ARCHITECTURE OF DICOTYLEDONOUS WEEDS IN SOME AREAS OF BANYUMAS REGENCY CENTRAL JAVA

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ABSTRAK -i

B. SUNARNO & F. HALLE. 1986, Arsitektur jenis-jenis gulma dik^til di beberapa daerah Banyumas, Jawa Tengah. *Bcriia Biologi* 3(4): 146 - 154 — Pengamatan lapangan dilakukan untuk mengetahui jenis-jenis gulma dikotil yang pola pertumbuhannya mirip dengan model arsitektur pohon. Hasilnya menunjukkan adanya 14 model pada 180 jenis gulma yang tumbuh di 4 daerah Kecamatan di Kabupaten Banyumas. Model yang paling umum dijumpai adalah model STONE, model LEETJ-WENBERG dan model ATTIMS. Suku yang dianggap kaya dengan model antara lain Euphorbiaceae (10 jenis). Lamiaceae (14 jenis), Papilionaceae (20 jenis) yang masing-masing memiliki 5 model dan Asteraceae (37 jenis) dengan 4 model. Marga polimorfik dijumpai pada *Cassia, Desmodium,* dan *Lindernia* yang masing-masing dengan 3 model dan pada *Mimosa. Ocimum, Polygala* serta *Pluchea* masing-masing memiliki 2 model. Dalam penelitian ini tidak diketemukan model arsitektur yang baru.

INTRODUCTION

The tree architecture has been considered as visible, morphological expression of genetic blueprint of a tree at any one time. The series of tree architectures in an ideal circumstance determines the growth program that is genetically stable. The growth program which determines the successive architectural phases is here referred as a model. There are 24 recognized tree models in which 23 models have been named after well known botanists (Halle *et al.* 1978).

On the basis of architectural model merely as an important approach to the understanding of plant constructional principles regardless of size, Cremers (1973), Cremers (1974) and Jeannoda-Robinson (1977) analyzed the architecture of lianes and herbaceous plants. The diversity of weed species with varying morphological features is a great source with respect to the occurrence of various models. But little attention has been paid to weed architecture. The concept of weed is extended accordingly, to include plants having a rapid vegetative and generative growth, numerous fruits and seeds, wide tolerance to environmental factors, and high competitive ability (Baker 1974). In this context weeds include ruderal plants, agricultural weeds, and herbs and other wild plants with a height not exceeding 3 meters with low-branching appearance.

The present study is mainly concerned with description of the architecture of dicotyledonous weeds which conform to tree models growing in followed land in Centra! Java.

MATERIALS AND METHODS

The observation was conducted in Wangon. Purwokerto. Baturaden and Cilongok, Banyumas regency. Central Java. The Backer & Bakhuizen van den Brink Jr.'s (1963 - 1968) Flora of Java was used for identification of specimen. Each architectural phase and the natural habits of the observed weeds were diagramatically illustrated. Determination of architectural models, at least after carefull examination of all considerable phases, was carried following Halle *et al.* (1978).

RESULTS AND DISCUSSION

The 180 weed species examined, belonging to 111 genera and 42 families, conform to 14 known tree models (Table 1). The rapid flowering and fruiting of the majority of species during the examination was the main difficulty in the determination of the models. The differentiation of growing tips into flowers or inflorescences supersede the branch formation. This phenomenon is

known as "neoteny" (Halle *et al.* 1978) which implies the loss of several proceeding vegetative differentiation sequences. In determining the models. therefore, it was necessary to find individual weeds with complete branching. Neoteny is related to reproductive strategy of weeds to insure the continuity of such short-live species. This contrasts to the mode of life of big forest tree, which generally posses a long vegetative growth period before flowering. With an exception of *Cassia occidentalis* which has RAUH'S model (Halle *et al.* 1978) rhytmic growth is rarely found in the observed weeds.

