

UREDINALES OF GUATEMALA BASED ON COLLECTIONS
BY E. W. D. HOLWAY

I. INTRODUCTION, COLEOSPORIACEAE AND UREDINACEAE

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Guatemala, the largest of the Central American republics, and with much more than one third of their total population, is a land of great charm for the traveler and the naturalist. The hot, low lands near the coast, especially on the Atlantic side, with their dense tropical growth, the extensive plateau of the interior, ranging from 8,000 feet elevation in the north to half that altitude in the south, thus supplying a temperate climate, and the many high mountains with their pine-clad summits and cool breezes, give a wonderful range for all forms of vegetation. The large proportion of Indians among the population, the many cities of twenty-five to seventy-five thousand inhabitants, the diversity of landscape, and the enjoyable climate lend a special fascination to the task of the explorer.

The rusts of Guatemala have been made known through the efforts of two tireless collectors of superior botanical attainments, who gave the Uredinales their first attention, endeavoring to take ample specimens to illustrate both the rust and its host, but who gathered also other fungi, as well as higher forms, especially phanerogams. Not a dozen collections of Guatemalan rusts are known from all other sources taken together.

Professor W. A. Kellerman made four visits to Guatemala at the beginning of the years 1905, 1906, 1907 and 1908, and was so enamored of the country and its interesting vegetation that upon returning from his third trip in April, 1907, he laid plans for a peripatetic school of tropical botany. On his next visit he took with him a few students from the University of Ohio. The program for this visit had been completed and arrangements made for departure homeward when a brief illness terminated the career of a zealous and undaunted collector. The larger part of the rich material secured during these four years yet remains unstudied. Two papers dealing with the rust por-

tion have been published by Dr. Frank D. Kern,¹ the first one enumerating forty species, five being described as new, and the second giving fifteen species, one being described as new. Two decades of fungi were issued by Professor Kellerman,² together containing seventeen species of rusts. All the collections listed in these four publications and a few others are cited in the following pages, making a total of 112 of the Kellerman mycological numbers.

Professor E. W. D. Holway has made three visits to Guatemala: December 30, 1914, to February 10, 1915; February 7 to March 23, 1916; and December 19, 1916, to February 18, 1917. The last visit, although the longest of the three, was brought to a premature termination by the disturbing influences of the European war. A total of 600 rust numbers has resulted from these explorations, and a duplicate set of this rich lot of material was placed without restrictions in the hands of the writer for study. As will be seen by the following enumeration there are considerably more than two hundred species represented, that is, every third specimen collected supplied an additional species. In order to make a full showing of all Guatemalan rusts known up to the present time, there have been added eighteen species from the Kellerman material not taken by Professor Holway, and four such species from other sources.

Considering the area of country involved and the comparatively limited amount of exploration, the list of species here presented doubtless indicates a richer rust flora for Guatemala than for any similar area on the North American continent, although it is the opinion of Professor Holway, based on field experiences, that southern Mexico is the real paradise for the collector of rusts. No comprehensive account of Mexican rusts has yet been published, and statistical comparison is not at present possible.

Professor Holway entered Guatemala each time at the Atlantic port of Barrios, and made good use of the country's five hundred miles of railway. He also explored by other means of transportation and particularly by the aid of mules and Indian guides. Professor Holway possesses in a high degree those accessory qualifications of a successful collector, unbounded enthusiasm, keen enjoyment of the beautiful,

¹ Kern, F. D. The rusts of Guatemala. *Journ. Myc.* 13: 18-26. 1907; The rusts of Guatemala II. *Mycologia* 3: 288-290. 1911.

² Kellerman, W. A. Fungi selecti Guatemalensis exsiccati. *Journ. Myc.* 12: 238-241. 1906; 13: 99. 1907.

and a buoyant disposition that makes light of hardships. A few brief excerpts from his letters to the author will illustrate the manner in which he searched for rusts with such eminent success.

