **Mpio. San Justo**; San Francisco, 3 Dec 1946, *B. Balegno 903* (NY); 2 km E de Arroyito, borde del camino, 2 May 1971, *A. Krapovickas, L. A. Mroginski, & A. Fernández 18530* (CTES). **Mpio. Sobremonte**; San Francisco del Chañar, 4 Dec 1944, *B. Balegno 267* (NY, W). **Mpio. Totoral**; Las Peñas *B. Balegno 1140* (MO, NY). Mpio. Tulumba; Cerro Sauce Puncu, 2 Nov 1945, *A. R. Cuezzo 742* (NY). **LA PAMPA: Mpio. Caleu Caleu**; Comisaria de Río Colorado, barranca and flat upland, 15 Apr 1943, *H. H. Bartlett 19942* (MICH, NY, US). **Mpio. Hucal**; Laguna La Tigra, 18 Jan 1986, *C. B. Villamil 3809* (NY). **Mpio. Lihué Calel**; Lihue-Calel, 5 Dec 1981, *A. L. Cabrera, et al. 32798* (SI); Lihuel Calel, 24 Nov 1941, *A. Castellanos s.n. [37528]* (BA); Sierra de Lihuel-Calel; en la cima, 30 Nov 1959, *N. S. Troncoso 20589* (US). **Mpio. Loventue**; cerca de Telén, 16 Mar 1938, *A. L.*

Cabrera 4368 (GH, NY); R.N. 152 de Lihué Calel, laderas prxó.[sic] ACA, 29 Jan 1975, *O. Boelke et al. 16005* (SI). **Mpio. Realico**; Realico, 9 Jan 1945, *A. G. Schulz 5912* (GH). **Mpio. Ultracan**; Utracán, 65 km S de Sta. Rosa, 7 Nov 1972, *A. Krapovickas et al. 22663* (CTES, LL). **LA RIOJA: Mpio. Chilecito**; Guanchín, 22 Nov 1927, *A. Castellanos s.n. [27/2026]* (BA). **MENDOZA**: Tupungato, 25 May 1933, *A. Ruiz Leal 1505* (NY, SI). **Mpio. Guaymallen**; Mendoza, 1916, *E. Carette 3046* (NY). **Mpio. Las Heras**; Challao, 19 Oct 1907, *C. Osten 5737* (G). **Mpio. Lujan**; Lujan, 25 Jan 1919, *A. Ruiz 671 [25/2192]* (BA, NY); Charcas de Coria; vecino de los cultivos, escasa, 9 Feb 1945, Semper, J. 339 (NY). **Mpio. Maipu**; Maipu, cerca de las Barrancas, 19 Mar 1936, *E. Carette & A. Ruiz Leal 3877* (NY-2). **Mpio. San Rafael**; Cuesta de los Terneros, 24 Oct 1991, *A. Lutz 51* (CTES); Cuesta de los Terneros, 8 Feb 1945, *A. Lourteig 845* (UC). **Mpio. Tunuyan**; Los Arboles, 19 Feb 1933, *A. Ruiz Leal 1102* (NY). **Mpio. Tupungato**; Tupungato, an la llanura, 23 Feb 1933, *A. Ruiz Leal 1220* (NY). **SAN LUÍS: Mpio. Colonel Pringles**; Coronel Pringles, 14 Oct 1989, *M. Múlgura 1105* (MO); Trapiche, 27 Feb 1944, Varela 675 (NY). **Mpio. General Pedernera**; El Morro, [Ea. La Emboseada], 26 Jan 1948, *W. Partridge s.n. [56144]* (BA). **TUCUMÁN: Mpio. Leales**; Tres Pozos, 5 Dec 1938, *Descole & Schreiter 86116* (GH).

MÉXICO. AGUASCALIENTES: **Mpio. Rincón de Romos**; 2 km S and 2 km E of Rincon de Romos, low un-grazed meadow with some permanent wet places, occasional, 4 Sep 1967, *R. McVaugh 23659* (MICH). **Mpio. Aguascalientes**; Aguas Calientes, Jul 1931, *H. W. Viereck 1291* (US). **CHIHUAHUA**: **Mpio. Aldama**; Aldama, on Road leaving village to the E, silt, widespread and locally abundant, 30 Jul 1948, *W. P. Hewitt 306* (GH). **Mpio. Chihuahua**; 20 km al N de Chihuahua, rumbo a Ciudad Juarez; matorral espinoso con pastizal, laderas de material igneo, 10 Aug 1989, *F. González-Medrano, I. Diaz, & H. Gonzalez 17154* (MEXU); 4 km al W de Sacramento, matorral de Prosopis, 10 Aug 1971, *F. Jimenez 87* (CAS, MICH); vicinity of Chihuahua, 8-27 Apr 1908, *E. J. Palmer 61* (GH, MO, NY, US); km 60 carretera Panamericana, Chihuahua--Ciudad Juarez, Rancho Experimental "La Campana", 6 Aug 1974, *J. Valdes R. VR-563* (MEXU-2); Sacramento, near Chihuahua, 23 Aug 1846, *A. Wislizenus 149* (MO). **Mpio. Ciudad Camargo**; 1 mi. [1.6 km] S of central Cd. Camargo along Highway 45 in open remnant Chihuahuan Desert scrub, rocky, sandy clay, 18 Sep 1972, *J. Henrickson 7740* (LL). **Mpio. Coyame**; 23.1 road mi. [37.2 km] SW of Coyame at El Pastor, sandy and clay riverbed, 16 Sep 1971, *J. Henrickson 6742a* (LL). **Mpio. Jiménez**; microwave relay station, 21 km NW of Escalon, E of Highway to Jimenez, steep hills of extrusive igneous rocks, gravelly, thin, 7 Jul 1972, *F. C. Chiang, T. Wendt, & M. C. Johnston 8312C* (TEX); between Escalon and Caballo, Highway 49, near border of Chihuahua and Ceballos, Durango, 26 Jun 1977, *J. D. Dwyer 14228* (MEXU, MO, NY); El Carmen, 5.8 mi. [9.3 km] NW of Escalon on MX Hwy 45, 16 Mar 1978, *T. R. VanDevender s.n.* (ARIZ). **Mpio. Meoqui**; Meoqui, 24 Aug 1935, *H. Le Sueur Mex-179* (CAS, GH, TEX); Bachimba Canyon, 23 Mar 1885, *C. G. Pringle 100* (BM, CAS, MEXU-2, MICH, MO, NY, US). **COAHUILA**: **Mpio. Acuña**; Sierra del Burro, al W de Villa Acuna; matorrales medianos subinermes con pastizal y bosque bajo, 29 Aug 1985, *F. G. Medrano 14751* (MEXU-2). **Mpio. Melchior Muzquiz**; Muzquiz, Sabinas River, 11 Jul 1936, *E. Marsh 407* (GH). **Mpio. Ocampo**; Sierra del Pino, S canyon, below the oak and pine belts, floor of canyon, W COA, 26 Aug 1940, *I. M. Johnston & C. H. Muller 717* (GH); 9 km S of El Tule, Barra de San Jose, vicinity of Rancho El Tule, S foothills of the igneous Sierra Hechiceros, along arroyos, ca. 24 km due N of Castillon and close to the CHI[sic] boundary, 12 Jun 1941, *R. M. Stewart 456* (BM, CAS, GH, LL-3, MEXU-2, MO, NY-2). **Mpio. Parras de la Fuente**; zona de los chupaderos, ca. 18 km al S de Parras, 8 Jun 1984, *G. A. Rodriguez & M. A. Carranza 125* (TEX); Parras, Mar 1905, *C. A. Purpus 1085* (MO, NY); Sierra de Parras, arbusto ripario, 30 Jul 1976, *F. A. Roig 9063* (SI). **Mpio. Ramos Arizpe**; Canada de Diente, Sierra de la Paila, 19 Sep 1989, *J. A. Villareal & M. A. Carranza 5200* (IEB). **Mpio. Sabinas**; Sabinas, 21 May 1902, *E. W. Nelson 6781* (S, US). **Mpio. Saltillo**; Saltillo and vicinity, 15-30 Apr 1898, *E. J. Palmer 55* (BM, G, GH, K, MEXU, MO, NY, US). **Mpio. San Buenaventura**; El Berrendo, near Muzquiz, 13-16 Jul 1939, *S. S. White 1819* (MICH). **Mpio. Sierra Mojada**; Sierra Mojada Mts., 12 Apr 1892, *M. E. Jones 358* (US); 15 km NW of Jaco, along Road to Victoria, via Temporales de Honorato, broad valley, low silty flat, common, E COA[sic]; ca. 28- N, 6 Jul 1941, *R. M. Stewart 671* (GH, LL, MEXU). **DURANGO**: Rocky hillside, Los Angeles, 7 Nov 1957, *R. Moran 6260* (LL). **Mpio. Cuencamé**; Ejido las Mercedes, Cuencamé, campo experimental de Zonas Aridas, ca. 19 km al N de Cuencamé, carretera 40 Durango-Torreon, matorral microfilo, 8 May 1992, *R. Andres G., J. A. Villareal, & M. A. Carranza P. 1537* (IEB); carretera Torreon-Durango, cerca de Cuencamé, DUR[sic]., 2 Sep 1960, *F. Medellin-Leal 1025* (MEXU); along washes near Pasaje, 23 Aug 1939, *F. Shreve 9123* (ARIZ, CAS). **Mpio. Durango**; Cd. Durango and vicinity, Apr-Nov 1896, *E. J. Palmer 127* (ARIZ, BM, G, GH, MEXU, MICH-2, MO, NY, S); Sierra Madre Occidental, Cerro de Mercado, N of Durango; gravelly slope, 24-25 Aug 1934, *F. W. Pennell 18151* (MEXU, NY, US). **Mpio. Nazas**; 0.9 road mi. [1.4 km] E of Nazas along Highway, in red sandy clay, 13 Aug 1973, *J. Henrickson & T. Wendt 12334* (LL). **Mpio. San Juan del Rio**; 3.2 mi. [5.1 km] S of Palmitos, 5 Nov 1957, *R. Moran 6205* (LL, MEXU). **Mpio. Villa Hidalgo**; Cerro San Javier, ca. 7 road mi. [11.3 km] W of La Resolana on MX Hwy 45, rolling hills, area punctuated by small oak-clad outcrops w/ much more diverse flora, 17 Jul 1996, *M. F. Wilson & M. A. Wells 96-217* (ARIZ). **GUANAJUATO**: **Mpio. Dolores Hidalgo**; Presidio "El Cortijo", a 16 km al NE de la Cd. de Dolores Hidalgo sobre la carretera a

San Luis de la Paz, 6 Jan 1996, *R. Ocampo 13* (IEB). **Mpio. San Luis de la Paz**; San Luis de la Paz, 28 Oct 1958, *G. N. Jones 23250* (LL); El Patrocinio; matorral, potrero, abundant, 7 Jun 1997, *R. Santos 102* (IEB). **Mpio. Victoria**; +3 km de Victoria, carretera San Luis de la Paz; matorral crassicaule, ladera de cerro, abundant, 13 Jul 1993, *E. Carranza & E. Perez 4663* (IEB, MEXU); Palmilla, 5 km al W de Victoria; matorral arbustivo, ladera de cerro, escaso, 22 Nov 1988, *E. Ventura & E. Lopez 6405* (IEB, MEXU). **HIDALGO**: **Mpio. Ajacuba**; Barranca el Corazon, al N del poblado Santiago Tezontlale, vertiente S de la sierra del Mexe, ejido S. Tezontlale, matorral xerofilo, rocas volcanicas de los grupos San Cristobal y San Juan, 4 Nov 1989, *V. I. Diaz et al. 727* (ARIZ, TEX). **Mpio. Ixmiquilpan**; roadside N of Ixmiquilpan; dry soil w/ open cactus and Hechtia scrub, 7 Jul 1948, *H. E. Moore, Jr. & C. E. Wood, Jr. 3737* (BH, MEXU, MICH, US); Ixmiquilpan, Jul 1905, *C. A. Purpus 1415* (GH, MO, NY). **Mpio. Tasquillo**; Cerro del Junquillo al SW de Tasquillo, matorral espinoso, abundante, 2 Jun 1982, *L. Tenorio P. & C. Romero de T. 501* (MBM, TEX). **Mpio. Tecozautla**; Gandho, 4 km al N de Tecozautla; vegetacion secundaria, 12 Jul 1980, *M. Hernandez R & R. Hernandez V. 4690* (CAS, MO). **NUEVO LEON**: **Mpio. Cadereyta**; Río Ramos, 80 km SE of Monterrey, May 1946, *J. J. Roybal 942* (MEXU). **Mpio. Galeana**; El Penuelo, Opuntia forest, common, 24 Jul 1991, *Hinton et al. 21103* (GH, IEB, TEX). **Mpio. Higueras**; Sabinas Hidalgo to Monterrey, on Highway Libre 85, ca. 65 km from Monterrey, soil adjacent to road cut; 26 12.424’ N, 100 6.031’ W, 23 May 2001, *S. J. Siedo 1046* (TEX). **Mpio. Monterrey**; Monterrey, Sta. Catarina, desfiladero [*Abbon 69*], Jul 1911, *G. Arséne 6156* (GH, MO, US); Chipinque Mesa near Monterrey, 25 Sep 1937, *L. A. Kenoyer s.n.* (MO); Monterrey, by streams, 7 Sep 1902, *C. G. Pringle 11086* (BH, CAS, GH, K, MEXU-3, MICH, MO, NY, US); Topo Chico, near Monterrey, 1 Feb 1907, *W. E. Safford 1226* (US). **OAXACA**: **Mpio. Puerto Angel**; Pochutla, 29 Mar 1958, *F.*

Miranda 8842 (MEXU). **PUEBLA**: **Mpio. Tehuacan**; Afueras al S de Tehuacan, Izotal, 28 Jul 1982, *F. C. Chiang, P. Davila, G. Gomez F-2366* (MEXU); Afueras al S de Tehuacan, 28 Jul 1982, *F. C. Chiang, P. Davila, & G. Gomez 2366* (TEX); Tehuacan area, Tlacotepec, NW part of Tehuacan Valley, soils gravelly gray or brown, thorn-scrub-cactus, 27 Jul 1961, *C. E. Smith Jr., F. A. Peterson, & N. Tejeda 4119* (G, MEXU, US). **QUERÉTARO**: **Mpio. Cadereyta**; margen izquierda del Río San Juan, orilla de rio, abundant, 7 Aug 1990, *Teresita 3* (IEB); Cadereyta de Montes, matorral crassicaule perturbado, comun, 7 Oct 1978, *S. Zamudio R. 3384* (IEB, MEXU). **Mpio. Colon**; Cerros frente a granjas Toliman, cerca de Galeras, suelo casi negro, pedregoso, 13 Oct 1993, *M. Hernandez R., J. Orozco H., & C. Orozco L. 10390* (MEXU). **Mpio. La Cañada**; Amazcala, El Marques, pastizal amacollado arborfrutescente, 17 Jun 1994, *A. Avalos M. 77* (IEB). **Mpio. Querétaro**; Querétaro [*Agniel 27*], 1910-13, *G. Arséne 10302* (US). **Mpio. Tequisquiapan**; 5 km al N de Tequisquiapan, pastizal en orilla de camino, abundant, 24 May 1986, *R. Fernandez N. 3283j* (IEB, MEXU, NY, TEX); Tequisquiapan, Sierra de Mastranzo, 15 Sep 1959, *L. Paray 2970* (MEXU). **Mpio. Tolimán**; Higuerillas-Toliman road off of Route 120, Barranca about 5 km from Higuerillas, 5 Jul 1974, *S. H. Sohmer 9264* (MEXU); 3.5 km al SSW de San Pablo Toliman; bosque de encino sobre rocas igneas riolitas, comun, 14 Jul 1978, *S. Zamudio R. 3136* (IEB, MEXU). **SAN LUIS POTOSÍ**: **Mpio. Charcas**; Charcas, Jul-Aug 1934, *C. L. Lundell 5184* (ARIZ, CAS, GH, LL, MEXU-2, MICH, NY). **Mpio. Matehuala**; campo experimental de CNIZA, 5 km al S de Matehuala, matorral mediano subinerme parvifolio, 15 Jul 1975, *F. G. Medrano et al. 8103* (MEXU); campo experimental de CNIZA, 5 km al S de Matehuala, matorral mediano subinerme parvifolio, 15 Jul 1975, *F. G. Medrano et al. 8115* (MEXU). **Mpio. Rio Verde**; Cerro al SW de Pastora, 29 Jun 1961, *F. Takaki 1085* (MEXU). **Mpio. San Luis Potosí**; Flora Mexicana, San Luis

Potosi, 1879, *J. G. Schaffner 339* (BM, CAS, MICH, NY-2, US-2). **Mpio. Villa de Guadalupe**; 2 km al S de Berrendo, La Mesilla, suelo 20 cm de profundidad, limo-areno-arcilloso, vegetacion microfila, 6 Jul 1973, *V. J. Villa* (ARIZ). **Mpio. Zaragoza**; ca. 200 yds E of Highway 57, 28.1 km S of San Luis Potosi, Junction 57 & 70, 3 km s of Junction 2/Highway to Villa de Reyes, access via road to Los Pilares, 27 Sep 1977, *T. Reeves R6302* (LL); Zaragoza, ladera riolitica con vegetacion espaciada, 7 Jul 1954, *J. Rzedowski 3511* (TEX). **TAMAULIPAS**: **Mpio. San Carlos**; Flora of the Sierra de San Carlos, La Tamaulipeca, vicinity of San Miguel; valley floor, 25 Jul 1930, *H. H. Bartlett 10568* (LL, MICH, US). **ZACATECAS**: **Mpio. Cedros**; Cedros, bajillos, 1908, *F. E. Lloyd 69* (MO, US). **Mpio. Chaichihuites**; Mesillas, 19 Sep 1848, *J. Gregg 453* (MO). [**Mpio. Gral. Francisco Murguía**]; 19 mi. [19 km] NNE of Nieves, in rocky canyon at margin of desert, at Puerto del Muerto, 3 Sep 1971, *J. Henrickson B6343* (LL). **Mpio. Mazapil**; 8 km by road WSW of Coapas to Camacho, E of El Huisache; W sloping, calichified alluvial fan, 28 Mar 1973, *M. C. Johnston, F. Chiang, & T. Wendt 10444E* (LL).

UNITED STATES. TEXAS: **Atascosa Co.**; 2 mi. [3.2 km] S of Poteet, 2 May 1970, *P. A. Fryxell 1277* (NY); Jourdanton, 16 Feb 1914, *C. D. Marsh 11089* (US); Pleasanton, along creeks, 16 Mar 1916, *E. J. Palmer 9768* (CAS, GH-2, MO, S). **Bandera Co.**; Sabinal Canyon State Natural Area, ca. 1600 ft. from the confluence of Can Creek and the Sabinal River, 10 Jun 1975, *J. Smith 660* (LL). **Bastrop Co.**; Colorado, Texas, 16 Oct 1902, *S. M. Tracy 8308* (NY, TEX, US). **Bexar Co.**; 2 mi. [3.2 km] SW of Von Ormy, brushland, 4 Jan 1963, *D. S. Correll 26945* (LL); Beacon Hill, San Antonio, 10 May 1918, *E. D. Schulz s.n.* (MICH); O. P. Schnabel Park in NW San Antonio, at Junction of Highway 16 and Braun Road, 20 Jun 1998, *S. J. Siedo 638* (TEX); head of the San Antonio River, Sep 1891, *L. F. Ward s.n.* (US). **Brewster Co.**;

Chisos Mts., in basin, lower slopes, 17 Aug 1944, *C. L. Lundell 13276* (LL); Oak Canyon, 1 Sep 1937, *E. G. Marsh 235* (F); rocky ground near Garden Spring, S of Marathon, 21 May 1928, *E. J. Palmer 34039* (GH, NY); Highway 385 ca. 2 mi. [3.2 km] N of Marathon, E side of road in fencerow, 28 Aug 2004, *S. J. Siedo 1120* (TEX); lava flow ca. 4 mi. [6.4 km] S of Black Gap Wildlife Refuge Headquarters, roadside shrub, 6 Apr 1971, *D. Sutherland 2799* (NY); arroyo through limestone 0.3 mi. [0.5 km] W of Nine Point Mesa Ranch, 21 Apr 1998, *G. L. Webster, & B. Westlund 32580* (TEX). **Brooks Co.**; Falfurrias, 21 Nov 1926, *B. C. Tharp 4644* (US). **Brown Co.**; Brownwood, rocky soil, 18 Jun 1966, *J. M. Ewing 49* (TEX); Brownwood, rocky bluffs, 10 Aug 1877, *J. Reverchon 691* (NY). **Burnet Co.**; Marble Falls, along limestone bluff on the River, abundant throughout central Texas, 27 Nov 1897, *W. L. Bray 16* (NY); Roadside 0.5 mi. [0.8 km] E of Buchanan Dam, 18 Jul 1946, *H. S. Gentry 18* (LL); Granite Mt., along FM 1431, 1.8 mi. [2.9 km] W of the Junction of FM 1431 and US 281, W of Marble Falls, 7 Jun 1988, *L. E. Urbatsch et al. 4820* (NY). **Caldwell Co.**; Luling, "Chaffinell", 1892, *L. J. Stevens s.n.* (BH). **Callahan Co.**; Rocky bluffs, Baird, Apr 1882, *J. Reverchon 741* (GH). **Coke Co.**; Bronte, along rocky streams, 27 Oct 1916, *E. J. Palmer 11159* (CAS-2, GH-2, MO). **Comal Co.**; Bracken, 22 Mar 1900, *W. M. Canby, Sargent, & Trelease 190* (GH); Comanche Spring, New Braunfels, May 1850, *F. J. Lindheimer 1070* (ARIZ, BM, F, G-2, GH, MO, NY, TEX-LL, US, W). **Concho Co.**; Ft. Concho, W Texas, rocky hills, Apr-May 1882, *J. Reverchon 1965* (BH, F, G-2, GH, NY-2, US). **Crockett Co.**; Lancaster Hill, 30 mi. [46.3 km] W of Ozona on Highway 290, foot of talus slope near the Pecos River, 10 Aug 1949, *D. J. Edson 20* (TEX). **Culberson Co.**; 3-5 mi. [4.8-8 km] S of Double Wells, 3-5 mi. [4.8-8 km] N of Río Grande, alluvial gravel along Green River, Glenn Creek, 21 Jun 1943, *U. T. Waterfall 4629* (GH, MO); 6.5 mi. [10.5 km] NW of Van Horn, on red sandstone along arroyo and base of canyon in the SW slopes of

Beach Mt., 14 Jul 1943, *U. T. Waterfall 5091* (CAS, GH, MO, NY); 6.5 mi. [10.5 km] NW of Van Horn; red sandstone slopes along arroyo running up SW Beach Mt., 2 Aug 1943, *U. T. Waterfall 5458* (CAS, F, GH, MO, NY). **Duval Co.**; 10 mi. [16.1 km] W of Falfurrias on FM 285, 10 Apr 1965, *R. Ramos & L. Murillo 99* (TEX). **Edwards Co.**; base of cliffs on talus slope ca. 15 mi. [24.1 km] SE of Carta Valley, 7 Sep 1965, *D. S. Correll 31550* (LL, NY). **Frio Co.**; Pearsall, Apr 1914, *M. F. Payne s.n.* (US); Junction of I-35 and FM 117 outside Dilley, ca. 15 mi. [25.7 km] S of Pearsall, ca. 16 mi. N of Cotulla; Prosopis scrub, 17 Jun 2000, *S. J. Siedo 1028* (TEX). **Gillespie Co.**; among boulders at summit of Bear Mt., just N of Fredericksburg, 10 Apr 1957, *D. S. Correll & C. Schweinfurth 15782* (LL); 20 mi. [32.2 km] N of Fredericksburg on sandy soil derived from granite, 14 Jun 1949, *R. W. Kelting 35* (TEX). **Guadalupe Co.**; 3 mi. [4.8 km] W [of] Seguin, fence row bordering Highway 725 near McQueeney; drainage area-Guadalupe River, soil-clay, Blackland Prairie vegetation, 20 Jun 1973, *I. G. Patterson 136* (LL, NY). **Hudspeth Co.**; rocky canyon 20 mi. [32.2 km] W of Van Horn, 31 Aug 1937, *L. N. Goodding 6002* (ARIZ); 6.8 mi. [10.9 km] W of Van Horn along IH-10 at road-cut, 22 Aug 1998, *S. J. Siedo 676* (TEX); igneous slopes of Eagle Mts., E of Eagle Peak, 16 Aug 1947, *U. T. Waterfall 7776* (GH, NY). **Jeff Davis Co.**; Muzquiz canyon, 10 mi. [16.1 km] SE of Ft. Davis, 30 Apr 1961, *J. Bequaert s.n.* (ARIZ, TEX); ca. 5 mi. [8 km] S of Toyahvale, gravelly plain, 23 Jun 1964, *D. S. Correll & C. Hanson 29840* (GH, LL); Davis Mts., old Ft. Davis, 9-12 Jul 1921, *R. S. Ferris & C. D. Duncan 2703* (CAS-2, MO, NY). **Karnes Co.**; 2 mi. [3.2 km] SW of [Kenedy] Karnes City on Highway 72, 28 Apr 1958, *B. Thompson & A. Graham 44* (TEX). **Kenedy Co.**; Norias Division of King Ranch, 20 Apr 1954, *M. C. Johnston 54605* (LL, TEX). **Kinney Co.**; common in moist live oak thickets in mesquite scrub 2 mi. [3.2 km] W of Uvalde Co. line, 15 mi. [24.1 km] E of Brackettville, 9 Sep 1942, *C. H. Muller 5077* (ARIZ, GH).

Kleberg Co.; Kingsville, Spring, [Mar-May] 1940, *J. F. Sinclair s.n.* (MO, TEX). **La Salle Co.**; US Highway 81, 3 [4.8 km] mi. N of Encinal, 16 Apr 1963, *G. Gamboa & W. C. Dohnke Jr. 179* (TEX); 10.5 mi. [16.9 km] N of Encinal/La Salle Co. line, 17 mi. [27.4 km] S of Cotulla/Nueces River along Interstate-35; *Prosopis* scrub w/ much *Helianthus*; ca. 7:00 pm, 17 Jun 2000, *S. J. Siedo 1027* (TEX). **Live Oak Co.**; S limits of George West on Highway 281, chaparral belt, sandy soil, 30 Apr 1947, *E. Whitehouse 18354* (MICH, NY). **Llano Co.**; 8 mi. [12.9 km] SE of Llano on Texas Highway 71 and 4.5 mi. [7.2 km] E on Co. Road to Kingsland; mesquite-oak-grassland zone, common in open areas, 26 Apr 1974, *W. Hess 3156* (ARIZ, NY, US); granite hills at Inks Dam, 21 May 1940, *C. L & A. A.. Lundell 9028* (LL, MICH, NY). **Mason Co.**; along U.S. Highway 87, 10 mi. [16.1 km] S of Mason, 27 Apr 1942, *A. & A. R. Nelson 5195* (CAS, GH, TEX). **McCulloch Co.**; 4.6 mi. [7.4 km] ENE of Rochelle, 31 May 1963, *L. H. Shinners 30132* (TEX). **McMullen Co.**; 15 mi. [24.1 km] N of Freer, 28 Apr 1958, *B. Thompson & A. Graham 62* (TEX). **Nueces Co.**; Corpus Christi, 1889, *Nealley 333b [365]* (US). **Pecos Co.**; 15 mi. [24.1 km] W of Sanderson; low places in dry stream bed, abundant, 3 Jul 1945, *R. McVaugh 7321* (F, LL, MICH). **Presidio Co.**; Marfa, 25 Jun 1940, *C. L. Hitchcock & L. Stanford 6811* (NY); foothills SW of Chinati Mts., 8 mi. [12.9 km] N of Ruidosa; abundant along arroyos in shrubby grassland transition, 28 Jul 1945, *C. H. Muller 8431* (LL, MICH, NY). **Reeves Co.**; Toyah Creek, 7.75 mi. [12.5 km] NE of Balmorhea, few on gravelly sand bar in creek bed, 8 May 1946, *V. L. Cory 52206* (CAS, GH, MICH, NY-2). **San Saba Co.**; 2.6 mi. [4.2 km] W of Richland Springs, 31 May 1963, *L. H. Shinners 30156* (TEX); San Saba, 15 Jul 1937, *B. C. Tharp s.n.* (TEX). **Tarrant Co.**; Forth Worth, 10 Aug 1880, *G. W. Letterman s.n.* (BH). **Terrell Co.**; along arroyos, limestone soil along Highway, 20 mi. [32.2 km] E of Dryden, 10 Apr 1949, *B. H. Warnock, J. O. Parks, & B. L. Turner 105* (TEX). **Travis Co.**; along shore below Mt.

Bonnell, 12 Aug 1943, *F. A. Barkley 13432* (NY, TEX); Shaffer Bend Resource Area on Lake Travis off FM 1431, 2 Apr 1998, *S. J. Siedo 588* (TEX). **Uvalde Co.**; Uvalde, 90 mi. [144.8 km] NW from San Antonio; Flora of South Western Texas, Jul 1879, *E. J. Palmer 1035* (G, NY, US); 0.5 mi. [0.8 km] N of Junction of Highway 83 & Road 127, roadside thicket, hard brown silt, this species dominant in apparent secondary growth situation, 9 May 1961, *A. Traverse 2127* (GH, LL). **Val Verde Co.**; 6.5 mi. [10.5 km] N of Vinegarone, 3 May 1942, *V. L. Cory 39092* (TEX); Seminole Canyon S. H. P., in Seminole Canyon, 10 May 1988, *Z. Labus 136* (TEX); 10 mi. [16.1 km] NW of Langtry, 1 May 1955, *B. L. Turner 3768* (TEX). **Willacy Co.**; NW of Headquarters, Sauz Ranch, 30 Jul 1953, *M. C. Johnston 53253.28* (TEX). **Zavala Co.**; Crystal City, 2 Apr 1925, *A. H. & A. A. Wright s.n.* (BH).

10B. ALOYSIA GRATISSIMA var. **SCHULZIAE** (Standl.) Moldenke, Phytologia 9: 500. 1964. *Lippia ligustrina* var. *schulziae* Standl., Field Museum Pub. Bot. 4: 256. 1929. *Aloysia ligustrina* var. *schulziae* (Standl.) Moldenke, Phytologia 1: 95. 1934. *Aloysia lycioides* var. *schulziae* (Standl.) Moldenke, Phytologia 2: 464. 1948. *Lippia gratissima* var. *schulziae* (Standl.) L. Benson, Trees & Shrubs Southwest Deserts, ed. 3: 203. University of Arizona Press: Tucson. 1981. TYPE: UNITED STATES. TEXAS: Jeff Davis Co.; vicinity of Fort Davis, 5 Aug 1928, *E. D. Schulz 2020* (HOLOTYPE: F!).

Leaves opposite; petioles absent to 1 mm long; laminae narrowly elliptic to narrowly ovate (3:1, L:W), rugose, 0.5-2.5 cm long, 0.5-1.5 cm wide, margins entire to obscurely toothed along apical 2/3, basally acute, apically acute, adaxially strigose, abaxially villous to incanous with an understory of sub-sessile, glandular trichomes.

Calyx sub-actinomorphic, tubular, 2-4 mm long, setose with an understory of sub-sessile, glandular trichomes; lobes 4, trullate to subulate, acuminate. **Corolla** tube 2-3 mm long, pubescent medially to distally; limb 2.5-3.5 mm wide, pubescent.

Discussion: As treated in the present account, *Aloysia gratissima* in North America is composed of two varieties, the typical var. *gratissima* and var. *schulziae*. The two taxa appear to intergrade in regions of contact, as noted on the distribution map (fig. 22). Intergrades between these taxa usually have leaves typical of var. *gratissima* but corolla pubescence similar to or approaching that of var. *schulziae*. Specimens with leaves similar to var. *schulziae* and pubescence of var. *gratissima* are rare, but have been noted to occur.

Distribution and habitat (fig. 24): Arid regions of northwestern to north central Mexico, southern to western Texas, and Arizona; calcareous to clay soils; 25-1200 m; flowering year round, depending on rainfall.

Etymology: The var. *schulziae* was named in honor of Ellen D. Schulz (1892-1970), well known Texas botanist and collector of the type.