The size factor does not influence the growth pattern of any models. *Oxalis corymbosa* (Fig.IA) and *Biophytum reinwardtii* (Fig. IB) with a maximum height of about 15 cm share a similar mode! with *Areca catechu* or *Cocos nucifera* (CORNFR'3 model) which have more than 35 meters in maximum height. *Euphorbia parviflora* (Fig. 2A) and *Basillicumpolystachyon* (Fig. 2B), herbs with 0.1 — 0.5 m in height, exhibit TROLL'S and PETIT'S models similar to *Pterocarpus indicus* and *Morinda citrifolia.* respectively. There are numerous other reasonable comparisons which could not be mentioned here. Figure no. 3 shows the representative weeds conformed with 14 of the 24 models of trees.

The families rich in models were Euphorbiaceae (10 species), Lamiaceae (14 species) and Papilionaceae (20 species), each possessing 5 models, Asteraceae (37 species) has 4 models. Euphorbiaceae is also considered as a family rich in tree models (Halle 1971). The common models in the observed weeds were ATT1MS'. LEEUWENBERG'S and STONE'S models with the conformed species number of 51 (28,3%). 48 (26,6%) and 36 (20%), respectively. The common models are appropriately related to the weed reproductive strategy as is shown by their general characteristics, i.e. pleonanthy. neoteny and modular in growth with numerous inflorescences or flowers. Polymorphic genera having three models each were *Cassia, Lindernia* and *Desmodium* and those having two models were *Ocimum, Mimosa, Polygala* and *Pluchea.* No new model has been recorded in this observation. Distinct models initially observed in some weeds, turned out to be reduced forms of known models.

It was concluded that the key to tree architectural models can be used in determining dicotyledonous weed architectures in the field. Evidently the size factor does not influence architectural models in plant as a whole. The difference between the weed and tree architectures is only in the growth strategies conforming with their reproductive biologies. Weeds with relatively short lifespan have a strategy of high reproductive ability, characterized by neoteny and pleonanthy. Consequently a more carefull examination is necessary before Halle's key to tree models is applied to weeds. Studies over a wide area to explore the architectural model of weeds, and observation of monocotyledonous species is required to make it possible to find out new models in weeds.

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Table 1. Architectural weed models and their member species found in the observed areas

Models	Species	Family
ATTIMS'	*Acalypha boehmerioides* Miq.	Euphorbiaceae
	A. indica L.	—„—
	Alternanthera sessilis **R. Br.**	Amaranthaceae
	Ammania baccifera L.	Ammaniaceae
	A. microcarpa D.C.	- „ -
	Barleria cristata L.	Acanthaceae
	Borreria alata (Aubl.) DC.	Rubiaceae
	B. articularis (L.f.) F .N.Will.	- „ -
	B. brachystema (Bth.) Vahl.	—»—
	B. laevis (Lamk.) Griseb.	—"—
	B. ocymoides (BurmX) R.Br.	- „ -
	Cassia obtusifolia L.	Caesalpiniaceae
	Cleome aspera Koen.	Capparidaceae
	Clitoria laurifolia L.	PapiHonaceae
	Desmodium heterophyllum DC.	- „ -
	D. trifolium DC.	- „ -
	Diodia ocymifolia (R. &S.)Brem.	Rubiaceae
	D. sarmentosa Swartz.	- „ -
	Dipteracanthus repens (t.) Hassk.	Acanthaceae
	Flemingia congesta Roxb.	Papilionaceae
	F. lineata Roxb.	—„-
	Fleurya aestuans Gaud.	Urticaceae
	F. intemtpta Gaud.	-„—
	HedyotisdiffusaWM.	Rubiaceae