A week after reaching Guatemala City on his first visit, Professor Holway started for Antigua "over a road with two-foot holes and two-foot boulders and much dust," as he says, and at a lunch station, "within ten rods of the hotel, collected twenty-five rusts." The next day he writes from San Rafael: "Arrived here about noon, and although the afternoon was misty and dark I found about fifteen more rusts." Two days later he writes from Antigua: "Grand place! Volcanoes 8,000 feet directly above the town. Out three hours and found everything rusted here that was *not* at San Rafael." A single extract may be taken from the letters of the second trip. On February 22 he writes from Mazatenango. "This is the most surprising place! A fine, perfectly clean hotel, good food, no mosquitoes, the grandest and most luxuriant vegetation, and fine views of the Volcans de Atitlan and Santa Maria! There *is* a fly in the ointment—ticks the botanist has always with him." On his third trip, a letter written the middle of January says: "I wish you could have been with me at San Felipe and seen the Volcan de Santa Maria, the fine tree ferns, the brilliant orchids blooming on the tree trunks, etc., etc.—There *were* some ticks." Upon reaching Huehuetenango, a much more northern locality than any hitherto explored, ninety miles from the railroad, that is "three days' mule ride," and which promised to be especially rich in rusts, a telephone message was received giving warning of the changed attitude toward foreigners due to recent developments in the war. It was deemed advisable to make a hasty departure for Guatemala City, and as soon as arrangements could be made a steamer was taken from the west coast for return to the United States.

In the last few years there have been a number of notable explorations for rusts in the different parts of the American tropics, but doubtless none of them has yielded so rich a harvest of additional species for the North American flora as the work of Professor Holway in Guatemala. Part of these new species are forms previously known only from South America, but very many more are species new to science. As a presentation of the rust flora of Guatemala, however, the list as it now stands must be accepted as only a good beginning. Even the species given in many cases require the discovery of additional stages in order to make known their full life cycle. It must also

be remembered that much of the northern part of Guatemala yet remains to be explored, especially the great department of Petén which includes nearly one third of the area of the country and is botanically a veritable *terra incognita*. Even the better known parts will yield many more species, especially the cool summits of the high mountains. As Professor Holway wrote in May, 1917, "the Volcan de Santa Maria is very rich and has only been scratched;" and the same might be said of other localities in this enumeration, even those most frequently mentioned.

The author has been assisted in the study of the Guatemalan material not only by Professor Holway, but also by various members of the botanical staff of the Purdue University Agricultural Experiment Station, working in connection with the preparation of the rust portion of the North American Flora, to whom many thanks are due, and especially to Professor H. S. Jackson and Dr. E. B. Mains, who have described some of the species.

In order to bring out more clearly the several groups of rusts, their relationships, and the association of the new species, the list of species will be presented in several parts. The first part includes twenty-two species belonging to the families Coleosporiaceae and Uredinaceae. This group is more notable for its familiar names than for novelties. The heteroecious species, *Coleosporium Ipomoeae*, *C. Viburni*, *Melampsora Bigelowii*, *M. arctica*, *Cronartium Quercus* and *C. coleosporioides*, common in the northern United States, seem to be abundant in this tropical country. It should be noted, however, that with the exception of the last-named only uredinia are recorded. Pines are common enough in the region, especially at higher altitudes, but little search has yet been made for aecia (Peridermiums) on them at the season of the year when they are most likely to be found. The aecia possibly may be rare or wanting for these species so far south, unless *Cronartium coleosporioides*, which shows telia, is an exception. New hosts are recorded for this last species.

Finding the common grape-vine rust of warmer regions on a native species may prove to be a matter of economic importance. Although first reported from America, the principal observations regarding the nature of the rust have been made in India and Japan.

Family: **Coleosporiaceae**

Coleosporium domingensis (Berk.) comb. nov. (on Apocynaceae).

Plumiera lutea Ruiz & Pav.

Plumiera rubra L.

A specimen of this rust on *P. lutea* is in the cryptogamic herbarium of the New York Botanical Garden, collected by J. Donnell Smith, at Cuyatenango, April, 1892, showing uredinia. A collection on *P. rubra* was made by Kellerman, at Palmar, Dept. Quezaltenango, Feb. 11, 1906, II, 5460, reported by Kern, Journ. Myc. 13: 18-26. 1907, and issued in Kellerman's Fungi Selecti Guatemalensis 13, under the name *C. Plumierae* Pat.

The species is apparently abundant in the West Indies, but these two collections are the only ones known from the continent. Telia are seemingly rare. The aecia doubtless appear on pine leaves, whenever formed, as in all other species belonging to the genus *Coleosporium*, but no trace of them has yet been secured.

