

# A REVISION OF THE SOUTH AFRICAN SPECIES OF ADENIA.

by

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## INTRODUCTION.

The genus *Adenia* was founded by Forskal on a plant collected in Arabia and which he named *A. venenata*. In the original description, the genus is stated as having 6-merous flowers. Ascherson, (1)\* as pointed out by Engler, first drew attention to the fact that *Adenia* Forsk. (1775) and *Modecca* Lam. (1797) were synonymous. Engler (5) states that it is absolutely certain that *Modecca abyssinica* Hochst. and *Adenia venenata* Forsk. are identical although the former is 5-merous, explaining that it is quite possible that Forskal had a specimen with 6-merous flowers in front of him as "in the related genus *Keramanthus*, 6- and 5-merous flowers occur". Engler further explains (l.c.) that he attempted to separate the two genera but was unsuccessful. The majority of workers had apparently, as suggested by Ascherson, overlooked or not recognised this fact.

Smith (17) in 1821 substituted *Blepharantes* Sm. for *Modecca* Lam. Wight and Arnold (20) in 1834 divided the genus *Modecca* into two subgenera *Microblepharis* Wight & Arn. and *Blepharantes* (Sm.) Wight & Arn. Roemer (14) in 1846 divided *Modecca* into the genera *Microblepharis* (W. & A.) Roem. and *Erythrocarpus* Roem. while Bentham and Hooker (3), 1867, distinguished 2 genera *Ophiocaulon* Hook. f. and *Modecca* Lam. recognising *Clemanthus* Klotsch., *Paschanthus* Burch. and *Kolbia* Beauv. as synonyms of *Modecca*. Baillon (2), in 1888, divided *Modecca* into three sections, *Eumodecca* Baill., *Ophiocaulon* (Hook. f.) Baill. and *Keramanthus* (Hook. f.) Baill. thus further enlarging the conception of the genus by incorporation of the latter two genera. Engler (l.c.) in 1892, added two more sections to Wight and Arnold's division of the genus *Adenia* (in which *Modecca* was included), viz. *Euadenia* Engl. and *Hildebrandtiothamnus* Engl.

In 1893 Harms (6) wrote: "Von hohem Interesse ist die Anatomie der Gattungen *Adenia*, *Ophiocaulon*, *Echinothamnus* und *Keramanthus*. Es scheint mir bei diesen der anatomische Bau ganz deutlich auf eine enge Zusammengehörigkeit hinzuweisen." He (7) in 1895 subscribed to Engler's division of the genus *Adenia* in which he not only included (like Bentham and Hooker) the genera *Clemanthus* Klotsch. and *Kolbia* Beauv., but also *Keramanthus* Hook. f. each representing only one species. In 1897 he (8) further enlarged the genus incorporating 3 genera, viz. *Paschanthus* Burch. (= *Jaggia*, Schinz.), *Echinothamnus* Engl. and *Ophiocaulon* Hook. f. The first 2 monotypic genera were combined, constituting his sect. 1 *Paschanthus*, while the last, comprising some dozen closely related species in tropical and southern Africa, constituted his section 2, *Ophiocaulon* previously raised to this position by Baillon in 1888, as noted above. In addition to this the section *Hildebrandtiothamnus* (originally his sect. 4) was sunk and the genus *Keramanthus* given sectional rank as was also previously done by Baillon. De Dalla Torre and Harms (1907) have upheld this division of *Adenia* in the 5 sections, *Paschanthus*, *Ophiocaulon*, *Blepharantes*, *Keramanthus*, *Microblepharis* and *Euadenia*. In 1921, however, the section *Microblepharis* W. & A. was not included by Harms (10) but in 1925 (11) he resuscitated it.

\* Figures in parenthesis refer to "Literature Cited" on page 544.

None of these sections, as defined by Harms, will allow for the inclusion of *A. glauca* and *A. spinosa*, two apparently very closely related species, differing mainly in the presence of spines and simple leaves in the one species as opposed to compound leaves in the other species—both without glands (“Coronascuppen”, etc.). Harms (11) includes *A. glauca* in *Blepharantes* presumably based on Schinz’s description of this species in which he (Schinz) described the petals as “im Grunde des Receptaculum inseriert” which the present writer did not find to be the case. (See discussion under *A. glauca* on p. 523.) The following is a summary of the synonymy of the genus *Adenia* Forsk. accepting the conception of Harms [presumably based, to some extent at least, on his extensive studies of anatomic characters (referred to elsewhere)] and certain other workers mentioned above:—

- 1775. *Adenia* Forsk. Fl. Aeg. Arab., p. 77.
- 1797. *Modecca* Lam. Encycl. meth. bot. lv., 208.
- 1807. *Kolbia* P. Beauv. Fl. d’Oware et Ben., 11, 91.
- 1821. *Blepharantes* Smith Gramm. of Bot., 188.
- 1822. *Paschanthus* Burch., in Burch. Travels 1, 543.
- 1846. *Microblepharis* M. Roem., Synops. 11, 133, 200.
- 1846. *Erythrocarpus* M. Roem., Synops. Mon. 11, 204.
- 1863. *Clemanthus* Klotsch., Peters Reise Mossamb. Bot., 143.
- 1867. *Ophiocaulon* Hook. f., Gen. Plant, 1, 111, 813.
- 1876. *Keramanthus* Hook. f., Bot. Mag. T., 6271.
- 1889. *Jäggi* Schinz., Verh. Bot. Ver. Brand, XXX, 253.
- 1891. *Echinothamnus* Engl., Bot. Jahrb. 14, 383.

The genus has attracted attention in South Africa mainly as a result of the poisoning of human beings from *A. digitata*. In 1922 poisoning (and one death) of adults was reported as a result of the chewing of the tubers of *A. digitata* which were mistaken for that of a cucurbitaceous plant. Previously Burt Davy reported death and poisoning of children as well as suspected poisoning from this species. In 1928 death of a child and poisoning of others were also ascribed to this species. A study of its poisonous principles at the Veterinary Research Laboratory, at Onderstepoort,\* revealed two toxic principles, hydrocyanic acid and a toxalbumin, “Modeccin”. Steyn (18) reports that hydrocyanic acid has been found in the fresh leaves of this species as well as that of *A. glauca*, but in the latter case not in the “root” which he states is edible. Dr. E. E. Galpin reported in December, 1931, that he had observed children eating the fruits of *A. glauca*, which they said were very nice. According to Watt and Brandwyk (19), *A. senensis*, *A. gummifera* and *A. Kirkii* are used medicinally.

Harvey states that the fruits of *A. hastata* are edible; Bryant states that *A. repanda* is greedily eaten by stock which is also reported for *A. hastata*; Potts (13) states that natives, when thirsty, suck the sap of the “tuber” of *A. multiflora*, but this information must be incorrect as will be explained further on, and the confusion is very probably attributable to the fact that *A. glauca* occurs in the same locality and is nontoxic and edible. Forskal described *A. venenata* as having poisonous tubers while *A. palmata* is also said to be poisonous.

The South African species which represent only a very small percentage (approximately 10 per cent.) of the world’s species have been recorded mainly from the Transvaal. The genus is largely restricted to the tropics of the old world and from Africa approximately 50 species have been described. It is of more than usual interest as it exhibits some most interesting plant forms (Plates 1, 2, 3 and 4).

\* Green, H. H., and Andrews, W. H., 1923: The toxicity of *A. digitata* Burt Davy (*Modecca digitata* Harv.) 9th and 10th Rpt. Dir. Vet. Educ. & Res., pp. 381-91. Green, H. H., and Kamerman, P., 1924: The protein phytotoxin with special refce. to the new “modeccin” Journ. S.A. Chem. Inst. 7, pp. 3-5.

There are in South Africa (and South West Africa) the desert-arid region forms, *A. repanda* (Burch.) Engl. and *A. Pechuelli* (Engl.) Harms, the latter being a plant of very strange habit. At the other extreme there is the interesting, widely distributed, liana, *A. gummifera* (Harv.) Harms, which often grows to enormous size with very long woody thick stems, up to  $2\frac{1}{2}$  and 3 inches diameter. Intermediate forms are represented by several species in South Africa, two types being distinguished, viz. one with a fleshy swollen partly or largely above the soil (Plates 1-4), the other with a tuberlike underground portion from which the annual branches arise. In the former case the green or above-ground swollen main axis assumes more or less characteristic shapes in the different species. Of this type there are only 4 described species, one, *A. globosa* Engl., occurring in East Africa, the other 3 having been recorded from South Africa and that, with the exception of two specimens only, from the Transvaal. Judging from the figures of the spinescent *A. globosa* Engl., it would seem that this species is not closely related to any of the 3 South African species of similar habit, amongst which there is also a spinescent species.