Table 1. Continued

Models	Species	Family
	H. vertidllata (L.) Lamk.	—„—
	H.vestita G.Don.	—f)—
	Hyptis brevipes Poit.	Lamiaceae
	H. pectinata (L.)Poit.	—„—
	H. rhomboidea Mart. & Gal.	- „ -
	H. suaveolens (L.) Poit.	—(—
	Impatiens balsamina L.	Balsaminaceae
	/. *platypetala* lindl.	—„—
	Indigofera suffuticosa Mill.	Papilionaceae
	/. *sumatrana* Gaertn.	—„—
	Jussieua erecta L.	Onagraceae
	/. toi/o/w Vahl.	- „ -
	Lantana camara L.	Verbenaceae
	i. *trifolia* L.	—„—
	Lauren tia longiflora (L.) Petern.	Campanulaceae
	Leucas lavandulifolia Smith.	Lamia ceae
	i. *zeylanica* (L.) R. Br.	—„—
	Lindemia anagallis (Burm.f.) Penn.	S chrophulariaceae
	Z„ *Crustacea* (L.) F. v.M.	—„—
	i. *procumbens* (Crock.) Philcox.	—„—
	Ludwigia parviflora Roxb.	Onagraceae
	i. *prostrata* Roxb.	- „ -
	Poknisia viscosa DC.	Capparidaceae
	Poly gala glomerata Lour.	Polygalaceae
	Scoparia dulcis L.	Schrophulariaceae
	Sesamum orientate L.	Pedaliaceae
	Smithia sensitiva Ait.	Papilionaceae

Table 1. Continued

Models	Species	Family
	Triumfetta indica (L.) Backer	Tiliaceae
	Urena lobata L.	Malvaceae
CHAMBER-LAIN'S	*Asclepias currasavica* L.	Asclepiadaceae
	Drosera indica L.	Droseraceae
	Leea rubra Bl.	Leeaceae
CHAMPAG-NAT 'S	*Mimosa invisa* Mart.	Mimosaceae
	Orthosiphon aristatus Miq.	Lamiaceae
	Rubus chrysophyllus Miq.	Rosaceae
COOK'S	*Phyllanthus niruri* L.	Euphorbiaceae
	P. urinaria L.	—„—
	Sauropus androgynus (L.) Merr.	— „—
CORNER'S	*Biophytum reinwardtii* Klotsch.	Oxalidaceae
	Oxalis corymbosa DC.	- „ -
HOLTTUM'S	*Crepis japonica* Bth.	Asteraceae
LEEUWEN-BERG'S	*Achyranthes aspera* L.	Amarantha-ceae
	Borreria repens DC.	Rubiaceae
	Capsicum frutescens L.	Solanaceae
	Centipeda minima (L.) A.Br. & Asch.	Asteraceae
	Qidemia hirta (L.) D. Don.	Melastoma-ceae
	Crotalaria anagyroides L.	PapiBona-ceae
	C. retusa L.	—.,-
	C. usaramoensis Baker f.	—„—

Table 1. Continued

Models	Species	Family
	Cyathula prostrata Bl.	Amarantha-ceae
	Eclipta prostrata (L.) L.	Asteraceae
	Eleuteranthera ruderalis (Sw.) Sch. Bip.	—«—
	Galinsoga parviflora Cav.	- „ -
	Hedyotis corymbosa (L.) Lamk.	Rubiaceae
	Heliotropium indicum L.	Boragina-ceae
	Hemigraph is javanica Brem.	Acanthaceae
	H. brunelloides (Lamk.) Brem.	—.—
	Lindemia ciliata (CoIsm.) Penn.	Schrophula-riaceae
	L. multiflora (Roxb.) Mukherjee^	—„—
	Mirabilis jalapa L.	Nyctagina-ceae
	Mollugo pentaphylla L.	Aizoaceae
	Ocimum americanum L.	Lamiaceae
	O. sanctum L.	- „ -
	O. species	- „ -
	Pectis ciliaris L.	Asteraceae
	Peperomia pellucida Kth.	Piperaceae
	Physalis angulata L.	Solanaceae
	P. minima L.	- „ -
	Pluchea sp.	Asteraceae
	Poly gala paniculata L.	Polygala-ceae
	Portulaca oleracea L.	PortuJaca-ceae
	Richardia brasiliensis Gomez.	Rubiaceae
	Ricinus communis L.	Euphorbia-ceae