The director of the Royal Kew Herbarium kindly sent the writer recently a fragment from the type material of *Uredo domingensis* Berk., published in 1852, in the Ann. Mag. Nat. Hist., 2d series, vol. 9, as on an unknown plant from the West Indian island of Santo Domingo. Although the fragment sent was only a centimeter square, it bore numerous sori in good condition. It was easy to see that the fungus was the uredinial stage of a *Coleosporium*. From the peculiar areolation of the smooth surfaces of the leaf it was possible tentatively to refer the host to *Plumiera*. With the assistance of Mr. Percy Wilson, of the New York Botanical Garden, this assumption was confirmed, and it was further made highly probable that it belonged to *P. rubra*, but that could not be positively confirmed. The specific name of the rust is here changed to agree with this discovery. It has also been found that *Uredo plumieriicola* P. Henn. (Hedwigia 43 : 161. 1904) is to be referred to the same species.

2. **COLEOSPORIUM IPOMOEAE** (Schw.) Burr. (on Convolvulaceae).

Ipomoea glabriuscula House, Sanarate, Dept. Guatemala, Feb. 10, 1916, II, III, 471.

Ipomoea muricata Roem. & Schult., Guatemala City, Dec. 31, 1914, II, 1.

Ipomoea Petri Donn. Sm. (*I. sericophylla* Peter, not Meissn.), San Lucas Toliman, 5,100 feet alt., Dept. Solola, Feb. 2, 1915, II, 181; Moran, Dept. Amatitlan, Dec. 22, 1916, II, 619.

It was collected by Kellerman, on *Ipomoea macrocalyx* (Ruiz & Pav.) Choisy, at Laguna, Dept. Amatitlan, Jan. 19, 1906, II, 5450, and Jan. 20, 1906, II, 5408, on *I. tyrianthina* Lindl., at Moran, Dept. Amatitlan, Jan. 25, 1906, II, 5435, and on *Pharbitis hederacea* (L.) Roth, at Laguna, Jan. 17, 1906, II, 5405, 5409, and all reported by Kern in Journ. Myc., *l. c.*

It is a common rust in both tropical and temperate America. The connection of the aecial form on pine leaves has been proven by cultures.

3. COLEOSPORIUM VIBURNI Arth. (on Caprifoliaceae).

Viburnum sp., Volcan de Agua, Dept. Sacatépquez, March 7, 1916, II, 567, 574.

A species of wide distribution in North and South America, but local and rarely collected. It undoubtedly has its aecia on leaves of pine, but they have not yet been detected.

4. COLEOSPORIUM ELEPHANTOPODIS (Schw.) Thüm. (on Carduaceae).

Elephantopus hypomalacus Blake, San Felipe, Dept. Retalhuleu, Jan. 13, 1917, II, III, 704.

This species occurs in tropical North and South America. It was collected by Kellerman on *E. mollis*, at Los Amates, Dept. Izabal, March 15, 1905, II, 5362, and reported by Kern in Journ. Myc., *l. c.*

5. COLEOSPORIUM EUPATORII Arth. (on Carduaceae).

Eupatorium collinum DC., Huehuetenango, Jan. 21, 1917, II, 758.
Eupatorium sp., Tecpan, Dept. Chimaltenango, Jan. 1, 1917, II, 659; Quezaltenango, Jan. 31, 1917, II, 812.

Common on various species of *Eupatorium* in tropical North and South America. It was collected by Kellerman on *E. collinum*, at Palmar, Dept. Quezaltenango, Feb. 11, 1906, II, 5458, and reported by Kern in Journ. Myc., *l. c.*

6. COLEOSPORIUM STEVIAE Arth. (on Carduaceae).

Stevia lucida Lag., Huehuetenango, Jan. 23, 1917, II, 772.

Stevia subpubescens Lag., Cerro Quemado, Dept. Quezaltenango, Jan. 21, 1915, II, 104.

This heteroecious species has not been reported before outside of Mexico. Aecia are not known for it.

7. COLEOSPORIUM VERBESINAE Diet. & Holw. (on Carduaceae).

Verbesina apleura Blake, Quezaltenango, Jan. 17, 1917, II, 739.

Verbesina Holwayi Rob., Quezaltenango, Jan. 17, 1917, III, 737
(with *Puccinia cognata*).

Verbesina perymenioides Sch. Bip., San Lucas Toliman, 5,100
feet alt., Dept. Solola, Feb. 2, 1915, II, iii, 172.

Verbesina scabriuscula Blake, San Felipe, Dept. Retalhuleu, Jan.
14, 1917, II, 723.

Verbesina sublobata Benth., San Rafael, Dept. Guatemala, Jan. 9,
1915, II, 51; San Lucas Toliman, 5,100 feet alt., Dept. Solola,
Feb. 2, 1915, II, 175B (with *Puccinia cognata*).