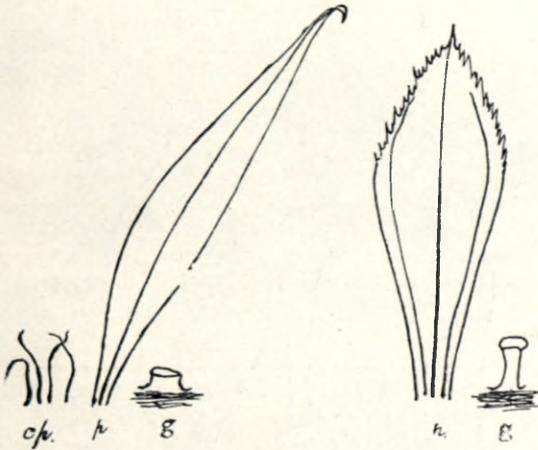


Fig. 1.—Variation in petal, gland and coronal processes in two flowers from Obermeyer in Trans. Mus. 29287, ♀, belonging to *A. digitata* (Harv.) Engl.



Fig. 2.—Two petals from two different flowers from Liebenberg 3366, ♀, belonging to *A. digitata* (Harv.) Engl.

### The Root-stem Relations.

In the absence of anatomic proof the writer has adopted the view that the tuberlike structure when below ground only (which is normally the case in *A. repanda*, *A. senensis*, *A. Wilmsii*, *A. digitata* and *A. hastata*) is entirely a root structure except for the attenuated perennial portion at the top thereof, from which the annual branches arise and which is formed from accumulated annual growths or from elongation or enlargement of the bud-producing zone. When the swollen perennial main axis is largely or partly above the ground (as in the case of *A. fruticosa*, *A. spinosa* and *A. glauca*) then the underground portion is regarded as root structure and the aboveground part (green portion) as stem structure, the soil level being regarded the line of demarcation between the two kinds of structures. The annual axes or stems are referred to as branches. This characterisation is resorted to only as a matter of convenience for the description of the species.

## MORPHOLOGICAL NOTES AND STUDIES.

*The Flower.*

The classification of certain species of *Adenia* is not only made more difficult by leaf heterophylly but also by polymorphism and the presence of male and female flowers on different individuals (very rarely on the same individual) and to some extent by marked variations in floral structures, within the species, although on the same individual there usually appears to be little variation (figs. 1, 2 and 3). It may be pointed out that in the majority of the species polymorphism is very apparent, the difference in structures of the flower being marked in the two sexes apart from the obvious differences (abortion of androecium and gynaecium respectively) as a result of the unisexual nature of the flower. This is particularly characteristic of the petals.

In the literature there are two interpretations of the morphology of the flower parts and the writer has adopted the interpretation which follows hereunder, in which is included a description of the main features of the flower.

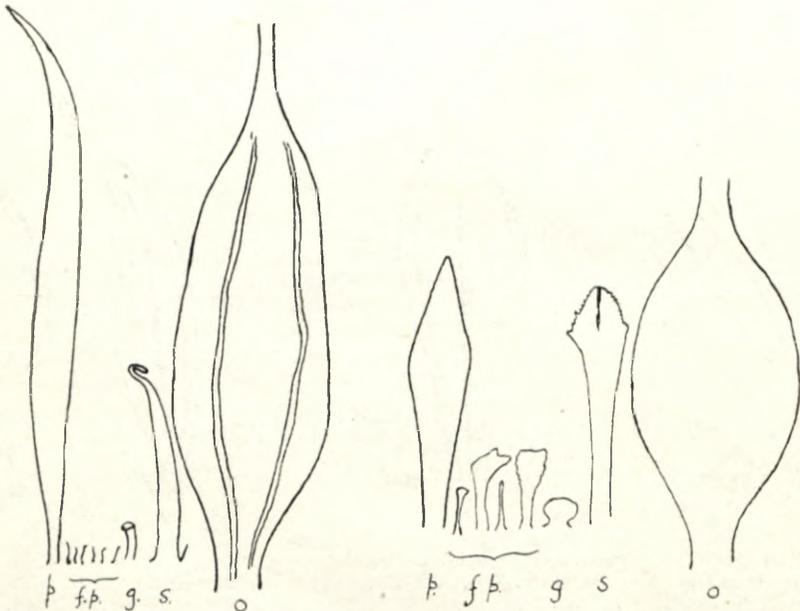


Fig. 3.—Variation in petal, gland, coronal processes, ovary and staminode in two flowers A and B from Liebenberg 3056, ♀, belonging to *A. digitata* (Harv.) Engl. A is from the original specimen and B from a specimen grown in the gardens of the D.P.I. o, ovary; s, staminode; g, gland; fp, coronal processes; p, petal.

*Receptacle.*

That part of the flower more or less below the "glands" (q.v.) and above the articulation with the pedicel. The articulation is never absent.

*Calyx tube.*

Part of the "receptacle" of Harms, Engler, etc.

*Calyx lobes.*

(5). The "sepals" of Harms, Engler, etc.

*Corolla.*

Petals 5, alternating with the calyx lobes, inserted at the sinuses of the latter or at varying depths on the calyx tube, depending upon the species.

### Corona.

The filiform processes which arise from the calyx tube near its base and are arranged in a sinuate ring or in groups in a circle. "Korona" (in part) or "Effigurationen" (in part) of Harms. This is homologous to the prominent structure in certain other genera of the family, e.g. *Passiflora*.

### Androecium.\*

In the male flower 5 stamens and in the female flower 5 staminodes either free or otherwise connate for part of their length at the base. The staminal or staminodal column is adnate to the receptacle (? and/or calyx tube), at 5 points (always opposite the petals), so forming 5 depressions or pockets from the base of which arise the "glands".

### Gynaecium.\*

In the female a normal stipitate ovary with numerous ovules on 3 placentae (parietal) and a 3-branched style and pufflike stigma. In the male an abortive structure semiterete linear-cylindric in shape somewhat tapering upwards, surrounded by the staminal column. The fruit is a capsule, normally 3-valvate, dehiscent or indehiscent, with anatropous arillate seeds.

### Glands.

(5). The 5 structures which arise from the base of the pockets or depressions and which alternate with the petals. "Receptaculumeffigurationen," "Zungenförmige Schuppen," "Corona Schuppen," "Schuppenförmige Effigurationen," "Outer staminodes," "glands of the disc." This term (gland) is used for convenience, as these structures may actually be "Outer staminodes" or even the vestiges of an aborted coronal structure. Absent in certain species.

The slender processes ("corona") vary a great deal in the various species, being rudimentary in certain individuals or certain of the South African species. Their absence, together with the absence of glands in any particular species may perhaps be looked upon as a sufficiently strong reason to exclude such species from the genus *Adenia*. These processes when numerous or in a continuous circle around the calyx tube very often appear to arise from the edge, or to be the lacerated margin or upper part, of a membranous tissue which lines the base of the calyx tube (? or uppermost part of the receptacle) and it is apparently also this same tissue which joins the filamental column (collar or tube) formed by the connate filaments or staminodes, to the base of the calyx tube at 5 points, so forming the 5 pockets or depressions. This membranous tissue is often clearly seen in certain flowers (when dissected) and such a wider conception of the corona seems also to be justified by the occurrence of these processes on the tissue joining stamens to calyx (and/or receptacle?) in such species as *A. glauca* or *A. spinosa*.

### THE INFLORESCENCE.

The inflorescence in *Adenia* presents interesting features and in order to understand these and the variations better, particular attention was paid to it. The main features in the various species are discussed elsewhere. At this stage the general features will be dealt with.

Harms (9) has made a special study of the morphology of the inflorescence and tendrils in the *Passifloraceae*. Speaking about the "Inflorescensträger oder Pedunculus", he states that for *Adenia*: "Dieser trägt seltener nur einen, meist zwei Seitenäste, während er in der Mitte in eine Ranke ausläuft. Die blütentragenden Seitenzweige zeigen cymöse Verzweigung in mannigfacher Art und verschiedenem Grade". The typical *Adenia* inflorescence is a longer or shorter "peduncle" terminating in a tendril and having two

\* As stated, in the S. African spp. dioecism is practically the rule.

opposite or alternate side branches or "cymes" which may be repeated one or more times. Common variations—with reference to the South African species—are (1) the absence (non-development) of one or both cymes, when the peduncle may terminate in a flower-bearing pedicel; (2) the peduncle terminating in a pedicel.