Representative specimens: MEXICO. CHIHUAHUA: **Mpio. Hidalgo de Parral**; Parral; agostadero, pastizal mediano arborescente, comun, suelo castano oscuros, 19 Jun 1980, *G. Ochoa J. G. 23* (MEXU). **COAHUILA**: **Mpio. Acuña**; N Coahuila, vicinity of Aguachile Mt., limestone canyon area, 28 Aug 1966, *D. Flyr 1141* (MO). **Mpio. Castanos**; alrededores de cabecera municipal, matorral xerofilo, 10 Sep 1996, *M. González 2710* (IEB). **Mpio. Cuatrociénegas**; Carmen Pass, ca. 38 km W of Monclova, at old quarry on side of road, 6 Aug 1978, *P. A. Fryxell 3024* (NY, TEX); 7.3 mi. [11.7 km] S of Puerto Salada along road to Santa Tecla, Cuatro Cienegas Basin, 13 Jul 1968, *E.*

Lehto, D. Keil, & D. J. Pinkava 5597 (LL); 7.3 mi. [11.7 km] S of Puerto Salada along road to Santa Tecla, Cuatro Cienegas Basin, 13 Jul 1968, *E. Lehto, D. Keil, & D. J. Pinkava 5597* (LL). **Mpio. Parras de la Fuente**; El Toro near Movano, Jul 1910, *C. A. Purpus 4518* (BM, GH, MO-2, US). **Mpio. Progreso**; 9.5 km NW of Rancho Pajaros Azules on the road to Ejido Primero de Mayo; matorral, 13 Mar 1973, *M. C. Johnston, F. Chiang, & T. Wendt 10151* (MEXU). **Mpio. Sabinas**; Sabinas, 21 May 1902, *E. W. Nelson 6781* (S, US). **DURANGO**. **Mpio. Mapimi**; 45 km al E de la Cd. de Ceballos; 26- 29-52"N, 103- 32-58"W, 26 Jun 1981, *A. Alba 41* (MEXU). **Mpio. Villa Hidalgo**; Cerro San Javier, ca. 7 road mi. [11.3 km] W of La Resolana on MX Hwy 45, rolling hills, 2100 m, 17 Jul 1996, *M. F. Wilson & M. A. Wells 96-217* (ARIZ). **SONORA**: Arroyo del Pulpito, near Colonia Oaxaca, 31 Jul 1938, *S. S. White 741* (ARIZ, GH, MICH). **Mpio. Altar**; 2 mi. [3.2 km] E of Moreno; along sandy wash, 25 Feb 1933, *I. L. Wiggins 6293* (CAS, US). **Mpio. Bacadehuachi**; Bacadehuachi, in river valley, 20 or 2 Nov 1890, *C. V. Hartman 257* (GH, NY, US). **Mpio. Cucurpé**; Cienega on the Río Saracachi, 1.7 mi. [2.7 km] NW of Agua Fria, 11 Aug 1977, *D. E. Goldberg, 77-124* (ARIZ). **Mpio. Estancia Trincheras**; 6 road mi. [9.7 km] NE of abandoned mine in pass between Cerro San Luis and Sierra Santa Rosa, ca. 15.5 air mi. [24.9 km] S and 6.5 air mi. [10.5 km] W of Trincheras, along wash, 24 Feb 1983, *J. E. Bowers & R. M. Turner 2194* (ARIZ); near Mina Sahuarito, S of Cerro San Luis on the road from Mina San Ignacio, 20 air mi. [32.2 km] SW of Trincheras; gravelly hills cut by large wash, 11 Mar 1983, *A. C. Sanders et al. 3581* (MEXU). **Mpio. Guaymas**; Pacific Slope, Oroz, near Río Yaqui; loam flats, 7-8 Sep 1935, *F. W. Pennell 20230* (NY, US). **Mpio. Mpio. Hermosillo**; 7.8 road mi. [12.6 km] to Mazatan, NE of Cobachi, 2.6 mi. [4.2 km] by Rancho San Fermin access road to ranch house, 1.9 mi. [3.1 km] by ranch road E to bufflegrass clearing, Sinaloan thornscrub, 20 Aug 1982, *F. Reichenbacher 1025* (ARIZ).

Huatabampo; Río Mayo Region, Loma Moroncarit, small natural area of thorn-forest, 11 Oct 1988, *P. S. Martin et al. s.n.* (ARIZ). **Mpio. Magdalena de Kino**; Rancho la Tinaja Colorada, unos 15 km al NE de Magdalena de Kino; matorral xerofilo, suelos arenosos, someros, 11 Aug 1996, *A. Flores M., O. Gutierrez R., & A. Delucio 4612* (IEB, MEXU); vicinity of Magdalena, 25 Apr 1910, *J. N. Rose, P. C. Standley, & P. G. Russell 15073* (NY, US). **Mpio. Pitiquito**; 3.5 mi. [5.6 km] by road NE of Desemboque, riverbed and flood plain of the Río San Ignacio, 23 Feb 1968, *R. S. Felger et al. 17429* (ARIZ, TEX); Pozo Coyote, sm. ranch ca. 10 km N from El Desemboque along the Arroyo San Ignacio, uncommon; vicinity of 29-37'15"N, 112-22'15"W, 24 Mar 1983, *R. S. Felger et al. 83-105* (MEXU, MO, NY, TEX); on alluvial soil, 20 mi. [32.2 km] S of Pitiquito, near Los Temporales, 23 Oct 1932, *F. Shreve 6022* (ARIZ). **Mpio. Santa Ana**; Palm Canyon, 25 km SE of Magdalena on road to Cucurpe, Sierra Babiso, 13 Aug 1995, *A. L. Reina-Guerrero, & T. R. VanDevender 95-403* (ARIZ). **Mpio. Ures**; Rancho Aguilar Noria, N of Ures and Santiago, open broad drainage, Sonoran desert scrub, 21 Apr 1991, *E. Joyal 1992* (CAS, MEXU, TEX). **TAMAULIPAS**: **Mpio. Matamoros**; Matamoros, Apr 1836, *J. L. Berlandier 3004* (MO, NY); E of Los Coyotes, 15 Feb 1939, *H. Le Sueur 405* (TEX).

UNITED STATES. ARIZONA: **Pima Co.**; 5.2 mi. [8.4 km] WNW of Arivaca at Arivaca Wash, near flowing river ca. 100 m S of road, 23 Apr 1807, *C. R. Broome et al. 1807* (NY); Buenos Aires National Wildlife Refuge, Arivaca Creek ca. 5.5 mi. [8.9 km] NW of Arivaca, 14 May 1988, *S. P. McLaughlin & J. E. Bowers 4622* (ARIZ). **Santa Cruz Co.**; Pena Blanca Mts., dry shallow rocky draws, 5 Oct 1934, *L. N. Goodding 103G* (ARIZ); Santa Cruz Co.; 5 mi. [8 km] E of Ruby, 5 May 1930, *G. J. Harrison & C. J. King 6964* (ARIZ, CAS); Coronado National Forest, foothills of Tumucacori Mts., ca. 0.25 mi. [0.4 km] S from junction of northern tributary and Rock

Coral Canyon, open SSW-facing desert slope, 5 Apr 1991, *W. Hodgson 6172* (NY); growing along the Nogales-Ruby Road just above the start of Atascosa Peak Trail, 13 Jul 1949, *J. Kaiser 49-109b* (ARIZ); Pajarito Mts., Bartlett Mt., NE branch of Holden Canyon, SW of townsite of Ruby, in narrow rocky drainage, 8 Jul 1981, *G. S. Mills & L. J. Toolin 1742* (ARIZ); Santa Cruz Co.; side canyon to Holden Canyon on NW base of Bartlett Mt., rocky canyon bottom, 29 Oct 1981, *T. R. VanDevender & L. J. Toolin s.n.* (ARIZ). **TEXAS**: **Cameron Co.**; chapparal of clay hills in vicinity of Pa[l]mito Hill off Route 4 between Brownsville and Boca Chica, 5 Mar 1968, *D. S. Correll 35557* (LL); 8 mi. [12.9 km] W of Boca Chica, in scrub on low ridge, 2 Apr 1941, *C. L. & A. A. Lundell 9995* (LL, MICH, NY); Green Island, 23-24 Jun 1922, *B. C. Tharp 1233* (TEX). **Dimmit Co.**; Baccharis-Mesquite associate area, on bluff along S bank of Nueces River, along US 83, 13 Nov 1949, *W. C. McCulley 12* (ARIZ); 5 mi. [8 km] NW of Carrizo Springs, 21 Aug 1967, *A. R. & A. F. Moldenke 2342* (LL). **Hidalgo Co.**; Lower Río Grande Valley, 2 mi. [3.2 km] S of Alamo, 2 Jul 1932, *E. U. Clover 10* (ARIZ-2, CAS-2, MEXU, MICH, NY); off US 83, 1 mi. [1.6 km] E of Sullivan City, on gravelly hill, 1 Apr 1941, *C. L. & A. A. Lundell 9843* (MICH, NY); [Sam] Fordyce, 21 Apr 1906, *S. M. Tracy 9144* (BH, BM, F, G, GH, MO, NY-2, TEX, US, W). **Kinney Co.**: Ft. Clark, International Boundary Commission, 10 May 1893, *E. A. Mearns 1463* (CAS, GH, NY, US). **Maverick Co.**; Eagle Pass, 10 May 1914, *D. Griffiths 6344* (MO). **Pecos Co.**; near Sheffield, fields near Pecos River, 23 Jul 1921, *R. S. Ferris & C. D. Duncan 2979* (CAS-2, MO). **Starr Co.**; mixed thorn scrubland of moderate slope ca. 7000 ft. N of US 83 from a point ca. 0.8 road mi. [1.3 km] E of W Junction w/ FM 1430 at La Puerta, just E of main N-S Road through the Lower Río Grande Valley National Wildlife Refuge, 1 Feb 1994, *W. R. Carr 13310* (TEX); 8 mi. [12.9 km] NE of Río Grande City, in scrub on sand, 3 Apr 1941, *C. L. & A. A. Lundell 9927* (MICH, NY). **Terrell Co.**; 9 mi. [14.5 km]

W of Sanderson, gravelly arroyo near Emerson Station on the Southern Pacific R.R., 6 Jul 1958, *D. S. Correll & M. C. Johnston 19363* (GH, LL); Sanderson Canyon, just E of Sanderson along Highway 90, 22 Aug 1998, *S. J. Siedo 694* (TEX). **Webb Co.**; 5.6 mi. [9 km] S of Encinal/La Salle Co. line along I-35, San Roman Interchange exit, Prosopis scrub, ca. 6:30 pm., 17 Jun 2000, *S. J. Siedo 1026* (TEX); FM 1472, 10 mi. [16.1 km] NW of Laredo, red sand, 23 Nov 1962, *M. J. Solis 95* (TEX). **Zapata Co.**; US 83, 10 mi. [16.1 km] S of Zapata, 8 Mar 1963, *J. P. Cabrera 71* (LL); Falcon S. R. A., ca. 500 ft. SW of Park H.Q., mixed thorny scrubland, 20 Mar 1990, *W. R. Carr 10324* (TEX).

10C. ALOYSIA GRATISSIMA var. **ANGUSTIFOLIA** (Troncoso) Botta, Darwiniana 22: 89. 1979. *Aloysia chacoensis* var. *angustifolia* Troncoso in Burkart, Darwiniana 13: 630. 1964. TYPE: ARGENTINA. BUENOS AIRES: Campana, 28 Oct 1934, *A. Burkart 6695* (HOLOTYPE: SI!).

Leaves opposite; petioles absent to 0.3 mm long; laminae narrowly elliptic (8:1-4:1, L:W), 0.5-1.5 cm long, 0.1-0.3 cm wide, margins entire, essentially truncate, apically acute, adaxially strigose, abaxially puberulent. **Calyx** sub-actinomorphic, tubular, 1.5-2.0 mm long, setose with an understory of sub-sessile, glandular trichomes; lobes 4, trullate, acuminate, often revolute. **Corolla** tube 1.8-2.6 mm long, pubescent medially to distally; limb 1.5-2.5 mm wide, pubescent.

Discussion: The var. *angustifolia* intergrades with var. *gratissima* in Santiago del Estero and Cordoba, Argentina (fig. 23). The intergrades are usually characterized by elliptic leaves, akin to var. *gratissima*, but corolla pubescence similar to or approaching that of var. *angustifolia*. Troncoso (1964) treated var. *chacoensis* as a distinct species and var. *angustifolia* as a variety under it. However, Botta (1979) recognized these taxa as varietal entities under *A. gratissima*, this assessment is followed here.

Distribution and habitat (fig. 25): West-central Argentina in the states of Córdoba, Entre Ríos, San Luís, Santa Fé, and Santiago del Estero; up to 450 m; flowering October to July.

Etymology: This variety was named for its relatively narrow leaf blades.

Representative specimens: ARGENTINA. CÓRDOBA: **Mpio. Calamuchita**; Valle de los Reartes, without date, *A. Castellanos 585* (SI). **Mpio. Capital**; Córdoba, Alta Córdoba, 11 Apr 1944, *A. M. R. Huidobro 466* (US). **Mpio. Cruz del Eje**; Serrezuela Punta de Sierra, 7 Nov 1945, *R. Cuezzo 887* (F, NY, W). **Mpio. San Alberto**; Monte at San Jose, 13 km W of Villa Dolores, 8 Jul 1943, *H. H. Bartlett 20601* (MICH, US). **Mpio. San Justo**; El Tío, 8 Dec 1946, *B. Balegno 971* (F, NY, W). **Mpio. Esquina**; Loc. Route 27, 3 km N de Esquina, orilla del rio Corrientes, en los alrededores, 1 Dec 1974, *A. Krapovickas et al. 26989* (CTES, LL). **ENTRE RÍOS**: **Mpio. Diamante**; Diamante, barranca, 1 Nov 1970, *A. Burkart et al. 28067* (UC). **Mpio. Paraná**; Paraná, Paraçao, 31 Oct 1962, *A. Burkart 23805* (F, MICH, UC). **SAN LUÍS**: **Mpio. Capital**; Mendoza to San Luis, Ruta Nacional 7 between Jarilla and San Luis, 30 km W of San Luis and 2 km W of junction with Ruta Provincial 15, 21 Dec 2001, *S. J. Siedo 1081* (TEX). **SANTA FÉ**: **Mpio. 9 de Julio**; Santa Margarita, 10 Oct 1943, *A. Castellanos s.n. [47339]* (BA). **Mpio. San Jeronimo**; Estancia Los Charabones, Fn, Chilcas; en el bosque bajo de proxima Lag. del Toro, 25 Nov 1975, *R. Carnevali 3681* (CTES). **SANTIAGO DEL ESTERO**: **Mpio. Capital**; Arraga, Est. Exp. Agropecuaria INTA, 27 Dec 1982, *E. Carrizzo 43* (CTES); San Lorenzo, Ruta 64, 24 km SW de Santiago del Estero, 17 Nov 1994, *A. Krapovickas & C. L. Cristóbal 46195* (CTES).

10D. ALOYSIA GRATISSIMA var. **CHACOENSIS** (Moldenke) Botta**,** Darwiniana 22: 89. 1979. *Aloysia chacoensis* Moldenke, Lilloa 5: 373. 1940. TYPE: ARGENTINA. CHACO: Tirol, on side of mountain, shrub 1-2 m tall with oily peculiarly fragrant foliage and white flowers, Feb 1934, *A. G. Schulz 1494* (HOLOTYPE: NY!; PHOTOHOLOTYPE: SI!).

Aloysia casadensis Hassler & Moldenke, Phytologia 3: 107. 1949. TYPE: PARAGUAY. CHACO: Puerto Casado, edge of montes, Feb 1817, *T. Rojas 2529* (HOLOTYPE: MVM; PHOTOHOLOTYPE: LL!, NY!; ISOTYPES: LIL!, NY!; PHOTOISOTYPE [NY]: F!; TYPE FRAGMENT: NY!).

Leaves opposite; petioles 0.1-0.8 mm long; laminae elliptic (3:1-3:2, L:W), 0.6-1.3 cm long, 0.3-0.6 cm wide, margins entire, basally more or less acute, apically acute, adaxially strigose, abaxially adpressed pilose. **Calyx** sub-actinomorphic, tubular, 2-3 mm long, setose with an understory of sub-sessile, glandular trichomes; lobes 4, trullate to subulate, acuminate, often spreading. **Corolla** tube 2.5-3.5 mm long, pubescent medially to distally; limb 2.5-3.5 mm wide, pubescent.

Discussion: As discussed above, this taxon is a geographic entity which intergrades with other such population systems of *A. gratissima* when contiguous. Moldenke (1940) and Troncoso (1964) treated var. *chacoensis* as a distinct species but I cannot find sufficient morphological evidence to support this. The two taxa replace each other geographically and are not known to be sympatric. In addition, the two population systems intergrade when contiguous and there is evidence of gene flow between them.

Hassler and Moldenke (1949) recognized *A. casadensis* as a distinct species, even though both are from the Chaco region of northern Argentina and western Paraguay. The protologue contains no discussion so their rational for describing a new taxon is unknown. Inspection of the type specimens of each suggests they are identical, with the exception of slightly more prominent teeth along the leaf margins of the *A. casadensis* material.

Distribution and habitat (fig. 25): Chaco region of northern Argentina to western Paraguay; rocky calcareous slopes and igneous outcrops; 100-800 m; flowering November to June.

Etymology: The var. *chacoensis* was named for the state of Chaco, Argentina, where the type was collected. The synonymous *Aloysia casadensis* was named for the type locality of Puerto Casado, Chaco, Paraguay.

Representative specimens: ARGENTINA. CHACO: **Mpio. 12 de Octubre**; Hermoso Campo, borde del bosque, suelo fertíl, alto, 19 Mar 1955, *A. G. Schulz 9001* (F, SI). **Mpio. Primero de Mayo**; Colonia Benítez; terreno arcilloso duro, en bosquecillas ralos, abundante an la zona, Sep 1931, *A. G. Schulz 254* (CTES). **Mpio. Independencia**; Napenay, Route Nacional 16, en bosque, 29 Dec 1970, *A. Krapovickas & C. L. Cristóbal 17299* (CTES, LL). **CHACO: Mpio. Libertador General San Martin**; Zapallar, Ruta 11, 4 May 1947, *A. Reales 625* (NY). **Mpio. San Fernando**; Fontana, 1930, *T. Meyer 277* (SI). **Mpio. Punilla**; Villa Carlos Paz, 24 Nov 1989, *E. Cabral, L. Anzótegui, & S. M. Pire 551* (CTES). **FORMOSA**: **FORMOSA**: **Mpio. Patiño**; Las Lomitas, en campos, ramas apoyantes, 13 Dec 1984, *A. Schinini & S. M. Pire 24264* (F, UC). **Mpio. Formosa**; Abundante Formosa, Jan 1918, *P. Jörgensen 2473* (GH, MO, NY-2, SI, US). **Mpio. Pirané**; al S a 1 km Pirané, 23 Nov 1945, *I. Morel 379* (F, MO, NY, W).

SALTA: **Mpio. Gral. Martin M. Guëmes**; Campo Santo, ante de Cabeza del Buey, 29 Jan 1947, *C. A. O'Donell 4366* (F, NY, W). **SAN LUÍS**: **Mpio. Ayacucho**; Ruta Provincial 9 between junction with Ruta Nacional 146 and San Francisco del Monte del Oro, 6 km S of Ruta Nacional 146, roadside stop at shrine named "Christo y la Virgen de San Nicolas;" rocky hills, 22 Dec 2001, *S. J. Siedo 1085* (TEX). **SANTIAGO DEL ESTERO**: **Mpio. Ojo de Agua**; Sol de Julio, Ferrocarril Central de Argentina, 24 Mar 1943, *H. H. Bartlett 19796* (GH, UC, MICH, US). **Mpio. Silipice**; Arraga, Campo "La Maria"-INTA[sic], 3 Apr 1990, *C. Saravia Toledo 2435* (CTES).

PARAGUAY. BOQUERÓN: **Mpio. Mcal. Estigarribia**; Puerto Casado & vicinity, near Estancia "Guajhó;" open ground, 18 Oct 1956, *T. M. Pedersen 4089* (US). **PRESIDENTE HAYES**: **Mpio. Chaco Paraguayo**; 15 km E de Pozo Colorado; en quebrachal, crece con mayor vigor en el desmonte con suelo quemado, 19 Dec 1987, *A. Schinini & R. Palacios 26185* (CTES). **Mpio. Pozo Colorado**; Pozo Colorado, 30 Nov 1988, *G. Caballero Marmori 1513* (CTES); Santa Elisa, lat. 23°10' S, Dec 1903, *E. Hassler 2635* (F, GH, K, MICH, MO, NY, UC, US, W). **Mpio. Villa Hayes**; Estancia Loma Pyta, crece en matorral, 8 Dec 1978, *P. Arenas 664* (NY).

11. ALOYSIA LYCIOIDES Cham.

Shrubs 1.0-5.0 m in height. **Leaves** opposite; petioles 0.2-0.8 cm; laminae elliptic to ovate (ca. 3:1, L:W), 1.5-4.5 cm long, 1.0-3.5 cm wide, margins entire to serrate, basally attenuate, apically rounded to sub-acute, adaxially strigose, abaxially puberulent. **Inflorescence** loosely spicate; peduncle 0.5-2.0 cm long, pilose; rachis 2-10 cm long, pilose; pedicels 0.5-1.0 mm long. **Bracts** lanceolate, 1.0-1.5 mm long, 0.5-1.0 mm wide, acuminate, setulose, margins ciliate. **Calyx** zygomorphic, 2.5-3.5 mm long, tubular, setose with an understory of sub-sessile, glandular trichomes; lobes 4, usually in lateral pairs, trullate, acuminate. **Corolla** weakly zygomorphic, white; tube 2.0-3.5 mm long, glabrous; limb 2-3 mm wide, glabrous. **Stigma** sub-capitate, laterally disposed. **Fruit** obovoid, 1.5-2.0 mm long, 1.0-1.5 mm wide, glabrous, bilobed, lobes ca. 0.1 mm long; intermericarpal cavity reduced, the surface papillate.

Key to the varieties of *A. lycioides*

1. Leaves spathulate to obovate, rarely ovate, apically rounded, margins mostly entire, occasionally obscurely serrate medially to distally. 12a. var. lycioides

1. Leaves ovate to elliptic, apically obtuse to sub-acute, margins serrate. 12b. var. schulziana

11A. ALOYSIA LYCIOIDES Cham. var. **LYCIOIDES**, Linnaea 7: 237. 1832. *Lippia lycioides* (Cham.) Steud., Nomencl. Bot. ed. 2, 2: 54. 1841. TYPE: BRAZIL. Brasilia, praesertim in provincia Cisplatina pluribus locis et temporibus collegit, without date, *Sellow s.n.* (HOLOTYPE: LE; ISOTYPES: G!, K, W-3!).

Lippia affinis Briq., *nom. illeg.*, Bull. Herb. Boissier 4: 339. 1896; non Schau. in DC., Prodr. 11: 576. 1847. *Lippia sellowii* Briq., Ann. Conserv. Jard. Bot. Genéve 4: 21. 1900. *Aloysia uruguayensis* Moldenke, *nom. illeg.*, Phytologia 1: 167. 1935. *Aloysia sellowii* (Briq.) Moldenke, Rev. Sudamer. Bot. 4: 15. 1937. *Aloysia gratissima* var. *sellowii* (Briq.) Botta, Darwiniana 22: 85. 1979. TYPE: URUGUAY. MONTEVIDEO: Montevideo [cultivated?], without date, *F. Sellow 1744* (HOLOTYPE: G!; PHOTOHOLOTYPE: F!, MO!, NY!; TYPE FRAGMENT: F!).

Lippia affinis Briq. is a later homonym of *Lippia affinis* Schau. in DC. and is therefore illegitimate. *Aloysia uruguayensis* was proposed by Moldenke (1937) as a *nomen novum* for *Lippia affinis* and is illegitimate since it is superfluous (because of *Lippia sellowii*) and is based on an illegitimate name.

Lippia ligustrina var. *paraguariensis* Briq., Ann. Conserv. et Jard. Bot. Genéve 7-8: 305. 1904. *Aloysia ligustrina* var. *paraguariensis* (Briq.) Moldenke, Phytologia 1: 167. 1935. *Aloysia lycioides* var. *paraguariensis* (Briq.) Moldenke, Phytologia 2: 464. 1948. *Aloysia gratissima* var. *paraguariensis* (Briq.) Moldenke, Phytologia 9: 500. 1964. TYPE: PARAGUAY. PARAGUARI: Paraguari, arbisseau epineux de 2-3 metres de hauteur, fleurs blanches, feuilles exhalant une forte odeur de terebenthine, Jan 1875, *B. Balansa 1015* (HOLOTYPE: P).

Lippia ligustrina var. *lasiodonta* Briq., Annuaire Conserv. Jard. Bot. Genéve 7-8: 305. 1904. TYPE: PARAGUAY. PARAGUARI: feuilles a odeur de terebenthine, fleurs blanches, 15 Mar 1881, *B. Balansa 3117* (HOLOTYPE: P; ISOTYPES: F!, K!, MO!).

Lippia pulchra Briq., Arkiv Bot. 2, no. 10: 18. 1904. *Aloysia pulchra* (Briq.) Moldenke, Phytologia 1: 95. 1934. TYPE: BRAZIL. RIO GRANDE DO SUL: Porto Alegre; Parthenon, in dumetis, nec non hinc inde culta, 4 Nov 1892, *C. A. M. Lindman A.579* (HOLOTYPE: G!; PHOTOHOLOTYPES: F!, MO!, NY!; ISOTYPES: F!, G!, GH!, S!, US!; TYPE FRAGMENT: NY!).

Aloysia gratissima var. *oblanceolata* Moldenke, Phytologia 15: 462. 1968. TYPE: BRAZIL. RIO GRANDE DO SUL: in hedgerows at Gloria, southeast of Porto Alegre, 2 Oct 1948, *A. L. & H. N. Moldenke 19684* (HOLOTYPE: NY!).

Leaves 1.5-4.5 cm long, 1.0-3.5 cm wide, spathulate to obovate, rarely ovate, margins entire, occasionally obscurely serrate medially to distally, adaxially strigose, abaxially puberulent. **Bracts** lanceolate, 1.0-1.5 mm long, 0.5-1.0 mm wide, acuminate, setulose, margins ciliate. **Calyx** lobes trullate, acuminate. **Corolla** tube 2.0-3.5 mm long, glabrous; limb 2-3 mm wide, glabrous. **Chromosome** number, n=18 (Coleman, 1982).

Discussion: The name *Aloysia lycioides* was proposed by Chamisso in 1832 and was in popular usage from its publication until 1898. Kuntze (1898) made the erroneous determination that *Verbena ligustrina* was the same as *A. lycioides* and gave the former priority over the latter. Kuntze's logic is unknown since his protologue merely states: "*Verbena ligustrina* Lag. 1816 = *Aloysia lycioides* Cham. 1832 = *Lippia lyc.* Steud." (1898). Troncoso (1962) determined that *V. ligustrina* was a separate taxon and a member of *Verbena*, not *Aloysia*; her assessment is followed here.

Lippia affinis was proposed by Schauer in de Candolle's *Prodromus* (1847). *L. affinis* Schauer is a true member of *Lippia* and not easily confused with any member of *Aloysia*. Briquet proposed *Lippia affinis* in 1896, an illegitimate name he later corrected this by creating the *nomen novum*, *L. sellowii*. Moldenke (1935) also created a *nomen novum* to replace Briquet's illegitimate epithet, *A. uruguayensis*, which he later corrected by proposing the combination, *A. sellowii*.

Aloysia lycioides has often been treated as a synonym of *A. gratissima* (Moldenke, 1940; Troncoso, 1962; Botta, 1979). Field observations and examination of herbarium material and reveal these taxa to be distinct. The morphological characters used in the key readily distinguish them without difficulty in most cases. In addition they routinely occur together without hybridization (fig. 23, 24) and they reportedly have different chromosome numbers (table 2).

Aloysia lycioides can be subdivided into two geo-morphologic varieties. The typical var. *lycioides* is widespread, displaying gradual, clinal variation across its broad range. This pattern breaks down in and around the states of Jujuy, Salta, and Tucumán in Argentina. Here, var. *lycioides* intergrades with var. *schulziana* across a relatively short geographic distance.

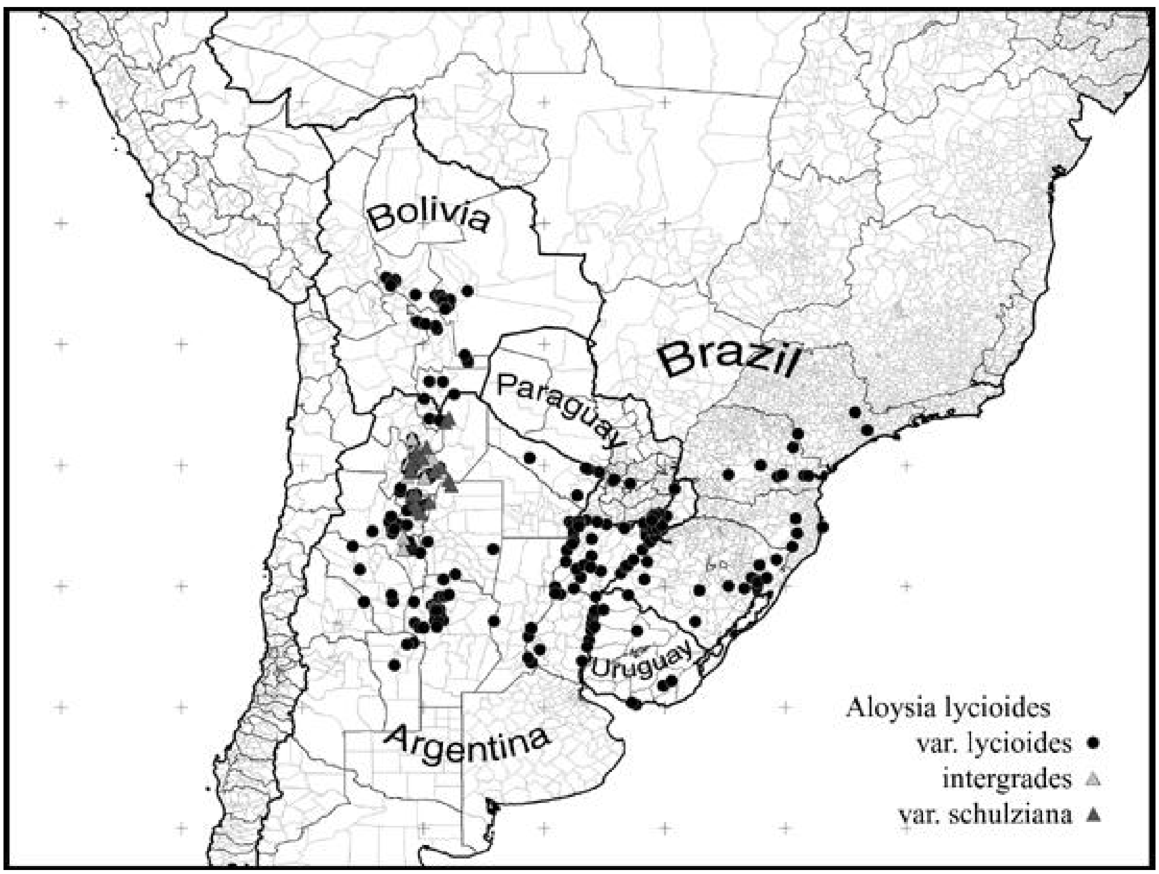

Figure 26: Distribution of *Aloysia lycioides*.

Distribution and habitat (fig. 26): Temperate to sub-tropical regions of Bolivia, northeastern Argentina, Paraguay, southern Brazil, and Uruguay; 25-2600 m; flowering year round, depending on rainfall.

Etymology: *Aloysia lycioides* was named for its superficial resemblance to the genus *Lycium*. *Lippia sellowii* is named in honor of Friedrich Sellow (1789-1831), who collected the type.

Common names and uses: Arroyau del campo, cedronell, chá da India, kutu kutu, La Muña, niña rupá, poleo, palo amarillo, romerillo, and cendroncillo.

The essential oil of this species is reported to have antimicrobial activity against a variety of organisms including Staphylococcus aureus, S. epidermidis, Micrococcus luteus, Klebsiella pneumoniae, Escherichia coli, Salmonella sebutol, Saccharomyces cerevisiae, and Candida albicans (Simionatto, 2005).

