

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

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ABSTRAK

B. SUNARNO & F. HALLE. 1986, Arsitektur jenis-jenis gulma dik^util di beberapa daerah Banyumas, Jawa Tengah. *Berita 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 Central 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 diagrammatically illustrated. Determination of architectural models, at least after careful 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 preceding 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) rhythmic growth is rarely found in the observed weeds.

The size factor does not influence the growth pattern of any models. *Oxalis corymbosa* (Fig. 1A) and *Biophytum reinwardtii* (Fig. 1B) with a maximum height of about 15 cm share a similar mode! with *Areca catechu* or *Cocos nucifera* (CORNF'R3 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 ATTIMS', 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. pleonanthly, 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 dicotyle-

donous 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 pleonanthly. 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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REFERENCES

- BACKER, C.A. & BAKHUIZEN VAN DEN BRINK JR. 1963/1968. *Flora of Java*. Vo. I - III, NVP. Noordhoff. Groningen.
- BAKER, H.G. 1974. The evolution of weeds. *Annual Review of Ecology and Systematics* 5 : 1 - 23.
- CREMFRS, G. 1973. Architecture de quelques Hanes d'Afrique tropicale. *Candollea* 28 : 249 — 280.
- CREMERS, G. 1974. Architecture de quelques hanes d'Atrique Tropicale. 2. lianes dont L'architecture est originate- *Candollea* 29 : 57 — 110.
- HALLE, F. 1971. Architecture and growth of tropical trees exemplified by the Euphorbiaceae. *Biotropica* 3(1) : 56 - 62.
- HALLE, F., OLDEMAN R.A.A. & TOMLINSON, P.B. 1978. *Tropical trees and forest; an architectural analysis*. Springer-verlag, Berlin.
- JEANNODA-ROBINSON, V. 1977. *Contribution a l'etude de Varchitecture des Herbes*. These. Universite de Sciences et Technique du Languedoc, Montpellier (Unpublished).

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

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

Table 1. Continued

Models	Species	Family
	<i>H. verticillata</i> (L.) Lamk.	—, —
	<i>H. vestita</i> G.Don.	—, —
	<i>Hyptis brevipes</i> Poit.	Lamiaceae
	<i>H. pectinata</i> (L.) Poit.	—, —
	<i>H. rhomboidea</i> Mart. & Gal.	—, —
	<i>H. suaveolens</i> (L.) Poit.	—, —
	<i>Impatiens balsamina</i> L.	Balsaminaceae
	<i>I. platypetala</i> Lindl.	—, —
	<i>Indigofera suffruticosa</i> Mill.	Papilionaceae
	<i>I. sumatrana</i> Gaertn.	—, —
	<i>Jussiaea erecta</i> L.	Onagraceae
	<i>I. toi/o/w</i> Vahl.	—, —
	<i>Lantana camara</i> L.	Verbenaceae
	<i>i. trifolia</i> L.	—, —
	<i>Laurentia longiflora</i> (L.) Petern.	Campanulaceae
	<i>Leucas lavandulifolia</i> Smith.	Lamiaceae
	<i>i. zeylanica</i> (L.) R. Br.	—, —
	<i>Lindemia anagallis</i> (Burm.f.) Penn.	Schrophulariaceae
	<i>Z. Crustacea</i> (L.) F. v.M.	—, —
	<i>i. procumbens</i> (Crock.) Philcox.	—, —
	<i>Ludwigia parviflora</i> Roxb.	Onagraceae
	<i>i. prostrata</i> Roxb.	—, —
	<i>Poknisia viscosa</i> DC.	Capparidaceae
	<i>Polygala glomerata</i> Lour.	Polygalaceae
	<i>Scoparia dulcis</i> L.	Schrophulariaceae
	<i>Sesamum orientale</i> L.	Pedaliaceae
	<i>Smithia sensitiva</i> Ait.	Papilionaceae