Harms further states: "Im allgemeinen wiederholt sich die dichasiale Verzweigung mit Ausbildung einer Mittelblüte einige wenige Male oder es gehen durch Fehlschlagen eines der beiden Seitenästchen die Dichasien schon bald oder erst by Achsen höherer Ordnung in Monochasien über". Presumably under dichasial branching Harms includes those cases where the side-branches ("Seitenästchen") are not only opposite but also alternate and this is essentially the nature of the inflorescence in the South African species, in which sidebranches are always alternate except perhaps those (of the first order) arising on the peduncle. In the South African species the standard groundplan for the inflorescence is one in which each relative main axis (always with terminal flower) has usually two lateral branches with a tendency either towards the monochasial (only 1 bract, with or without its side-branch present) or towards the trichasial or pleiochasial\* (where more than 2 alternate bracts, with or without their side-branches are present).

The switching over to a mono-, tri-, or pleiochasium, particularly the latter two, is apparently of unusual occurrence in the South African species because the youngest relative main axes practically always bear two alternate bracts with buds. On the older axes, however, this may sometimes occur.

In accordance with the law of development in the cymose inflorescence, the uppermost side branch of each relative main axis is the oldest (and most developed) and naturally flowers on this are relatively older than those of the branch below it. The branches of any relative main axis are always alternate, and it very rarely happens that such branches fail to develop in due course, i.e. is only represented by a bract, without a bud, unless of course they are the youngest bracts on the inflorescence. That portion of each relative main axis which bears the flower (that is the pedicel) is often pushed aside and is less developed than the side-branches.

All flowers (by definition) are borne terminally on each relative main axis (which may or may not be repeated one or more times) and are therefore pedicellate, besides being articulate. Not only does the distance between the side-branches (or their bracts) vary a great deal in different species but also on the same inflorescence or on the same or different individuals. The pedicel length is subject to similar variation due to the position of the oldest (or nearest) relative bract very rarely being so short as to appear to be lacking or almost so, as, for example, in *A. Wilmsii*.

If then the side-branches remain undeveloped and their respective bracts are displaced to their uppermost limit (i.e. bordering the articulation) the flower will appear sessile and bracteolate. This is observed in *A. Wilmsii* (fig. 13). Further modification gives us the inflorescences of many species of *Passiflora* as pointed out by Harms and others. In these the "peduncle" has undergone maximum reduction so that tendril and side-branches (or only 1 side-branch) arise side by side in the axil of the leaf having their bracts forced (displaced) on to their respective axes thus giving on each 3 bracts (2 bracteoles and 1 bract)† which in the various species of *Passiflora* assume various positions or modifications from the three scattered narrow bracts to involucre of various shapes and sizes.

Although, to some extent, the characters of the inflorescence differ somewhat in the different species and are fairly constant for certain species, there is a marked variation in one or two of the species (e.g. *A. digitata*) and they would therefore not appear to be suitable for the characterisation of species.

\* A 4th side branch, represented by a bract, has only been observed once (in Fig. 15).

† This is not uncommon in the case of *A. glauca*.

Harms refers to inflorescence dimorphism in the two sexes, e.g. in *A. venenata* but such has not been established for the South African species. He also records the occurrence of "traubenähnliche Blütenstände" in certain species, in which category the reproductive branchlets of *A. gummifera* and *A. Wilmsii* may presumably be placed.

The interesting behaviour in *A. gummifera* (Harv.) Harms, to which Engler and Harms have drawn attention, should here be mentioned. In this species (and presumably in related species, according to these workers) there are usually 2, sometimes 3, buds in the axils of the leaves, the lowermost of which develops into a tendril or strong inflorescence, the other into a branchlet of varying size. This branchlet may at times give the impression (with leaf abscission or ? non-development of leaves) of being a compound inflorescence. As noted elsewhere these "secondary" inflorescences of the branchlets, apparently (in the South African specimens), always (?) end in pedicels, not in tendrils. Presumably Engler and Harms have only observed this branchlet ("Seitenzweig Spross") above (i.e. in the axil of) a tendril and not above an inflorescence. In the South African material, this branchlet has been observed above a strongly developed inflorescence in which the main axes (peduncles) terminate in tendrils.

#### VARIATION AND ABNORMALITIES IN THE SPECIES.

In his researches on the utilisation of the anatomic structure for the limitation and division of the *Passifloraceae*, Harms in 1893 drew attention to the differences as well as variations, in the anatomic structures exhibited by the various related genera and species of the *Passifloreae* (including *Modeceae*) for the latter group of which he particularly suggests the possible value of characters like "Bau des Holzes, die Excrete des Blattes (Krystalzellen, 'Drüsen', Gerbstoffbehälter) und die Haarbildung", the latter term being used in a sense to include the curvature of the cells of the epidermis. At the same time he points out that a number of these characters vary a great deal and should only be used with care for the limitation of species, although the above-mentioned characters as well as others such as strength of outer epidermis walls, structure of mesophyll, etc., could be utilised for such purpose.

In the revision of the South African species, the present writer has experienced great difficulty in classifying certain specimens belonging to a group which he has referred to as the "digitata-senensis-complex". He has observed great variation in leafshape, in glands and in the number of "ruby-coloured" or giant cells (presumably the "Gerbstoffbehälter" of Harms) on the upper and lower surfaces of the leaves of specimens of the same species and even on the same specimen, as well as variation in the waxy covering in the same species. Variation in the "ruby-coloured cells" (viz. the "Gerbstoffbehälter") is only a reflection of the anatomic variation of the species. In view of this fact and the variation observed by Harms for several of his anatomic characters (in the same species) the writer does not feel that the classification of a difficult group like the "digitata-senensis-complex" would be much facilitated by the study of anatomic differences. Differences in anatomic characters would no doubt be more marked in the case of those plants that are not so closely related or those that are easily separated on morphological characters. Whether, however, anatomic characters will have taxonomic value in cases where the comparatively numerous morphological characters have failed, that is, where the latter vary so much that classification is impossible or very difficult, seems doubtful.

#### *A. hastata* (Harv.) Schinz

In this species fairly wide variations are evident in the characters of the inflorescence; in size and stoutness of the inflorescence, including tendril and in stoutness of tendril in relation to the peduncle. The "cymes" are usually opposite and few of the peduncles terminate in pedicels, tendrils being usually present. In the number of flowers to a "cyme" there is a wide difference. The majority of specimens have 1-flowered or 1- to 2-flowered

cymes but several specimens are up to 5- or 6-flowered (or more?). On the same specimen the number of flowers to a cyme is quite constant. It may be noted that of three sheets of Rogers 12606 one sheet showed typical 1-flowered "cymes", while the other two were both many-flowered.

It is interesting to note that the apical glands of the leaf (paired glands at the apex of the leaves) are sometimes absent on some specimens.

In figs. 4 and 5 two drawings of inflorescences of this species are shown.



Fig. 4.—Typical inflorescences of *Adenia hastata* (Harv.) Schinz., enlarged several times. From Rogers in Trans. Mus. 13273, ♂.

Very great variations were observed in size and shape of flower and the parts thereof. This was particularly noticeable in the case of the petals which varied from entire or almost so, in some specimens, to the characteristic fimbriate ones (the processes of the petals being of very variable length) of the species, in the males.

The following abnormalities were observed :—

Rogers 13273 : A sixth petal arising much below the others and differing somewhat from them.

Thorncroft 2034 : Calyx lobes and petals 4-merous (stamens 5). Apparently only 1 flower of this nature.

Breyer 17956 : Small leaves in axils of some inflorescences.