Representative specimens: ARGENTINA. CATAMARCA: Mpio. Andalgala; Andalgala, 2 Sep 1915, *P. Jörgensen 1020* (BA, GH, US); **Mpio. Capital**; El Jumeal, without date, *E. A. Ulibarri 900* (SI). **CHACO: Mpio. Primero de Mayo**; Colonia Benitez, 12 Mar 1954, *A. G. Schulz 8699* (CAS, G-2, GH, W). **CÓRDOBA: Mpio. Pocho**; Sierra de Pocho, Los Túneles, 16 Dec 1963, *Ragonese & Piccinini 9719* (SI). **Mpio. Punilla**; Capilla del Monte, 30 Mar 1944, *C. A. O'Donell & J. M. Rodriguez 903* (F, GH). **Mpio. Santa Maria**; hill near limestone quarry, Malagueño, Sierra de Cordoba, 18 Mar 1942, *H. H. Bartlett 20076* (GH, MICH, UC, US). **Mpio. Tulumba**; 14 km N de San Jose de la Dormida, 2 May 1971, *A. Krapovickas, L. A. Mroginski, & A. Fernández 18544* (CTES, LL). **CORRIENTES: Mpio. Bella Vista;** Bella Vista, gully near the river, 28 Jan 1956, *T. M. Pedersen 3703* (G, MO, NY, SI, US). **Mpio. Berón de Astrada**; 15 km W de Ita Ibate, Arroyo Santo Isabel, en campos altos, 16 Jan 1977, *A. Schinini 14121* (F, LL); **Mpio. Capital**; Corrientes, 25 Mar 1947, *M. R. Malvarez 1431*

(NY); Riachuelo, 28 Dec 1976, *R. Martínez Crovetto & A. Schinini 10801* (CTES). **Mpio. Curuzú Cuatiá**; Route 24, 6 km NE de Perugorria, Ea. La Eugenia, en algarrobal degradado, blanqiuzal, 9 Mar 1995, *A. Schinini et al. 29217* (F, MICH). **Mpio. Empedrado;** Empedrado costa Río Paraná, 11 Jun 1945, *T. Ibarrola 3059* (NY-2); thickets on clay, estancia Las Tres Marias, 11 Jan 1962, *T. M. Pedersen 6428* (GH, UC, US). **Mpio. Esquina**; 26 km SE de Liberatador Ea. La Blanca, en bosque de ñandubay, 12 Mar 1975, *A. Krapovickas et al. 27453* (G, LL, MO). **Mpio. Ituzaingó**; Rápidos del Apipé, Oct 1977, *A. L. Cabrera et al. 28973* (G, GH, UC). **Mpio. Lavalle**; Punta del Rubio, Santa Lucía, Nov 1968, *R. Herbst 1202* (CTES). **Mpio. Mburucuyá**; Estancia Santa Teresa, 23 Nov 1950, *T. M. Pedersen 874* (NY, US). **Mpio. Mercedes**; Mercedes, Río Mirinay at Route 41; isolated forest along stream, surrounded by grassland, 19 Feb 1982, *L. R. Landrum 4323* (MICH, NY, US). **Mpio. Monte Caseros**; Juan Pujol, hab. borde caminos, 9 Feb 1945, *T. Ibarrola 2362* (NY). **Mpio. Saladas**; Río San Lorenzo y Ruta 12, 5 Jan 1975, *J. Irigoyen & A. Schinini 142* (CTES, G, LL). **Mpio. San Cosme**; Paso de la Patria, Costa Toledo, May 1945, *T. Meyer 8888* (GH, NY). **Mpio. San Luis del Palmar**; 14 km E de S. L. del Palmar, camino a Herlitzka; borde de camino, suelo areno-arcilloso, 29 Jan 1972, *C. Quarín, L. Mroginski, & J. M. González 390* (CTES). **Mpio. San Martin**; La Cruz, 10 Nov 1936, *A. Burkart 8078* (SI). **Mpio. Santo Tomé**; Garruchos, Estancia San Juan Bautista, costa del Río Uruguay, borde de monte, 20 Sep 1974, *A. Krapovickas et al. 25760* (CTES, G, LL). **Mpio. Sauce**; Charca El Timbó, 3 km N de Sauce, en bosque abierto, 22 Oct 1977, *O. Ahumada 1319* (MBM). **ENTRE RÍOS: Mpio. Colón**; terraplanes ruta 14 al S de la Ciudad de Colón, 28 Mar 1970, *A. Burkart & N. Troncoso 27876* (MO, NY). **Mpio. Concordia**; Ayuí, N del hotel CTM, cerca selva en galería, Nov 1976, *N. S. Troncoso et al. 1253* (G, GH, UC). **Mpio. Gualeguaychu**; Puente del Gualeyán, Gualeguaychú, 6 Jan 1932, *A. Burkart 4140* (SI). **Mpio. Uruguay**;

Concepción del Uruguay, barrancas, 28 Nov 1934, *A. L. Cabrera 3179* (NY-2); Concepción del Uruguay, Feb 1905, *C. M. Hicken 3537* (SI). **Mpio. Victoria**; Victoria, 10 Nov 1946, T. Meyer 1015 (NY). **FORMOSA: Mpio. Laishi**; Reserva Ecológica El Bagual, San Francisco de Laishi, orilla del monte bajo, 10 Nov 1996, *A. Digiacomo 189* (CTES). **JUJUY**: **Mpio. El Carmen**; Manantiales, 15 Sep 1981, *A. Rotman 518* (CTES). **Mpio. Tumbaya**; Volcan, Cerro Alta; ladera del cerro, terreno ripario, 15 Feb 1927, *S. Venturi 4890* (BA, CAS, F, MO, UC, US). **LA RIOJA: Mpio. General Sarmiento**; Sierra Famatina, Guauchíu Viejo, 25 Jan 1928, *A. Castellanos s.n. [28/328]* (BA). **MISIONES: Mpio. Apóstoles**; San José, 9 Nov 1979, *R. Martínez Crovetto 11440* (CTES). **Mpio. Cainaguás**; Ruta Prov. 7, camino de Aristobulo de Valle a Jardín América, 4 km de A. del Valle; borde de selva sobre pendiente pronunciada, suelo rocoso, 11 Feb 1996, *O. Morrone, N. B. Deganini, & A. M. Cialdella 635* (NY). **Mpio. Candelaria**; Santa Ana, 15 Mar 1944, *Bertoni s.n. [98421]* (GH, NY, US). **Mpio. Capital**; Posadas, in fruticeto ad praedium "La Granja", 13 Dec 1907, *E. L. Ekman 2000* (F, GH, LL, MICH, MO, NY). **Mpio. Concepcion**; Barra Concepcion, 8 Feb 1927, *Zolta, Steullet, & Deautier s.n. [27/77]* (BA). **Mpio. Iguazú**; Puerto Wanda; alto pedregoso, 16 Dec 1950, *J. E. Montes 10402* (US). **Mpio. Leandro N. Alem**; Cerro Azul, 12 Oct 1977, *A. L. Cabrera et al. 28634* (SI). **Mpio. San Ignacio**; San Ignacio, 5 Feb 1947, *B. R. Medina 240* (NY, TEX); San Ignacio, Colonia, habitat en bosqecillo ralo, exterior imediato de la selva marginal, lugar alto, poco abundante, flores y hojas medicinales, 12 Apr 1956, *J. E. Montes 14911* (F, LL, NY, TEX, US). **SALTA**: **Mpio. Anta**; Miraflores, 22 Mar 1951, *F. E. Luna 262* (BA). Mpio. Caldera; La Caldera, 10 Nov 1978, *A. L. Cabrera 29751* (NY). **Mpio. La Viña**; Cerrillos to La Viña along Ruta Nacional 68, just N of Osma between Arroyo Osma and Osma pueblo proper, between km markers 136 & 137; shallow roadcut on E side of road, 30 Dec 2001, *S. J. Siedo et al.*

1114 (TEX); Cerrillos to La Viña along Ruta Nacional 68, just N of Osma between Arroyo Osma and Osma pueblo proper, between km markers 136 & 137; shallow roadcut on E side of road, 30 Dec 2001, *S. J. Siedo et al. 1115* (TEX). **Mpio. Metán**; Río de las Conchas, 22 Jul 1930, *A. Castellanos s.n. [30/1752]* (BA, NY). **SANTIAGO DEL ESTERO: Mpio. Ojo de Agua**; Ojo de Agua, 17 Apr 1945, *P. García 913* (GH). **TUCUMÁN: Mpio. Lules**; Manantial, 8 Sep 1941, *T. Meyer 4289* (GH, NY). **Mpio. Río Chico**; alrededores de Sta. Ana, Nov 1902, *G. A. Baer 99* (BA, G, SI). **Mpio. Tafi Viejo**; Ruta Prov. 341, rocky hills with open scrub forest near Las Tipas, 7 Nov 1978, *S. A. Renvoize 3389* (NY, US). **Mpio. Trancas**; Trancas, montes malos, 16 Dec 1913, *Rodríguez 1175* (GH, NY-2, SI).

BOLIVIA. CHUQUISACA: Mpio. Azero; 5 km N de Carandaytí, 12 Apr 1977, *A. Krapovickas & A. Schinini 31216* (CTES, F, G, MICH). **Mpio. L. Calvo**; Centro El Salvador—CIMBOC[sic], Clausura El Huare, 15 Apr 1993, *C. Saravia Toledo et al. 11830* (CTES, GH). **Mpio. Yamparaez**; Tarabuco ca. 30 km hacia Zudanez, restos de bosque degradado, abundante en la zona, 7 Mar 1981, *S. G. Beck 6243* (LL, MO). **COCHABAMBA: [Mpio. Cercado];** Valle de Cochabamba, Depart. Cochabamba, meereshöhe 2600 m, 16 Dec 1928, *J. Steinbach 8768* (BA, F, G-2, GH-2, MO, NY, UC, US). **Mpio. Campero Mizoque**; Mizoque, sobre la colina pedregosa, 11 Feb 1967, *R. F. Steinbach 664* (F, GH, MICH, MO, NY, UC, US). **Mpio. Cercado**; Cochabamba, 26 Feb 1920, *E. W. D. & Mrs. Holway 326* (GH, US). **Mpio. Quillacollo**; Quillacollo, 22 km hacia Oruro en camino asfaltado, bosque arbustivo; lat. 35 N, 31 Mar 1979, *S. G. Beck 874* (LL). **SANTA CRUZ: Mpio. Caballero**; 0.5 km from main Camarapa-San Isidro Highway, on Road to Pulquina Arriba, arid valley, 31 Dec 1995, *M. Nee 46679* (NY, TEX). **Mpio. Cordillera**; ruderales in Boyuibe, 23 Jul 1987, *M. Nee 35332* (NY, TEX). **Mpio. Florida**; Santa Cruz ca. 165 km hacia Cochabamba; chaparral espinoso con quebracho, 24 Mar 1981, *S. G. Beck 6786* (LL, SI, US). **Mpio. Vallegrande**; 1 km S of highest pt. on Mataral to Trigal Road, 10 km S of Mataral and 10 km NNW of El Trigal; subtropical deciduous dry forest on slopes, 24 Dec 1989, *M. Nee & I. Vargas C. 38324* (NY, TEX). **TARIJA**: **Mpio. Cercado**; Tarija, in gullies and narrow canyons, mudstone or boulder clay, Feb 1926, *E. K. Balls B6092* (F, K, UC). **Mpio. O'Connor**; Entre Ríos, 29 Apr 1983, *A. Krapovickas & A. Schinini 38866* (CTES, LL, MO, UC).

BRAZIL. PARANÁ: **Mpio. Canta Galo**; Canta Galo, 17 Dec 1992, *A. C. Cervi et al. 3871* (NY). **Mpio. Jaguaraiva**; Jaguariahyva[sic] opp., ad marginem silvulae, 18 Dec 1915, *P. Dusén 17441* (G, NY, US). **Mpio. Palmeira**; Papagaio, 6 km W of Rodovia do Café turnoff; campo, thicket, cliff and bog, 21 Jan 1965, *L. B. Smith & R. M. Klein 14930* (US). **Mpio. Pien**; Pien, arredores, afloramentos rochosos decompostos, 20 Feb 1988, *G. Hatschbach & O. S. Ribas 51897* (CAS, G, LL, MO). **RÍO GRANDE DO SUL: Mpio. Arroio dos Ratos**; Fazenda Faxinal, Arroio dos Ratos, 6 Feb 1980, *A. Burkart 1980* (F, MO). **Mpio. Baje**; Caçapava do Sul, Seival; no campo, beira da mata, 22 Jan 1992, *A. Jasper & M. Rossato 8083* (NY, US). **Mpio. Caxias do Sul**; Ana Rech; faxinal arbusto, 15 Oct 1988, *R. Wasum & M. Rossato 4663* (NY, US). **Mpio. Itaqui**; 6 km E de Itaqui, Trepadeira, 19 Dec 1972, *J. Lindeman et al. 21077* (CTES). **Mpio. Porto Alegre**; P. Alegre, Morro da Gloria, 12 Sep 1945, *B. Rambo 29146* (NY). **Mpio. Sao Borja**; Dist. Sta. Rosa, Rincón de São Lucas, Ea. de las Bonitas, ca. Río Butuí; orilla de selva, muy abundante, 12 Sep 1993, *R. Záchia 1421* (CTES). **Mpio. Sao Leopoldo**; S. Leopoldo, in dumetis campestribus, 25 Oct 1945, *E. Henz 35495[a]* (MO, NY). **SANTA CATARINA: Mpio. Bom Retiro**; Bom Retiro, campo, 8 Jan 1948, *P. R. Reitz 1970* (F, G, NY, UC). **Mpio. Río do Sul**; Serra do Matador, capoeira, 26 Jan 1959, *P. R. Reitz & L. B. Klein 8340* (NY, SI, UC, US). **Mpio. São Joaquim**; banks of Río Porteira, E of Bom Jardin da Serra, Cambajuva, 17 Jan 1957, *L. B. Smith, P. R. Reitz, & R. Klein*

10250 (NY, US). **SÃO PAULO: Mpio. Itaporanga**; São Paulo, Itaporanga num quintal, Feb 1944, *B. J. Pickel 359* (NY).

PARAGUAY. BOQUERÓN: **Mpio. Pedro P. Pena**; Chaco, Apr 1917, *T. Rojas 2542* (NY). **CENTRAL: Mpio. Limpio**; Piquete Cué, en cuneta de calle, 20 Apr 1985, *E. Bordas 3894* (CTES). **PARAGUARÍ**: **Mpio. Paraguari**; Cerro Mbatovi, 26 Jan 1988, I. Bosualdo 1354 (CAS, NY, TEX).

URUGUAY. ARTIGAS: Arroyo Guaviyú, 20 Mar 1948, *A. Castellanos s.n. [15042]* (NY). **LAVALLEJA**: Cerro Lorencita, 14 May 1948, *D. Legrand 2897* (NY). **MONTEVIDEO:** Paso del Molino, 30 Oct 1907, *M. B. Berro 4748* (G, NY). **PAYSANDÚ**: Chapicuy, orillas del rio Uruguay, Sta. Sofía, without date, *Rosengurtt B-3231* (NY). **SAN JOSÉ:** Río Santa Lucia, adyacencia de Colonia Etchepare; abunda en el bosque ribereño, 17 Apr 1935, *Rosengurtt A-409* (BH, GH, NY, US). **TACUAREMBÓ:** Valle Eden, 19 Feb 1947, *H. Osorio 13843* (NY).

11B. ALOYSIA LYCIOIDES var. **SCHULZIANA** (Moldenke) Siedo, **comb. nov.** *Aloysia schulziana* Moldenke, Lilloa 5: 381. 1940. *Aloysia gratissima* var. *schulziana* (Moldenke) Botta, Darwiniana 22: 87-89. 1979. TYPE: ARGENTINA. SALTA: San Bernardo, 1400 m, Feb 1936, *A. G. Schulz 1447* (HOLOTYPE: NY!).

Aloysia meyeri Moldenke, Lilloa 5: 378. 1940. TYPE: ARGENTINA. TUCUMAN: Mpio. Trancas, San Pedro de Colalao, shrub 1.5-2 m tall with white flowers, 4 Jan 1940, *T. Meyer 3092* (HOLOTYPE: NY!; ISOTYPES: LIL-2!, SI!).

Leaves opposite; petioles 0.2-0.8 cm; laminae elliptic to ovate, 1.5-4.5 cm long, 0.7-3.5 cm wide, margins prominently serrate, adaxially strigose, abaxially puberulent.

Bracts lanceolate, 1.0-1.5 mm long, 0.5-1.0 mm wide, acuminate, setulose, margins ciliate. **Calyx** lobes trullate, acute to acuminate. **Corolla** tube 2-4 mm long, glabrous to sparsely pubescent distally; limb 2.0-3.5 mm wide, glabrous.

Discussion: The var. *schulziana* occurs from the state of Tucumán to the state of Jujuy in Argentina. It is allopatric with var. *lycioides* and intergrades with it to the north, east, and south of its range. Botta (1979) maintained the two taxa as separate species, even though they are allopatric and intergrade when contiguous. *Aloysia gratissima* is clearly distinct from *A. lycioides*, being sympatric without signs of hybridization; this is confirmed by my personal observations in the field (e.g. *Siedo 1098* and *1099*).

Etymology: As noted by Moldenke (1940), *Aloysia schulziana* is named "in honor of and in grateful appreciation of" August G. Schulz (1899-1992); the synonym *A. meyeri* was named in honor of Teodoro Meyer (1910-present), according to Moldenke (1940), an "enthusiastic collector of Argentine plants."

Distribution and habitat (fig. 26): Arid to mesic regions in the states of Jujuy, Salta, and Tucuman, Argentina; calcareous to sandy soils; 50-1800 m; flowering year round, depending on rainfall.

Representative specimens: ARGENTINA. JUJUY: Mpio. El Carmen; Dique La Cienega, en bosque secundario, 6 Jan 1971, *A. Krapovickas & C. L. Cristóbal 17543* (CTES, LL, SI). **Mpio. San Pedro**; San Pedro de Jujuy, 17 May 194[5], *J. Herrera 500* (GH). **SALTA: Mpio. Anta**; Parque Nacional Finca El Rey, camino a Pozo Verde, antes 1st cruce, 17 Nov 1981, *Brown & Molmierea 1616* (NY); Chañar Muyo, 28 Jan 1948, *F. E. Luna 674* (NY). **Mpio. Capital**; Cerro San Bernardo, 17 Feb 1941, J. B. Correa 40 (NY); 14 km SE of Salta centro; 5 km S of limits of Parque

Industrial along Ruta Provincial 39, 2 km S of junction of Ruta Provincial 39 and Ruta Provincial 48; roadside between dirt road and agricultural fields, 27 Dec 2001, *S. J. Siedo et al. 1106* (TEX); ca. 8 km N of Salta Centro, N along Ruta Nacional 9, E ca. 3 km along road toward Universidad Catolica, then NE along dirt road near Universidad toward mountains, 27 Dec 2001, *S. J. Siedo et al. 1105* (TEX). **Mpio. Cerrillos**; Cerrillos, 3 Mar 1942, *Zabala 336* (GH); Cerrillos, 10 Mar 1941, *T. Meyer 3732* (GH-2, NY). **Mpio. General Jose de San Martin**; 4 km NW of Embarcación, level, open grass and brush country, edge of woods, 25 Feb 1937, *J. West 8440* (GH, MO, UC). **Mpio. Gral. Martin M. Guëmes**; Guëmes, 29 Mar 1945, *T. Meyer 8338* (NY). **Mpio. La Viña**; Coronel Moldes, 9 Nov 1978, *A. L. Cabrera 29736* (MO, NY); Río La Viña, Salta-Cafayate road, 84 km SE of Salta; disturbed flat valley floor, 20 Sep 1985, *A. Gentry 51729* (G, NY). **Mpio. Metan**; Metán, 8 Dec 1946, *M. R. Malvarez 138* (F, NY); pasaje del Río Juramento, Feb 1873, *P. G. Lorentz & G. Hieronymus 327* (F, G, US); Metán Viejo, Río Metan, barrancas del rio, 28 Mar 1975, *A. Krapovickas, C. L. Cristóbal, & J. M. Gonzales 27922* (LL); El Tunal, 21 Mar 1989, *C. Saravia Toledo 1932* (CTES). **Mpio. Rosario de Lerma**; Campo Quijano, cerros, 18 Nov 1942, *A. Burkart 13204* (NY); 5 km S de Campo Quijano, camino a El Alisal, 3 Dec 1992, *J. Pensiero & G. Marino 4249* (NY). **Mpio. San Martin**; Senda Hacienda, Rio Seco, puente de la Route Nacional 34, 4 Apr 1977, *A. Krapovickas & A. Schinini 30899* (CTES, F, MICH). **SANTIAGO DEL ESTERO: Mpio. Copo**; Matoque, 14 Jul 1947, Luna, E. 278 (NY). **TUCUMÁN**: Tucumán to Salta via Ruta Nacional 9, Vipos, 4 km W of Ruta 9 along dirt road toward mountains, road 36 km N of Tucumán, 26 Dec 2001, *S. J. Siedo et al. 1102* (TEX). **Mpio. Burruyacú**; Tucumán to Burruyacú, Ruta Provincial 305 ca. 7 km N of Burruyacú along road which turns from paved to dirt ca. 2 km N of town; roadside in disturbed area, 25 Dec 2001, *S. J. Siedo et al. 1101* (TEX). **Mpio. Capital**; Villa Lujan, 20 Jan 1919, *S. Venturi 175* (BA, CAS, GH, US). **Mpio. Cruz Alta**; San Vicente, May 1917, *Bailetti 86* (GH). **Mpio. San Pedro de Colalao**;. **Mpio. Trancas**; camino a S. Pedro de Colalao, a 3 km del pueblo, orillas de la ruta, 22 Nov 1973, *B. M. Amengual & P. Legname 4701* (CAS); Tapia, 12 Mar 1914, *Castillón 32260* (GH); San Pedro de Colalao, 28 Jan 1951, *T. Meyer 16434* (LL, NY-2, US); Tapia, 31 Dec 1919, *Schreiter 1201* (GH-2, NY, US); Trancas, 11 Jan 1913, *Monetti 12* (NY, US).

12. **ALOYSIA OBLANCEOLATA** Moldenke, Phytologia 3: 108. 1949. TYPE: PARAGUAY. San Bernardino, cultivated, Jul 1915, *T. Rojas 53a* (HOLOTYPE: MVM; PHOTOHOLOTYPE: LL!, NY!; ISOTYPE: NY!).

Shrubs 1-3 m in height. **Leaves** opposite, clustered into fascicles of 2-8 leaves; more or less sessile; laminae spathulate or oblanceolate, 0.8-2.0 cm long, 0.3-1.0 cm wide, margins entire, revolute to sub-revolute, basally attenuate, apically rounded, often mucronulate, rarely retuse or cleft, adaxially minutely scabrous, sometimes muriculate, abaxially glabrous. **Inflorescence** loosely spicate; peduncle 0.5-2.0 cm long, pubescent with an understory of sub-sessile, glandular trichomes; rachis 2-5 cm long, pubescent with an understory of sub-sessile, glandular trichomes; pedicels 0.3-0.5 mm long. **Bracts** reduced, midrib obscure, widely obovate, 1.0-1.5 mm long, 0.5-0.8 mm wide, short-acuminate, strigulose with an understory of sub-sessile glandular trichomes, at least basally. **Calyx** tubular, 2.0-3.5 mm long, four-costate, setose with an understory of sub-sessile, glandular trichomes; lobes 4, trullate, acute to short-acuminate. **Corolla** sub-actinomorphic, white to pale lilac; tube 2.5-3.8 mm, glabrous to sparsely pubescent distally; limb 3-4 mm wide, glabrous. **Stigma** sub-capitate, more or less laterally disposed, lobes oblique. **Fruit** (immature) glabrous; mature fruit material not seen.

Discussion: *Aloysia oblanceolata* is readily distinguished by its broadly obovate bracts and abaxially glabrous leaves clustered into fascicles of 2-8 and having revolute margins. This taxon was originally described from cultivated material, but its presence in the native flora, see below, is well established leaving little doubt as to its validity. Although, *Aloysia oblanceolata* is sympatric with *A. lycioides*. The two taxa are not known to form hybrids.

Distribution and habitat (fig. 27): Known from only a few populations in Paraguay and southern Brazil; rocky soils; flowering December to April.

Etymology: This species was named for the oblanceolate shape of the leaf blades.

Common names and uses: Poleo é, poleo i, and puhu akú. This species is cultivated in Paraguay and is reportedly used in teas to treat stomach or digestive ailments (*Krapovickas & Boelcke 19655* [CTES]).

Additional specimens examined: BRAZIL. PARANÁ: **Mpio. Chopinzinho**; Canta Galo, Rodovia BR-77, próximo ao Río Cavernoso, solo rochoso, campo graminoso, 22 Feb 1992, *G. Hatschbach & E. Barbosa 56433* (MBM, W). **Mpio. Laranjeiras do Sul**; Laranjeiras do Sul, orla do campo, 20 Apr 1964, *G. Hatschbach 11237* (F, LL); Rincão Grande, 12 Oct 1974, *G. Hatschbach 35189* (LL, MBM, MO, NY, UC); Laranjeiras do Sul, arredores; campo, borda de capaõ, 1 Oct 1980, *G. Hatschbach 43202* (MBM).

PARAGUAY. CENTRAL: **Mpio. Ypacarai**; Paraguari Centralis: In regione lacus Ypacaray, Jan 1913, *E. Hassler 11497* (F, GH, MO, NY, UC, US).

CORDILLERA: **Mpio. Caacupe**; Caacupe, Companía Cabañes, 6 Mar 1988, *N. Soria 2098* (CAS, NY, TEX).

Figure 27: Distribution of *Aloysia oblanceolata*.

13. ALOYSIA CORDATA Siedo, **sp. nov.** (figs. 28-30)

TYPE: BRAZIL. PARANÁ: Mpio. São José dos Pinhaes; Río Pequeno, do brejo, 17 Jan 1969, *G. Hatschbach 20792* (HOLOTYPE: NY!; ISOTYPES: K!, MICH!, MO!, UC!).

Aloysia brasiliensis *similis; frutex 1-2 m; ramulis glabris, gracilibus; foliis ternatis sessilibus; laminis cordatis, glabris; marginibus strigosis; basim cordatis; apicem sub-apiculatis; inflorescentiis spicatis erectis; corollis lilacinus*.

Shrub 1-2 m in height, slender, few-branched. **Leaves** 3-whorled, antrorsely adpressed, internodes highly regular in length, sessile; laminae cordate, sclerophyllous, 0.3-1.0 cm long, 0.3-0.9 cm wide, margins entire, minutely scabrous, basally cordate, apically mucronulate, adaxially glabrous, smooth, lustrous, abaxially glabrous, smooth, satin-lustrous. **Inflorescence** loosely spicate; peduncle 1-3 cm long, strigulose; rachis 4-12 cm long, strigulose; pedicels 0.5-1.0 mm long. **Bracts** reduced, linear to lanceolate, 1.0-1.5 mm long, ca. 0.5 mm wide, acuminate, strigulose. **Calyx** zygomorphic, tubular; 1.5-2.0 mm long, setose, glandular, lobes 4, trullate, acute. **Corolla** sub-actinomorphic, white; tube 2.5-3.5 mm long, sparsely villulous apically; limb 2-3 mm wide. **Stigma** capitate, apically disposed, lobes oblique. **Fruit** obovoid, 1.0-1.5 mm long, 1.0-1.5 mm wide, glabrous, apically weakly bilobed, lobes less than 0.1 mm; intermericarpal cavity reduced, surface smooth.

Discussion: *Aloysia cordata* is readily distinguished by its sessile, cordate, and glabrous leaves with entire, minutely scabrous, margins. This species is believed to be most closely related to *A. polygalifolia* and *A. brasiliensis*. All three species occupy the southern tip of Brazil (fig. 28). Nevertheless, no evidence of gene flow or hybridization between these several taxa has been detected.

Distribution and habitat (fig. 30): Sub-tropical regions of eastern Paraná, Brazil; marshy or swampy areas; flowering October to January.

Etymology: This species is named for its cordate or heart-shaped leaf blades.

Figure 28: Holotype of *Aloysia cordata* (*Hatschbach 20792* [NY]).

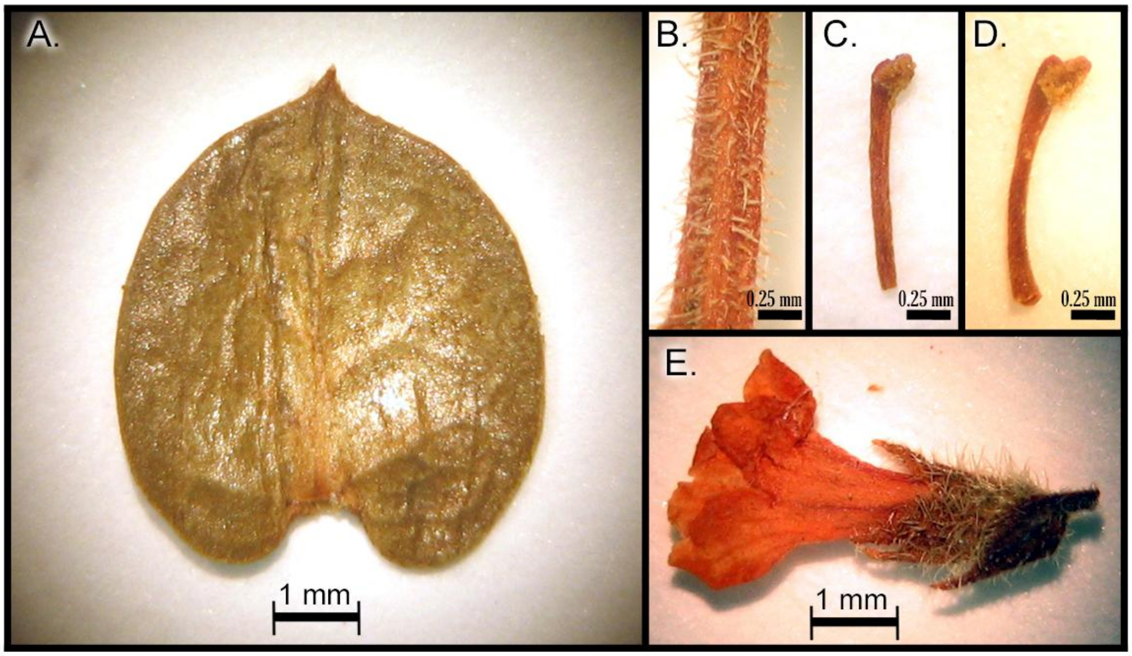

Figure 29: Light micrographs of *Aloysia cordata* showing (A) leaf, 10x mag.; (B) rachis, 20x mag.; (C, D) style and stigma, 20x mag.; (E) flower, 10x mag. (*Hatschbach 20792* [NY]).

Additional collections examined: BRAZIL. PARANÁ: Mpio. Piraquara; Novo Tirol, local brejoso, raro, 27 Nov 1964, *G. Hatschbach 11896* (F, MBM); S. Maria, 11 Oct 1969, *G. Hatschbach 22418* (UC). **Mpio. Texeira Soares**; Florestal, 29 km para, leste de Curitiba estrada C.-Paranaguá; campo limpo, em lugares aguados num corrego pantanoso, isolado e raro, 12 Dec 1947, *G. Tessmann 2741* (NY).

14. ALOYSIA BRASILIENSIS Moldenke, Phytologia 3: 162. 1949. TYPE: BRAZIL. PARANÁ: Paraná, 4 Jan 1904, *P. K. H. Dusén s.n. [46798]* (HOLOTYPE: R; PHOTOHOLOTYPE: F!, LL!, NY!; TYPE FRAGMENT: NY!).

Shrub 1-3 m in height. **Leaves** 3-whorled; petioles absent to 1.5 mm; laminae narrowly elliptic to elliptic, sclerophyllous, 1.2-4.0 cm long, 0.4-1.5 cm wide, margins entire, often weakly sub-revolute, basally acute, apically acute to rounded-triangular, often mucronulate, adaxially scabrous, abaxially sparsely to moderately strigose. **Inflorescence** loosely spicate; peduncle 1.5-3.5 cm long, strigulose; rachis 3-14 cm long, strigulose; pedicels 0.5-1.0 mm long. **Bracts** linear to lance-linear, 2.0-3.5 mm long, 0.5-1.0 mm wide, acuminate, strigulose. **Calyx** zygomorphic, tubular; 2.5-3.5 mm long, setose; lobes 4, trullate, acute to short-acuminate. **Corolla** sub-actinomorphic, lilac to light blue; tube 4.0-4.5 mm long, pubescent; limb 3.5-4.0 mm wide, pubescent. **Stigma** capitate, apically disposed, lobes oblique. **Fruit** obovoid, 1.0-1.5 mm long, 1.0-1.5 mm wide, glabrous, apically bilobed, lobes ca. 0.1 mm; intermericarpal cavity reduced, surface smooth.