Table 1. Continued

Models	Species	Family
LEEUWEN-BERG'S	*Rostellularia obtusa* Nees.	Acanthaceae
	Salvia riparia H.B.K.	Lamia ceae
	Solanurti comitis DunaL	Solanaceae
	S. melongena L. f. *spontanea*	—„—
	S. torvum Sw.	—„—
	Sphaeranthus africanus L.	Asteraceae
	S. indicus L.	—„—
	Spigelia anthelmia L.	Loganiaceae
	SpUanthes iabadicensis A.H. Moore	Asteraceae
	S. paniculata DC.	—„—
	Stachytarpheta indica (L.) Vahl.	Verbenaceae
„„;..	*S. jamaicensis* (L.) Vahl	—„—
	Synedrella nodiflora (L.) Gaertn.	Asteraceae
	Tephrosia noctiflora Bojer	Papilionaceae
	Wedelia montana (BL) Boerlage	Asteraceae
MCCLURE'S	*Polygonum barbatum* L.	Polygonaceae
	P. *chinense* L.	—„—
	P. caespitosum BL	—„—
PETIT'S	*Abelmoschus tnoscatus* Medik.	Malvaceae
	Basilicum polystacfcyon (L.) Moench.	Lamia ceae
	Phyllanthus maderaspatensis L.	Euphorbiaceae
	Piper aduncum L.	Piperaceae
RAUH'S	Cassia *occidentalis* L.	Caesalpiniaceae

Takel 1. Contiuned

Models	Species	Family
SCARRONE?	*Bidens biternata* (Lour.) She'riff.	Asteraceae
	B. pilosa L.	—„—
	Cassia alata L.	Caesalpiniaceae
	Cosmos caudatus H.BJC.	Asteraceae
	Melastoma affine D.Doh.	Melastomaceae
STONE'S	*Adenostema lavenia* (L.) O.K.	Asteraceae
	Ageratum conyzoides L.	—„—
	A. houstonianum Mill.	—„—
STONE'S	*Alysicarpus nummularifolius* DC.	Papilionaceae
	Amaranthus lividus L.	Amaranthaceae
	A. spinosus L.	—„—
(L.) DC	*Blumea balsamifera*	Asteraceae
	5. /acera (Burm.f.)DC.	—„—
	B. riparia (Bl.)DC.	—„—
	B. mollis (DDon.) Merr.	- „ -
	J?. *sessiliflora* Decne.	- „ -
	Boerhavia erecta L.	Nyctaginaceae
-	*Celosia argentea* L.	Amaranthaceae
	Chromolaena odoraia (L.) R.M.King & B.L. Rob.	Asteraceae
	Desmodium capitatum DC.	Papilionaceae
	D. heterocarpum'hC.	- „ -
	D. triquetrum DC.	—„—
	Diochrocephdia bicolor (Roth.)Sch.	Asteraceae
(L)Bl	*Dysophylla auricularia*	Lamia ceae

Table 1. Continued

Models	Species	Family
	Emilia sonchifolia (L.) Wight.	Asteraceae
	Erechtites valerianifolia (Wolf.) DC.	—„—
	Eupaforium inulifolium H.B.K.	—„—
	Flemingia strobilifera R.Br.	Papiliona-ceae
	Gynura procumbens (Lour.) Men.	Asteraceae
	Hypericum mutilum (Hornera.) Bold.	Hyperica-ceae
	Lindernia viscoso (Hornem.) Bold.	Schrophu-iariaceae
	Mikania cordata (Burm.f.) B.L. Rob.	Asteraceae
	Nasturtium indicum L.	Brasicaceae
	Ocimum gratissimum L.	Lamia ceae
	Pluchea indica (L.) Less	Asteraceae
	Sonchus arvemis L.	—„—
	Sphenoclea zeylanica Gaertn.	Sphenoclea-ceae
	Tridax procumbens L.	Asteraceae
	Vemonia cinerea (L.) Less.	—„—
	V. patula (Dryand.) Merr.	—„—