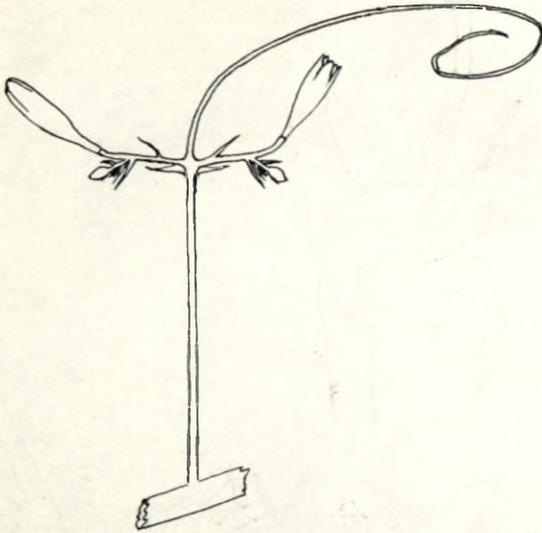
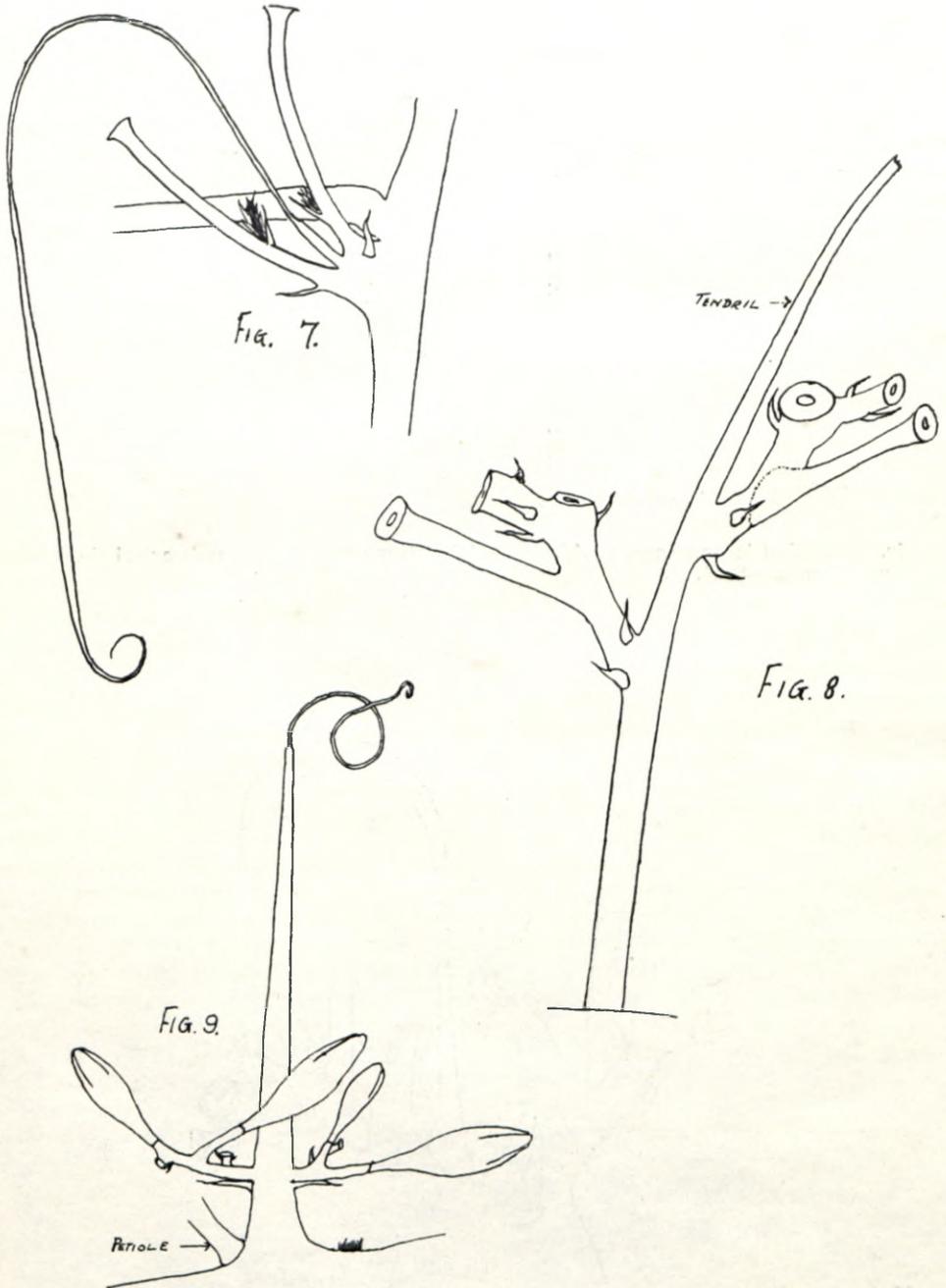


Fig. 5.—Typical inflorescences of *Adenia Hastata* (Harv.) Schinz., enlarged several times. From Thorncroft 2034, ♂.



Fig. 6.—Inflorescences of *A. glauca* Schinz, enlarged many times. From Galpin 11605, ♀.



Figs. 7 and 8.—Inflorescences of *A. glauca* Schinz, enlarged many times. 7 and 8 are from Galpin 13197, ♀.

Fig. 9.—A typical inflorescence of *A. spinosa* Burt Davy, enlarged many times. From Bremekamp and Schweickerdt in Trans. Mus. 29882, ♂.

*A. glauca* Schinz

Except for fairly marked variations in the inflorescence, this species is fairly uniform in its flower parts.

What is unique is that occasionally the inflorescences are clustered at the bases of flowering shoots or of branches or of branchlets but also often occur at the bases of tendrils and in these cases the "cymes" are very contracted or apparently only represented by single pedicels (with flowers) on very reduced peduncles. In the latter cases there are no tendrils, though peduncles usually end in tendrils. Usually, however, inflorescences are axillary (axils of leaves) fairly short (with no visible peduncles) with "cymes" 1- to 2-flowered but occasionally many-flowered, ending in tendrils though not infrequently in long (flower-bearing) pedicels. Like the stipules the bracts are reddish brown and those of the undeveloped side-branches are often found to be displaced along their respective axes.\*

In figs. 6, 7 and 8 two typical inflorescences are shown. No abnormalities were observed.

It should be pointed out here that the writer has not been able to find any glands in this species although marks were observed (grouping of "veins") coinciding with the position of glands in the ordinary *Adenia* flower. Schinz in describing this species (l.c.) states that "Die unanschaulichen Receptaculumeffigurationen, die den Staminodien opponiert sind, haben zungenförmige Gestalt". He further states that the petals "finden wir im Grunde des Receptaculum inseriert". The present writer has always observed the petals to be inserted at the sinuses of the calyx lobes ("Kelchblätter" of Schinz), that is at the upper margin of the "Receptaculum".

*A. spinosa* Burt Davy

In this species the inflorescences are usually axillary (axils of spines or those of leaves), the "cymes" being many-flowered although occasionally 1-few-flowered. Inflorescences are usually much reduced (compact). Such reduced inflorescences not only occur in the axils of spines but are, not infrequently, also clustered near the base of the latter. The thorn may be considered as the modified main axis of the inflorescence for not only does it often function as a tendril, but it usually has buds near the base corresponding to the position of the main branch of the inflorescence and, in fact, occasionally possesses normal cymes (Bremekamp and Schweickerdt 469 in Transvaal Museum). This type of inflorescence is shown in fig. 9. It also is of interest to record the presence of leaves in, what appears to be, normal, axillary, reduced inflorescences. There are usually 2 to 3 flowers present and such inflorescences are perhaps to be regarded as very reduced branchlets, arising, it would appear, in the axils of spines, not in those of leaves, as axillary inflorescences do. Presumably such branchlets should be interpreted as truly axillary, being the development of a second bud in the leaf axil.

No abnormalities or marked variations were observed.

*A. gummifera* (Harv.) Harms

The occurrence of both primary and secondary inflorescences is interesting. The former occur in axils of leaves while the latter occur on almost leafless branches which arise in the axils of primary inflorescences. Secondary inflorescences are not visibly axillary as leaves have often not developed or have dropped early. The 1-many-flowered "cymes" are usually alternate and usually the peduncles end in tendrils (though sometimes in pedicels), but "cymes" are occasionally also opposite. One or both of the cymes may be undeveloped (rudimentary) when they are represented by their bracts only or very little besides. Not infrequently the inflorescence consists only of 2 bracts and a long terminal flower-bearing pedicel. Peduncles are usually well-developed, particularly in the primary inflorescences where they are often very long (up to 10 cm.).

\* The bases of tendrils and the pedicels of the primary branches are also red-coloured.

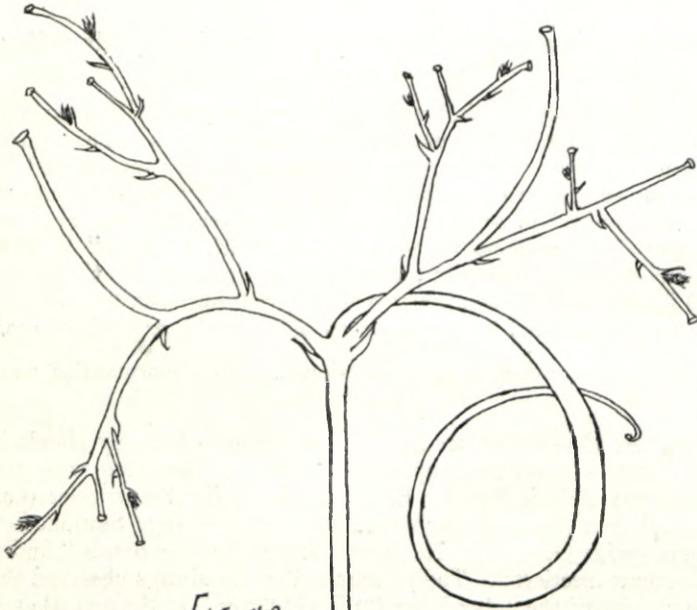


FIG. 10.