Discussion: *Aloysia brasiliensis* is believed to be closely related to *A. polygalifolia* and *A. cordata* by virtue of the following synapomorphies: sclerophyllous leaves, glabrous stems, puberulent rachises, and oblique stigma lobes. These allopatric species reportedly occur in similar habitats yet there is no evidence of intergradation or gene flow between the populations concerned.

Distribution and habitat (fig. 30): Sub-tropical areas of southern Brazil; swampy areas and riparian associations; 700-1200 m; flowering September to May.

Etymology: This species was named for the country of Brazil, where the type was collected.

Additional collections examined: BRAZIL. PARANÁ: **Mpio. Alto Parana**; Calmão, in subpaludosis, 15 Mar 1910, *P. Dusén 9278* (F, GH, MICH, MO, NY). **Mpio.**

Paula Freitas; Río Claro, 17 Nov 1972, *G. Hatschbach 30664* (LL, MBM, MICH, MO, UC). **Mpio. Porto Vitoria**; Estr.[sic] para Porto Vitoria, do brejo, 16 Oct 1965, *G. Hatschbach 14905* (F, GH, K, LL, MBM, MO, NY-3, US). **Mpio. Prudentopolis**; Relogio, 22 Oct 1960, *G. Hatschbach 7342* (UC). **Mpio. União da Vitória**; Rondinha, 1 May 1960, *G. Hatschbach 6979* (MBM, UC).

15. ALOYSIA POLYGALIFOLIA Cham., Linnaea 7: 236. 1832. TYPE: BRAZIL. without date or location, *F. Sellow s.n.* (LECTOTYPE [here designated]: G!; PHOTOHOLOTYPES of B [destroyed]: GH!, NY-2!). The holotype for this species was destroyed and the isotype housed at G is selected as the lectotype since no other specimen in known.

Shrub 1.5-4.0 m in height. **Leaves** 3-whorled, often antrorsely adpressed; petioles absent to 1.0 mm; laminae elliptic to ovate, sclerophyllous, 0.3-1.0 cm long, 0.3-0.9 cm wide, margins entire, revolute, basally truncate to cordate, apically acute to weakly acuminate, adaxially scabrous, abaxially sparsely to moderately strigulose, at least along midrib. **Inflorescence** loosely spicate; peduncle 1.0-2.5 cm long, densely setulose with an understory of sub-sessile, glandular trichomes; rachis 3-10(-14) cm long, densely setulose with an understory of sub-sessile, glandular trichomes; pedicels 0.5-1.0 mm long. **Bracts** reduced, midrib present, linear to lance-linear, 2-3 mm long, 0.5-1.0 mm wide, acuminate, setulose. **Calyx** zygomorphic, tubular, 2-3 mm long, externally setose, glandular; lobes 4, trullate, acute to weakly acuminate. **Corolla** sub-actinomorphic, white to lilac; tube 3.0-4.5 mm long, sparsely pubescent distally; limb 3.0-4.5 mm wide, pubescent. **Stigma** capitate, apically disposed, lobes oblique. **Fruit**

obovoid, 1.5-2.0 mm long, 1.0-1.5 mm wide, glabrous, apically bilobed, lobes ca. 0.1 mm; intermericarpal cavity reduced, surface smooth.

Discussion: *Aloysia polygalifolia* is morphologically similar to *A. cordata* on the basis of its sessile, more or less cordate, antrorsely adpressed leaves. They are readily discerned via the characters detailed in the key. As mentioned above, these species are also similar to *A. brasiliensis* since they have identical inflorescence and flower morphology. *Aloysia brasiliensis* occupies the intervening area between the ranges of *A. polygalifolia* and *A. cordata*; though the latter two appear to be more closely related.

Distribution and habitat (fig. 30): Riparian associations in the sub-tropical forests of Rio Grande do Sul, Santa Catarina, and Paraná, Brazil; 700-1200 m; flowering September to March.

Etymology: This species was named for the its leaves which bear a superficial resemblance to those of the genus *Polygala*.

Representative specimens: BRAZIL. PARANÁ: Mpio. Palmas; Morro de Baliza, 19 Nov 1972, *G. Hatschbach 30734* (LL, MICH, MO, NY, UC); Palmas, rod[ovia] Ponte Serrada, 13 Dec 1980, *G. Hatschbach 43482* (F, LL); rodovia para Mangueirinha, 6 Dec 1989, *G. Hatschbach & V. Nicolack 53669* (MBM, US); 10 km ao[sic] NE de Palmas, 4 Dec 1971, *G. Hatschbach, L. B. Smith, & R. Klein 28171* (LL, MO, NY, UC, US). **RÍO GRANDE DO SUL**: **Mpio. Nonoai**; Nonoai ad fl. Uruguay superius; in dumetosis subpaludosis, 3 Mar 1945, *B. Rambo 28141* (NY). **Mpio. Porto Alegre**; P[orto] Alegre, Morro da Gloria, 17 Sep 1933, *B. Rambo 435* (NY, W). **Mpio. São Borja**; Barreto Viana pr., S. Leopoldo; in paludosus dumetosis, 24 Oct 1949, *B. Rambo 44118* (NY). **Mpio. São Leopoldo**; arredores de S. Leopoldo, Oct 1941, *J. Eugenio 663* (NY). **SANTA CATARINA**: **Mpio. Agua Doce**; E of Palmas, 5 km S of

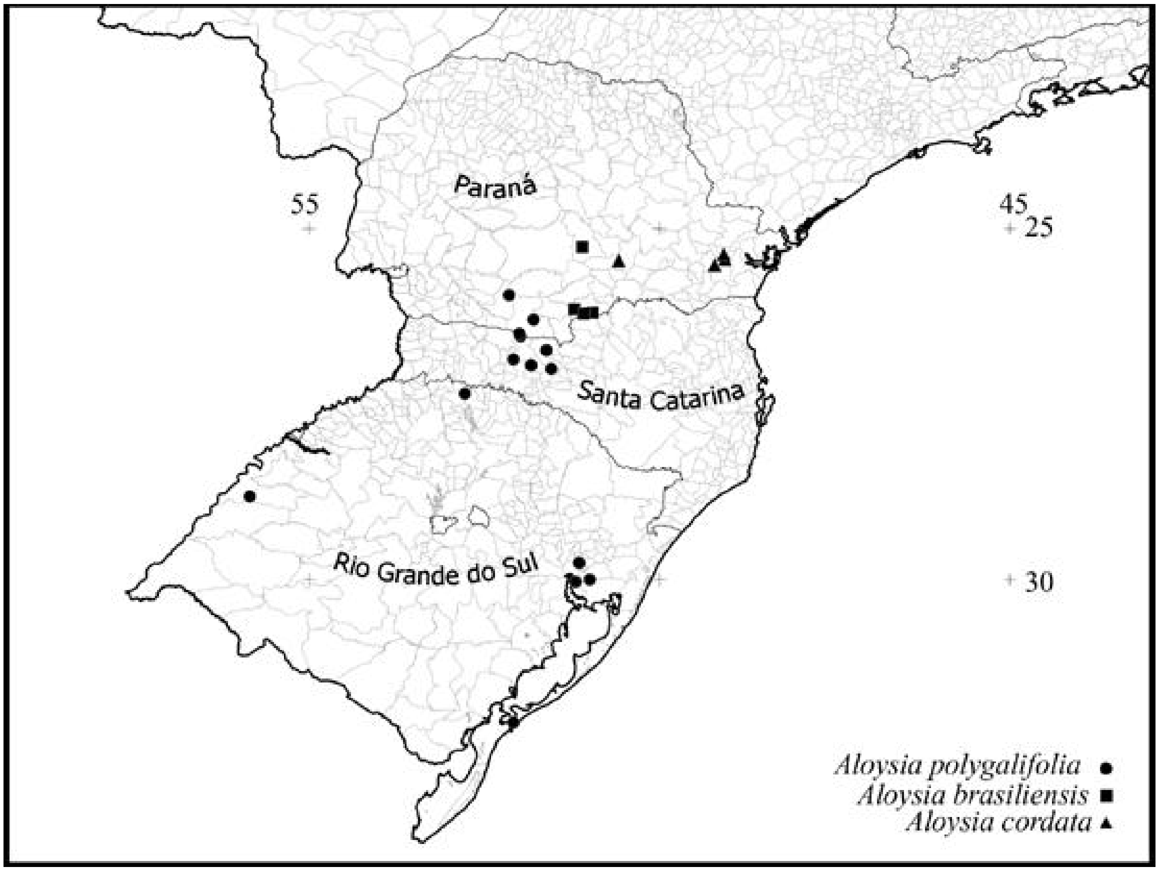

Figure 30: Distribution of *Aloysia cordata*, *A. brasiliensis*, and *A. polygalifolia*.

turn to the S in Road; brook bank, woods margin, 6 Dec 1971, *L. B. Smith, R. M. Klein, & G. Hatschbach 15683* (F, GH, US); bog, river bank, and campo, Campos de Palmas, 15-19 km S of Horizonte, 4-5 Dec 1964, *L. B. Smith & R. M. Klein 13577* (MO, US). **Mpio. Irani**; Campo de Irani; dry field, bog, gallery forest, and ruderal, 8 Nov 1964, *L. B . Smith & R. M. Klein 13029* (NY, UC). **Mpio. Ponte Serrada**; on road to Fachinal dos Gruedes; bog, upland forest, and ruderal, 13 Oct 1964, *L. B. Smith & P. R. Reitz 12478* (LL).

16. ALOYSIA HATSCHBACHII Moldenke, Phytologia 18: 341. 1969. TYPE: BRAZIL. PARANA: Mpio. Pien; Pien, rocky campo, 8 Mar 1967, *G. Hatschbach 16101* (HOLOTYPE: NY!; ISOTYPES: LL-2!, MO!, UC!, US!).

Shrubs 1-2 m in height. **Leaves** opposite; petioles 1-3 mm long; laminae sclerophyllous, elliptic to obovate, 1.5-4.0 cm long, 0.5-2.0 cm wide, margins serrate along apical half, basally entire, attenuate, apically rounded, mucronulate, adaxially glabrous, abaxially puberulent, venation reddish-brown. **Inflorescences** loosely spicate; peduncle 1.5-3.0 cm long, strigulose; rachis 3.0-9.5 cm long, strigulose; pedicels absent to 0.5 mm long. **Bracts** reduced, scale-like, lance-linear, 1.0-1.5 mm long, 0.25-0.50 mm wide, acuminate, glabrous. **Calyx** zygomorphic, tubular, 2-3 mm long, setose, understory of glandular trichomes; lobes 4, trullate, weakly acuminate. **Corolla** sub-actinomorphic, white to light purple; tube 3-4 mm long, pubescent distally; limb 2-3 mm wide, strigulose. **Stigma** capitate, apically disposed. **Fruit** obovoid, 1.0-1.5 mm long, 1.5-2.0 mm wide, glabrous, apically weakly bilobed, lobes less than 0.1 mm; intermericarpal cavity reduced, surface smooth.

Discussion: This species is superficially similar to *A. lycioides*, from which it is readily distinguished by its sclerophyllous leaves, revolute leaf margins, and dark-brown abaxial venation. It is believed to be related to *A. polygalifolia*, *A. brasiliensis*, *A. cordata*, and *A. chamaedryfolia*, based on characters of the inflorescence, flower, calyx, and leaves.

Distribution and habitat (fig. 31): Known from only four collections in the municipios of Pien and Río Negro, Paraná, Brazil; rocky soil; flowering November to February.

Etymology: *Aloysia hatschbachii* was named in honor of Gerdt Hatschbach (1923-present), prominent collector in southern Brazil.

Additional collections examined: BRAZIL. PARANÁ: Mpio Pien; Rodovia para Campinas, solo rochoso de pequeno morro, 18 Feb 1992, *J. Cordeiro 1302* (MBM); Pien, 27 Nov 1990, *C. B. Poliquesi & J. M. Silva 15* (MBM, W). **Mpio. Río Negro**; Pien[?], 14 Jan 1959, *G. Hatschbach 5409* (LL, MBM).

Figure 31: Distribution of *Aloysia hatschbachii*.

17. **ALOYSIA CHAMAEDRYFOLIA** Cham., Linnaea 7: 234. 1832. *Lippia chamaedrifolia* (Cham.) Steud., Nomencl. Bot. ed. 2, 2: 54. 1841. TYPE: BRAZIL. "Brasilia," without date, *F. Sellow s.n.* (LECTOTYPE [here designated]: W!; ISOLECTOTYPES: G-2!, W!). The holotype was destroyed at B during WWII, a lectotype is selected from the remaining isotypes for comparative purposes.

Shrub 0.5-3.0 m in height. **Leaves** opposite; petioles 1.0-2.0 mm long; laminae ovate to suborbicular, sclerophyllous, 0.5-3.0 cm long, 0.5-2.0 cm wide, margins prominently dentate, weakly revolute, basally rounded to obtuse, apically essentially rounded, mucronulate, adaxially scabrous, satin-lustrous, abaxially strigulose with an understory of sub-sessile glandular trichomes, venation brownish. **Inflorescences** loosely spicate; peduncle 1.0-4.5 cm long, hispidulous with an understory of sub-sessile, glandular trichomes; rachis 3-15 cm long, hispidulous with an understory of sub-sessile, glandular trichomes; pedicels 0.5-1.0 mm. **Bracts** reduced, linear to lanceolate, 1-2 mm long, ca. 0.5 mm wide, acuminate, setulose. **Calyx** zygomorphic, tubular, 1.5-2.5 mm long, setose, understory of sub-sessile glandular trichomes; lobes 4, trullate, acute. **Corolla** sub-actinomorphic, blue to light purple; tube 2.5-3.5 mm long, pubescent distally; limb 2-3 mm long, pubescent. **Stigma** capitate, apically disposed. **Fruit** obovoid, 1.5-2.0 mm long, 2.0-2.5 mm wide, apically setulose, bilobed, lobes ca. 0.1 mm long; intermericarpal cavity reduced, surface smooth.

Discussion: This species has sclerophyllous leaves like *A. polygalifolia*, *A. cordata*, *A. hatschbachii*, and *A. brasiliensis*, as well as similar inflorescence, calyx, and corolla characters. It is easily distinguished from these species by its ovate to sub-orbicular leaves which are prominently dentate with spreading teeth.

Distribution and habitat (fig. 32): Temperate to sub-tropical regions of Uruguay, southern Brazil, and northeastern Argentina; rocky soils; 200-3000 m; flowering October to March.

Etymology: This species was named for its relatively low-growing habit and its "dry" or sclerophyllous leaves.

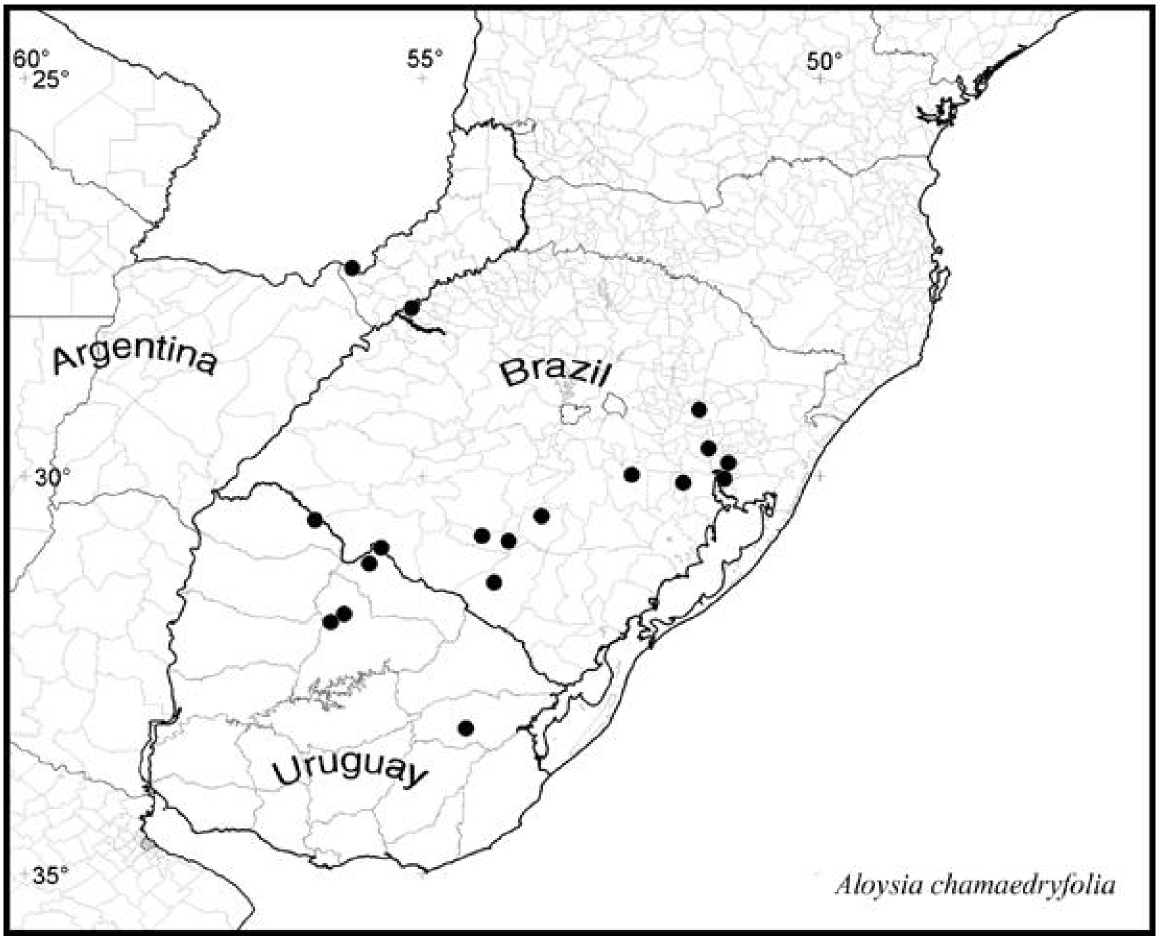

Figure 32: Distribution of *Aloysia chamaedryfolia*

Representative specimens: ARGENTINA. MISIONES: Mpio. Capital; Posadas, Bonpland; Plantae in civitate Misiones collectae., 20 Jan 1908, *E. L. Ekman*

2004 (GH, MICH, NY). **BRAZIL. RÍO GRANDE DO SUL:** Ibaré, Serpentine, National Geographic "Mercosur" Botanical Expedition-Jan./Feb. 1996, 7 Feb 1996, *R. R. Brooks MS399* (MO). **Mpio. Baje**; Casa de Pedra, Bagé, 14 Dec 1982, *M. Sobral et al. 1432* (MBM). **Mpio. Bento Gonçalves**; Camaquã, Faz. Casa Bento Gonçalves; in campo ad ruinas domus, Mar 1972, *A. Sehnem 12994* (US). **Mpio. Caçapava do Sul**; near Caçapava do Sul, thicket by roadside, 9 Nov 1977, *T. M. Pedersen 11963* (CTES, NY, MBM, SI, UC). **Mpio. Montenegro**; Parecí Novo, 3 Oct 1945, *Henz 29581* (NY). **Mpio. Río Pardo**; Río Pardo, 10 Feb 1948, *Palacios-Cuezzo 987* (NY). **Mpio. Sapucaia do Sul**; as montem Sapucaia pr[ope] S[ao] Leopoldo, in dumentosis subhumidis, 10 Nov 1949, *B. Rambo 37957* (NY).

URUGUAY. ARTIGAS: cerca Arroyo Catalancito, 30 Jan 1948, *A. Castellanos s.n.* (NY). **TACUAREMBÓ:** Valle Edén, 21 Mar 1909, *Berro 5594* (NY); Valle Edén, 20 Feb 1947, *A. Castellanos, s.n.* (NY-2); Valle Edén, 19 Feb 1947, *H. Osorio s.n.* (NY); Valle Edén; en pedregales, 3 Feb 1947, *Rosengurtt B-4967* (BH, NY, US).

18. ALOYSIA CRENATA Moldenke, Phytologia 9: 182. 1963. TYPE: PARAGUAY. ALTO PARANÁ: in regione fluminis Alto Paraná, 1909-1910, *K. Fiebrig 6137* (HOLOTYPE: US!; ISOTYPES: GH!, LIL!; TYPE FRAGMENT: LL!).

Aloysia krapovickasii Moldenke, Phytologia 47: 330. 1981. TYPE: ARGENTINA. CORRIENTES: Mpio. Ituzaingó; in pantano on Rte. 39 ca. 10 km from Rte. 14, 24 Sep 1974, *A. Krapovickas, C. L. Cristobál, A. Schinini, M. M. Arbo, C. Quarin, & J. M. Gonzalez 26439* (HOLOTYPE: LL!; ISOTYPE: MBM).

Shrub 1-2 m in height. **Leaves** 3(-4) ranked; petioles 1-4 mm long; laminae narrowly elliptic to elliptic (3:1-2:1, L:W), 3.5-6.5 cm long, 1.0-2.5 cm wide, margins crenate-serrate, basally acute to weakly attenuate, apically acute to rounded-triangular, adaxially velutinous, abaxially densely velutinous with an understory of sub-sessile, glandular trichomes. **Inflorescence** a spicate raceme, flowers loosely arranged; peduncle 2.5-3.5 cm long, velutinous; rachis 4-12 cm long, velutinous; pedicels 0.5-1.0 mm long. **Bracts** reduced, with midrib, linear to lance-linear, 3-5 mm long, 0.5-1.0 mm, acuminate, densely velutinous. **Calyx** zygomorphic, tubular; 2.5-3.5 mm long, externally velutinous, setose at maturity; lobes 4, trullate, acute. **Corolla** sub-actinomorphic, salverform, white; tube 3-5 mm long, pubescent; limb 3-4 mm wide, glabrous to pubescent. **Stigma** capitate, lobes oblique. **Fruit** cordate, 1.5-2.0 mm long, 1.5-2.0 mm wide, glabrous, apically bilobed, lobes 0.1-0.3 mm long; intermericarpal cavity somewhat reduced, surface smooth.

Discussion: *Aloysia crenata* is believed to be closely related to *A. chamaedryfolia* and *A. polygalaefolia* since it displays synapomorphies characteristic of subgroup "*Sclerophylla*." It is readily distinguished by its elliptic leaves which are light green with crenate margins and. incanous vestiture.

The type of *Aloysia krapovickasii* is from Corrientes, Argentina, in close proximity to the type locality for *A. crenata*, a fact ignored by Moldenke. In his protologue for *A. krapovickasii* he states it is "very distinct" but provides no discussion or data by which to distinguish them. The type specimens are nearly identical morphologically, as are the corresponding Paraguayan and Argentine populations.

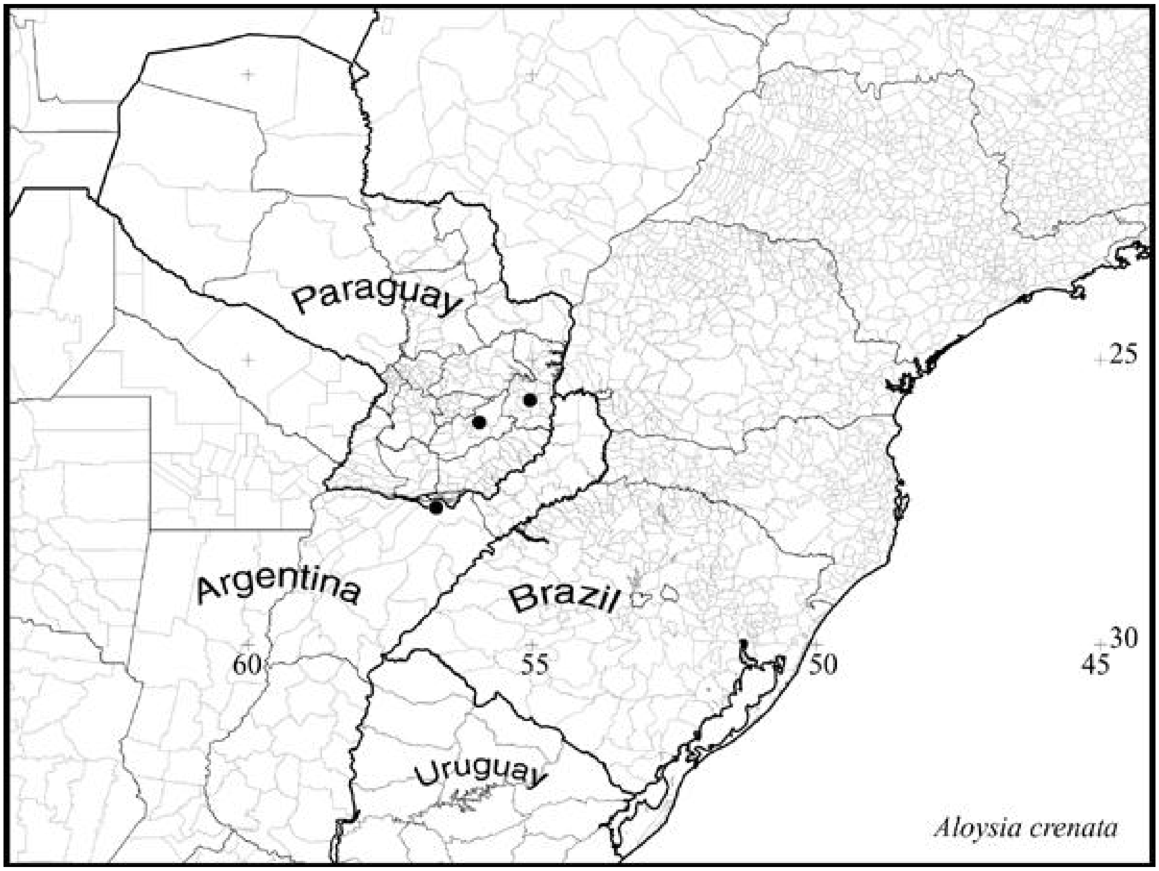

Figure 33: Distribution of *Aloysia crenata*.

Distribution and habitat (fig. 33): Occurring the state of Corrientes, Argentina, and Caazapa and Alto Parana, Paraguay; riparian associations; flowering September to May.

Etymology: *Aloysia crenata* was named for its crenate leaf margins while *A. krapovickasii* was named in honor of the prominent Argentine botanist, Antonio Krapovickas (1921-present).

Additional specimens examined: ARGENTINA. CORRIENTES: Mpio. Ituzaingó; Ruta 39, a 10 km de Ruta 14, 11 Feb 1978, *A. L. Cabrera, & A. A. Sáenz 29106* (F, SI).

PARAGUAY. CAAZAPA: Mpio. Abaí; Abaí región, San Juan Nepusoneo, May 1932, *T. Rojas 5903* (SI).

19. ALOYSIA AREQUIPENSIS Siedo, **sp. nov.** (figs. 34-37)

TYPE: PERÚ. AREQUIPA: Mpio. Arequipa; Tiabaya; open, rocky slope, 8 Apr 1925, *F. W. Pennell 13079* (HOLOTYPE: NY!; ISOTYPES: F!, GH!, S!).

Aloysia scorodonioides *similis; frutex sub 0.5 m; ramulis gracilibus, quadrangulatis vel rotundatis; petiolis 1.0-2.0 mm longis; laminis anguste elliptiis 1.0-1.5 cm longis, basim cuneatis, marginibus crenato-serratis; inflorescentiis racemis spiciformibus cylindricis congestis 2.0-4.0 cm longis; pedunculis ca. 1 cm longis; calycibus quadrilobus anguste campanulatis.*

Shrubs 0.5-1.5 m in height, reported thyme-like odor (*Sandeman 3835*). **Leaves** opposite, rarely 3-whorled; petioles 1-2 mm long; laminae 1-2 cm long, 0.5-1.2 cm wide, elliptic, margins finely serrate along apical 2/3 to 1/2, basally entire, adaxially strigose, abaxially tomentose, with an understory of sub-sessile, glandular trichomes. **Inflorescence** more or less loosely spicate, mostly terminal; peduncle 0.5-2.0 cm long, densely strigulose with an understory of sub-sessile, glandular trichomes; rachis 1.5-5.0 cm long, densely strigulose with an understory of sub-sessile, glandular trichomes. **Bracts** reduced, lance-elliptic, 1-3 mm long, 0.5-1.0 mm long, apically acute to short-acuminate, strigulose, with an understory of sub-sessile, glandular trichomes. **Calyx** sub-actinomorphic, tubular, setulose to setose, with an understory of sub-sessile, glandular trichomes; lobes 4, triangular. **Corolla** weakly zygomorphic, lavender to pink with whitish center; tube 2-3 mm long, pubescent with an understory of sub-sessile, glandular trichomes present distally; limb 3-4 mm wide, pubescent with an understory of sub-sessile, glandular trichomes. **Stigma** capitate, apically disposed, lobes oblique. **Fruit** obovoid, 1.0-1.5 mm long, 1.0-1.5 mm wide, glabrous, apically bilobed, lobes 0.2-0.5 mm; intermericarpal cavity reduced, the surface papillate.

Discussion: *Aloysia arequipensis* is believed to be closely related to *A. scorodonioides* by virtue of similarities in inflorescence, calyx, and fruit characters. It is readily distinguished by its somewhat congested flowers and elliptic leaves (1-2 cm long, 0.5-1.5 cm wide), with margins which are basally entire and finely serrate along the apical two-thirds. *Aloysia scorodonioides* has compact to elongate inflorescences, ovate to orbicular leaves, with crenate to crenate-dentate margins.

Moldenke annotated a large number of specimens of *Aloysia arequipensis* as *A. spathulata*. This is puzzling since the former is a synonym of *A. scorodonioides* var. *hypoleuca* and is very distinct morphologically.

Distribution and habitat (fig. 37): Arid climates in the states of Arequipa and Lima, Peru; rocky slopes; 2000-3000 m; flowering September to April.

Etymology: This species is named for the state of Arequipa, Peru, where the type was collected.

Additional specimens examined: **PERÚ**. **AREQUIPA**: **Mpio. Arequipa**; 12 km S of Arequipa, in rocky gulch, 14 Sep 1938, *W. J. Eyerdam & A. A. Beetle 22129*

Figure 34: Holotype of *Aloysia arequipensis* (*Pennell 13079* [NY]).

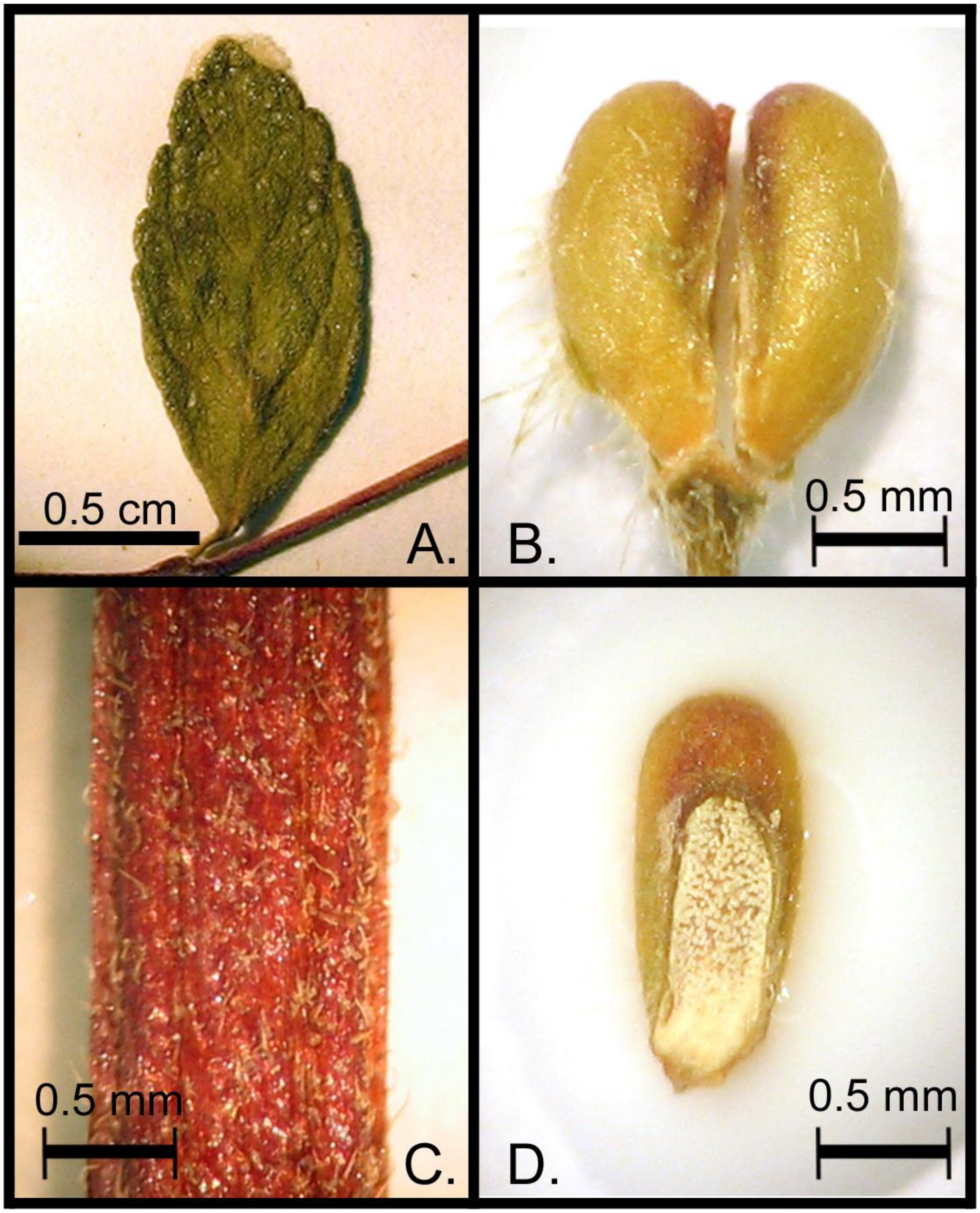

Figure 35: Light micrographs of *Aloysia arequipensis* showing (A.) leaf, 1x mag.; (B.) schizocarp, 20x mag.; (C.) stem, 20x mag.; (D.) mericarp with view of intermericarpal cavity, 20x mag. (*Pennell 13079* [NY]).