Table 1. Continued

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

Table 1. Continued

Models	Species	Family
	<i>Cyathula prostrata</i> Bl.	Amarantha-ceae
	<i>Eclipta prostrata</i> (L.) L.	Asteraceae
	<i>Eleuteranthera rude-ralis</i> (Sw.) Sch. Bip.	—, —
	<i>Galinsoga parviflora</i> Cav.	- ,, -
	<i>Hedyotis corymbosa</i> (L.) Lamk.	Rubiaceae
	<i>Heliotropium indi-cum</i> L.	Boragina-ceae
	<i>Hemigraphis java-nica</i> Brem.	Acanthaceae
	<i>H. brunelloides</i> (Lamk.) Brem.	—, —
	<i>Lindemia ciliata</i> (CoIs.) Penn.	Schrophula-riaceae
	<i>L. multiflora</i> (Roxb.) Mukherjee^	—, —
	<i>Mirabilis jalapa</i> L.	Nyctagina-ceae
	<i>Mollugo pentaphylla</i> L.	Aizoaceae
	<i>Ocimum americanum</i> L.	Lamiaceae
	<i>O. sanctum</i> L.	- ,, -
	<i>O. species</i>	- ,, -
	<i>Pectis ciliaris</i> L.	Asteraceae
	<i>Peperomia pellucida</i> Kth.	Piperaceae
	<i>Physalis angulata</i> L.	Solanaceae
	<i>P. minima</i> L.	- ,, -
	<i>Pluchea</i> sp.	Asteraceae
	<i>Poly gala paniculata</i> L.	Polygala-ceae
	<i>Portulaca oleracea</i> L.	PortuJaca-ceae
	<i>Richardia brasili-ensis</i> Gomez.	Rubiaceae
	<i>Ricinus communis</i> L.	Euphorbia-ceae

Table 1. Continued

Models	Species	Family
LEEUWEN- BERG'S	<i>Rostellularia obtusa</i> Nees.	Acanthaceae
	<i>Salvia riparia</i> H.B.K.	Lamiaceae
	<i>Solanum comitis</i>	Solanaceae
	Dunal	
	<i>S. melongena</i> L. f. spontanea	—, —
	<i>S. torvum</i> Sw.	—, —
	<i>Sphaeranthus africanus</i> L.	Asteraceae
	<i>S. indicus</i> L.	—, —
	<i>Spigelia anthelmia</i> L.	Loganiaceae
	<i>Spilanthes iabadiensis</i> A.H. Moore	Asteraceae
	<i>S. paniculata</i> DC.	—, —
	<i>Stachytarpheta indica</i> (L.) Vahl.	Verbenaceae
	<i>S. jamaicensis</i> (L.) Vahl	—, —
	<i>Synedrella nodiflora</i> (L.) Gaertn.	Asteraceae
<i>Tephrosia noctiflora</i> Bojer	Papilionaceae	
<i>Wedelia montana</i> (BL) Boerlage	Asteraceae	
MCCLURE'S	<i>Polygonum barbatum</i> L.	Polygonaceae
	<i>P. chinense</i> L.	—, —
	<i>P. caespitosum</i> BL	—, —
PETIT'S	<i>Abelmoschus moscatus</i> Medik.	Malvaceae
	<i>Basilicum polystachyon</i> (L.) Moench.	Lamiaceae
	<i>Phyllanthus madraspatensis</i> L.	Euphorbiaceae
	<i>Piper aduncum</i> L.	Piperaceae
RAUH'S	<i>Cassia occidentalis</i> L.	Caesalpinaceae