Table 1. Continued

Models	Species	Family
TOMLIN-SON'S	*Centella asiatica* Urb.	Apiaceae -
	Elephantopus scaber L.	Asteraceae
	Eryngium foetidum L.	Apiaceae
TROLL'S	*Aeschynomene americana* L.	PapiHona-ceae
	Corchorus acutangulus Lamk.	Tiliaceae
	Euphorbia hirta L.	Euphorbia-ceae
	E. microphylla Roth.	—„—
	E. parviflora L.	—„—
	Desmodium gangeticum DC.	PapiUona-ceae
	Ficus hirta L.	Mora ceae
	F. quercifolia Roxb.	—„—
	Mimosa asperata L.	Mimosaceae
	M. pudica L.	—»»—
	Pilea microphylla Liebm.	Urticaceae
	Sida acuta L.	Malvaceae
	Sida retusa L.	—„—
	Sida rhombifolia L.	-„-

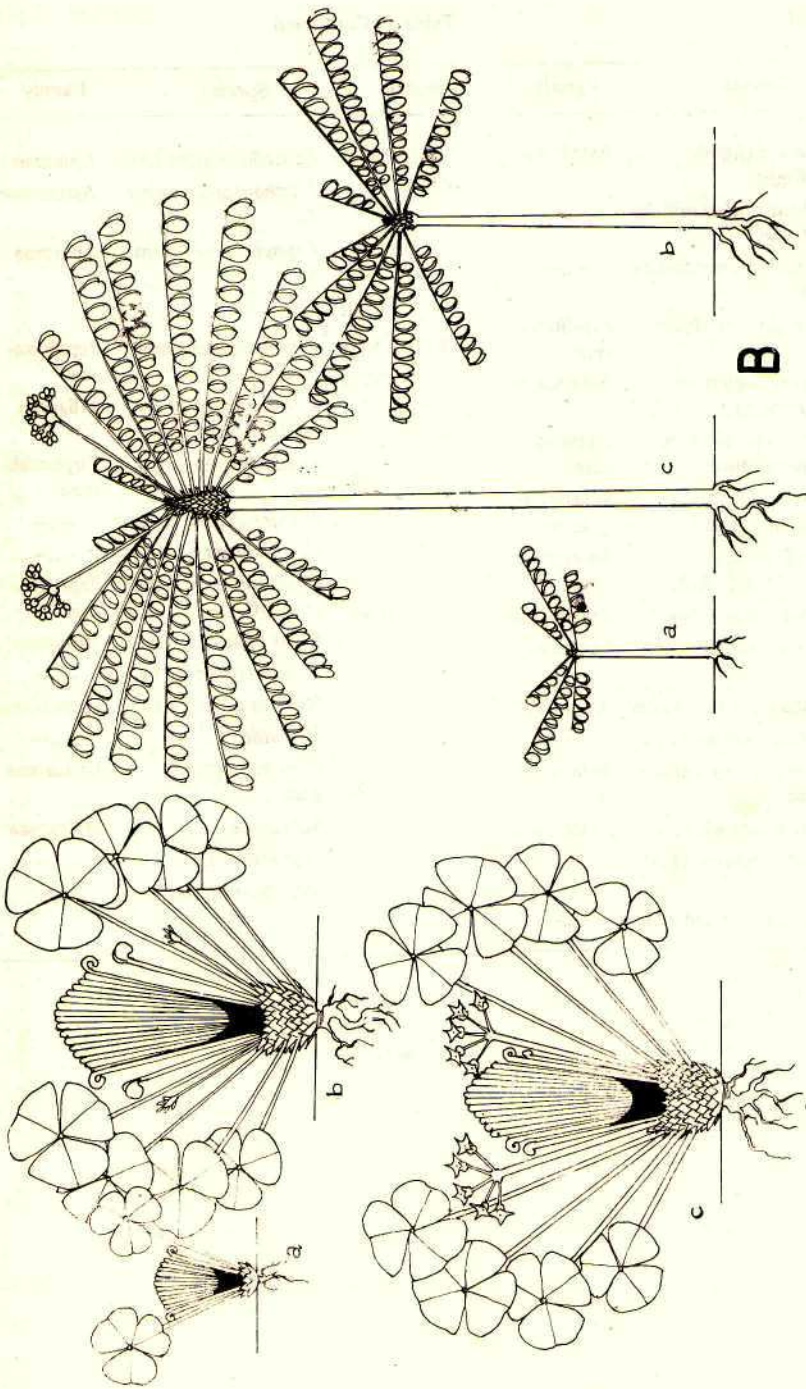