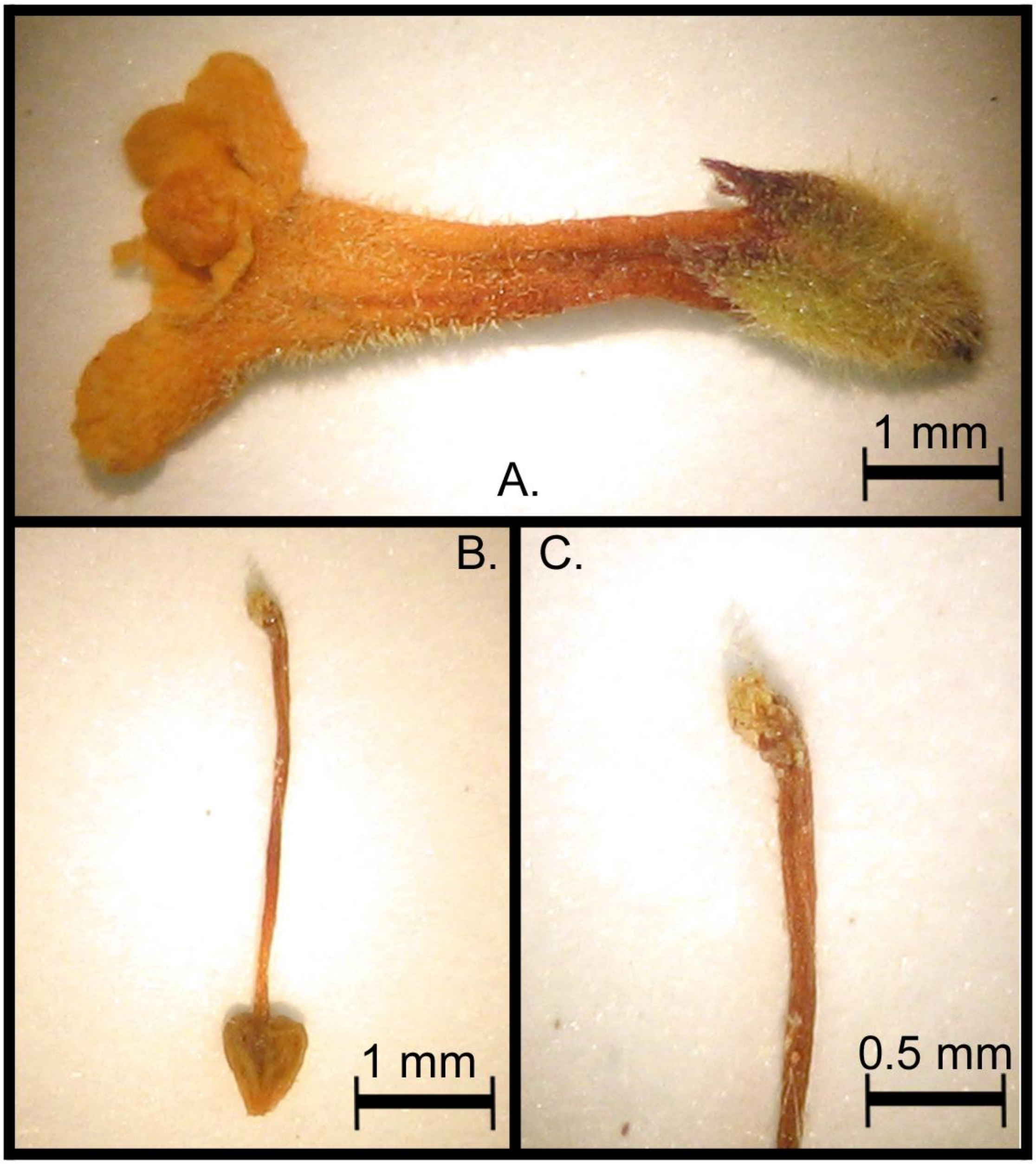

Figure 36: Light micrographs *Aloysia arequipensis* showing (A.) flower, 10x mag.; (B.) gynoecium, 10x mag.; (C.) close-up of stigma, 20 x mag. (*Pennell 13079* [NY]).

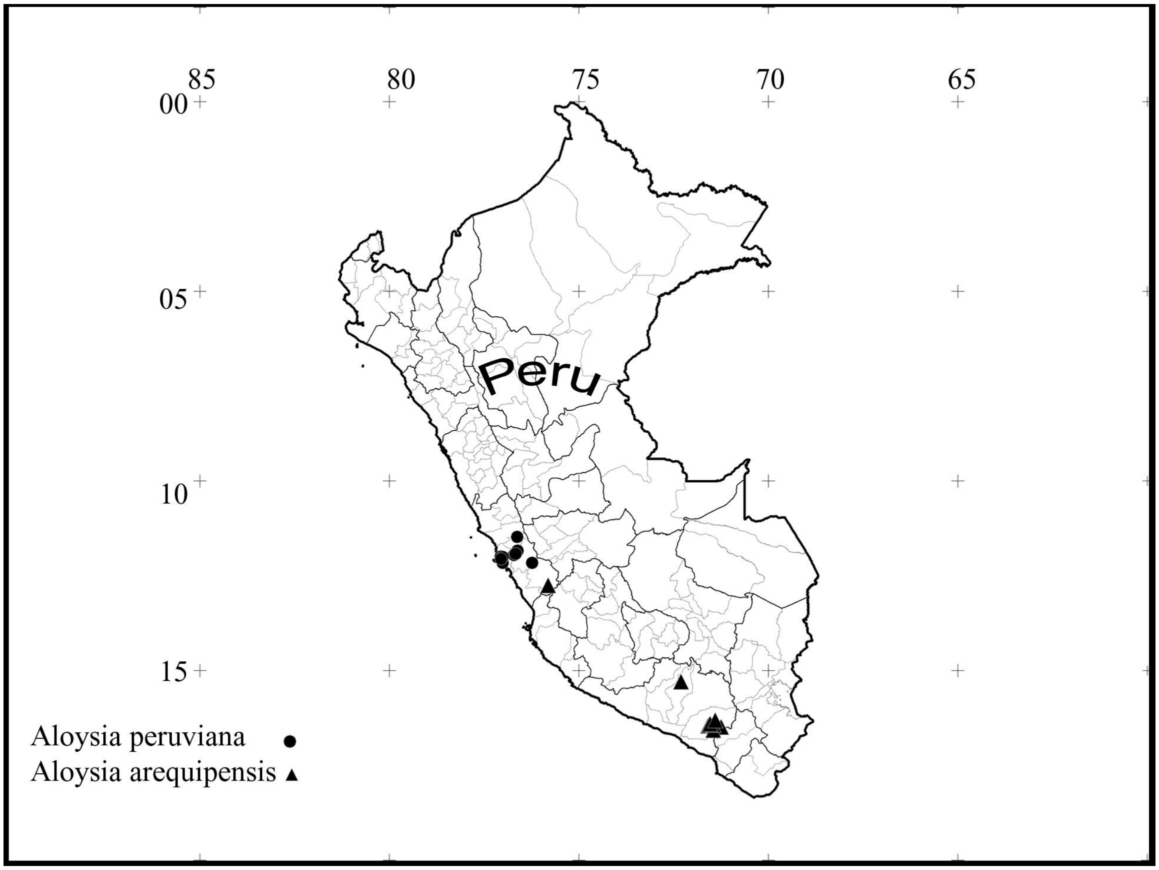

Figure 37: Distribution of *Aloysia arequipensis* and *A. peruviana*.

(GH, UC); Tingo, open, rocky slope, 8 Apr 1925, *F. W. Pennell 13134* (F, NY, S, US); Arequipa, lower slope of El Misti in volcanic ash, 22 Mar 1951, *S. Saunders 102* (TEX); Cerros de Jesus, 10 Apr 1959, *C. Vargas C. 12671* (US); Quequena, arenoso, 17 Mar 1967, *C. Vargas C. 19146* (LL). **Mpio. Castilla**; Quebrada de San Lorenzo, near Arequipa; rocky wall, 11 Mar 1939, *P. A. Munz 15509* (NY-2). **LIMA**: **Mpio. Yauyos**; Aiza, entre Catahuas y Tupe, Pradera, 30 Jan 1952, *E. Cerrate 1282 & O. Tovar 696* (MO, SI).

20. ALOYSIA PERUVIANA (Turcz.) Moldenke, Rev. Sudamer. Bot. 4: 15. 1937. *Lippia peruviana* Turcz., Bull. Soc. Nat. Mosc. 36, 2: 200. 1863. TYPE: PERU. Punochuca, without date, *Mathews s.n.* (LECTOTYPE [here designated]: BM!; ISOTYPE: BR; PHOTOISOTYPE [BR]: NY!).

Aloysia aloysioides Loes. & Moldenke, Phytologia 2: 9. 1941. TYPE: PERU. LIMA: below Surco, 1800 m, Feb 1909, *A. Weberbauer 5206* (HOLOTYPE: F!; PHOTOHOLOTYPES: LL!, NY!; ISOTYPES: S!, US!; TYPE FRAGMENT: NY!).

Aloysia leptophylla Loes. & Moldenke, Phytologia 2: 11. 1941. TYPE: PERU. without location, 1909-1914, *A. Weberbauer 5374* (HOLOTYPE: F!; PHOTOHOLOTYPES: LL!, NY!; TYPE FRAGMENT: NY!).

Shrub 1-2 m in height. **Leaves** opposite; petioles 2-6 mm; laminae elliptic to ovate, 3-6 cm long, 2-5 cm wide, margins crenate to dentate, basally rounded to truncate, apically rounded to acute, adaxially strigose, abaxially strigose, with an understory of sub-sessile, glandular trichomes. **Inflorescences** loosely spicate; peduncle 1.0-3.5 cm long, villous with an understory of sub-sessile, glandular trichomes; rachis 2-12 cm long, villous understory of sub-sessile glandular hairs; pedicels essentially absent to 0.2 mm long. **Bracts** reduced, midrib present, lanceolate, 2-4 mm long, 0.5-1.0 mm wide, acuminate, strigulose. **Calyx** weakly zygomorphic, campanulate, 1.5-2.5 mm long, setose, lobes 4, trullate, short-acuminate. **Corolla** zygomorphic, white, whitish-pink, to lavender; tube 4.0-5.5 mm long, glabrous to puberulent distally; limb 3.5-4.5 mm long, glabrous. **Stigma** sub-capitate, laterally disposed. **Fruit** broadly ellipsoid, 1.0-1.5 mm long, 1.0-1.5 mm wide, glabrous, apically bilobed, lobes ca. 0.1 mm long; intermericarpal cavity reduced, the surface papillate.

Discussion: This species is morphologically similar to *Aloysia arequipensis* with its campanulate calyx and elongated floral tube (2-4 times the length of the calyx). The two species are allopatric and no intergradation, or evidence of gene flow, has been observed between them. *Aloysia peruviana* is sympatric with *A. scorodonioides* in the state of Lima, Peru; but evidence of hybridization has not been detected between these taxa.

Distribution and habitat (fig. 37): Western regions of the state of Lima, Perú; rocky slopes; 1200-2050 m; flowering February to May.

Etymology: This species was named after the country of Peru, where it is known to occur and the type was collected.

Representative specimens: PERÚ. LIMA: Mpio. Huarochiri; hill above Barba Blanca, 15 km NE of Chosica on Río Santa Eulalia, sunny open hillsides, gravel soil, 21 Mar 1939, *O. B. Horton 10993* (GH, UC); camino a Huarochirí, 16 Feb 1961, *J. Soukup 4872* (US); **Mpio. Lima**; above Chosica, between Lima and Matucana; habitat stony, 13 Apr 1946, *R. Ferreyra 755* (NY); above Chosica, between Lima and Matucana; habitat stony, 13 Apr 1946, *R. Ferreyra 759* (F, NY); Santa Eulalia Road, few km N of Chosica and S of Huinca, dry steep hills, 7 Mar 1982, *A. Gentry & D. Smith 36089* (F, LL); La Paloma, Lima, dry mtside, isolated bushes, 12 Apr 1952, *S. G. E. Saunders 142* (MICH); Km 60-65 @ C. Valle de Rimac; entre rocas, poco frecuente, 11 Apr 1949, *M. O. Velarde N. 1637* (SI).

21. **ALOYSIA MINTHIOSA** Moldenke, Phytologia 2: 12. 1941. TYPE: PERU. ANCASH: Mpio. Casma; Yautan, in a cliff crevice, ca. 2000 ft., 9 Oct 1922, *J. F. MacBride & W. Featherstone 2564* (HOLOTYPE: F!; PHOTOHOLOTYPES: LL!, NY!; ISOTYPE: GH!; TYPE FRAGMENT: NY!).

Sub-shrub to **shrub** up to 1.5 m in height, reportedly minty fragrant (*MacBride & Featherstone 2564* [GH]). **Leaves** opposite; petioles 0.5-1.0 mm long; laminae elliptic to ovate, often conduplicate, 0.7-3.5 cm long, 0.5-2.0 cm wide, margins dentate, basally rounded to acute, often oblique, apically acute, adaxially sparsely strigose, abaxially puberulent, with an understory of sub-sessile, glandular trichomes. **Inflorescences** loosely spicate; peduncle 0.5-2.0 cm long, villous; rachis 5-10 cm long, villous; pedicels essentially absent to 0.2 mm long. **Bracts** reduced, lance-linear, midrib present, 1.5-2.0 mm long, 0.3-0.5 mm wide, acuminate, sparsely strigulose with an understory of sub-sessile, glandular trichomes. **Calyx** zygomorphic, more or less tubular, 1-2 mm long, puberulent, with an understory of sub-sessile, glandular trichomes present; lobes 4, trullate, acuminate. **Corolla** sub-actinomorphic, white to pale pink; tube 2-5 mm long, glabrous to pubescent distally; limb 2-4 mm wide, sparsely pubescent with an understory of sub-sessile, glandular trichomes. **Stigma** sub-capitate, laterally disposed. **Fruit** broadly obovoid, 1.0-1.5 mm long, 1.0-1.5 mm wide, glabrous, apically bilobed, lobes 0.3-0.5 mm long; intermericarpal cavity enlarged, the surface papillate.

Discussion: *Aloysia minthiosa* is believed to be most closely related to *A. peruviana*, based on characters of the calyx, corolla, and fruit. Both taxa occur in the state of Lima, Peru along with *A. scorodonioides*, but no detectable hybrids between any of these several taxa have been noted.

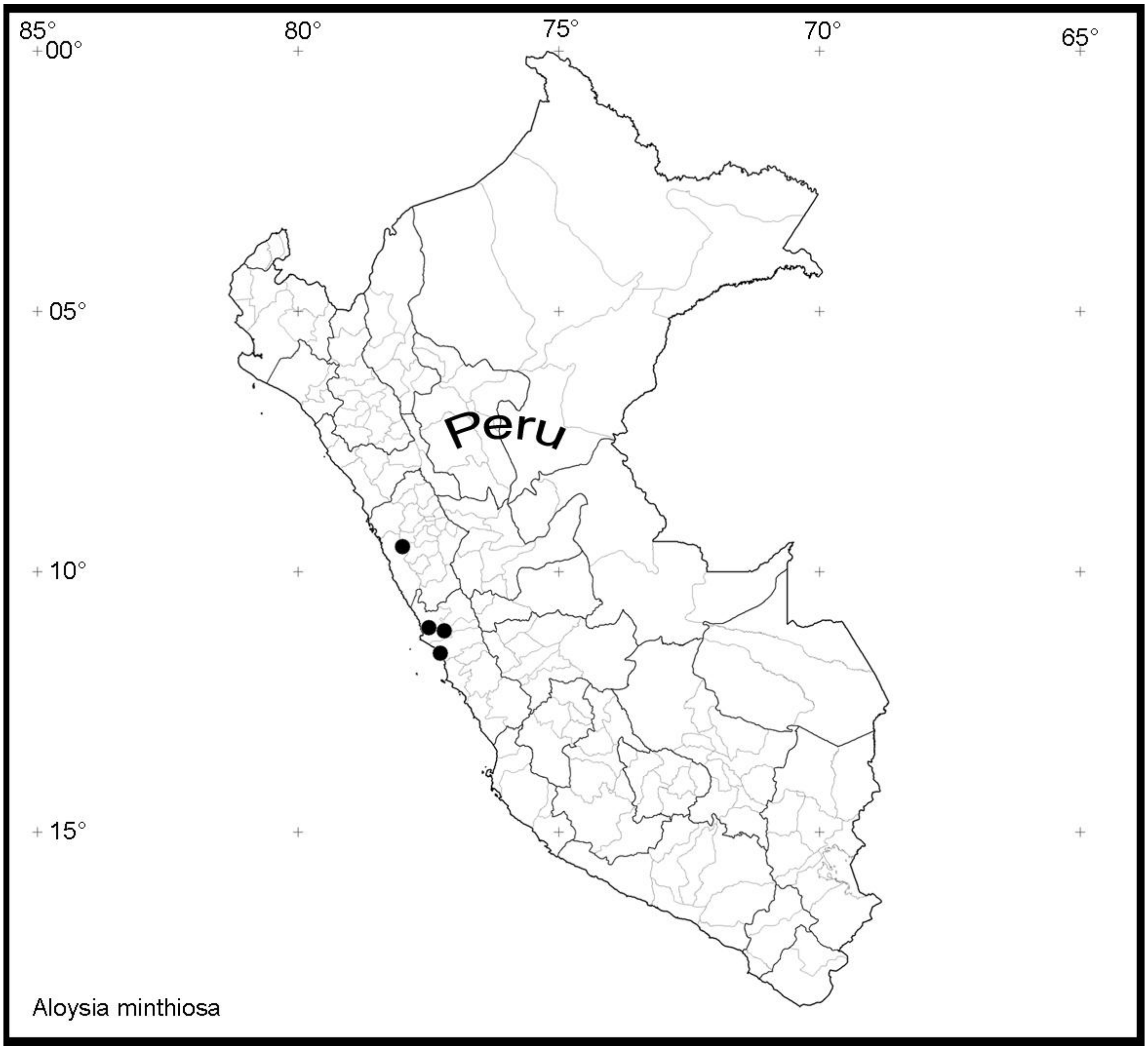

Figure 38: Distribution of *Aloysia minthiosa*.

Distribution and habitat (fig. 38): Arid regions of Ancash and Lima, Perú; rocky cliffs; 500-2000 m; flowering in October and from March to May.

Etymology: This species was named for its mint-like odor.

Representative specimens: PERÚ. ANCASH: **Mpio. Casma**; Yautan, cliff crevice, 9 Oct 1922, *J. F. Macbride & W. Featherstone 2564* (F, GH, NY). **LIMA**: **Mpio. Chancay**; near Sayan, between Huacho and Churin, habitat stony, 28 May 1948, *R. Ferreyra 3511* (NY); 8 km E of Sayan; flat, sandy, rocky waste at foot of cliffs, 15 Apr 1939, *T. H. Goodspeed 17356* (UC).

22. ALOYSIA SALVIIFOLIA (Hook. & Arn.) Moldenke, Lilloa 5: 331. 1940. *Verbena salviifolia* Hook. et Arn., Bot. Beech. Voy. 42. 1830. *Lippia chilensis* Schau. in A. DC., Prodr. 11: 573. 1847. TYPE: CHILE. ELQUI: Coquimbo; pr[ope] Coquimbo, Feb 1843, *M. A. Gay s.n.* (HOLOTYPE: G!; PHOTOHOLOTYPES: F-2!, MO-2!, NY-3!; ISOTYPE: G!; PHOTOISOTYPES: NY-2!; TYPE FRAGMENT: F!).

Lippia chilensis was proposed as a replacement name for *Verbena salviifolia* since *Lippia salviifolia* Cham. made this epithet unavailable for use in *Lippia* (Schauer, 1847). If included within *Aloysia*, the correct name is *A. salviifolia*.

Shrub 0.5-2.0 m tall. **Leaves** opposite, rarely alternate, sessile; laminae elliptic, 2-4 cm long, 1-2 cm wide, margins entire or entire basally with apical 1/2 dentate, basally more or less truncate, usually clasping the node, apically acute to obtuse, adaxially sparsely strigose, abaxially sparsely strigose with a dense understory of sub-sessile, glandular trichomes. **Inflorescences** densely spicate; peduncle 1.5-3.0 cm long, villous with an understory of sub-sessile, glandular trichomes; rachis 3-12 cm long, villous with an understory of sub-sessile, glandular trichomes; pedicels 0.5-1.5 mm long. **Bracts** prominent, lance-ovate, midrib present, 4.0-5.5 mm long, 1.0-2.5 mm wide, acuminate, villous, with an understory of sub-sessile, glandular trichomes. **Calyx** weakly zygomorphic, tubular, 2.0-3.5 mm long, setose, with an understory of sub-sessile, glandular trichomes; lobes 4, trullate, acute to short acuminate. **Corolla** sub-actinomorphic, white; tube 2.5-3.5 mm long, glabrous; limb 3.5-5.0 mm wide, glabrous. **Stigma** sub-capitate, laterally disposed. **Fruit** broadly obovoid, 1.5-2.0 mm long, 1.5-2.0 mm wide, apically setose, prominently bilobed, lobes ca. 0.5 mm long; intermericarpal cavity reduced, the surface papillate.

Discussion: *Aloysia salviifolia* is the only species of *Aloysia* native to Chile and is believed to be most closely related to *A. minthiosa*. It shares the synapomorphies of subgroup *"Densiflora"* but can be easily distinguished by vegetative features. *Aloysia salviifolia* has leaves which are essentially clasping the stem and margins which are revolute and entire to coarsely dentate-serrate along the distal two-thirds.

Distribution and habitat (fig. 39): Arid regions of Elqui and Huasco, Chile; rocky slopes; 600-1450 m; flowering August to November.

Etymology: This species was named for its leaves which bear a superficial resemblance to those found in the genus *Salvia*.

Common name and uses: Salvia blanca.

This species is reportedly "used largely by the Chileans as medicine" (*Wagenknecht 18423* [UC]).

Additional specimens examined: CHILE. **ELQUI**: **Mpio. Coquimbo**; [La] Serena, Mineral Los Plomos, 16 km al E de Tres Cruces, 3 Feb 1949, *W. Biese 2920*(SGO). **Mpio. La Higuera**; Coquimbo, in the Valley Río Seco Los Choros, 20 Sep 1975, *O. Zöllner 8320* (MO, NY). **Mpio. Vicuña**; Hacienda La Campana, quebrada La

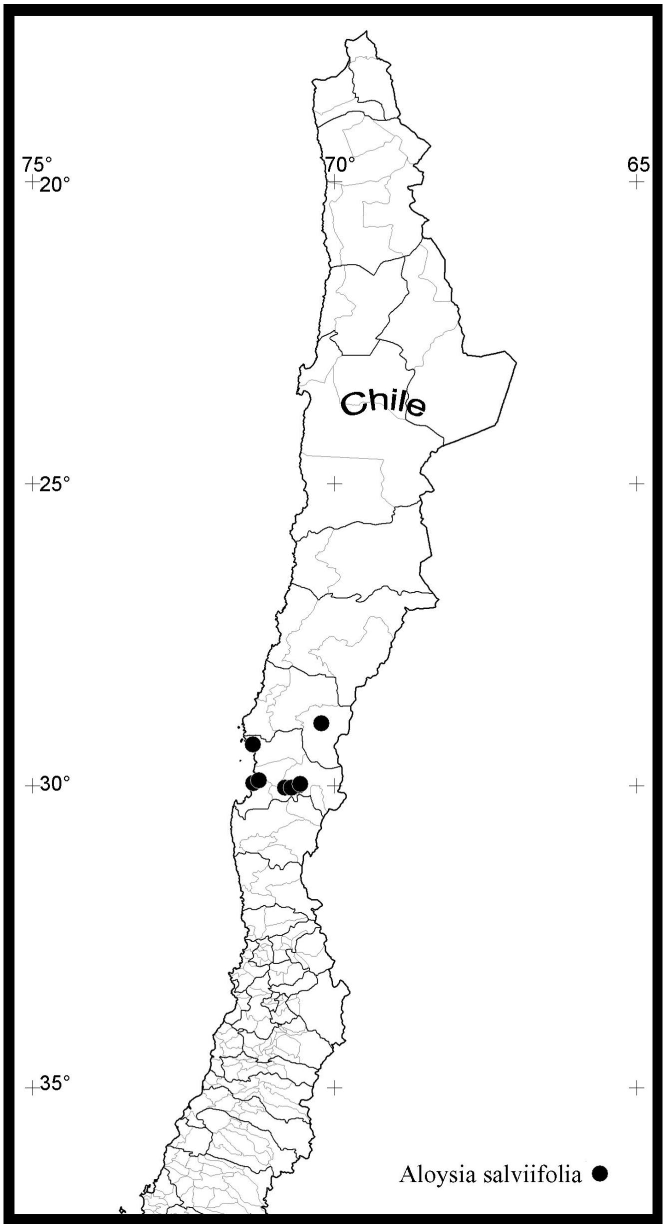

Figure 39: Distribution of *Aloysia salviifolia*.

Despensa, entre Diaguitas y Rivadavia, Coquimbo, 14 Oct 1940, *G. Looser 4221* (NY); Quebrada San Carlos, NE del cerro Los Mantos, frecuente, 12 Oct 1984, *M. Mahu s.n.* (SGO); Los Chiches, 3 km W of Vicuña, along Road to La Serena, rocky slopes, 26 Aug

1939, *R. Wagenknecht 18423* (F, G, GH, MO, UC); Rivadavia, Nov 1923, *E. Werdermann 103* (CAS, F, G, GH, MO, UC). **HUASCO**: **Mpio. Vallenar**; La Pampa, valley of the Río del Transito, 2-3 Jan 1926, *I. M. Johnston 5859* (GH).

23. **ALOYSIA POLYSTACHYA** (Griseb.) Moldenke, Lilloa 5: 380. 1940. *Lippia polystachya* Griseb., Abh. Königl. Ges. Wiss. Göttingen 19: 242. 1874. TYPE: ARGENTINA. CORDOBA: prope Las Mollas ditionis Las Penas, loco unico obvia, Jan 1871, *P. Lorentz 130* (LECTOTYPE [here designated]: G!; ISOLECTOTYPES: US!, VT). The holotype was destroyed at B during WWII and, though photographs of the holotype remain (F!, GH!, MO!, NY-2!), a lectotype is designated for comparative purposes.

Shrub 0.5-1.5 m in height, reportedly mint-scented (*Ulibarri 332* [SI]). **Leaves** mostly alternate, rarely opposite, sessile; laminae narrowly elliptic to elliptic, 2-4 cm long, 0.3-1.0 cm wide, margins entire, basally acute to weakly attenuate, apically acute to more or less rounded, often mucronulate, adaxially strigose, abaxially puberulent with an understory of sub-sessile, glandular trichomes. **Inflorescence** compactly spicate, 1-5 per leaf axil; flowers congested, four ranked, sessile; peduncle 0.5-1.0 mm long, tomentose; rachis 0.3-3.0 cm long, tomentose. **Bracts** reduced, widely obovate to depressed obovate, 1.0-1.5 mm long, 1.0-1.5 mm wide, short-acuminate to cordate, minutely tomentose. **Calyx** weakly zygomorphic, tubular, 1.0-1.5 mm long, minutely tomentose; lobes 4, triangular, abaxial sinus often cleft to base, margins ciliate. **Corolla** sub-actinomorphic, white; tube 1.0-1.5 mm long, distally pubescent with an understory of sub-sessile, glandular trichomes; limb 1.5-2.0 mm wide, pubescent with an understory of sub-sessile, glandular trichomes. **Stigma** sub-capitate, laterally disposed. **Fruit** broadly obovoid, 1.0-1.2 mm long, 1.0-1.2 mm wide, glabrous, apically bilobed, lobes ca. 0.5 mm long; intermericarpal cavity reduced, the surface papillate. **Chromosome** number, 2*n*=36 (Andrada et al., 1998).

Discussion: This species is believed to be closely related to *Aloysia catamarcensis* since it shares the synapomorphies of compact inflorescences, more or less four-ranked flowers, abaxially cleft calyx, and a deeply bilobed fruit.

Distribution and habitat (fig. 40): Northwestern Argentina in the states of Catamarca, Cordoba, La Rioja, Salta, and San Luis; calcareous loam; 350-1550 m; flowering September to May.

Etymology: This species was named for its inflorescences which usually occur in clusters of 2-5 per leaf axil.

Common names and uses: Burrito, burro, doctorcito, poleo del burro, poleo de castillo, and té de burro.

This plant is widely cultivated in South America for use in tea and is reported to have medicinal properties. Two related studies have shown that the hydroalcoholic extract of *Aloysia polystachya* has anxiety relieving properties in mice and rats without sedative or depressant side effects (Hellion-Ibarrola et al., 2006; Mora et al., 2005). H. Vasquez reports (*Vasquez 58* [CTES]):

> Se utilizan las hojas. Sus aplicaciones son múltiples. Indistintamente para cualquiera de ellas se prepara en forma de infusión o decocción. Es curativo contra dientes y encías flojas, inflamación y mucocidades en la garganta. En casos de tos, diarreas, sudornocturno en los tuberculosos. Mala digestión, bronquitis ronquera. En casos de inflamación o supuración de la garganta se utilizan en formas de gágaras.

La cocción o la infusión se utiliza para lavar la cabeza, elimina las impurezas. Resumiendo, las propiedades son diuréticas, antiinflamatoria, digestivo, antidiarreico, antisudorifico, y fortificante.