Verbesina sp., Volcan de Agua, Dept. Sacatépequez, March 7,
1916, II, 575.

The species was united with *C. Helianthi* in the N. Amer. Flora
(7 : 89. 1907), but the cultures by Hedgcock and Hunt³ indicate that
it may be distinct, an assumption which is strengthened by the much
more southern range, being common in Mexico, Central America and
the West Indies, while the Coleosporium on Helianthus is not reported
south of the United States. It was collected by Kellerman on *V.*
gigantea Jacq., Patalul, Dept. Solola, Feb. 13, 1906, II, 5385, and on
V. turbacensis H. B. K., Los Amates, Dept. Izabal, March 15, 1905,
II, 5315, and reported by Kern in Journ. Myc., l. c.

8. COLEOSPORIUM PARAPHYSATUM Diet. & Holw. (on Carduaceae).

Liabum hypochlorum Blake, San Felipe, Dept. Retalhuleu, Jan.
13, 1917, II, III, 703.

Liabum sublobatum Rob., San Lucas Toliman, Dept. Solola, Feb.
2, 1915, ii, III, 179; Retalhuleu, Feb. 26, 1916, II, 532.

Liabum sp., San Felipe, Dept. Retalhuleu, Jan. 12, 1917, II, 690.

This heteroecious species has not been reported before outside of
Mexico. Its aecia are unknown.

Family: **Uredinaceae (Melampsoraceae)**

9. MELAMPSORA BIGELOWII Thüm. (on Salicaceae).

Salix Bonplandiana Kunth, Quezaltenango, Jan. 18, 1917, II, 752.

Salix Humboldtiana stipulacea Schn., Antigua, 5,300 feet alt.,
Dept. Sacatépequez, Jan. 11, 1915, II, 72.

A heteroecious species with aecia on *Larix*, and very common in
North America, especially in the uredinial stage.

The rust appears also to be common in Guatemala. It was col-

³ An alternate form for *Coleosporium Helianthi*. Phytopath. 7: 67. 1917.

lected by Kellerman on *Salix Humboldtiana* H. B. K., near Patalul, Dept. Solola, Feb. 16, 1906, II, 5473 (Kellerm. Fungi Sel. Guat. 2), and reported by Kern in Journ. Myc., *l. c.* The willow, *S. Humboldtiana*, forms conspicuous groves in the middle altitudes.

10. MELAMPSORA ARCTICA Rostr. (on Salicaceae).

Salix taxifolia microphylla Schn., Huehuetenango, Jan. 22, 1917, II, 763.

This species of willow rust has small urediniospores, and is a somewhat common form in northern regions, especially in the mountains. It has aecia on *Abies*.

11. PHAKOPSORA VITIS (Thüm.) Syd. (on Vitaceae).

Vitis caribaea DC., Guatemala City, Jan. 7, 1917, II, 680.

This is the first record of the rust occurring upon native grapes in America. The spores from this specimen in general are smaller than usual, and the paraphyses are noticeably thickened on the convex side. The latter character is not mentioned in the diagnosis given in the North American Flora (7 : 102), where it is listed under the name *Physopella Vitis*. It is a common tropical rust, whose life history is not fully known.

12. SPIRECHINA RUBI (Diet. & Holw.) Arth. (on Rosaceae).

Rubus laxus Rydb., Huehuetenango, Jan. 21, 1917, II₂, III, 756.

Rubus Pringlei Rydb., Volcan de Agua, 7,000 feet alt., Dept. Sacatépequez, Jan. 13, 1915, II₂, 80; same March 7, 1916, II₂, 559, 560.

Rubus sp., San Rafael, Dept. Guatemala, Jan. 7, 1915, II₂, 17, 33; Quezaltenango, Jan. 13, 1917, O, II₁, II₂, III, 746.

Not until the fine specimen of this rust on *Rubus laxus* was examined did the real differences between primary and secondary uredinia in this species manifest themselves. In this specimen the under surface of the leaf is evenly covered with orange telia, the color coming from the spore contents, the walls being colorless, while the upper surface is well covered with secondary uredinia, of course unaccompanied with pycnia. All the other collections except one here listed proved to have secondary uredinia only. Comparing these collections with others from Mexico, it was not difficult to make out that in this species both primary uredinia (with pycnia) and secondary uredinia (without pycnia) are epiphyllous, and do not noticeably differ morphologically either in sori or spores. The spores of both stages origi-

nate within the epidermal cells, which they stimulate into abnormal growth. When the overarching part of the host is pushed back from the sorus, only the outer wall or upper half of the epidermal layer is involved. The species, on account of its one-celled teliospores, is often listed as *Uromyces Rubi* Diet. & Holw.