Tabel 1. Continued

Models	Species	Family
SCARRO- NE?	<i>Bidens biternata</i> (Lour.) Sheriff.	Asteraceae
	<i>B. pilosa</i> L.	—, —
	<i>Cassia alata</i> L.	Caesalpinaceae
	<i>Cosmos caudatus</i> H.B.J.C.	Asteraceae
STONE'S	<i>Melastoma affine</i> D.Doh.	Melastomaceae
	<i>Adenostema lavenia</i> (L.) O.K.	Asteraceae
	<i>Ageratum conyzoides</i> L.	—, —
	<i>A. houstonianum</i> Mill.	—, —
STONE'S	<i>Alysicarpus nummularifolius</i> DC.	Papilionaceae
	<i>Amaranthus lividus</i> L.	Amaranthaceae
(L.) DC	<i>A. spinosus</i> L.	—, —
	<i>Blumea balsamifera</i> (L.) DC	Asteraceae
	<i>B. /acera</i> (Burm.f.) DC.	—, —
	<i>B. riparia</i> (Bl.) DC.	—, —
	<i>B. mollis</i> (DDon.) Merr.	—, —
	<i>J?. sessiliflora</i> Decne.	—, —
	<i>Boerhavia erecta</i> L.	Nyctaginaceae
	<i>Celosia argentea</i> L.	Amaranthaceae
	<i>Chromolaena odorata</i> (L.) R.M. King & B.L. Rob.	Asteraceae
	<i>Desmodium capitatum</i> DC.	Papilionaceae
<i>D. heterocarpum</i> H.C.	—, —	
<i>D. triquetrum</i> DC.	—, —	
<i>Diachrocephala bicolor</i> (Roth.) Sch.	Asteraceae	
<i>Dysophylla auricularia</i>	Lamiaceae	
(L)BI		

Table 1. Continued

Models	Species	Family
	<i>Emilia sonchifolia</i> (L.) Wight.	Asteraceae
	<i>Erechtites valerianifolia</i> (Wolf.) DC.	—,—
	<i>Eupatorium inulifolium</i> H.B.K.	—,—
	<i>Flemingia strobilifera</i> R.Br.	Papilionaceae
	<i>Gynura procumbens</i> (Lour.) Men.	Asteraceae
	<i>Hypericum mutilum</i> (Hornera.) Bold.	Hypericaceae
	<i>Lindernia viscosa</i> (Hornem.) Bold.	Schrophulariaceae
	<i>Mikania cordata</i> (Burm.f.) B.L. Rob.	Asteraceae
	<i>Nasturtium indicum</i> L.	Brassicaceae
	<i>Ocimum gratissimum</i> L.	Lamiaceae
	<i>Pluchea indica</i> (L.) Less	Asteraceae
	<i>Sonchus arvensis</i> L.	—,—
	<i>Sphenoclea zeylanica</i> Gaertn.	Sphenocleaceae
	<i>Tridax procumbens</i> L.	Asteraceae
	<i>Vernonia cinerea</i> (L.) Less.	—,—
	<i>V. patula</i> (Dryand.) Merl.	—,—

Table 1. Continued

Models	Species	Family
TOMLINSON'S	<i>Centella asiatica</i> Urb.	Apiaceae -
	<i>Elephantopus scaber</i> L.	Asteraceae
	<i>Eryngium foetidum</i> L.	Apiaceae
TROLL'S	<i>Aeschynomene antiricaria</i> L.	Papilionaceae
	<i>Corchorus acutangulus</i> Lamk.	Tiliaceae
	<i>Euphorbia hirta</i> L.	Euphorbiaceae
	<i>E. microphylla</i> Roth.	—,—
	<i>E. parviflora</i> L.	—,—
	<i>Desmodium gangeticum</i> DC.	Papilionaceae
	<i>Ficus hirta</i> L.	Moraceae
	<i>F. quercifolia</i> Roxb.	—,—
	<i>Mimosa asperata</i> L.	Mimosaceae
	<i>M. pudica</i> L.	—,—
	<i>Pilea microphylla</i> Liebm.	Urticaceae
	<i>Sida acuta</i> L.	Malvaceae
	<i>Sida retusa</i> L.	—,—
	<i>Sida rhombifolia</i> L.	—,—