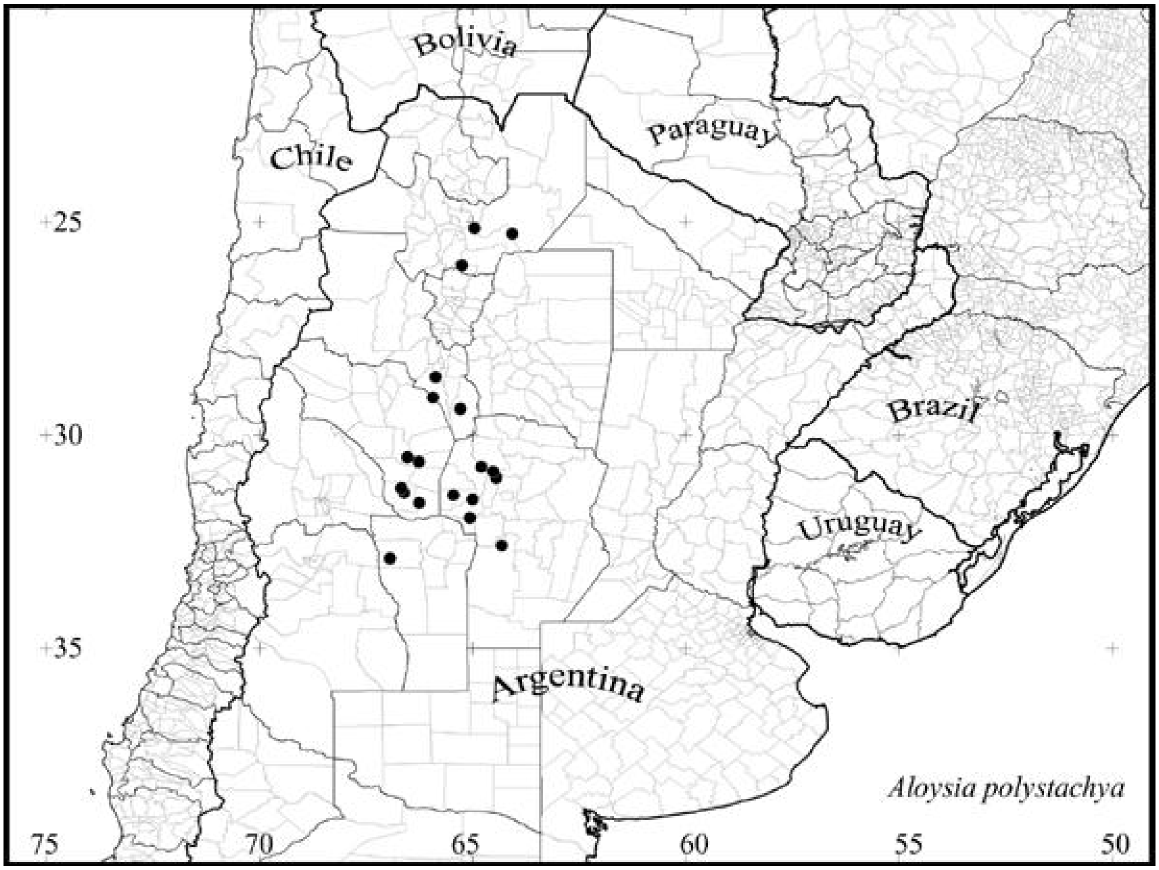

Figure 40: Distribution of *Aloysia polystachya*.

Representative specimens: **ARGENTINA**. **CATAMARCA**: **Mpio. Capayan**; El Banado, 14 Jan 1947, *A. Brizuela 90* (NY); **Mpio. La Paz**; Quebracho Colorado, 9 Mar 1947, *A. Brizuela 1082* (NY); Esquiu, planta de té de burro con flor, 9 Dec 1946, *A. Brizuela 389* (NY). **CÓRDOBA**: Quebrada de la [Gicayada] frente a Chancani, 11 Feb 1944, *A. Castellanos s.n. [51180]* (BA); **Mpio. Punilla**; Capilla del Monte, 7 Mar 1940, *E. G. Nicora 2494* (NY, SI); **Mpio. San Javier**; Quebrada de Las Rosas, 17 Mar 1953, *A. E. Lanfranchi 1075* (US); **CORRIENTES**: **Mpio. Bella Vista**; 10 km S de B. Vista, cauce seco del Arroyo Toropí, 13 Sep 1972, *A. Schinini 5355* (SI); **LA RIOJA**: **Mpio. Capital**; General Roca, San Francisco, 14 Apr 1928, *M. Gomez [28/770]* (BA, GH, NY); **Mpio. General Angel V. Penaloza**; a 5 km de Punta de los Llanos, rumbo a Tama, 26 May 1977, *R. Corzo & F. Biurrum 777* (MO); **Mpio. General Belgrano**; Ileal, cerca de Olta, 4 Feb 1941, *A. Castellanos s.n. [33887]* (BA, NY); **Mpio. Rosario Vera Penaloza**; Chepes [Mpio. reported as Gral. Roca], 11 Nov 1945, *A. R. Cuezzo 971* (MO, NY, W); Estancia Santa Rosa de Yaryura, Potrero 1, cerca de La Jarilla; bosque chaqueño occidental, infrecuente, 22 Jan 1969, *D. L. Anderson 1529* (SI); **SALTA**: **Mpio. Anta; Quebrachal**, 22 May 1947, *J. E. Lima 143* (NY); **Mpio. Candelaria**; Potrera el Nogalito; en el bosque, Apr 1925, *S. Venturi 3756* (BA, GH, SI, US). **SAN LUÍS**: **Mpio. Belgrano**; Caleras del Gigante, 14 Nov 1926, *A. Castellanos s.n. [26/2278]* (BA).

24. ALOYSIA CATAMARCENSIS Moldenke, Known Geogr. Distrib. Verb. Avicenn. 76. 1942. TYPE: ARGENTINA. CATAMARCA: Quebrada de Tala, 15 Mar 1909, *Castillón 956* (HOLOTYPE: NY!; ISOTYPES: LIL!).

Shrub 0.5-1.5 m in height. **Leaves** opposite; petioles 3-6 mm long; laminae ovate to elliptic, 1.5-3.5 cm long, 0.7-2.0 mm wide, margins crenulate to serrate, basally short-attenuate, apically rounded to sub-acute, adaxially pilose. **Inflorescence** compactly spicate, flowers sessile, four-ranked; peduncle 0.3-1.0 cm long, strigose; rachis 0.5-2.0 cm long, strigose. **Bracts** reduced, lanceolate, midrib present, 1.5-3.0 mm long, 0.5-1.2 mm wide, long-acuminate, margins ciliate, strigose, at least along midrib. **Calyx** zygomorphic, campanulate, 1.0-1.5 mm long, villous, understory of sub-sessile glandular trichomes; lobes 4, triangular, inferior sinus often cleft to base, margins ciliate. **Corolla** sub-actinomorphic, white, lavender, to blue-violet; tube 4-5 mm long, pubescent with an understory of sub-sessile, glandular trichomes; limb 1.5-2.0 mm wide, pubescent with an understory of sub-sessile, glandular trichomes. **Stigma** sub-capitate, laterally disposed. **Fruit** broadly obovoid, 0.8-1.0 mm long, 0.8-1.0 mm wide, glabrous, apically bilobed, lobes ca. 0.5 mm long; intermericarpal cavity reduced, the surface smooth to papillate.

Discussion: This species is presumed to be closely related to *Aloysia polystachya* since it shares the synapomorphies characteristic of subgroup *"Microstachya"*. It may be easily distinguished by its elliptic leaves with dentate margins (versus lance-linear to narrowly-elliptic leaves with entire margins). It is not easily mistaken for any other member of the genus and appears to be sympatric with *A. polystachya* in the southern portion of the state of Catamarca, Argentina. These species remain distinct in this region and no evidence of hybridization has been detected.

Distribution and habitat (fig. 41): Arid regions of northwestern Argentina in the states of Catamarca, La Rioja, and Salta; rocky slopes; 800-1800 m; flowering October to April.

Etymology: This species was named after the state of Catamarca, Argentina, where the type was collected.

Common names and uses: Inca yerba and salvia blanca.

Botta (1979) reports that extracts of this species may be mixed with that of *Salvia gilliesii*, prepared as an infusion, and taken as a popular remedy for a variety of ailments.

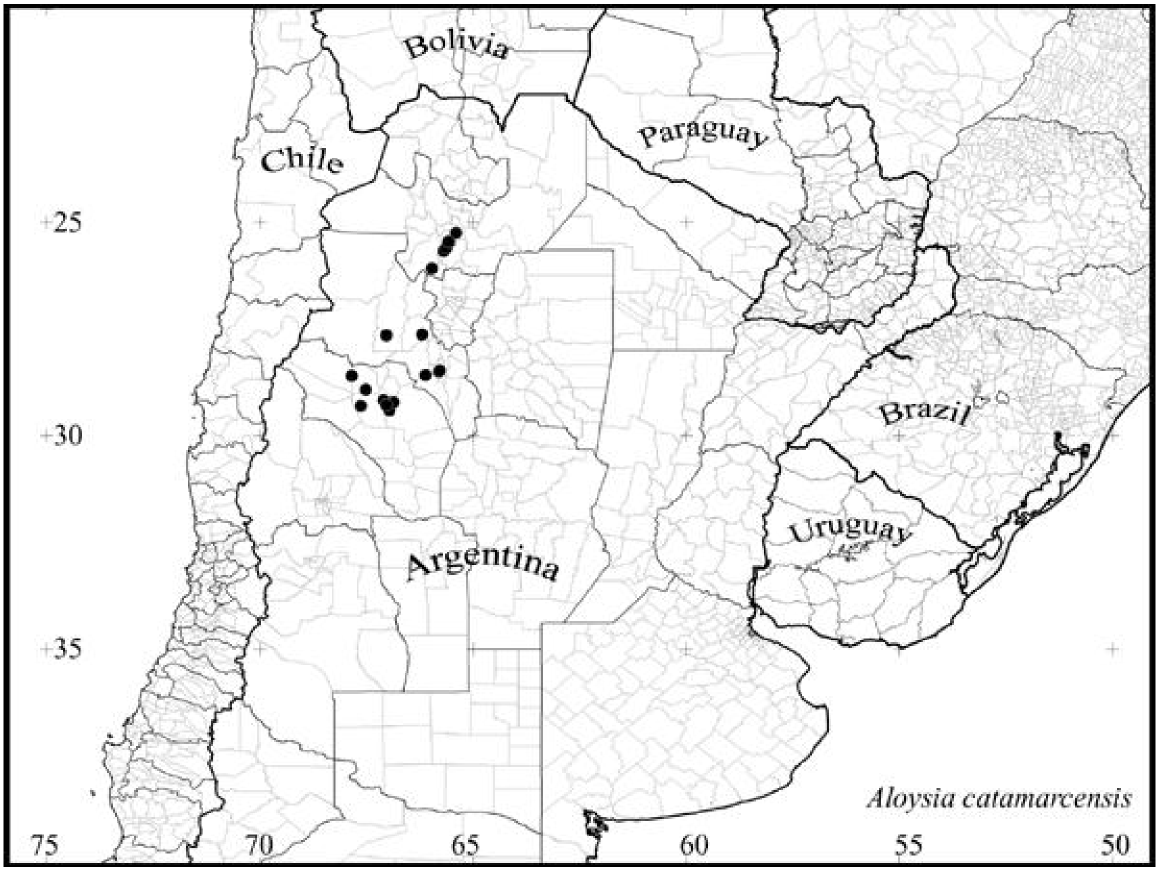

Figure 41: Distribution of *Aloysia catamarcensis*.

Representative specimens: ARGENTINA. CATAMARCA: Mpio. Andalgalá; Cuesta de la Chilca, 26 Apr 1934, *R. Schreiter 32839* (GH, NY). **Mpio. Belén**; Belén, Cerrito de la Cruz, suelos rocosos, 23 Feb 1973, *E. A. Ulibarri 332* (MO, SI). **LA RIOJA: Mpio. Capital**. Faldeo oriental de la Sierra de Velasco frente a la ciudad La Rioja; entre Villa Luisa y Las Cañas, rumbo a El Cantadero; a 2 km del primero; poco frecuente, 24 Jan 1997, *F. Biurrun & E. Pagliari 4700* (CTES). **Mpio. Famatina**; Famatina, Cerros al E de Famatina, faldas pedregoso, 16 Mar 1980, *J. Hunziker 9731* (SI). **Mpio. General Sarmiento**; Las Conchas, 4 Mar 1944, *A. Soriano*

902 (SI). **Mpio. Gral. Lavalle**; Cuesta de Miranda, a 27 km W de Nonogasta, 17 Mar 1993, *S. M. Botta & D. C. Miconi 685* (MO). **Mpio. Sanagasta**; Huaco, en cerros, 4 Mar 1941, *A. Burkart 12548* (MO, NY-2, SI); Sanagasta, en el cerro, 3 Mar 1944, *A. Soriano 944* (NY, SI); **SALTA: Mpio. La Viña**; La Vina, 150 m antes del Mojon, km 77 del camino de Cafayate a Salta, 2 Apr 1971, *F. Vervoorst, N. Bacigalupo, & M. Correa 4318* (MO, NY).

25. ALOYSIA DUSENII Moldenke, Phytologia 1: 440. 1940. TYPE: BRAZIL. PARANÁ: shrubby campo at Tamandré, 4 Oct 1914, *P. Dusén 1050a* (LECTOTYPE [here designated]: S!; TYPE FRAGMENT: NY!; PHOTOHOLOTYPE: LL!, NY!). The holotype was housed at B and destroyed during WWII. A lectotype is selected from the surviving isotypes for comparative purposes. The specimen from S was chosen due to its quality and completeness.

Aloysia ternifolia Moldenke, Phytologia 2: 309. 1947. TYPE: ARGENTINA. SANTA CRUZ: rivulet at Itaiacoca, near Ponta Grossa, 17 Mar 1904, *P. Dusén 4228* (HOLOTYPE: S!; PHOTOHOLOTYPE: F!, LL!, NY!; ISOTYPES: NY!, US!; TYPE FRAGMENT: NY!).

Aloysia ternifolia f. *oppositifolia* Moldenke, Phytologia 28: 192. 1974. TYPE: BRAZIL. PARANA: Mpio. Pitanga; edge of Rio Bonito, 25 Feb 1971, *G. Hatschbach 26516* (HOLOTYPE: LL!; ISOTYPES: SI!, UC!, US!).

Shrub 1-2 m in height. **Leaves** opposite to 3-4 whorled; petioles 1-4 mm; laminae elliptic, 3-9 cm long, 1-3 cm wide, margins entire to serrate along apical 2/3 to

1/2, basally entire, acute to weakly attenuate, apically acute to more or less rounded, often mucronulate, adaxially sparsely strigose, abaxially sparsely strigose, at least along primary and secondary veins, with an understory of sub-sessile, glandular trichomes present. **Inflorescence** loosely spicate; peduncle 2-4 cm long, strigose; rachis 4-9 cm long, strigose; pedicels 0.2-0.5 mm. **Bracts** reduced, lance-elliptic, midrib present, 2-3 mm long, 0.5-1.0 mm wide, acuminate, sparsely strigose, at least along midrib. **Calyx** 2-lobed, campanulate, weakly inflated, 1.8-3.0 mm long, strigose, with an understory of sub-sessile, glandular trichomes present basally; lobes rounded to weakly bidentate, margins ciliate. **Corolla** weakly zygomorphic, white; tube 2.2-4.0 mm long, glabrous to sparsely pubescent distally; limb 3-4 mm wide, glabrous. **Stigma** sub-capitate, laterally disposed. **Fruit** broadly ellipsoid, 1-2 mm long, 1.0-1.3 mm wide, glabrous, apically bilobed, lobes ca. 0.1 mm; intermericarpal cavity reduced, the surface smooth to papillate.

Discussion: *Aloysia dusenii* has a 2-lobed calyx which is a character unusual in *Aloysia*, but common in *Lippia*. Other characters of *A. dusenii*, such as the inflorescence, corolla, stigma, and fruit, place it firmly within *Aloysia*. It is considered distinct from the more typical elements of the genus and placed into the group *"Pseudolippia"*. All members of this group have a two-lobed calyx and a roughly spheroid fruit, characters commonly seen in *Lippia*. *Aloysia dusenii* is positioned in the subgroup *"Ternifolia"* due to its elongated, loosely spicate inflorescences, reduced bracts, and 3(-4)-whorled, sometimes opposite, leaves.

It should be noted that this species is susceptible to an unknown pathogen causing the fruit to expand to 3-5 times normal size and take on a broadly fusiform appearance.

Four of the nine specimens cited from LL were observed to have at least some fruit displaying symptoms of this pathology.

Distribution and habitat (fig. 42): Riparian associations of Parana, Rio Grande do Sul, and Santa Catarina, Brazil; rocky slopes; 850-950 m; flowering October to February.

Etymology: *Aloysia dusenii* was named after Swedish botanist Per Karl Hjalmar Dusén (1855-1926), collector of the type who has contributed greatly to our knowledge of Brazilian botany.

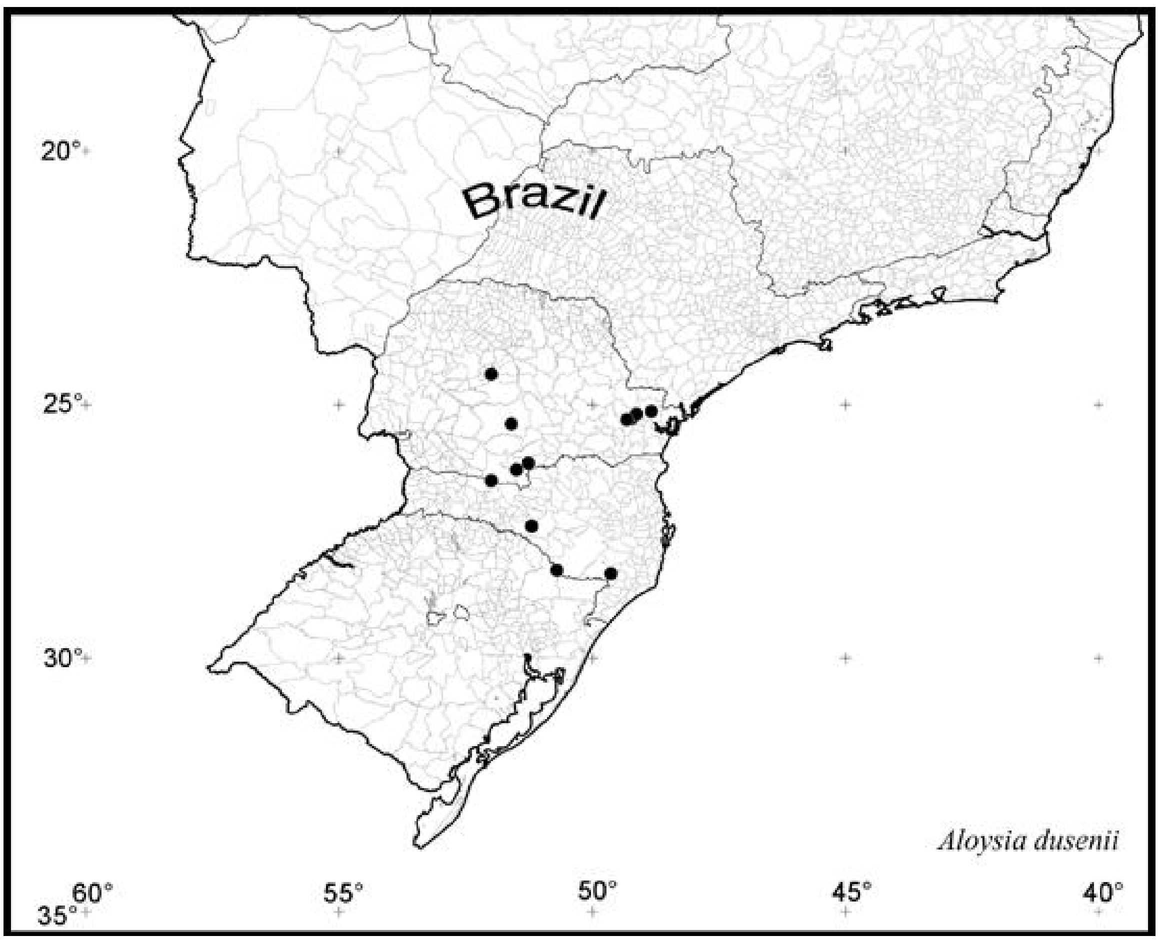

Figure 42: Distribution of *Aloysia dusenii*.

Representative specimens: BRAZIL. PARANÁ: Mpio. Almirante Tamandare; shrubby campo at Tamandare, 4 Oct 1914, *P. Dusén 1050a* (S, NY, NY); Tamandaré, 12 Nov 1942, *C. Stellfeld 164 [1106]* (NY). **Mpio. Bocaiúva do Sul**; Salto, das margens de córrego, 12 Nov 1959, *G. Hatschbach 6466* (MBM, MICH). **Mpio. Campina Grande do Sul**; Río Capivari, capoeira proximo ao rio, 8 Feb 1971, *G. Hatschbach 26325* (LL, MBM, UC); Praia Grande, margine Río Capivary Grande, 18 Oct 1959, *G. Hatschbach 6359* (MICH). **Mpio. Colombo**; Capivary, da mata das margens de rio, 28 Jan 1957, *G. Hatschbach 3754* (LL). **Mpio. General Carneiro**; Faxinal dos Souza; margem corrego, 7 Dec 1971, *G. Hatschbach 28366* (LL, NY, UC, US). **Mpio. Guarapuava**; Río Jordão, Entre Ríos, margens rio, 21 Oct 1969, *G. Hatschbach 22546* (MICH, MO, UC). **Mpio. Palmas**; Sete Butieiros; zona de campo, margens corrego, 20 Nov 1972, *G. Hatschbach 30756* (LL, MBM, UC); Jangada do Sul, margens do Río Jangada, 27 Oct 1956, *G. Hatschbach 3364* (LL, MBM). **Mpio. Pitanga**; Río Bonito, margens del rio, 25 Feb 1971, *G. Hatschbach 26516* (LL, SI, UC). **RÍO GRANDE DO SUL**: **Mpio. Bom Jesus**; Río Pelotas, camino S. Joaquim a Roncinha; en selva marginal, 26 Dec 1982, *A. Krapovickas & A. Schinini 38344* (CTES, LL, UC). **SANTA CATARINA**: **Mpio. Bom Jardim D'Serra**; 3 km W de Bom Jardim da Serra, Río Pelotas; margen rocoso del rio, 24 Dec 1982, *A. Krapovickas & A. Schinini 38277* (CTES, LL). **Mpio. Campos Novos**; Campos Novos, beira rio, 28 Oct 1963, *R. M. Klein 4112* (SI).

26. ALOYSIA SONORENSIS Moldenke, Phytologia 12: 428. 1965. TYPE: MEXICO. SONORA: 31.1 mi. S of Hermosillo, desert scrub on a sandy loam flat by a shallow wash, 2 Aug 1955, *M. C. Johnston 2712* (HOLOTYPE: MICH!;

PHOTOHOLOTYPE: TEX!; ISOTYPE: TEX!; PHOTOISOTYPE: TEX!; TYPE FRAGMENT: LL!).

Aloysia gentryi Moldenke, Phytologia 45: 468. 1980. TYPE: MEXICO. SONORA: Los Cerritos, ca. 40 mi. S of Navojoa, granitic slopes and bajada with thorn forest and open grassland, 100-800 ft., 1-3 Oct 1954, *H. S. Gentry 14408* (HOLOTYPE: LL!; PHOTOHOLOTYPE: TEX!; ISOTYPE: LL!, NY!; PHOTOISOTYPE: TEX!).

Shrubs 1.0-2.5 m in height. **Leaves** opposite; petioles 0.5-2.0 mm; laminae elliptic to obovate, 1.0-3.5 cm long, 0.5-1.2 cm wide, margins entire to finely serrate along the apical 1/2 to 1/3, adaxially strigulose, abaxially tomentose, with an understory of sub-sessile, glandular trichomes. **Inflorescence** compactly spicate; peduncle 0.1-0.5 cm, tomentose with an understory of sub-sessile, glandular trichomes; rachis 0.5-2.5 cm, tomentose with an understory of sub-sessile, glandular trichomes; pedicels 0.2-0.5 mm. **Bracts** reduced, ovate to obovate, 3-5 mm long, 1.5-2.0 mm wide, rounded to sub-acute, tomentose with an understory of sub-sessile, glandular trichomes. **Calyx** bilobate, tubular, 1.5-2.0 mm long, densely setulose to setose, lobes rounded, margins ciliate. **Corolla** zygomorphic, yellow to greenish-yellow; tube 1.5-3.0 mm long, pubescent medially to distally with an understory of sub-sessile, glandular trichomes present distally; limb 1.5-3.0 mm, pubescent with an understory of sub-sessile, glandular trichomes. **Stigma** sub-capitate, laterally disposed, lobes oblique. **Fruit** broadly ellipsoid, 1-2 mm long, 1-2 mm wide, glabrous, apically bilobed, the lobes less than 0.1 mm long; intermericarpal cavity enlarged, the surface papillate.

Discussion: This species belongs to subgroup *"Pseudolippia"*, based on similarities of corolla, calyx, and fruit characters. All have zygomorphic corollas with slender, basally flared tubes, two-lobed calyces with ciliate margins, and widely ellipsoid fruits with enlarged intermericarpal cavities. *Aloysia sonorensis* is readily distinguished from the rest of subgroup *"Pseudolippia"* by its reduced, tomentose bracts (versus the prominently foliaceous, strigulose bracts, 4-10 mm long).

Moldenke described *Aloysia gentryi* in 1980 from material collected in the state of Sonora, Mexico. He stated that the plant occurs "on or about postinsular cerritos" and quoted the collector as saying it is "...a postinsular endemic...known only from low granite hills, which appear to have been islands in the Gulf of California for a long time in the Tertiary Period." He did not compare *A. gentryi* with any other species. The type specimens of *A. sonorensis* and *A. gentryi* are very similar and I can find no justification for their recognition as distinct taxa.

Distribution and habitat (fig. 43): Coastal riparian environments in the state of Sonora, Mexico; rocky slopes on limestone and granite outcrops; 35-250 m; flowering March to December.

Etymology: *Aloysia sonorensis* is named for the state of Sonora, Mexico, where type was collected. The synonym, *A. gentryi*, was named in honor of Howard Scott Gentry (1903-1993), prominent collector and botanist in the southwestern United States and Mexico.

Representative specimens: **MÉXICO**. **SONORA**: **Mpio. Empalme**; 9 mi. [14.5 km] E of Empalme, end of Douglas Bridge on Highway 15, then 2.5 mi. [4 km] S of Highway on Playa del Sol Road; riparian desert scrub, 9 Oct 1985, *R. S. Felger, & F. W. Reichenbacher 85-1108* (ARIZ, TEX); 7.2 road mi. [11.6 km] S of Ortiz, 12 Aug

1969, *J. R. Hastings & R. M. Turner 69-34* (ARIZ). **Mpio. Guaymas**; along Highway 2, off Highway 15, ca. 58 mi. [93.3 km] S of Hermosillo and 27 mi. [43.5 km] N of Guaymas, 17 Dec 1967, *Clarke, Essig, & Bringle 953-2* (MICH); El Baviso, 1.1 mi. [1.8 km] N of San Carlos Road, from E end of San Carlos, then 1.8 mi. [2.9 km] W to corral at Arroyo Palma Quemada, riparian desertscrub, on flats near canyon bottom, 10 Oct 1985, *R. S. Felger & F. W. Reichenbacher 85-1229* (ARIZ, MEXU). **Mpio. Hermosillo**; 2.7 mi. [4.3 km] S of La Palma on Mexican Highway 15, between Hermosillo and Guaymas, desert plain; desertscrub, 8 Oct 1985, *R. S. Felger 85-1079 & F. W. Reichenbacher 1764* (ARIZ); 7.5 mi. [12.1 km] W of Junction with MX Highway 15, along Kino Bay Road cutoff, open desert scrub, 29 Dec 1983, *T. R. & R. K. VanDevender 83-113* (ARIZ). **Mpio. Huatabampo**; Sinaloan thornscrub, Arroyo Camahuiroa vicinity, in arroyo Camahuiroa 3.5 km upstream from mouth, 1.5 km NE Camahuiroa, 9.5 km, air, WNW Melchior Ocampo, at Jct. of Arroyo Bacamocha and Arroyo Camahuiroa, 26 Jun 1994, *S. L. Friedman 163-94* (ARIZ); 5.7 km SW of Ejido 10 de April at MX 15, 1.4 km W of Tierra y Libertad, ca. 7.4 km, air, ENE of Camahuiroa; coastal Sinaloan thornscrub, 15 Mar 1993, *T. R. VanDevender et al. 93-320* (CAS, ARIZ, TEX); 2.3 km NE of Las Bocas, ca. 50 air km S of Navojoa; dense coastal thornscrub, locally common, 26 Oct 1998, *A. L. Reina & T. R. VanDevender 98-2066* (MEXU).

27. **ALOYSIA BARBATA** (Brandegee) Moldenke, Phytologia 1: 416. 1940. *Lippia barbata* Brandegee, Proc. Calif. Acad. Sci., ser. 2, 2: 196. 1889. TYPE: MEXICO. BAJA CALIFORNIA SUR: La Giganta, 11 Jan 1889, *T. S. Brandegee s.n.* (HOLOTYPE: UC!; PHOTOHOLOTYPE: TEX!).

Lippia montana Brandegee, Proc. Calif. Acad. Sci. ser. 2, 3: 163. 1891. TYPE: San Bartolomé, Oct 10 1889, *T. S. Brandegee s.n.* (LECTOTYPE [here designated]:

UC!; ISOLECTOTYPE: US!). Three collections were cited by Brandegee in his protologue for *L. montana*; Sierra de la Laguna (UC!), San José del Cabo (NY!, UC!), and San Bartolomé (UC!, US!). The San Bartolomé collection was chosen as the lectotype since it is housed at two separate institutions and is of superior quality.

Shrub 1-3 m high, faint jasmine-vanilla odor. **Leaves** opposite; petioles 1.5-5.0 mm long; laminae elliptic to ovate, 2-7 cm long, 1.5-4.5 cm wide; basally rounded to sub-acute; apically acute to sub-acute; adaxially scabrous; abaxially densely strigulose, glandular. **Inflorescence** compactly spicate; peduncle 0.5-1.0 cm long, setulose mixed with long-stalked, glandular trichomes; rachis 1-7 cm long, setulose mixed with long-stalked, glandular trichomes; pedicels 0.5-1.0 mm long. **Bracts** elliptic, foliaceous, 3-nerved, 6-10 mm long, 2.5-4.0 mm wide, light green to purple-tinged, apically acuminate, adaxially strigulose, with an understory of sub-sessile, glandular trichomes. **Calyx** bilobed, 1.5-3.0 mm long, setose, with a dense understory of sub-sessile, glandular trichomes; lobes rounded to obscurely bidentate, margins ciliate. **Corolla** zygomorphic; tube 2.5-4.0 mm long, externally pubescent with an understory of sub-sessile, glandular trichomes present distally; limb 1.5-3.0 mm wide, pubescent, lateral lobes glabrous. **Stigma** sub-capitate, laterally disposed. **Fruit** obovoid, 2.0-2.5 mm long, 2.0-2.5 mm wide, glabrous, apically bilobed, lobes 0.2-0.3 mm long; intermericarpal cavity enlarged, the surface papillate.

Discussion: *Aloysia barbata* has spikes which are somewhat elongated with loosely arranged flowers. However, closer examination reveals calyx, corolla, and fruit characters more akin to members of species of the *"Pseudolippia"* complex. The corolla is flared basally, the fruit has an enlarged intermericarpal cavity, and the calyx is two-lobed.

Brandegee described *Lippia barbata* in 1889 and *L. montana* two years later in 1891. Examination of herbarium specimens from UC, and elsewhere, reveals Brandegee re-annotated all material of *L. montana* as *L. barbata*. I have examined the types for both and they are nearly identical. The type for *L. montana* is a more complete specimen while that of *L. barbata* is scant and was "described from fragments brought for culinary purposes by a Mexican of Comondu" (Brandegee, 1889).