Fig. 1A : *Oxalis corymbosa.*

Fig. 1B : *Biophytum reinwardtii.*

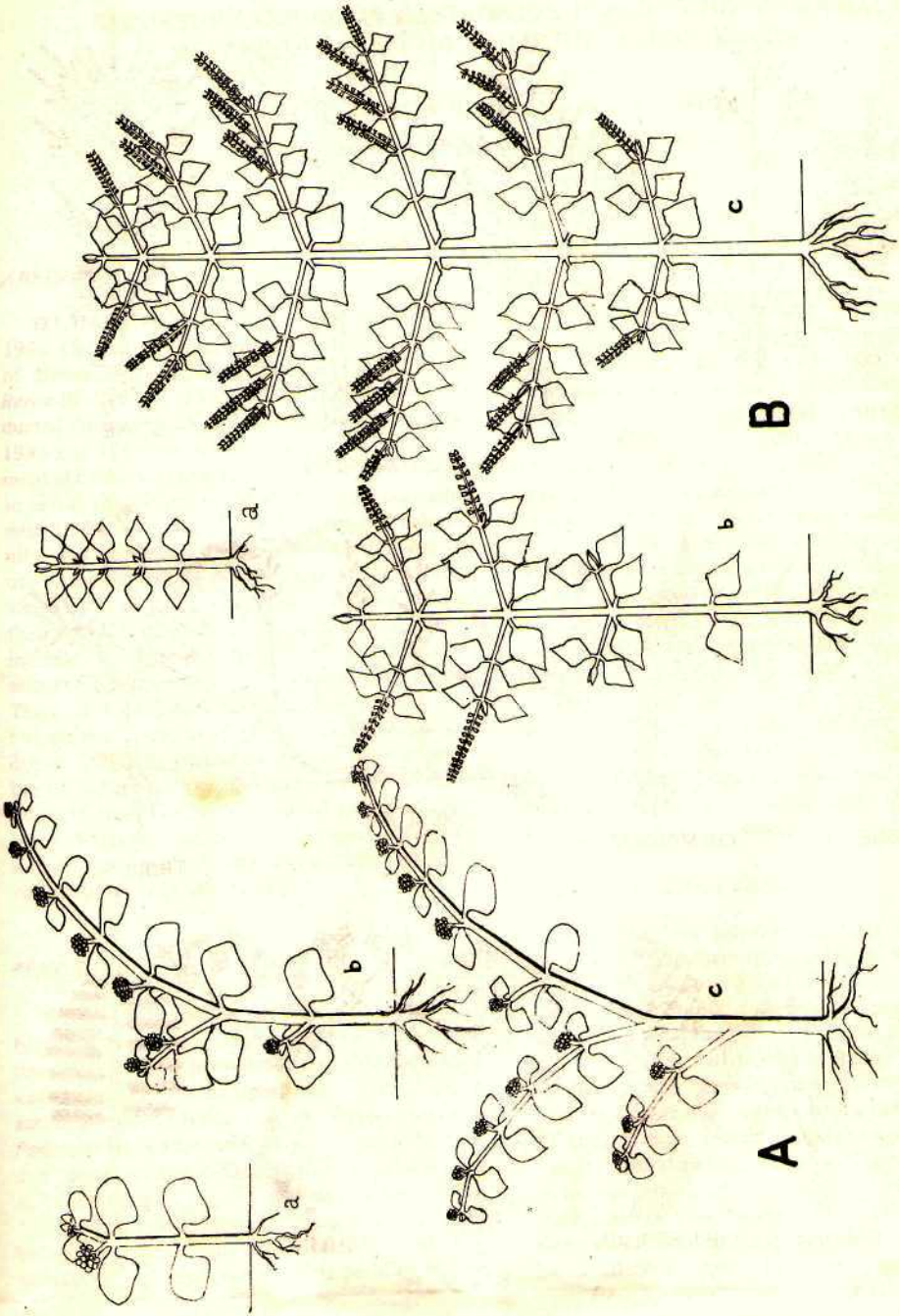

Fig. 2A : *Euphorbia parviflora.*

Fig. 2B : *Basilicum polystachyon.*

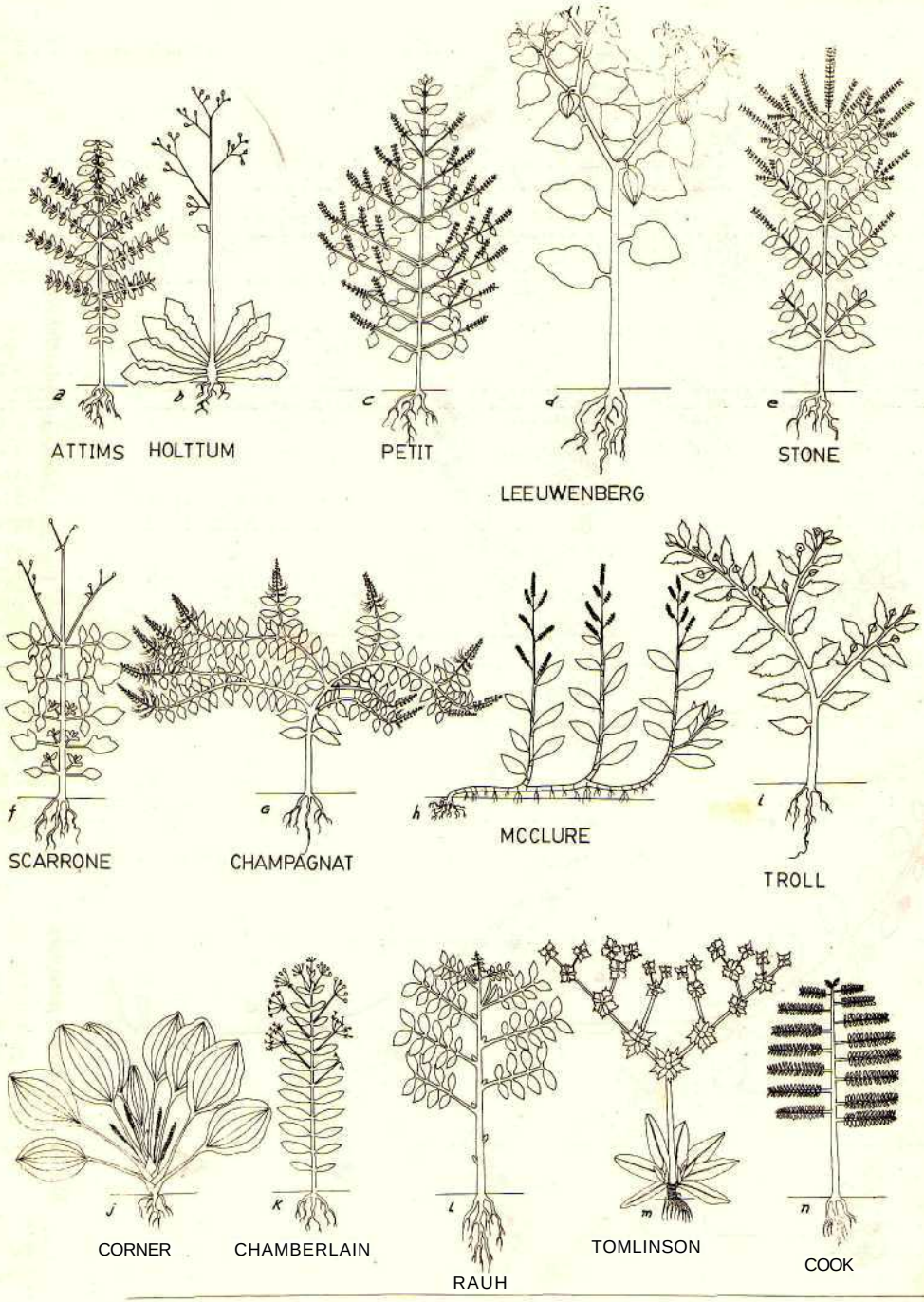

Fig. 3 : The observed 14 weed models in the study (example for the member species see table 1)