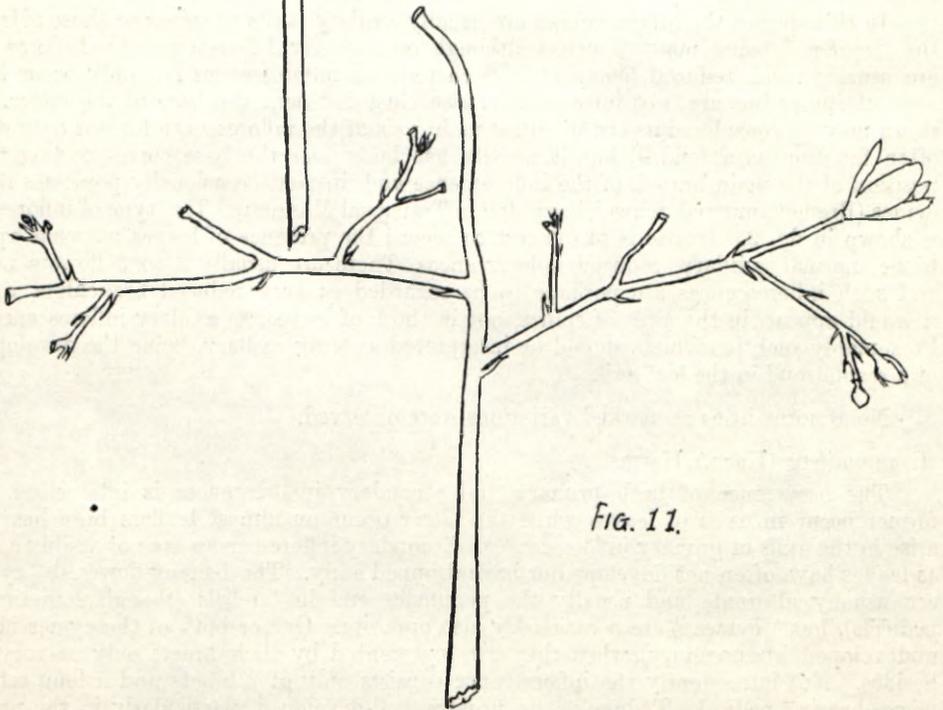


FIG. 11.

Figs. 10 and 11.—Inflorescences of *A. gummifera* (Harv.) Harms, enlarged several times. 10 is from Wylie in Natal Herb. 23313, ♀. 11 is from Watt and Brandwyk 1497.

In Figs. 10 and 11 two inflorescences of this species are shown. No abnormalities were observed.

With regard to floral structures, it can be recorded that this species does not show any marked variations and neither are the variations in other morphological characters very pronounced. Although differences in leaf shape, leaf size, number of large "Gerbstoffzellen" (black dots), etc., are quite noticeable.

*A. repanda* (Burch.) Engler

The inflorescences are usually small, insignificant, the bracts characteristically long. In some cases, particularly at the base of branches, they are so reduced that the flowers appear to be solitary, the "cymes" being rudimentary and the shortened peduncle terminating in a flower-bearing pedicel, not a tendril. Inflorescences are axillary. The "cymes" are very rarely opposite and one or both of them may develop, usually only the one develops; it may be the lower or the upper. The "cymes" are characteristically 1- to few-flowered. The peduncles end in pedicels (this usually is the case at bases of branches) or tendrils (usually this occurs towards apices of branches). Occasionally both cymes are undeveloped.

In Fig. 12 are shown some typical inflorescences.

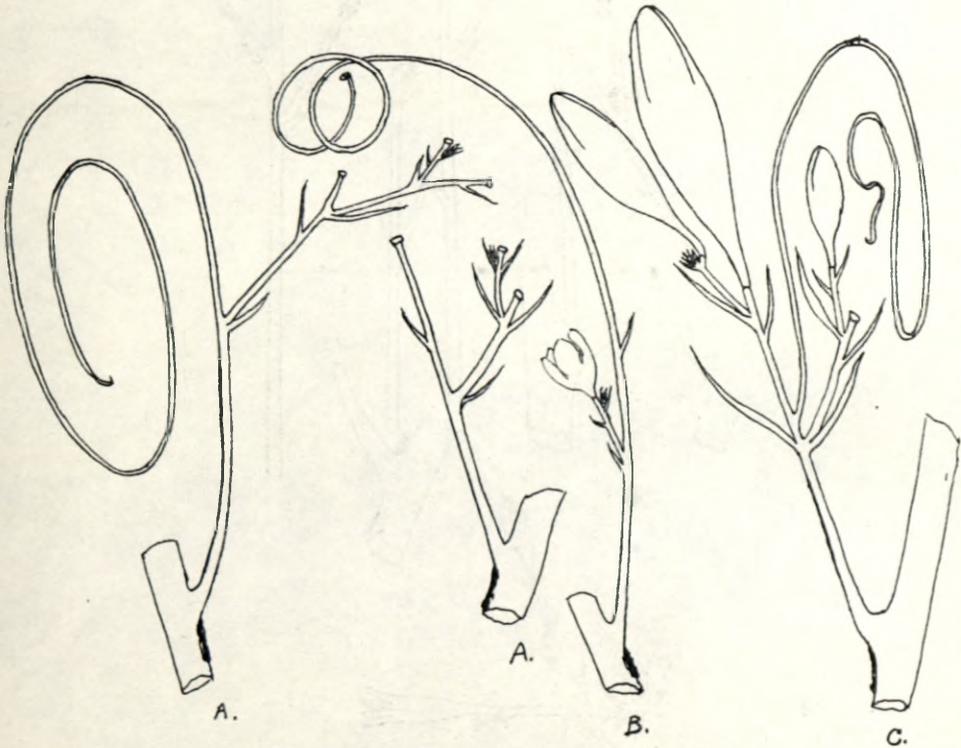


Fig. 12.—Inflorescences of *A. repanda* (Burch.) Engl. several times enlarged. A is from Pearson 8166 (Natal Herb.), B is from Dinter 4516, ♀, and C is from Marloth 1092, ♂.

On the whole this species is very uniform, showing a very narrow range of variation except perhaps for the insertion of petals. No abnormalities were observed other than 4 small sessile flower buds (side by side) on one of the tendrils in Marloth 1092 (in National Herbarium).

*A. Wilmsii* Harms

Of this species only a few specimens are available and the variation is not great except for leafsize. The species appears to produce different types of shoots, that is vegetative, reproductive and normal and these do not, apparently, arise at the same time on the same plant. The normal shoots have 1- to 3-flowered axillary inflorescences with the main axis (peduncle) always terminating in a flower and not a tendril. This terminal flower of the main axis is normal but one or both of the sidebranches (of the main axis) may be undeveloped. The reproductive shoots are reduced main stems with several alternate axillary inflorescences in which the leaves are considerably reduced, almost bractlike and the inflorescences more elaborate than in the normal shoot. The bracts on the main axis of the inflorescence or on any of its sidebranches may occupy any position on their respective axes and may sometimes be so close to the articulation as to give the flower the appearance

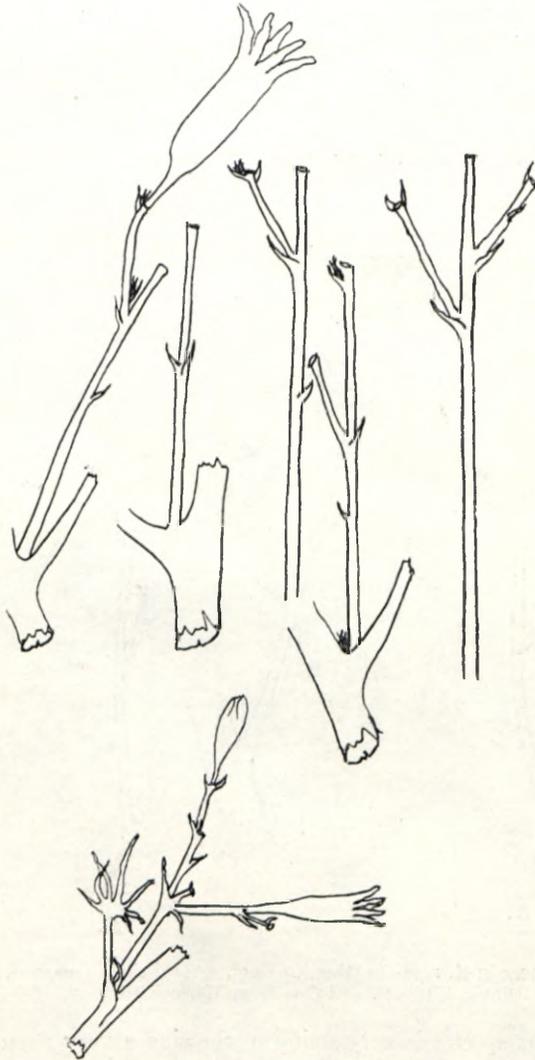


Fig. 13.—Inflorescences of *A. Wilmsii* Harms, several times enlarged. From specimens coll'd. by Miss van Wyk (Nation. Herb.).

of an axillary origin. In Fig. 13 inflorescences are depicted. The glands or nectaries at the apex of the pedicel are sometimes present in 2 pairs and not 1, which fact along with unusually broad petiole and peduncle, as well as the extra pair of lobes (7 altogether) rather suggests a degree of fasciation as being hereditary for this species which character may possibly have arisen as a mutation in the original species from which it was evolved.