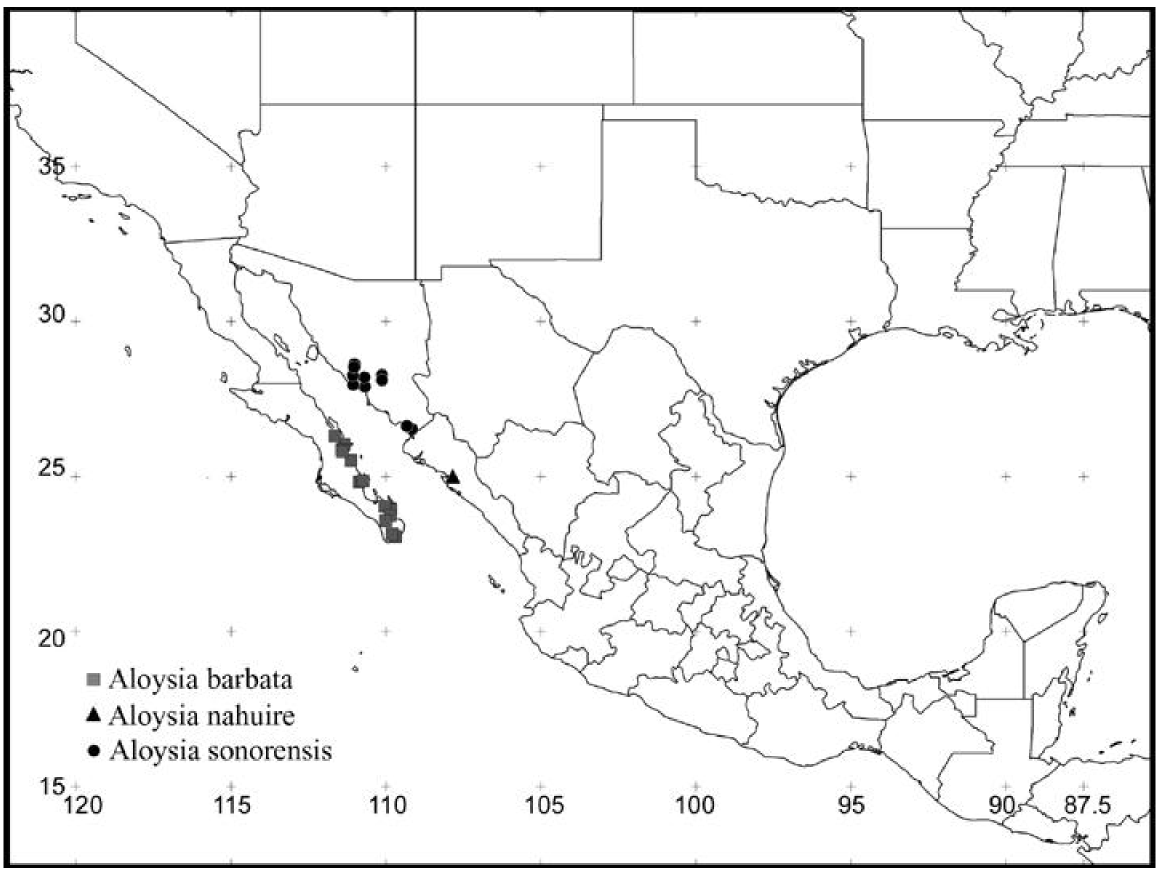

Figure 43: Distribution of *Aloysia barbata, A. nahuire, and A. sonorensis*.

Distribution and habitat (fig. 43): Coastal mountain ranges in the state of Baja California Sur, Mexico; talus and whitish volcanic tuff; 100-650 m; flowering October to May.

Etymology: This species was named for the long, setose hairs present on the mature fruit.

Common name and uses: Margarita.

Brandegee (1889) reported this species to have "culinary" uses in his protologue.

Representative specimens: MEXICO. BAJA CALIFORNIA SUR: Mpio. La Paz; Sierra de la Giganta, arroyo upstream, E of La Soledad, 28 Oct 1871, *A. Carter & R. Moran 5643* (MICH, NY, UC); primera subida Los Planes a boca del Alamo; matorral sarcocaule, ladera, 22 Aug 1996, *M. L. Dominguez 1374* (IEB). **Mpio. Loreto**; Sierra de la Giganta, La Esperanza, canyon floor, 19 Apr 1962, *A. Carter 4383* (ARIZ, NY, TEX, UC); Sierra de la Giganta, Canon del Cumbre, a branch of Arroyo de Agua Verde on trail to San Jose de Agua Verde, steep S facing slope, 23 Oct 1964, *A. Carter 4845* (BM, GH, MICH, UC, US); Sierra de la Giganta, S-facing slope of Cerro del Pino, N of Portzuelo de San Antonio, headwaters of arroyo El Coyote, SE of La Soledad and N of Cerro Mechudo, in small hollowed out basin in whitish volcanic tuff, 21 Feb 1970, *A. Carter 5458* (MICH, MO, UC); Sierra de la Giganta, La Victoria, small hanging valley, 20 Mar 1960, *A. Carter & R. Ferris 3902* (CAS-2, MICH, UC, US); Sierra Giganta, above Pt. Escondido, shady canyon slope, 21 Apr 1938, *H. S. Gentry 3755* (ARIZ, GH, MO, UC); Cayuca Ranch, Loreto, 23 Oct 1930, *M. E. Jones 27362* (CAS, GH, NY, US). **Mpio. San Antonio**; Cape Region, Arroyo del Leon, deep granitic canyon 34 km SE of La Paz on road to Los Planes, 29 Dec 1959, *A. Carter 3702* (UC); sandy washes near Highway 1 SE of San Bartolo, 28.2 mi. [45.4 km] SE of El Triunfo, 11 Jan 1983, *T. F.*

Daniel 2402 (MICH); Boca el Alamo, 15 Jan 1991, *J. L. Léon L. 4857* (CAS). **Mpio. San Jose del Cabo**; San José del Cabo, 10 Mar 1892, *T. S. Brandegee s.n.* (UC); Cape Region, San Lazaro Can[y]on, one plant on talus, 2 May 1959, *R. Moran 7323* (CAS-2, US). **Mpio. Todos Santos**; Sierra de la Laguna, 27 Jan 1890, *T. S. Brandegee s.n.* (UC).

28. ALOYSIA NAHUIRE Gentry & Moldenke, Phytologia 2: 12. 1941. TYPE: MEXICO. SINALOA: Croton Monte, coastal thorn forest, Cerro Tecomate, W of Pericos, 100 ft [30.5 m], 27 Feb 1930, *H. S. Gentry 5721* (HOLOTYPE: NY!; PHOTOHOLOTYPE: NY!; ISOTYPE: GH!, MICH!, UC-2!, US-2!; PHOTOISOTYPE: TEX!).

Shrub 1-4 m in height, reported to have a licorice-like odor (*Gentry 5721* [NY, GH, MICH, UC-2, US-2]). **Leaves** opposite; petioles 3-7 mm; laminae narrowly elliptic, 5.0-7.5 cm long, 1.2-2.0 cm wide, margins finely serrate, adaxially scabrous, abaxially strigulose, with an understory of sub-sessile, glandular trichomes. **Inflorescence** compactly spicate; peduncle 1-2 cm long, strigulose; rachis 1-4 cm long, strigulose; pedicels 0.5-1.0 mm long. **Bracts** lance-ovate, 8-10 mm long, 4.0-5.5 mm wide, strigulose. **Calyx** bilobed, 2.0-2.5 mm long; externally setose with an understory of sub-sessile, glandular trichomes; lobes rounded to obscurely bidentate, margins ciliate. **Corolla** zygomorphic; tube 2.5-3.5 mm long, distally strigulose; limb 2-3 mm wide, strigulose, lateral lobes glabrous. **Stigma** sub-capitate, laterally disposed. **Fruit** broadly obovoid, 1.5-2.0 mm long, 1.5-2.0 mm wide, glabrous, apically bilobed, lobes 0.1-0.3 mm long; intermericarpal cavity enlarged, the surface papillate.

Discussion: Moldenke included the type of *Aloysia coalcomana* within his concept of *A. nahuire*. Actually, *A. coalcomana* appears to be more closely related, both morphologically and geographically, to *A. chiapensis*. *Aloysia nahuire* is reported from coastal thorn forest in northern Mexico at much lower elevations.

Distribution and habitat (fig. 43): This species is known by a single collection from the Mexican state of Sinaloa; coastal thorn forest; ca. 30 m; flowering December and February.

Etymology: This species gets its epithet from its local vernacular name.

Common name and uses: Nahuire.

A tea is made from the foliage (Moldenke, 1941).

29. ALOYSIA COALCOMANA Siedo, **sp. nov.** (figs. 44-46)

TYPE: MÉXICO. MICHOACÁN: Mpio. Coalcoman de Matamoros; Sierra Naranjillo, Coalcoman, 1550 m, woods, frequent, local, 11 Mar 1941, *Hinton et al. 15766* (HOLOTYPE: LL!; ISOTYPES: G!, MICH!, NY!, S!, UC!, W!).

Shrub to small tree up to 6 m in height. **Leaves** opposite; petioles 0.6-1.0 cm long; laminae 6-10 cm long, 2-3 cm wide, narrowly lance-elliptic, margins finely serrate, revolute, adaxially scabrous, abaxially sparsely villous, with an understory of sub-sessile, glandular trichomes. **Inflorescence** compactly spicate; peduncle 1-5 cm long, antrorsely strigulose mixed with long-stalked, glandular trichomes; rachis 1.5-4.0 cm long, antrorsely strigulose mixed with long-stalked, glandular trichomes; pedicels 2-3 mm long. **Bracts** foliaceous, narrowly elliptic to elliptic, 4-6 mm long, 1.5-2.0 mm wide, apically acuminate, tip usually revolute, strigulose. **Calyx** bilobed, 1.5-2.5 mm long, externally setose, glandular, lobes apically rounded, margins ciliate. **Corolla** zygomorphic; tube 2.0-2.5 mm long, strigulose distally; limb 2-3 mm wide, lateral lobes glabrous, superior and inferior lobes strigulose. **Stigma** sub-capitate, laterally disposed. **Fruit** obovoid, 1.5-2.0 mm long, 1.5-2.0 mm wide, glabrous, apically bilobed, lobes 0.1-0.2 mm long; intermericarpal cavity enlarged, the surface papillate.

Discussion: The type of *Aloysia coalcomana* was inexplicably included under their concept of *A. nahuire* by Gentry and Moldenke. This species is believed to be related to *A. chiapensis*, largely based on characters of the inflorescence. Additionally, the two taxa occur in very different habitat types, *A. coalcomana* in montane pine-oak forests at 1550 m and *A. nahuire* in coastal thorn forests at ca. 30 m elevation.

I visited the type locality for *A. coalcomana* on the 16 March 1999. Unfortunately, the mixed pine-oak woodland had been extensively logged at the time of my visit and little undisturbed vegetation remained. I collected several numbered sets in the area (*Siedo 737-752*) but could locate no specimens of *Aloysia*.

Distribution and habitat (fig. 46): Known from a single collection from pine-oak woodlands, Sierra Naranjillo, Michoacán, Mexico; 1550 m; flowering in March.

Etymology: This species is named for the Municipio of Coalcoman de Matamoros, Michoacán, Mexico, where the type collection was made.

Figure 44: Holotype of *Aloysia coalcomana* (Hinton et al. 15766 [LL]).

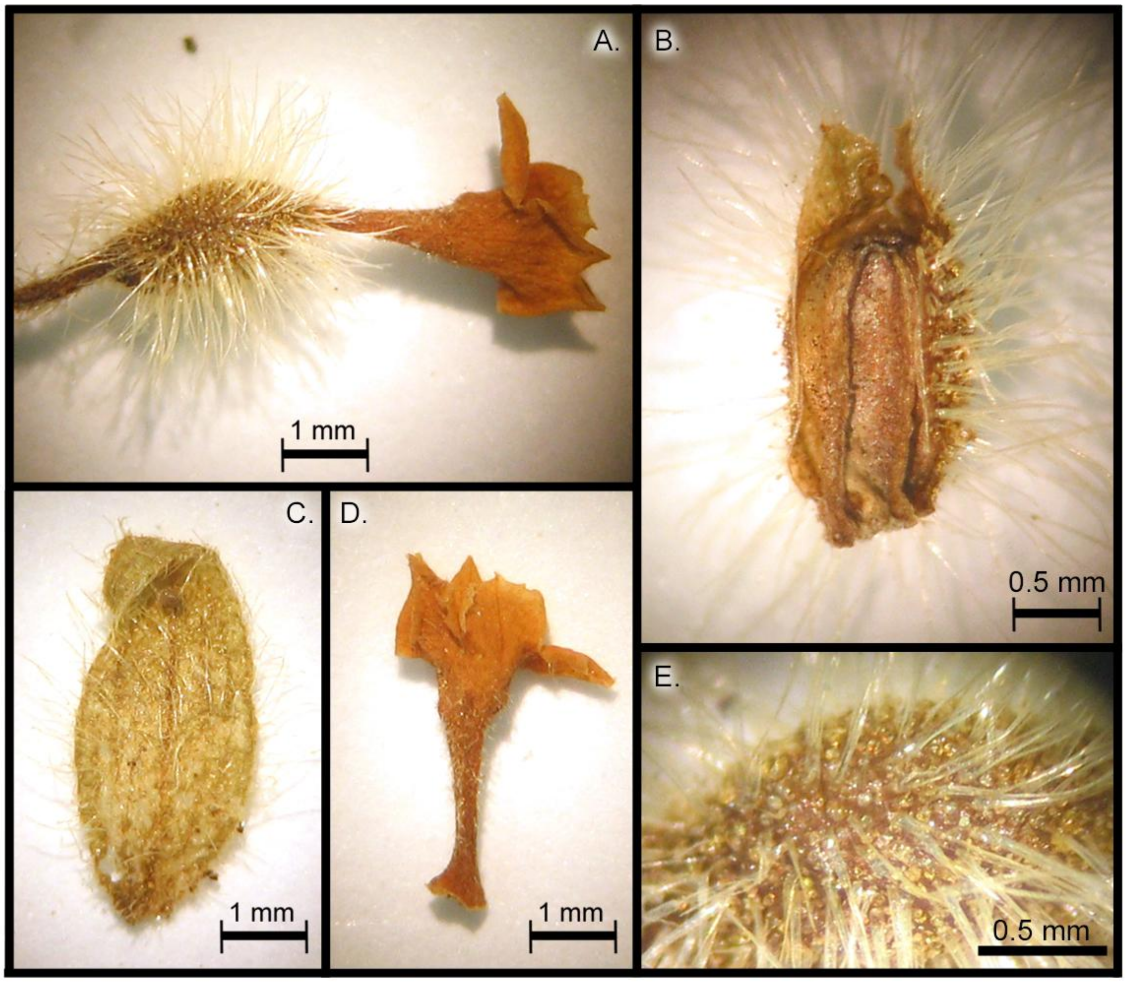

Figure 45: Light micrographs of *Aloysia coalcomana* showing (A.) flowers, 10x mag.; (B.) mericarp, 20x mag.; (C.) bract, 10x mag.; (D.) corolla 10x mag.; and (E.) close-up of calyx surface, 30x mag. (*Hinton et al. 15766* [LL]).

30. ALOYSIA CHIAPENSIS Moldenke, Phytologia 2: 307. 1947. TYPE: MEXICO. CHIAPAS: rocky banks at Montserrate[sic], March 1925, *C. A. Purpus 10519* (HOLOTYPE: NY!; ISOTYPES: GH!, UC!, US-2!).

Aloysia barbata var. *acapulcensis* Moldenke, Phytologia 12: 477. 1966. TYPE: MEXICO. GUERRERO: Puerto Marques, near Acapulco [cultivated?], 23 Dec 1957, *L. Paray 2666* (HOLOTYPE: ENCB; TYPE FRAGMENT: LL!).

Shrub 1-3 m in height. **Leaves** opposite; petioles 0.5-1.2 cm; laminae lanceolate to lanceolate-elliptic, 5.0-12.5 cm long, 1-4 cm wide, basally rounded, oblique, apically acuminate, margins serrate, adaxially scabrous, strigulose, abaxially velutinous, with an understory of sub-sessile, glandular trichomes. **Inflorescence** compactly spicate; peduncle 0.2-1.0 cm long, strigulose mixed with long-stalked, glandular trichomes; rachis 2-4 cm long, strigulose mixed with long-stalked, glandular trichomes; pedicels 1-2 mm long. **Bracts** foliaceous, elliptic, 5.0-8.5 mm long, 1.5-2.0 mm wide, apically acute, strigulose, with an understory of sub-sessile, glandular trichomes. **Calyx** bilobed, 1.0-1.5 mm long, setose, with an understory of sub-sessile, glandular trichomes; lobes rounded, margins ciliate. **Corolla** zygomorphic; tube 2.0-2.5 mm long, pubescent distally; limb 1.5-2.0 mm long, pubescent. **Stigma** sub-capitate, laterally disposed. **Fruit** obovoid, 1.5-2.0 mm long, 1.5-2.0 mm wide, glabrous, apically bilobed, lobes 0.1-0.2 mm long; intermericarpal cavity enlarged, the surface papillate.

Discussion: *Aloysia chiapensis* is belongs to subgroup *"Pseudolippia"* due to its bilobed calyx, broadly obovate fruit, hop-like inflorescences, showy, foliaceous bracts, and basally flared zygomorphic corollas. It may be readily distinguished by its velutinous leaves, pedicels which are 1-2 mm long, and elliptic bracts 5.0-8.5 mm long.

Moldenke described *Aloysia barbata* var. *acapulcensis* based on material obtained from Puerto Marques, Guerrero. At present, I have viewed the type fragment at TEX, LL but not the complete specimen housed at ENCB. Based on similarities in leaf characters and geographic proximity its included in synonymy under *A. chiapensis* with reservation.

Distribution and habitat (fig. 46): Riparian associations of southern Mexico; rocky slopes; up to 1500 m; flowering February to May.

Etymology: This species was named for the state of Chiapas, Mexico, where it is known to occur and the type was collected.

Representative specimens: **MÉXICO**. **CHIAPAS**: **Mpio. Cintalapa**; 5-7 km NW of Rizo de Oro along a logging road to Cerro Baul and Colonia Figaroa; slopes along a stream w/ seasonal evergreen forest, 19 Apr 1972, *D. E. Breedlove 24663* (CAS, LL, MO); Thorn Forest near and NW of Cintalapa along road to Colonia Francisco I. Madero, 29 Mar 1981, *D. E. Breedlove 50500* (CAS, MEXU, NY); 27 mi. [43.5 km] W of Cintalapa along Mexican Highway 190, wooded slope along creek bank, 17 May 1965, *D. E. Breedlove 9948* (CAS, F, LL, MICH). **Mpio. Jiquipilas**; 20 km N[W] of Jiquipilas and MX Highway 190, slope w/ tropical deciduous forest on the Finca San Eduardo, 18 Feb 1972, *D. E. Breedlove 24133* (CAS, MO). **OAXACA**: **Mpio. Santo Domingo de Tehauntepec**; Carrizal, km 35 al E de Salina Cruz, 30 Apr 1980, *S. G. Olivares 293* (TEX); Arroyo Las Minas, Rancho el Limon, El Limon se encuentra a 17 km al W de Tehauntepec, selva baja caducifolia, 23 Apr 1987, *C. Martinez R. 932* (TEX).

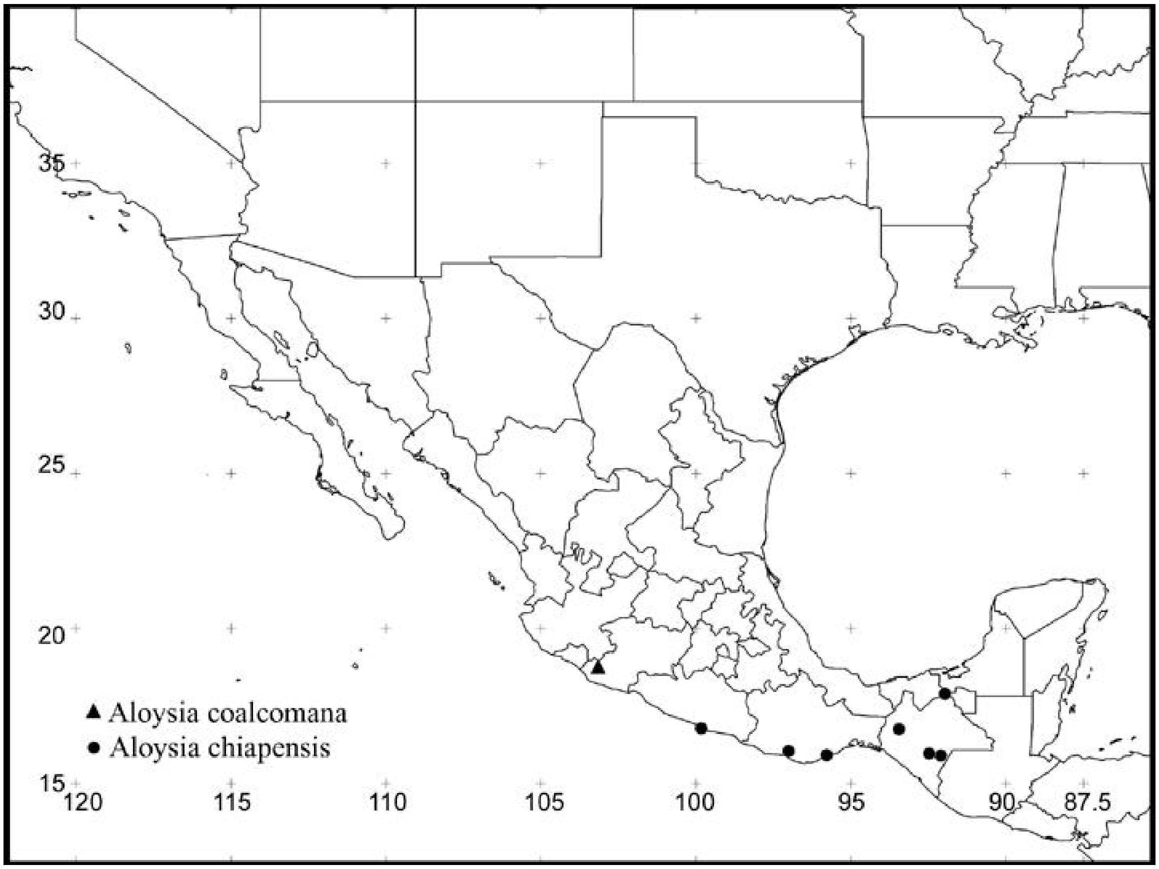

Figure 46: Distribution of *Aloysia coalcomana* and *A. chiapensis*.

Appendix A: Numerical List of Taxa

1. *Aloysia citrodora* Palau

2. *Aloysia fiebrigii* (Hayek) Moldenke

3. *Aloysia herrerae* Moldenke

4a. *Aloysia virgata* (Ruiz & Pav.) Moldenke var. *virgata*

4b. *Aloysia virgata* var. *laxa* (Chod.) Moldenke

4c. *Aloysia virgata* var. *urticoides* (Cham.) Siedo, **comb. et stat. nov.**

5a. *Aloysia castellanosii* Moldenke var. *castellanosii*

5b. *Aloysia castellanosii* var. *magna* Moldenke

6. *Aloysia velutina* Siedo, **sp. nov.**

7. *Aloysia macrostachya* (Torr.) Moldenke

8a. *Aloysia scorodonioides* (Kunth) Moldenke var. *scorodonioides*

8b. *Aloysia scorodonioides* var. *mathewsii* (Briq.) Moldenke

8c. *Aloysia scorodonioides* var. *hypoleuca* (Briq.) Moldenke

9. *Aloysia wrightii* (A. Gray) Heller

10a. *Aloysia gratissima* (Gill. & Hook.) Troncoso var. *gratissima*

10b. *Aloysia gratissima* var. *schulziae* (Standl.) Moldenke

10c. *Aloysia gratissima* var. *angustifolia* (Troncoso) Botta

10d. *Aloysia gratissima* var. *chacoensis* (Moldenke) Botta

11a. *Aloysia lycioides* Cham. var. *lycioides*

11b. *Aloysia lycioides* var. *schulziana* (Moldenke) Siedo, **comb. nov.**

12. *Aloysia oblanceolata* Moldenke

13. *Aloysia cordata* Siedo, **sp. nov.**

14. *Aloysia brasiliensis* Moldenke

15. *Aloysia polygalifolia* Cham.

16. *Aloysia hatschbachii* Moldenke

17. *Aloysia chamaedryfolia* Cham.

18. *Aloysia crenata* Moldenke

19. *Aloysia arequipensis* Siedo, **sp. nov.**

20. *Aloysia peruviana* (Turcz.) Moldenke

21. *Aloysia minthiosa* Moldenke

22. *Aloysia salviifolia* (Hook. & Arn.) Moldenke

23. *Aloysia polystachya* (Griseb.) Moldenke

24. *Aloysia catamarcensis* Moldenke

25. *Aloysia dusenii* Moldenke

26. *Aloysia sonorensis* Moldenke

27. *Aloysia barbata* (Brandegee) Moldenke

28. *Aloysia nahuire* Gentry & Moldenke

29. *Aloysia coalcomana* Siedo, **sp. nov.**

30. *Aloysia chiapensis* Moldenke

Appendix B: Index to Names Associated with *Aloysia*

Below is a list of names associated with the genus *Aloysia*. This includes all accepted species, their synonyms, names relegated to other genera, illegitimate names, doubtful names, and cheironyms. Accepted species names are indicated with boldface type.

Aloysia aloysioides Loes. & Moldenke =*Aloysia peruviana* (Turcz.) Moldenke

Aloysia arcuifolia Nesom =*Aloysia fiebrigii* (Hayek) Moldenke

Aloysia arequipensis Siedo, **sp. nov.** (19)

Aloysia attenuata Walp., Repert. Bot. Syst. 4: 42. 1845. =*Lippia vernonioides* Cham., Linnaea 7: 232. 1832. Moldenke (1942, personal notes) reports *Aloysia attenuata* is equivalent to *Lippia vernonioides* and his assessment is followed here.

Aloysia ayacuchensis Moldenke =*Aloysia herrerae* Moldenke

Aloysia barbata (Brandegee) Moldenke (27)

Aloysia barbata var. *acapulcensis* Moldenke =*Aloysia chiapensis* Moldenke

Aloysia beckii Moldenke =*Aloysia lycioides* Cham. var. *lycioides*

Aloysia boliviensis Moldenke **=***Aloysia scorodonioides* var. *hypoleuca* (Briq.) Moldenke

Aloysia brasiliensis Moldenke (14)

Aloysia casadensis Hassler & Moldenke =*Aloysia gratissima* var. *chacoensis* (Moldenke) Botta

Aloysia castellanosii Moldenke (5)

Aloysia castellanosii Moldenke var. ***castellanosii*** (5a)

Aloysia castellanosii var. ***magna*** Moldenke (5b)

Aloysia catamarcensis Moldenke (24)

Aloysia chacoensis Moldenke =*Aloysia gratissima* var. *chacoensis* (Moldenke) Botta

Aloysia chacoensis var. *angustifolia* Troncoso =*Aloysia gratissima* var. *angustifolia* (Troncoso) Botta

Aloysia chamaedryfolia Cham. (17)

Aloysia chamaedryoides Steud., *nom. nud. pro syn.,* Nomencl. Bot. ed. 2, 1: 62. 1840. =*Aloysia chamaedryfolia* Cham.

Aloysia chiapensis Moldenke (30)

Aloysia chilensis (Schau. in A. DC.) Moldenke, *nom. illeg.*, Rev. Sudamer. Bot. 4: 15. 1937. =*Aloysia salviifolia* (Hook. & Arn.) Moldenke

Aloysia citrodora Palau (1)

Aloysia coalcomana Siedo, **sp. nov.** (29)

Aloysia cordata Siedo, **sp. nov.** (13)

Aloysia crenata Moldenke (18)

Aloysia densispicata (Kunth & Bouché) Moldenke (see *Lippia densispicata*)

Aloysia dodsoniorum Moldenke =*Lippia dodsoniorum* (Moldenke) Siedo

Aloysia dusenii Moldenke (25)

Aloysia fiebrigii (Hayek) Moldenke (2)

Aloysia floribunda M. Martens & Galeotti =*Aloysia gratissima* (Gill. & Hook.) Troncoso var. *gratissima*

Aloysia fonckii (Phil.) Moldenke, Phytologia 2: 50. 1940. TYPE: CHILE. ELQUI: Mpio. Coquimbo; pr[ope] La Higuera, 4 Feb 1904, *F. Fonck s.n.* (HOLOTYPE: SGO!; PHOTOHOLOTYPE: NY!). =*Acantholippia trifida* (Gay) Moldenke

Aloysia gentryi Moldenke =*Aloysia sonorensis* Moldenke

Aloysia gracilis Acevedo, *nom. illeg.*, Bol. Mus. Nac. Host. Nat. Chile 25: 38. 1951. =*Acantholippia trifida* (Gay) Moldenke.

Lippia gracilis Schau. was proposed in 1847 for a species of *Lippia*. Philippi later proposed the same epithet in 1895 for a completely different taxon. Philippi's name is superfluous and illegitimate according to Article 52.1 of the *Code* (2000). I have examined type material of *Lippia gracilis* Schau. and it is definitely a different species than the one described by Phillipi years later. The taxon pertaining to Philippi's homonym was transferred to *Aloysia* by Acevedo de Vargas (1951) for unknown reasons. Acevedo's combination is based on an illegitimate name. Furthermore, Moldenke (1967) reports that Acevedo's transfer was baseless since *Lippia gracilis* Phil. is actually *Acantholippia trifida* (C. Gay) Moldenke and not a member of *Aloysia*. I have examined the type material and mounted photographs of *Lippia gracilis* Phil. at SGO and I agree with his assessment. This species has also been treated as part of *Lippia* (Sanders, 2000).

Aloysia gratissima (Gill. & Hook.) Troncoso (10)

Aloysia gratissima (Gill. & Hook.) Troncoso **var. *gratissima*** (10a)

Aloysia gratissima f. *macrophylla* Moldenke =*Aloysia gratissima* (Gill. & Hook.) Troncoso var. *gratissima*

Aloysia gratissima (Gill. & Hook.) Troncoso var. ***angustifolia*** (Troncoso) Botta (10c)

Aloysia gratissima (Gill. & Hook.) Troncoso var. ***chacoensis*** (Moldenke) Botta (10d)

Aloysia gratissima var. *oblanceolata* Moldenke =*Aloysia lycioides* Cham. var. *lycioides*

Aloysia gratissima (Gill. & Hook.) Troncoso var. *paraguariensis* (Briq.) Moldenke =*Aloysia lycioides* Cham. var. *lycioides*

Aloysia gratissima var. *revoluta* (Moldenke) Moldenke =*Aloysia virgata* var. *laxa* (Chod.) Moldenke

Aloysia gratissima var. *schulzae* (Standl.) Moldenke =*Aloysia gratissima* var. *schulziae* (Standl.) Moldenke (10b)

Aloysia gratissima var. ***schulziae*** (Standl.) Moldenke (10b)

Aloysia gratissima var. *schulziana* (Moldenke) Botta =*Aloysia lycioides* var. *schulziana* (Moldenke) Siedo

Aloysia gratissima var. *sellowii* (Briq.) Botta =*Aloysia lycioides* Cham. var. *lycioides*

Aloysia gratissima (Gill. & Hook.) Troncoso var. *sellowii* (Briq.) Botta =*Aloysia lycioides* Cham. var. *lycioides*

Aloysia hatschbachii Moldenke (16)

Aloysia herrerae Moldenke (3)

Aloysia krapovickasii Moldenke =*Aloysia crenata* Moldenke

Aloysia leptophylla Loes. & Moldenke =*Aloysia peruviana* (Turcz.) Moldenke

Aloysia ligustrina (Lag.) Small, Fl. Southeast U.S., ed. 1: 1013. 1903. =*Verbena ligustrina* Lag.

Aloysia ligustrina var. *paraguariensis* (Briq.) Moldenke =*Aloysia lycioides* Cham. var. *lycioides*

Aloysia ligustrina var. *schulzii* (Standl.) Moldenke =*Aloysia gratissima* var. *schulziae* (Standl.) Moldenke

Aloysia looseri Moldenke =*Aloysia virgata* var. laxa (Chod.) Moldenke

Aloysia lycioides Cham. (11)

Aloysia lycioides Cham. var. ***lycioides*** (11a)

Aloysia lycioides var. *paraguariensis* (Briq.) Moldenke =*Aloysia lycioides* Cham. var. *lycioides*

Aloysia lycioides var. *revoluta* Moldenke =*Aloysia virgata* var. *laxa* (Chod.) Moldenke

Aloysia lycioides var. ***schulziana*** (Moldenke) Siedo (11b)

Aloysia lycioides var. *schulzii* (Standl.) Moldenke =*Aloysia gratissima* var. *schulziae* (Standl.) Moldenke

Aloysia macrostachya (Torr.) Moldenke (7)

Aloysia meyeri Moldenke =*Aloysia lycioides* var. *schulziana* (Standl.) Moldenke

Aloysia minthiosa Moldenke (21)

Aloysia nahuire Gentry & Moldenke (28)

Aloysia oblanceolata Moldenke (12)

Aloysia ovatifolia Moldenke =*Xeroaloysia ovatifolia* (Moldenke) Troncoso

Aloysia peruviana (Turcz.) Moldenke (20)

Aloysia polygalaefolia Cham. =*Aloysia polygalifolia* Cham.