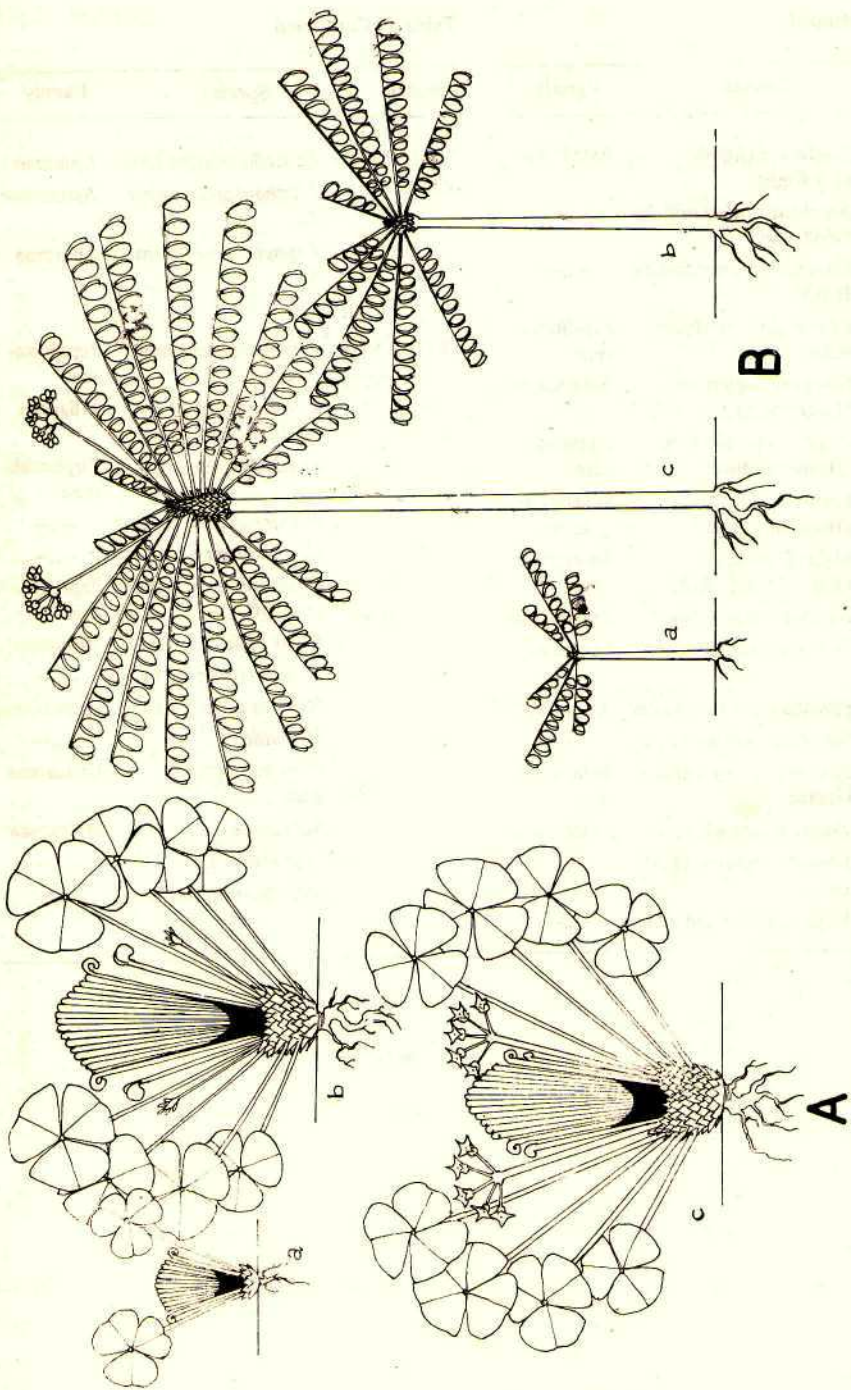


Fig. 1A : *Oxalis corymbosa*.

Fig. 1B : *Biophytum reinwardtii*.