*A. digitata* (Harv.) Engl.

In this species very marked variations were observed. The variation in leaf characters, particularly in shape and number of leaf lobes is a very striking feature as can be gauged from the photographs (Plates 16-36). As pointed out further on some of these forms had been mistaken for new species by other workers. In characters of the inflorescence and of flowers the variations are almost equally striking. Thus, the peduncle which is generally about 2 cm. long may often be absent or up to 6.5 cm. long. Or again, the flowers, which are usually 4-12 per inflorescence may often be only 2 and sometimes as high as 40 or 80. The distribution of giant cells (Gerbstoffbehälter) on the underside of the leaf has also been observed to be extremely erratic even on the same specimen and on the same leaf. Some typical inflorescences are shown in Figs. 14-17.

A few abnormalities were noted as follows: *Osborne in Nat. Herb.* (2639), 3 glands. *Rogers* 24185 bract adnate to the receptacle, 6 calyx lobes, 6 stamens and in a second flower only 4 stamens and 3 minute peglike outgrowths from the base of the anther. *Galpin* 13196, 2 stamens have their anthers and free filaments connate. *Breyer in Trans. Mus.* 24215, 1 flower with 6 calyx lobes and 6 stamens.

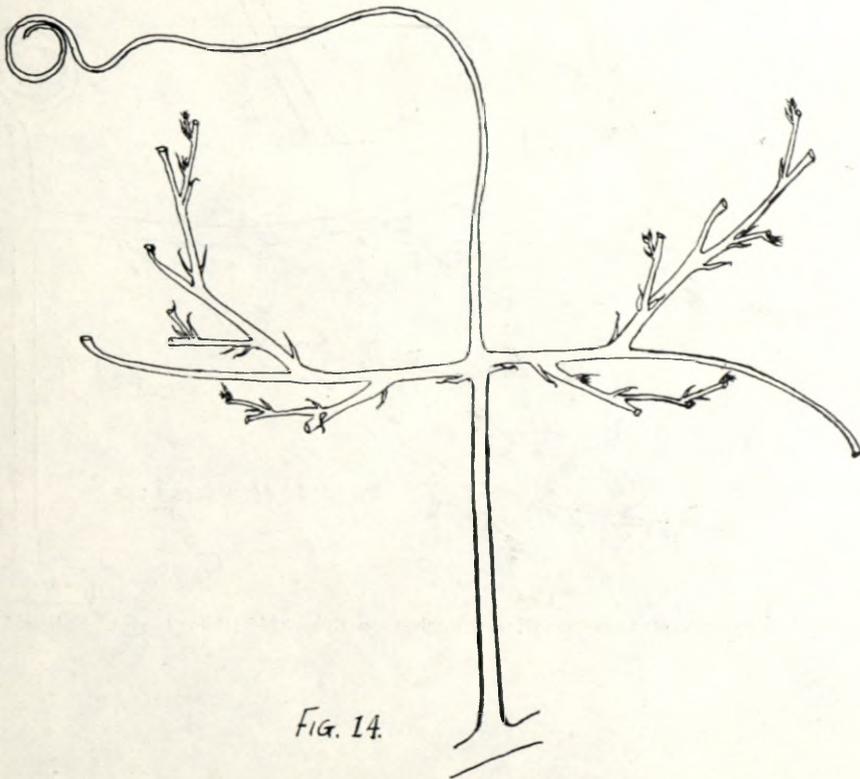


FIG. 14.

Fig. 14.—Inflorescence of *A. digitata* (Harv.) Engl., from Schweickerdt in *Trans. Mus.* 30164, ♂. Enlarged.

*A. fruticosa* Burt Davy

Inflorescences are 1- to 3-flowered, axillary; peduncles lacking or up to 3 or 4 mm. long, ending in normal flowers not tendrils, the latter being bracteate or non-bracteate, strong or weak. Tendrils occur in axils of leaves and branches in axils of tendrils. Leaf size is very variable.

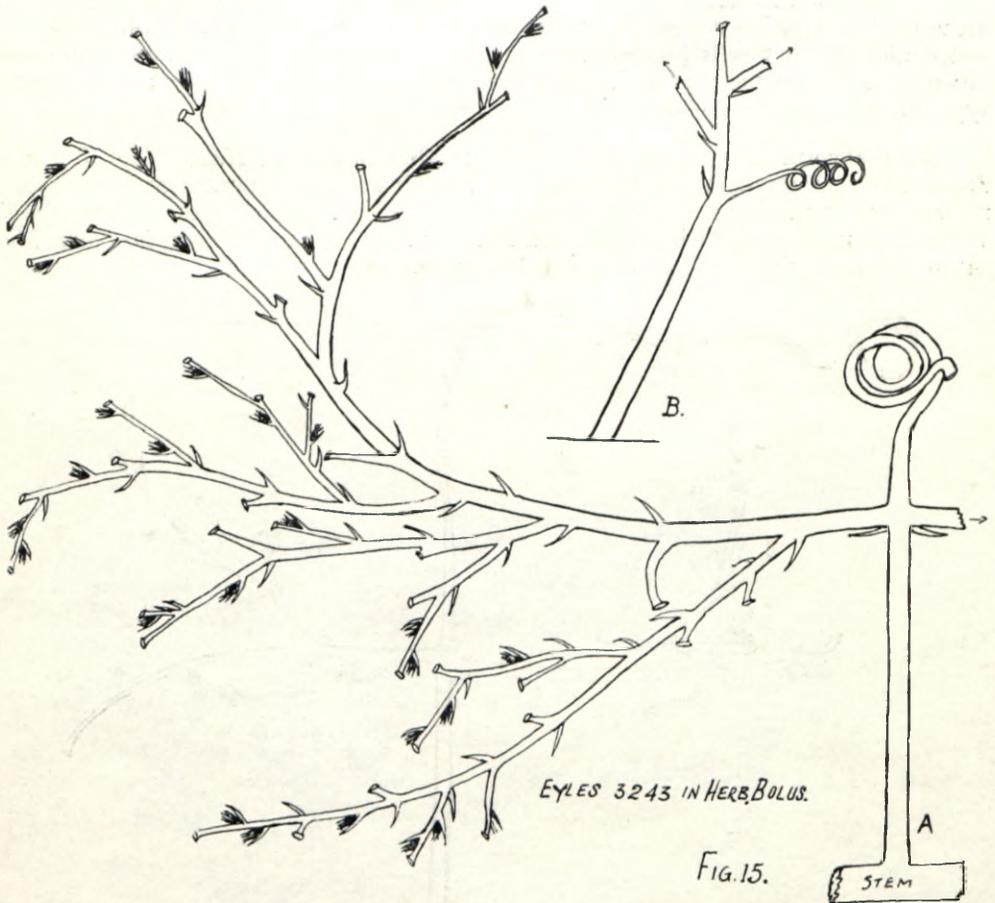


Fig. 15.—Inflorescence of *A. digitata* (Harv.) Engl., from Eyles 3243 (Bolus Herb.). Enlarged several times.