Aloysia polygalifolia Cham. (15)

Aloysia polystachya (Griseb.) Moldenke (23)

Aloysia pulchra (Briq.) Moldenke =*Aloysia lycioides* Cham. var. *lycioides*

Aloysia reichii Moldenke, Lilloa 5: 380. 1940. TYPE: CHILE. ELQUI: Vicuña; Cordillera de Coquimbo, Huanta, Jan 1904, *K. Reiche 19* (HOLOTYPE: SGO!; ISOTYPE: NY!). =*Acantholippia trifida* (Gay) Moldenke

Aloysia reichii var. *trilobata* Moldenke, Phytologia 2: 309. 1947. TYPE: CHILE. ELQUI: Vicuña; Region de Coquimbo, Río Turbio, 19 Oct 1940, *R. Wagenenknecht s.n. [Herb. Looser. 4238]* (HOLOTYPE: NY!; ISOTYPE: SGO!). =*Acantholippia trifida* (Gay) Moldenke

Aloysia salviaefolia (Hook. & Arn.) Moldenke =Aloysia salviifolia (Hook. & Arn.) Moldenke

Aloysia salviifolia (Hook. & Arn.) Moldenke (22)

Aloysia schulziana Moldenke =*Aloysia lycioides* var. *schulziana* (Moldenke) Siedo

Aloysia scorodonioides (Kunth) Moldenke (8)

Aloysia scorodonioides (Kunth) Moldenke var. *detonsa* (Briq.) Moldenke =*Aloysia scorodonioides* (Kunth) Moldenke var. *scorodonioides*

Aloysia scorodonioides var. ***hypoleuca*** (Briq.) Moldenke (8c)

Aloysia scorodonioides (Kunth) Moldenke var. *lopez-palacii* Moldenke =*Aloysia virgata* var. *laxa* (Chod.) Moldenke

Aloysia scorodonioides (Kunth) Moldenke var. ***mathewsii*** (Briq.) Moldenke (8b)

Aloysia scorodonioides var. *orbicularis* Moldenke =*Aloysia scorodonioides* (Kunth) Moldenke var. *scorodonioides*

Aloysia scorodonioides var. *parvifolia* Moldenke =*Aloysia scorodonioides* var. *hypoleuca* (Briq.) Moldenke

Aloysia scorodonioides (Kunth) Moldenke var. ***scorodonioides*** (8a)

Aloysia sellowii (Briq.) Moldenke =*Aloysia lycioides* Cham. var. *lycioides*

Aloysia sleumeri Moldenke =*Aloysia citrodora* Palau

Aloysia sonorensis Moldenke (26)

Aloysia spathulata (Hayek) Moldenke =*Aloysia scorodonioides* var. *hypoleuca* (Briq.) Moldenke

Aloysia ternifolia Moldenke =*Aloysia dusenii* Moldenke

Aloysia ternifolia f. *oppositifolia* Moldenke =*Aloysia dusenii* Moldenke

Aloysia triphylla (L'Her.) Britton =*Aloysia citrodora* Palau

Aloysia triphylla (L'Her.) Royle, *nom. nud. pro syn.*, Ill. Bot. Himal. Mts. 299. 1839. =*Aloysia citrodora* Palau

Aloysia triphylla f. *serrulata* Moldenke =*Aloysia citrodora* Palau

Aloysia urticoides Cham. =*Aloysia virgata* var. *urticoides* (Cham.) Siedo

Aloysia uruguayensis Moldenke, *nom. illeg.* =*Aloysia lycioides* Cham. var. *lycioides*

Aloysia velutina Siedo, **sp. nov.** (6)

Aloysia virgata (Ruiz & Pav.) Moldenke (4)

Aloysia virgata var. *argutedentata* Moldenke =*Aloysia virgata* var. *laxa* (Chod.) Moldenke

Aloysia virgata var. *elliptica* (Briq.) Moldenke =*Aloysia virgata* var. laxa (Chod.) Moldenke

Aloysia virgata var. ***laxa*** (Chod.) Moldenke (4b)

Aloysia virgata var. *platyphylla* (Briq.) Moldenke =*Aloysia virgata* var. *laxa* (Chod.) Moldenke

Aloysia wrightii (A. Gray) Heller (9)

Lippia affinis Briq. non Schau., *nom. illeg.* =*Aloysia lycioides* Cham. var. *lycioides*

Lippia aloysioides Loes. ex Moldenke, *nom. nud. pro syn.*, Phytologia 2: 9. 1941. =*Aloysia peruviana* (Turcz.) Moldenke

Lippia barbata Brandegee =*Aloysia barbata* (Brandegee) Moldenke

Lippia chamaedryoides Steud., *nom. nud.*, Nomencl. Bot. ed. 2, 1: 62. 1840. =*Aloysia chamaedryfolia* Cham.

Lippia chamidryoides Steud., *nom. nud.*, Nomencl. Bot. ed. 2, 1: 62. 1840. =*Aloysia chamaedryfolia* Cham.

Lippia chilensis Schau. in A. DC. =*Aloysia salviifolia* (Hook. & Arn.) Moldenke

Lippia citrodora Kunth, *nom. illeg.*, in Humbolt & Bonpland, Nov. Gen. Sp. 2: 269. 1818. =*Aloysia citrodora* Palau

Lippia densispicata Kunth & Bouché, Index Seminum Hort. Bot. Berol. 12. 1848. *Aloysia densispicata* (Kunth & Bouché) Moldenke, Phytologia 12: 29. 1965. TYPE: GERMANY. cultivated in Berlin, Jul 1848, *K. S. Kunth s.n.* (HOLOTYPE: B[destroyed]). The holotype was destroyed during WWII and no material has been located which may have been seen by Kunth or Bouché or with any reference to this name. Moldenke (pers. notes, TEX, LL) states that... "Nothing is known about this plant. The type was presumably collected from cultivated material in Germany (Berlin). Jackson says that its original home is South America." Moldenke (1965) transferred this name to *Aloysia* despite this and provides no discussion whatsoever. Based on Kunth's protologue, it is probable this species is synonymous with *A. scorodonioides*. However, a definitive assessment is impossible given the current lack of information.

Lippia dodsoniorum (Moldenke) Siedo, **comb. nov.** *Aloysia dodsoniorum* Moldenke, Phytologia 50: 308. 1982. TYPE: ECUADOR. GUAYAS: on hillside at Capeira, km 21 from Guayaquil to Daule, dry tropical forest, 20-200 m, 15 Sep 1981, *C. H. & P. M. Dodson 11224* (HOLOTYPE: LL!).

Upon encountering this type it was immediately obvious that it did not belong in *Aloysia*. It has a capitulate inflorescence, an elongated peduncle (4-6 cm long), a thickened rachis, densely imbricated flowers, and a reduced, two-lobed calyx. Why Moldenke assigned this species to *Aloysia* is unknown. At least, he provides no discussion in his protologue. No new information has come to light about this species since its proposal in 1982. It should be noted that the taxon is included on the IUCN Red List of Threatened Species (Santiana & Pitman, 2004).

Lippia fiebrigii Hayek =*Aloysia fiebrigii* (Hayek) Moldenke

Lippia floribunda Kunth in Humbolt & Bonpland, Nov. Gen. et Sp. 2: 267. 1818. =*Lippia americana* L., Sp. Pl. 633. 1753.

Lippia floribunda Briq. non Kunth, *nom. illeg.,* Annuaire Conserv. Jard. Bot. Genéve 4: 237. 1900; *non* Kunth in Humbolt & Bonpland, Nov. Gen. et Sp. 2: 267. 1818;

nec Phil., Anales Mus. Nac. Santiago de Chile 2: 59. 1891. ≡*Lippia briquetii* Moldenke, Torreya 34: 9. 1934.

Lippia floribunda Phil. non Kunth, *nom. illeg*. Anales Mus. Nac. Santiago de Chile 2: 59. 1891; non Kunth in Humbolt & Bonpland, Nov. Gen. et Sp. 2: 267. 1818. TYPE: CHILE. Prov. de Tarapacá, cerca de Usmagama, without date or collector (HOLOTYPE: SGO!; PHOTOHOLOTYPES: NY!, SGO!, LL!; ISOTYPE: B[destroyed]; PHOTOISOTYPES: GH!, MO!, NY!). =*Acantholippia trifida* (Gay) Moldenke

Lippia fonckii Phil., Anales Univ. Chile 90: 620. 1895. TYPE: CHILE. ELQUI: Mpio. Coquimbo; pr[ope] La Higuera, 4 Feb 1904, *F. Fonck s.n.* (HOLOTYPE: SGO!; PHOTOHOLOTYPE: NY!). = *Acantholippia trifida* (Gay) Moldenke

Lippia gracilis Phil., *nom. illeg.*, Anales Univ. Chile 90: 620. 1895, *non* Schauer in DC., Prodr. 11: 576. 1847. TYPE: CHILE. ANTOFAGASTA: Mpio. Antofagasta; desierto de Atacama, en Salto de San Andrés, *G. Flühmann s.n.* (HOLOTYPE: SGO!). ≡*Acantholippia trifida* (Gay) Moldenke

Lippia gratissima (Gill. & Hook.) L. Benson =*Aloysia gratissima* (Gill. & Hook.) Troncoso

Lippia gratissima var. *schulziae* (Standl.) L. Benson =*Aloysia gratissima* (Gill. & Hook.) Troncoso var. *schulziae*

"*Lippia grisebachii* Lorentz & Hieronymus", cheironym; Based on *Lorentz & Hieronymus 1115* (B; Photograph of B specimen: MO!, NY!). =*Aloysia lycioides* Cham.

"*Lippia ilan-ilan* Bailes", cheironym, Alph. List Inv. & Inc. Sci. Names Verb. & Avicen., p. 31. =*Aloysia virgata* (Ruiz & Pav.) Moldenke

"*Lippia leptophylla* Loes." cheironym, Moldenke, 1942. Alph. List Inv. & Inc. Sci. Names Verb. & Avicen., p. 31. =*Aloysia peruviana* (Turcz.) Moldenke

Lippia ligustrina (Lag.) Britton, Trans. New York Acad. Sci. 9: 181. 1890. =*Verbena ligustrina* Lag., Gen. et Sp. Nov. 18. 1816.

Lippia ligustrina var. *lasiodonta* Briq. =*Aloysia lycioides* Cham. var. *lycioides*

Lippia ligustrina var. *paraguariensis* Briq. =*Aloysia lycioides* Cham. var. *lycioides*

Lippia ligustrina var. *schulzii* Standl. =*Aloysia gratissima* var. *schulziae* (Standl.) Moldenke

"*Lippia lobata* Brandegee", cheironym, based on *M. E. Jones s. n.* [27362] "Oct. 23, 1930" (Specimens at: GH!, NY!, UC-2!, US!). =*Lippia barbata* Brandegee

Lippia looseri (Moldenke) Looser =*Aloysia virgata* var. *laxa* (Chod.) Moldenke

Lippia lycioides (Cham.) Steud. =*Aloysia lycioides* Cham. var. *lycioides*

Lippia montana Brandegee =*Aloysia barbata* (Brandegee) Moldenke

"*Lippia nahuire* Gentry", cheironym, Based on: *H. S. Gentry 5721* (Specimens at: NY!, UC-2!, US!). =*Aloysia nahuire* Gentry & Moldenke

"*Lippia pavoniana* Briq.", cheironym, based on *Pavón 401* (Specimen: G!; Photograph of G specimen: F!, MO!). =*Aloysia virgata* (Ruiz & Pav.) Moldenke var. *virgata*

Lippia peruviana Turcz. =*Aloysia peruviana* (Turcz.) Moldenke

Lippia polystachya Griseb**.** =*Aloysia polystachya* (Griseb.) Moldenke

Lippia pulchra Briq. =*Aloysia lycioides* Cham. var. *lycioides*

Lippia scorodonioides Kunth =*Aloysia scorodonioides* (Kunth) Moldenke var. *scorodonioides*

Lippia scorodonioides var. *detonsa* Briq. =*Aloysia scorodonioides* (Kunth) Moldenke var. *scorodonioides*

Lippia scorodonioides var. *hypoleuca* Briq. =*Aloysia scorodonioides* var. *hypoleuca* (Briq.) Moldenke

Lippia scorodonioides var. *mathewsii* Briq. =*Aloysia scorodonioides* (Kunth) Moldenke var. *mathewsii* (Briq.) Moldenke

Lippia sellowii Briq. =*Aloysia lycioides* Cham. var. *lycioides*

Lippia spathulata Hayek =*Aloysia scorodonioides* var. *hypoleuca* (Briq.) Moldenke

Lippia trifida Gay var. *gracilis* (Phil.) Reiche, *nom. illeg.,* Anales Univ. Chile 123: 380. 1908. ≡*Lippia gracilis* Phil., Anales Univ. Chile 90: 620. 1895, non *Lippia gracilis* Schauer in DC., Prodr. 11: 576. 1847. =*Acantholippia trifida* (Gay) Moldenke

Lippia triphylla (L'Her.) Kuntze =*Aloysia citrodora* Palau

Lippia urticoides (Cham.) Steud. =*Aloysia virgata* var. *urticoides* (Cham.) Siedo

Lippia urticoides var. *laxa* Chod. =*Aloysia virgata* var. *laxa* (Chod.) Moldenke

Lippia virgata (Ruiz & Pavon) Steud. =*Aloysia virgata* (Ruiz & Pav.) Moldenke

Lippia virgata var. *laxa* (Chod.) Briq. =*Aloysia virgata* var. *laxa* (Chod.) Moldenke

Lippia virgata var. *platyphylla* Briq. =*Aloysia virgata* var. *laxa* (Chod.) Moldenke

Lippia virgata var. *elliptica* Briq. =*Aloysia virgata* var. *laxa* (Chod.) Moldenke

Lippia wrightii A. Gray =*Aloysia wrightii* (A. Gray) Heller

Lippia wrightii var. *macrostachya* Torr. =*Aloysia macrostachya* (Torr.) Moldenke

Verbena alpigena Walp., Nov. Act. Nat. Cur. 19, Suppl. 1: 378. 1843. TYPE: UNKNOWN. There were no specimens mentioned in the protologue and, to date, no material has been located which may have been seen by Walpers. His herbarium was sold after his death and its present location is unknown (Stafleu & Cowan, 1988). Index Kewensis lists *Verbena alpigena* (ipni.org, 2005) as a synonym of *Aloysia scorodonioides*, as does Moldenke in his personal notes (TEX, LL).

Verbena citrodora (Palau) Cav. =*Aloysia citrodora* Palau

Verbena dentata Vis., Ort. Bot. Padova, p. 150. 1842. TYPE: UNKNOWN, reported as cultivated material from Orto Botanico di Padova, Italy, 1840 (Visiani, 1842). The type should be housed at PAD, but correspondence with R. Marcucci, curator, indicates this is not the case. A set of Visiani's types was housed at Berlin but has probably been destroyed. Index Kewensis lists this name as a synonym of *A. chamaedryfolia* (ipni.org, 2005) as does Moldenke in his personal notes housed at TEX, LL, but this synonymy cannot be confirmed.

Verbena gratissima Gill. & Hook. =*Aloysia gratissima* (Gill. & Hook.) Troncoso var. *gratissima*

Verbena ligustrina Lag**.**, Gen. et Sp. Nov. 18. 1816. TYPE: in Portu desiderato, without date or collector (HOLOTYPE: MA). Troncoso (1962) made a crucial contribution to the nomenclature of *Aloysia* when she viewed the type of *Verbena ligustrina* Lag. in the Madrid Herbarium (MA). She concluded that the epithet correctly belongs to *Verbena* and not *Aloysia*. Not having seen the type at MA, I follow Troncoso's (1962) analysis.

Verbena salviaefolia Hook. & Arn. =*Aloysia salviifolia* (Hook. & Arn.) Moldenke

Verbena salviifolia Hook. & Arn. =*Aloysia salviifolia* (Hook. & Arn.) Moldenke

Verbena trifolia Britton, *nom. nud. pro syn.*, Sci. Surv. Porto Rico & Virgin Islands 6: 140. 1925. =*Aloysia citrodora* Palau

Verbena triphylla L'Her. =*Aloysia citrodora* Palau

Verbena virgata Ruiz & Pav. =*Aloysia virgata* (Ruiz & Pav.) Moldenke var. *virgata*

Xeroaloysia ovatifolia (Moldenke) Troncoso, Darwiniana 12: 51. 1960. *Aloysia ovatifolia* Moldenke, Lilloa 5: 379. 1940. TYPE: ARGENTINA. CORDOBA: San Javier, La Barranca, 6 Feb 1939, *A. Castellanos s.n.* [*Herb. BA 31193*] (HOLOTYPE: BA!; ISOTYPE: NY!).

The monotypic genus *Xeroaloysia* was proposed by Troncoso (1960) on the basis of novel inflorescence and fruit structure. Moldenke apparently never addressed this transfer since there is no mention of it in the literature or his personal notes at TEX, LL. Most authors recognize the genus on the basis of its fruit which is a single, 2-locular, 2-seeded pyrene with a thin, mesocarp (Troncoso, 1960; Botta, 1979; Atkins, 2004); I agree with assessment.

Zapania citrodora Lam., *nom. illeg.*, Tabl. Encyc. 1: 59. 1791. =*Aloysia citrodora* Palau

Zapania virgata (Ruiz & Pav.) Poir., *nom. illeg.,* Encyc. 8: 845. 1808. =*Aloysia virgata* (Ruiz & Pav.) Moldenke

Appendix C: List of Exsiccatae

Abiatti, Garcia, & P. R. Legname s.n. "1975" (1)

Abrams, L. R. 13217 (10b)

Acevedo-Rodriguez, P., L. Arroyo, B. Mostacedo 4608 (4c)

Ackerman, T. 9210 (9)

Aguilar, A. 173 (4b)

Aguilar, R. M. (4b); 1027 (10d); 305 (4b); 823 (4b)

Ahumada, B. 8 (11a)

Ahumada, O. 1319 (11a)

------, A. Schinini & S. G. Tressens 3391 (11a)

Alba, A. 41 (10b)

Albers, C. C. 46210 (9); 46323 (10a); 46376 (7); 49068 (10a)

Allen s.n. (10a)

Alvarez, S. et al. 8054 (10b)

Amengual, B. M. & P. Legname 4705 (10a); 4701 (11b)

Anderson & Rhinehart 625 (9)

Anderson, D. L. 1529 (23)

Andreasen, M., R. L. Oliver, & S. Verhoek-Williams 526 (10a)

Andres R., G., J. A. Villareal, & M. A. Carranza P. 1537 (10a)

------, M. Martinez, & J. M. Sosa 1117 (7)

Andrews, D. M. 24 (10a); 23 (9); 9 (9)

Anzótegui, L. & G. Cuadrado 324 (4b)

Araújo, D. 95 (4c)

Arbo, M. M. et al. 8192 (11a); 690 (4b)

Archer, W. A. 4678 (11a); 4677 (4b)

Arechavaleta, J. 38 (17); 4 (17)

Arenas, P. (4b); 1493 (10d); 1715 (4b); 2295 (4b); 2421 (4b); 664 (10d)

------, D. Herrera, & G. Gilberti 276 (1); 351 (1)

Areval, E. 424 (4a)

Arnold, J. s.n. (9)

Arrillaga, Izaguirre, & Del Puerto 1752 (17)

Arséne, G. 6156 (10a); 6241 (7); 6921 (7)

Arteaga W., L. & L. Leigue A. A-03 (11a)

Asplund, E. 20152 (8a); 20163 (8a); 6533 (8a); E. 7010 (8a)

Atha, D. 492 (10a)

Atwood, N.D. 2026 (10b); 2070 (7)

B., A. N. 52-5 (10b)

Bacigalupo, N. M., N. S. Troncoso, & R. E. Guaglianone 2258 (11a)

Badcock, W. J. 375 (11a)

Baer, G. A. 31794 (18); 99 (11a)

Bailetti 18 [32289] (11a); 67 [32290] (11b); 86 (11b)

Bailey, L. H. 7479 (10a)

------. & E. Z. 278 (4c)

Bailey, V. 752 (9); s.n. (9)

Baird, J. s.n. (7)

Balansa, B. 3116 (4b); 3117 (11a)

Balcazar, J. 63 (4a)

------ & E. Lijeron 962 (4a)

Balegno, B. 1068 (10c); 1140 (10a); 1410 (10c); 1465 (10a); 1584 (11a); 267 (10a); 903 (10a); 971 (10a)

Balls, E. K. 6092 (11a); B6092 (11a); B7031 (8c)

Balslev, H. & F. Quintana 928 (8a)

Banda, R. s. n. (10a)

Bang, M. 2165 (4a); 5 (8c)

Baray, Rodriguez, & Molinar 90 (9)

Barclay, H. G. & P. Juajibioy 7788 (8a)

Barkley, F. A. 13432 (10a); 14T837 (10a); 16025 (10a); 19Ar588 (11a); 20Mz214 (10a)

------ & C. L. Fernandez C. 14500A (7)

------ et al. 14500A (7)

Barneby, R. C. 2421 (9)

Barr, R. J. 63-359 (10a); 67-441 (9)

Barrionuevo, A. s.n. “1947” (10c)

Bartlett, H. H. 10306 (7); 10568 (10a); 10595 (7); 19200 (11a); 19224 (11a); 19543 (11a); 19643 (11a); 19732 (18); 19796 (10a); 19942 (10a); 20004 (10a); 20076 (11a); 20405 (4b); 20513 (5a); 20601 (10a); 20602 (11a); 20613 (10a)

Bastián, E. 167 (11a)

Beale, D. & D. 190 (9)

Beales 11518 (10b)

Beck, S. G. 874 (11a); 3530 (8c); 4791 (4a); 6039 (8c); 6040 (8c); 6243 (11a); 6448 (4a); 6786 (11a); 7036 (11a); 7426 (11a); 8894 (8c); 12292 (4a); 12734 (4a); 14000 (8c); 17542 (8c)

------ & M. Liberman 9364 (4a); 9428 (8c); 9856 (4a)

Belshaw, C. M. 3290 (4a)

Benavides, R. E. 94 (10b)

Benedict 97 (9)

Bequaert, J. s.n. (10a)

Berkman, A. H. 3693 (9); 3695 (10a)

Berlandier, J. L. 1412 (10a); 3004 (10a)

Bernardi, L. 18795 (4a), 20280 (4b); 20470 (4b); 18876 (4c)

Berro, M. 5594 (17)

Bertoni, M. 1305 (4b); 1399 (4b); 1720 (4b); 1940 (4b); 2668 (4b); 761 (11b); s.n. "1945" (11a); s.n. [98421] (11a)

Bettella, P. 102 (4a)

Biese, W. 2920 (22)

Bingham, S. B. 447 (9)

Biurrun, F. 650 (11a)

------ & E. Pagliari 1302 (18); 3180 (18); 4700 (24); 4701 (18)

Blanchet, J. 1850 (4c); 289 (4c)

Blonea, J. 37072 (11a)

Bluhm, L. s.n. "1943" (10a)

Blumer, J. C. 1307 (9); 1307a (9)

Bodin, J. E. 220 (10a)

Boelke, O. et al. 16005 (10a)

Boffa, P. s.n. "1930" (10d)

Bogusch, E. R. 222 (10a); s.n. "1925" (9)

Bohrer, V. L. 1411 (9)

Boke, N. & J. Massey 195 (10a)

Bordas, E. 3644 (4b)

Bosualdo, I. 1354 (11a); 1355 (4b)

Botta, S. M. & D. C. Miconi 685 (24)

------, E. Ulibarri, & C. D. Miconi 273 (11a)

Bottimer, L. J. Z6 (10a)

Bowers, J. E. & R. M. Turner 2194 (10b)

------ & S. P. McLaughlin 2079 (10b); 3588 (9); R541 (9)

Bowers, J. E. 973 (9)

Boylan, K. 279 (10a)

Bradley, G. L. 83-328 (9)

Braem, S. s.n. "1927" (9)

Brandegee, T. S. s.n. "San Bartolomé" (27); s.n. "1892" (27); s.n. "1902" (27); s.n. "Sierra de la Laguna" (27)

------ et al. s.n. "San José del Cabo" (27)

Bray, W. L. 16 (10a); 310 (10a)

Breedlove, D. E. 24133 (30); 24663 (30); 48044 (30); 48987 (30); 50500 (30); 9948 (30)

Brewer, W. R. & C. T. Mason Jr. 1783 (10a)

Bridges, M. 1346 (22)

Brizuela, A. 1082 (23); 125 (23); 386 (10a); 389 (23); 437 (10a); 550 (10a); 882 (10a); 90 (23); 194 (10a)

Brooke, W. M. A. 5025 (11a); 5097 (11a); 5759 (4b)

Brooks, R. R. et al. MS399 (17)

Broome, C. R., et al. 1807 (10b)

Brown & Molmierea 1616 (11b)

Brown, G. W. B-76 (10a)

Brown, W. V. s.n. (10b)

Bruch, C. 2830 (10a);. s.n. “1896” (1)

Brunner, D. R. 1114 (4b)

Buchinger, M. s.n. [59096] (4c)

Buchtien, O. 3240 (8c); 3241 (8c); 3242 (8c); 3249 (8c); 4686 (8c); 557 (8c)

Budin, E. 6226 (5b)

Bueno, O. et al. 4230 (17)

Buratovich, F. 701 (10d); 710 (10d); 735 (10d); 822 (4b)

Burchell, W. J. 6348 (4a)

Burgess, T. L. 1712 (9)

Burgess, T. L., et al. s.n. (9)

Burkart, A. 12548 (24); 12549 (24); 13204 (11b); 14209 (11a); 18002 (11a); 1980 (11a); 23805 (10c); 26594 (11a); 29465 (11a); 30606 (11a); 4140 (11a); 8078 (11a); 8486 (10a)

------ & J. Gamerro 21891 (11a)

------ & N. Troncoso 26342 (4b); 27876 (11a); 28074 (11a)

------ et al. 23800 (10c); 28067 (10c); 30593 (4b)

Burke-Barrows, D. 24 (4c)

Burr, R. D. 348 (10a)

Bush, B. F. 1272 (10a); 815 (10a)

Butterwick, M. & E. Lott 3586 (9)

Butterwick, M. & J. Lamb 1253 (10b); 1550 (9); 2936 (10a)

Butterwick, M. & J. Poole B 378 (10b)

Butterwick, M. & S. Strong 1190 (10b); B-1041 (9)

Butterwick, M., J. Smith, & M. Whalen 561 (7)

Butzke, A. & M. Nodari 11364 (11a)

Caballero Marmori, G. 1513 (10d)

Cabral, E., L. Anzótegui, & S. M. Pire 551 (11a)

Cabrera, A. L. & A. A. Sáenz 29106 (18); 29187 (4c)

Cabrera, A. L. 28717 (24); 29538 (5a); 29717 (24); 29736 (11b); 29751 (11a); 29766 (11a); 2979 (4b); 29957 (11a); 3046 (11a); 3179 (11a); 4368 (10a); 5461 (10a); 924 (11a)

------ et al. 16695 (1); 16783 (24); et al. 16877 (1); et al. 24790 (11a); et al. 28634 (11a); et al. 28870 (4c); 28959 (4b); 28973 (11a); 28989 (11a); 29017 (11a); 30241 (4b); 30716 (1); 32798 (10a); 34745 (1)

------, A. Chicchi, & P. Hernandez 13804 (11a)

Cabrera, J. P. 71 (10b); 76 (10a)

Cáceres, S. 6 (4b)

Calago, K. 361 (11a)

Cameron, C. E. R. 140 (10b); 143 (7); 152 (10b)

Canby, W. M., C. S. Sargent, W. Trelease 190 (10a)

Cantino, P. 327 (11a); 557 (11a); 559 (11a); 714 (1)

Cárdenas, M. 2387 (8c); 2649 (4b); 4372 (4a); 4678 (11a); 4744 (4b); 5382 (11a); 5752 (4a); 5888 (11a); 637 (11a); 729 (11a)

Carette, E. 3046 (10a); s.n. [23908] (10a)

------ & A. Ruiz Leal 3877 (10a)

Carnevali, R. 2431 (4b); 3302 (11a); 3681 (10a); 3866 (11a); 3873 (11a); 4813 (11a); 5765 (4b)

Carr, W. R. 10320 (7); 10324 (10b); 10327 (7); 13310 (10b)

Carranza, M. A. & A. Rodriguez G. 1468 (7)

Carranza, M. A., M. Vasquez, & J. Noriega P. C-885 (9)

Carrizzo, E. 43 (10c)

Carter, A. 3702 (27); 4382a (27); 4383 (27); 4845 (27); 5458 (27); 5468 (27); 5871 (27)

------ & H. Sharsmith 4206 (27)

------ & R. Ferris 3902 (27); 3902A (27); 3902B (27); 3990 (27); 4103 (27)

------ & R. Moran 5643 (27)

Casas, J. F. 3726 (4b); 4452 (4b); 6357 (4b); FC 7705 (11a)

Castellanos, A. 585 (10c); s.n. "Valle Edén" (11a); s.n. [11669] (23); s.n. [15143] (17); s.n. [15762] (17); s.n. [15772] (17); s.n. [19062] (10a); s.n. [19615] (10c); s.n. [20165] (1); s.n. [24/1292] (4b); s.n. [24/1924] (11a); s.n. [26/2278] (23); s.n. [26/602] (5a); s.n. [27/2026] (10a); s.n. [27/2028] (1); s.n. [28/327] (1); s.n. [28/328] (11a); s.n. [30/1752] (11a); s.n. [31/1286] (11a); s.n. [33887] (23); s.n. [33892] (10a); s.n. [37528] (10a); s.n. [46957] (1); s.n. [46961] (5b); s.n. [47339] (10a); s.n. [47557] (10a); s.n. [51166] (4b); s.n. [51169] (11a); s.n. [51180] (23)

Castillón, L. 1710 [32365] (24); 2010 (4b); 32251 [956] (24); 32260 (11b); 85 (5b); 943 (1); 956 (24)

Cavalo, G. P. 783 (4c)

Ceballos, A. et al. 312 (1); 317 (4a); 338 (11a)

Cerón M., C. E. 1384 (8a); 5250 (8a)

Cerrate, E. 1282 & O. Tovar 696 (19)

Cervi, A. et al. 3871 (11a); et al. CA 7356 (4c)

Chandler, H. P. 7019 (10a)

Charpin, A. 25936 (1); AC 18408 (10a); AC 24086 (1)

Chateau, I. 3 (10b)

Chavez, E. 197 (4a)

Chiang, F. C., P. Davila, & G. Gomez 2366 (10a); F-2366 (10a)

Chiang, F. C., P. Davila, & J. L. Villaseñor 2207 (10a)

Chiang, F. C., T. Wendt, & M. C. Johnston 8178A (7); 8312C (10a); 8695B (9)

Christy, C. M. 2074 (9)

Clare, M. 62 (10a)

Clark, O. M. 11132 (9); 4764 (10a)

Clarke, Essig, & Bringle 953-2 (26)

Claude-Joseph, Bro. 2153 (1)

Claussen, P. 135 (4c); 1368 (4c); 308 (4c); 374 (4c); 608 (4c); s.n. "Minas Gerais" (4c); s.n. [8172] (4c)

Clemens, J. & Mrs. 963 (10a); 964 (10a)

Clover, E. U. 10 (10b); 1075 (7); 1079 (10b); 1268 (7); 1273 (10b); 1664 (7); 42 (9); 4416 (9); 5035 (9); 7145 (9)

Cochrane, T. S. 8448 (7)

Cominote, J. 24 (4c)

Conceição, C. A. 1564 (4c)

Cono 1971 (11a)

Cook, O. F. & G. B. Gilbert 1484 (4a); 1708 (4a); 247 (8c)

Cordeiro, J. & G. Hatschbach 470 (11a)

Cordeiro, J. 1302 (16)

Cordo et al. 77-d-46 (10c); 78-A-45 (11b)

Correa, J. B. 40 (11b)

Correll, D. S. 13977 (9); 20776 (7); 26945 (10a); 28957 (10b); 29005 (7); 29288 (7); 31550 (10a); 31566 (10b); 31618 (9); 35467 (7); 35557 (10b); 36810 (7)

------ & C. Hanson 29840 (10a)

------ & C. Schweinfurth 15782 (10a)

------ & E. E. Smith P978 (20)

------ & I. M. Johnston 18040 (7); 18222 (10b); 19721 (7); 19363 (10b); 24321 (9); 24429 (10b)

Cory, V. L. 17214 (7); 39092 (10b); 44756 (9); 52206 (10a)

Corzo, R. & F. Biurrum 777 (23)

Coville, F. V. 1841 (10a); 1921 (9)

Cozzo, D. s.n. [52562] (11a)

Cristóbal, C. L., D. Wasshausen, & V. Marunak 2266 (4b)

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Cristóbal, J. C. 11 (10a)

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