The genus *Spirechina* is here placed in the Uredinaceae (Melamporaceae) in association with *Kuehneola*. It has usually been placed near *Phragmidium*, because of its host affinities and the subcuticular pycnia, but both of these characters ally it equally well to *Pucciniastrum*. The occasional formation of intracellular urediniospores and teliospores also shows relationship to that genus. The lack of a uredinial peridium, however, places it, together with *Kuehneola*, in the subfamily Uredinatae, rather than in the Pucciniastratae.

The species was collected by Kellerman, on *Rubus glaucus* Benth., Guatemala City, Feb. 12, 1905, II, 4625; between Antigua and Volcan de Agua, Feb. 15, 1905, II, III, 5321; same, Feb. 18, 1905, II, iii, 5319, and II, 5320; on *R. poliophyllus* Focke, Volcan de Atitlan, Dept. Solola, Feb. 16, 1906, II, III, 5415; same between Antigua and Volcan de Agua, Feb. 18, 1905, II, 5363, all being reported by Kern in Mycologia. Numbers 4625 and 5363 were first erroneously reported by Kern in Journ. Myc., *l. c.*, as *Kuehneola albida*, a species not yet known south of the United States.

13. SPIRECHINA ARTHURI (Syd.) Arth. (on Rosaceae).

Rubus guyanensis Focke (?), Road between Quezaltenango and Colomba, Feb. 4, 1917, O, II₁, II₂, iii, 832.

This collection gives the first opportunity to study pycnia and uredinia of the species. Heretofore only a few urediniospores have been seen in connection with teliospores, independent uredinia not having been found.

The pycnia are amphigenous, scattered on gall-like swellings of the leaf, 0.2–1.5 cm. in diameter. They are subcuticular, golden- to chestnut-brown, discoid, 190–480 μ broad by 48–80 μ high; pycniospores ellipsoid, colorless, 3–4 μ long.

The primary uredinia are on the pycnial galls, at first circinating, afterward becoming crowded, confluent, and covering the gall. The urediniospores are 16–23 by 30–42 μ , with the walls colorless, about 1 μ thick, thickened at the apex 7–18 μ , and the apex rounded or acute.

The secondary uredinia are not on galls, but are scattered over the under surface of the leaf, round, 0.1–0.2 mm. across, pulverulent, yellow fading to white, with the ruptured epidermis inconspicuous.

The urediniospores are smaller than in the primary form, 16–19 by 24–35 μ , with the wall a little thicker, 1–1.5 μ , and not thickened above, or only moderately so, 2–8 μ .

The spirally winged sculpturing of the urediniospores is described in the N. Amer. Flora 7 : 183. The rust, showing uredinia, was detected on a phanerogamic specimen in the Gray Herbarium, on *Rubus Schiedianus* Steud., collected at Coban, Dept. Alta Vera Paz, H. von Türckheim 1149. It has not yet been taken outside of Guatemala.

14. SPIRECHINA LOESENERIANA (P. Henn.) Arth. (on Rosaceae).

Rubus sp.

A collection secured by C. & E. Seler, at Jalambohoch, Dept. Huehuetenango, August 1896, II, 2687, was described by P. Hennings under the name *Uredo Loeseneriana*, and this was later made the basis of the genus *Spirechina* by the writer. Other collections have been made in South America, which supplied telia, but no other collection has yet been reported for North America.

15. KUEHNEOLA MALVICOLA (Speg.) Arth. (on Malvaceae).

Malvaviscus arboreus Cav., Antigua, Dept. Sacatépequez, March 1, 1916, II, III, 543.

Malvaviscus mollis DC., Huehuetenango, Jan. 22, 1917, II, III, 766.

A long-cycle rust for which the pycnia are not yet known. It was collected by Kellerman, on *M. arboreus* (host determined by J. Donnell-Smith, Oct. 13, 1911), at Mazatenango, Feb. 28, 1905, II, 5375, and reported by Kern in *Mycologia* 3 : 288–290. 1911.

16. PUCCINIASTRUM SPARSUM (Wint.) Ed. Fisch. (on Ericaceae).

Arbutus sp., Cerro Quemado, Dept. Quezaltenango, Jan. 21, 1915, II, 121.