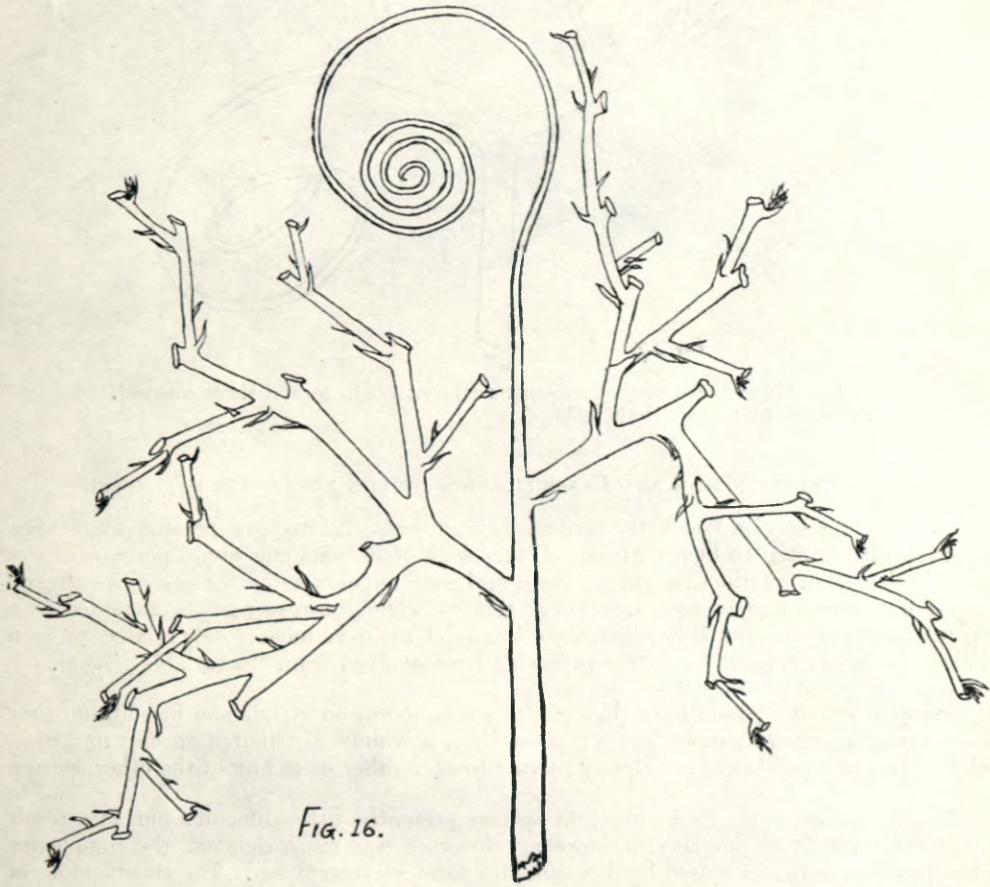


FIG. 16.

Fig. 16.—Inflorescence of *A. digitata* (Harv.) Engl., from Mogg 8182, ♀. Enlarged several times.

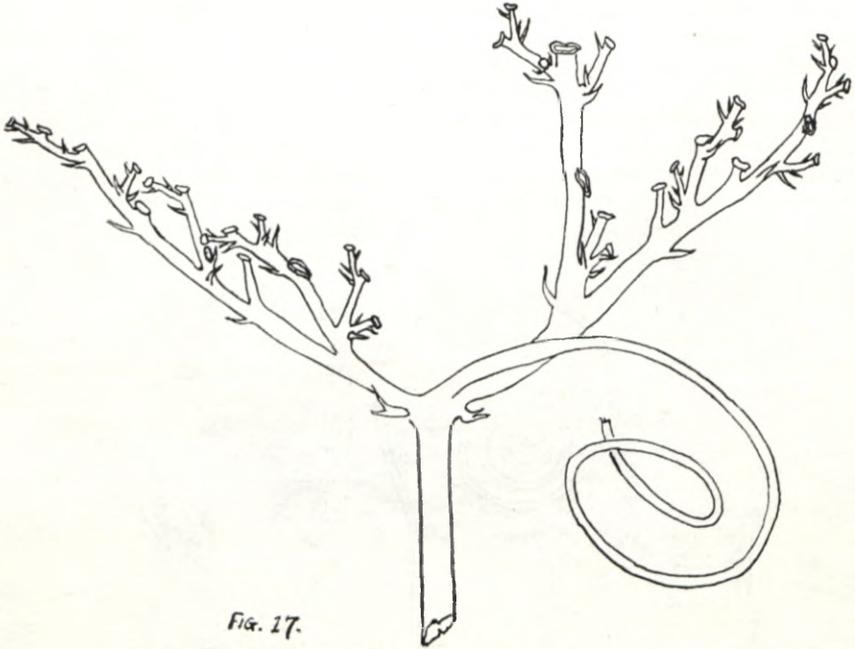


Fig. 17.—Inflorescence of *A. digitata* (Harv.) Engl., several times enlarged.  
From Osborne in Nat. Herb. 2639, ♂.

#### NATURAL RELATIONSHIPS AND CLASSIFICATION OF THE SOUTH AFRICAN SPECIES.

Of the eight species which the writer distinguishes, six, to our present knowledge, are practically limited to South Africa. Under such conditions one would perhaps expect a certain degree of relationship among them and such appears to be the case. As already pointed out *glauca* and *spinosa* are closely related while *fruticosa* may be regarded as a near relative; *digitata*, and *Wilmsii* on the other hand, are even more closely related to each other. The writer regards the latter as having been evolved from the variable *digitata*.

*Gummifera* and *repanda* have (like *glauca* and *spinosa*) no glands and in addition they lack coronae and have simple leaves; *gummifera*, a widely distributed species in Africa, and *hastata* and *repanda* are not clearly related to each other or to any of the other species.

The classification of the majority of species presented little difficulty but as a result of leaf heterophylly in one species, however, the work was much delayed, the complexity of the problem being increased by dioecism and floral polymorphism. The classification of the *senensis-digitata* material has resulted in more than 2 years delay in the completion of this study. Early in this work it became evident that leaf variability (heterophylly) within the *senensis-digitata* group has been responsible for the founding of a few additional species. To obtain the necessary proof for this view, has involved a good deal of time. This view is being illustrated by means of Plates 16-36 in conjunction with Plates 8-15 showing photos of type specimens of the species which were sunk. Moreover, further delay occurred when the South African material of *senensis-digitata* was forwarded to Kew for comparison, although, unfortunately, this procedure has been of little or no assistance.

Attention is here directed to the fact that amongst the material which the writer classifies under *A. digitata* a number of specimens have rather large fruits and may therefore represent a distinct group which appears to grow only in a certain area, approximately

defined by the Pretoria-Rustenburg districts. It is not unlikely that in future evidence may become available that would justify the separation of such large-fruited plants as a distinct variety (or perhaps species). However, such classification should be based on at least another character not associated with the fruit as otherwise male plants (and non-fruited female plants) from the same area, cannot be satisfactorily classified or will have to be classified with the species. Even if at this stage one were to favour separation of large-fruited specimens as a distinct group (variety or species) such a procedure would be impossible on account of this very difficulty, because there is as yet no means of separating male or non-fruited female plants. As a result of dioecism and floral polymorphism field studies would be necessary. Herbarium material is usually wanting in either fruit or flowers.

It should be mentioned that giant cells ("Gerbstoffbehälter") have not been observed on the Pretoria-Rustenburg specimens but, as pointed out, the distribution of this character is so variable and erratic that too much significance should perhaps not be attached thereto. Another character which would perhaps assist the elucidation of this problem is fruit colour.

#### A NOTE ON *A. multiflora* POTTS

This species was described from the growth made from an "enormous tuber" (61 cm. diameter and 30 cm. high) collected at Baviaanspoort, near Pretoria, by Dr. J. M. Fehrson in September, 1913. The description was based on material obtained from growth made "in a very sunny spot on the windowsill in the herbarium" (Transvaal Museum). The "tuber" was presumably not in soil and flowered first in February, 1914. "It never got a drop of water and again in October of the same year it made long shoots and flowered profusely as can be seen by the photograph taken at that time." Somewhat abnormal growth might be expected under such conditions and the present writer suggests that the numerous and small flowers as well as the unusually narrow lobed leaves (and the absence of tendrils too) that the "type" specimen showed was probably due to this or perhaps to the wrong season in which the plant first flowered. The multiflowered character is not unusual in *A. digitata*.

The "tuber" is stated to grow partly above ground and to have had a "grey leathery skin . . . green beneath". This character in itself was at first considered by the writer to be sufficiently distinct to justify a distinct species from *A. digitata* but on further study of photograph and type material in comparison with *A. digitata*, he observed a strong resemblance between the two and thereupon made another attempt to obtain material from the type locality, several previous visits having been unsuccessful. He was fortunate to locate two *Adenia* plants under a tree of *Acacia caffra*. They were growing side by side and their branches and leaves were dry but in the latter case both were of the *A. digitata* type. The two tubers were dug up and the one was completely underground and resembled a typical *A. digitata* tuber. The other one, partly above ground, was found to be growing immediately above a large root of the *Acacia* tree and had produced two separate "tap-roots" on either side of the root on which it was, so to speak, sitting astride, Plate 7. This obstruction possibly accounts for its appearance above the surface of the ground where the exposed surface was grayish but green just beneath, as described for *A. multiflora*.

The accompanying photograph shows the two "tubers". This, the writer contends proves that the appearance of the "tuber" above the surface of the ground is not due to a hereditary factor, but to environment. Whether subterranean obstruction is the only cause of this behaviour is doubtful for in the poisonous plant garden at the Onderstepoort Veterinary Research Laboratory, two plants of *A. digitata*, the tubers of which were originally "planted beneath the surface", have appeared above the surface and are said to be rising steadily.

## ACKNOWLEDGMENTS.

The writer wishes to thank the Chief, Division of Plant Industry, Department of Agriculture and Forestry, for the facilities which enabled him to carry out this study. To Dr. E. P. Phillips, Principal Botanist, he is greatly indebted for interest and guidance.