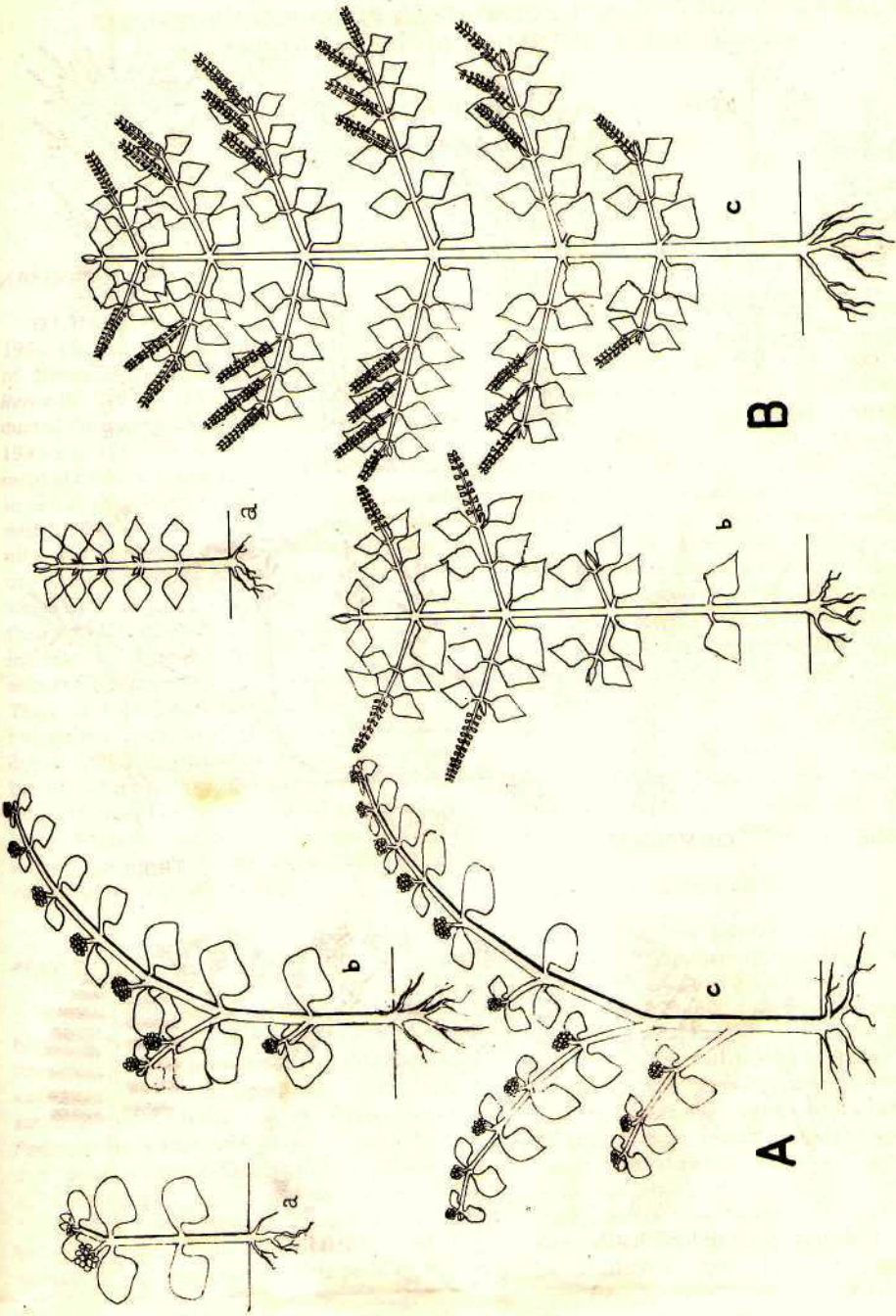


Fig. 2A : *Euphorbia parviflora*.

Fig. 2B : *Basilicum polystachyon*.