A heteroecious rust, especially common in western North America. It has not been reported before from so far south. Recent cultures by Dr. Ed. Fischer of Berne, Switzerland, show that in Europe the aecia occur on *Picea*.

17. MELAMPSORIDIUM ALNI (Thüm.) Kleb. (on Betulaceae).

Alnus acuminata H. B. K., Sololo, 7,500 feet alt., Jan. 29, 1915, II, 150.

Alnus jorullensis H. B. K., Quezaltenango, Jan. 28, 1917, II, 791.

Alnus sp., Volcan de Agua, Dept. Sacatépequez, March 7, 1916, II, 569.

A heteroecious rust more common northward. It occurs also in Europe. Only uredinia have been seen among North American collections. It was also found by Kellerman at San Rafael, Feb. 3, 1907, on an undetermined *Alnus*.

18. CEROTELIUM FICI (Cast.) Arth. (on Artocarpaceae).

Ficus padifolia H. B. K., San Felipe, Dept. Retalhuleu, Jan. 13, 1917, II, 707.

Ficus sp., San Antonio Suchitepequez, Feb. 24, 1916, II, 527; Retalhuleu, Feb. 26, 1916, II, 536.

The species was collected by Kellerman on *F. aurea* Nutt., at Gualan, Dept. Zacapa, Jan. 1, 1906, II, 5456, and reported by Kern in Journ. Myc., *l. c.*

A long-cycle rust, in America known only in the uredinial stage, although very abundant wherever *Ficus* grows. Some doubt still exists regarding the probable telial form of the American material, and there is a possibility that the generic assignment may not be right. Some mycologists prefer to list it as *Uredo Fici* Cast., or *Physopella Fici* Arth., or *Kuehneola Fici* Butl.

19. CRONARTIUM QUERCUS (Brond.) Schröt. (on Fagaceae).

Quercus sp., San Rafael, Dept. Guatemala, Jan. 10, 1915, II, 56; Guatemala City, Feb. 14, 1917, II, 866.

The species was collected by Kellerman on *Q. tomentosa* Willd., at Guatemala City, Feb. 2, 1905, II, 5304, and reported by Kern in Journ. Myc., *l. c.* Northward the species forms large aecial galls on the branches of pine, but they have not been seen in Guatemala.

20. CRONARTIUM COLEOSPORIOIDES (Diet. & Holw.) Arth. (on Scrophulariaceae).

Castilleja tenuiflora Benth., Solola, 5,300 feet alt., Jan. 27, 1915, II, iii, 125a; Antigua, Dept. Sacatépequez, Dec. 27, 1916, II, 644; Quezaltenango, Jan. 28, 1917, II, 788.

Castilleja sp., Quezaltenango, Jan. 16, 1917, II, 726.

Lamourouxia cordifolia Schl. & Cham., Guatemala City, Jan. 9, 1917, II, III, 685.

Lamourouxia dependens Benth., Volcan de Agua, Dept. Sacatépequez, March 7, 1916, II, 568.

Lamourouxia rhinanthifolia H. B. K., Quezaltenango, Jan. 21, 1915, II, 101.

This heteroecious rust is especially abundant in the western mountains of North America. It produces its aecia on the twigs and trunks of various species of pine. Its occurrence on *Lamourouxia* has not been reported before.

21. *CIONOTHRIX PRAELONGA* (Wint.) Arth. (on *Carduaceae*).

Eupatorium morifolium Mill., Guatemala City, Feb. 15, 1916, 491;
same, Jan. 9, 1917, 688; same, Feb. 8, 1917, 840.

Eupatorium odoratum L., Mazatenango, Dept. Suchitepequez,
Feb. 22, 1916, 525.

Eupatorium sp., Agua Caliente, Dept. Guatemala, Feb. 10, 1917,
852.

A short-cycle species. The genus contains forms with telia very similar to those of the long-cycle *Cronartium*. It was collected by Kellerman on *E. populifolium* H. B. K., at Los Amates, Dept. Izabal, March 15, 1905, 5301, 5302, and reported by Kern in *Mycologia*, *l. c.*

22. *ALVEOLARIA CORDIAE* Lagerh. (on *Ehretiaceae*).

Cordia riparia H. B. K., Colomba, Dept. Quezaltenango, Feb. 2,
1917, 821.

An interesting short-cycle species which probably forms no pycnia. It occurs also in the West Indies and South America.

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