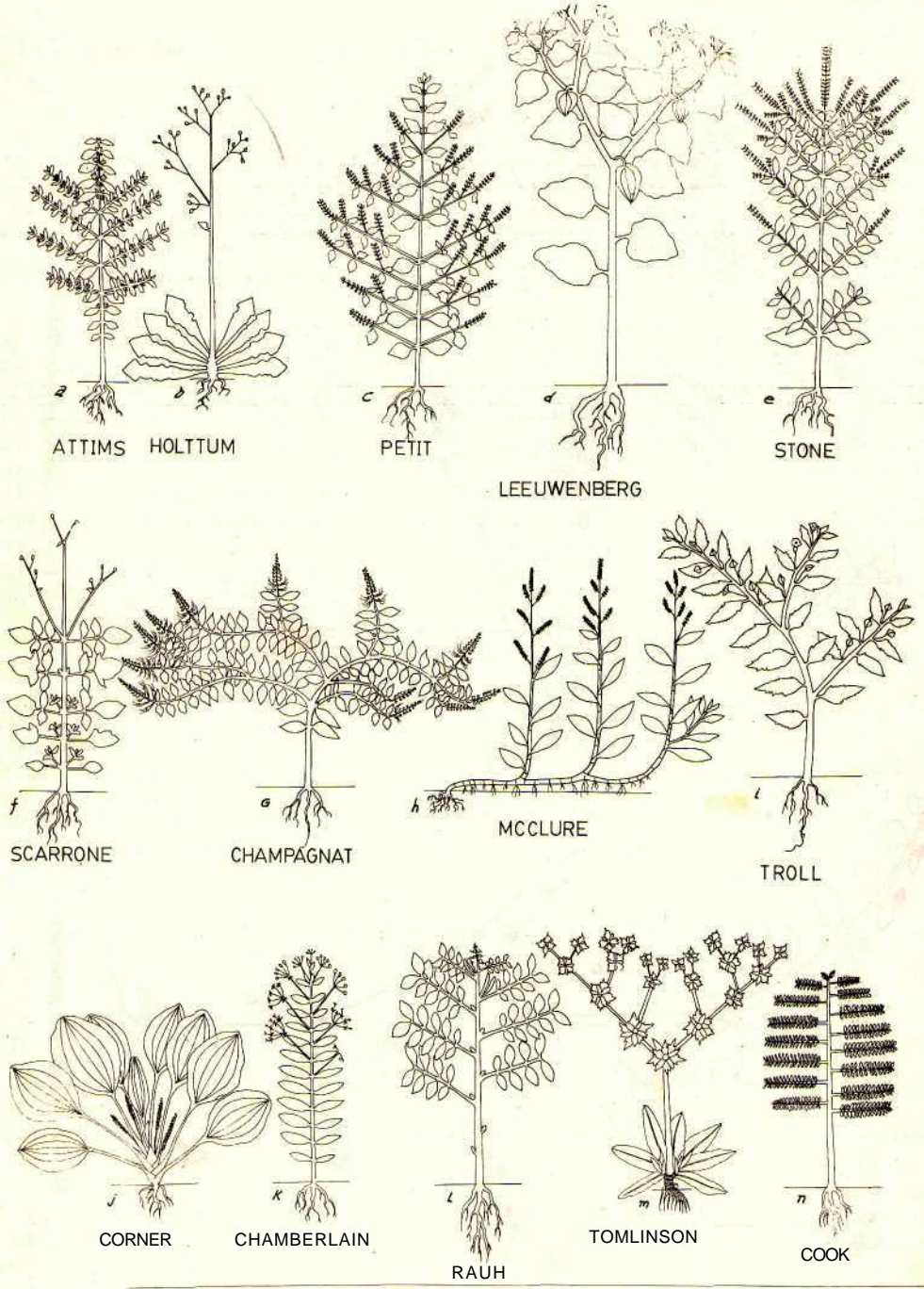


Fig. 3 : The observed 14 weed models in the study (example for the member species see table 1)