Dr. H. G. Schweickerdt, Botanist for the Division of Plant Industry at Kew, has rendered valuable assistance in connection with the literature, the examination of type specimens both at Kew and Berlin, the examination and comparison with Kew material of some 100 sheets of the two closely-related species, *digitata* and *senensis*. He spared neither trouble nor time to obtain the desired information and I therefore make grateful acknowledgment to him.

My thanks are also due to the Curator of the Bolus Herbarium, the directors of the Capetown Museum, Albany Museum and Transvaal Museum, as well as to the Professor of Botany, Witwatersrand University and the Mycologist in Charge of the Natal Herbarium for the loan of specimens. Mr. W. G. Barnard, Stock Inspector in Sekukuniland has, on request, forwarded a range of very useful material for which I wish to thank him very much.

## KEY TO THE IDENTIFICATION OF THE SPECIES.

- |  |                      |
|--|----------------------|
| 1. Plants with well-developed thorns; leaves simple.....   | <i>A. spinosa.</i>   |
| Plants without thorns (rarely with weak thorns in <i>A. fruticosa</i> but then leaves lobed)   | 2                    |
| 2. Leaves simple or not digitately compound.....   | 3                    |
| Leaves digitately compound.....  | 5                    |
| 3. Leaves at least 3 times as long as broad.....   | <i>A. repanda.</i>   |
| Leaves not more than 1.5 times as long as broad or leaves broader than long.....   | 4                    |
| 7. Leaves and flowers punctulate.....  | <i>A. gummifera.</i> |
| Leaves and flowers not punctulate.....   | <i>A. hastata.</i>   |
| 5. Leaves palmately 7-lobed (very rarely 5-lobed) tendrils absent.....   | <i>A. Wilmsii.</i>   |
| Leaves palmately 3- to 5-lobed, tendrils present.....  | 6                    |
| 6. Leaf-lobes more or less orbicular or somewhat broader than long; fruits variegated  | <i>A. fruticosa.</i> |
| Leaf-lobes at least twice as long as broad; fruits not variegated.....   | 7                    |
| 7. Leaf-lobes broadly elliptic or elliptic oblong very glaucous, entire, conduplicate;<br>petals arising in sinuses of the lobes. "Tuber" always partly above ground...            | <i>A. glauca.</i>    |
| Leaf-lobes lanceolate or lanceolate-ovate, not strikingly glaucous, not conduplicate;<br>petals arising near the base of the calyx tube. "Tubers" very rarely above<br>ground..... | <i>A. digitata.</i>  |

## DESCRIPTION OF THE SPECIES.

Where possible the sex of the specimen has been indicated as well as the herbarium in which the specimens may be found.

- A.—Albany Museum Herbarium, Grahamstown.  
 B.—Bulus Herbarium, Capetown.  
 C.—Natal Herbarium, Durban.  
 N.—National Herbarium, Pretoria.  
 S.—South African Museum Herbarium, Capetown.  
 T.—Transvaal Museum Herbarium, Pretoria.  
 W.—Witwatersrand University Herbarium, Johannesburg.

All specimens quoted were seen by the writer.

1. **A. spinosa** Burt Davy. Man. Fl. Pl. and Ferns. Pt. 1, 36, 221, 222.

*Main (swollen) axis*, irregular, tuberlike, variously shaped, fleshy, partly or mostly above ground, the latter green always growing in breadth, up to over 2 metres diameter (Bremekamp 3). *Branches*, numerous, "divaricate", arising from attenuations of the main stem; branchlets virgate, striate, glabrous, armed with spines; spines terete spreading, fairly stout or slender, 1-3 cm. apart, 1.2-4 cm. long, glaucous, resembling the branches or brownish, or the cortex thickened towards the base or in patches or from near the base upwards, with a straight or curved point or ending in a short tendril, with or without "toothlike" prominences or inflorescences near or at the base. *Leaves* simple, entire, sessile or shortly petioled, 1.5-3.2 cm. long, 1-2.3 cm. broad; oblong-ovate, retuse or emarginate or rounded at the apex, cordate or rounded at the base; glands absent on surface, two glands at the apex of the petiole and another smaller one at the apex of midrib below; petiole subsessile to 7 mm. long; stipules minute, toothlike from a broad base, reddish brown. *Inflorescence* short or very reduced, in axils of the spines or clustered at the base of spines; "cymes" 1-few-flowered; peduncles usually very abbreviated, terminating in pedicels or spines. *Male flowers* about 1.8 cm. long, yellowish. *Receptacle* scarcely 3 mm. long. *Calyx-tube* obconical, one-third the length of the lobes; lobes spreading, linear-oblong, entire, obtuse. *Petals* about two-thirds as long as the calyx-lobes, arising from their sinuses but appearing to be also partly inserted on the tissue joining calyx-tube to the staminal-tube, membranous, transparent, 1-nerved, linear, acuminate, narrowing below, subserrate or subundulate near the apices. *Corona* of slender processes, 0.5-1.0 mm. long, arising around the bases of the petals, partly or largely from the tissues joining staminal-tube to calyx-tube. *Stamens* much overtopped by the petals, extending to the middle of the calyx-lobes; filaments connate for half their length at the base, adnate to the calyx-tube at 5 points, forming 5 shallow narrow pockets; anthers linear or oblong; connective not produced into a point. *Glands* 0. *Ovary* rudimentary, small. *Female flowers* not seen. *Fruit* yellowish, about 2 cm. long, ovoid; pericarp leathery-papery, ? usually indehiscent.

TRANNSVAAL.—Zoutpansberg district: Messina, September 1918, *Rogers* in T. 24000, ♀. Messina, *Rogers* 19299, ♀ (N). Messina 2,000 ft., September 1918, *Rogers* 21664, ♂ and ♀ (N). Messina, *Rogers* 19341, ♀ (N). Near Messina, base of kopjie above the river Limpopo near the gorge, shrub w. elephantsfootlike base 27.5.27, *Young* in Herb. Moss. 14672, ♂, and T. 26933. On farm "Zoutpan No. 193", very characteristic of northern slopes of Zoutpansberg, main stem tuberous, about 1 ft. high and 2½ ft. broad at the base, Novem. 1932, *Obermeyer*, *Schweickerdt* and *Verdoorn* 137 (N & T), 2 sheets of each. North of Fogwells, 21.12.35, *Smuts* and *Gillett* 3114 (N). Pietersburg district: At Naauwpoort, 29.1.31, *Bremekamp* and *Schweickerdt* 469, ♂ (N & T).

2. *A. repanda* (Burch.)\* Engl. Bot. Jahrb. XIV 375.

*Main axis* a tuberlike topshaped—napiform root with a stem formed from accumulated remains of annual growths, subterranean ? or partly exposed. *Stem* woody, up to about 20 cm. high and 8 mm. thick, greyish brown. *Branches* straggling, ? or climbing, striate, grayish or purplish gray, glaucous, about 4 mm. thick at base, up to 120 cm. long, arising from the main stem or directly from the rootstock; branchlets absent. *Leaves* subsessile or shortly petioled, semi-conduplicate, 6–13 cm. long, 0.5–2 cm. broad, simple, subentire, remotely repand or short-lobed, with thinly cartilagenous green or reddish margins; linear-lanceolate or elongate-elliptic, obtuse, reticulated; glands on underside of leaf, below each marginal inequality (or lobe), below the apex at the end of the midrib and 2 at base of leaf on each side of apex of the petiole; petiole up to about 5 mm. long; stipules brownish, acicular, 1–1.5 mm. long. *Inflorescence* usually small, axillary, characteristically 2- to few-flowered; peduncle usually with alternate sidebranches, generally 1 sidebranch develops, occasionally both rudimentary; peduncle ending in tendril or pedicel; flowers usually dioecious, † “yellowish”, “dirty yellow” or “ochraceous”, or “greenish”. *Male flowers* about 2 cm. long. *Receptacle* usually about 3–4 mm. long, narrowly cylindrical, slightly widening upwards. *Calyx* obconically tubular, the limb half or slightly less the length of the tube; lobes spreading, ovate to ovate-oblong to subovate to elliptic oblong, obtuse or subobtuse, entire. *Petals* inserted a little below the sinuses of the calyx-lobes or occasionally towards the middle of the calyx-tube, membranous, transparent, 1-nerved or with branched palmate veins, narrowly oblong or elliptic-oblong, acute to subobtuse, entire. *Corona* 0. *Stamens* free, inserted usually at about the middle of the calyx-tube, rarely lower, about equalling the petals in length; filaments, subulate or linear-subulate, from half to as long as the length of the anthers; anthers broadly linear; connective not produced into a point. *Glands* 0. *Ovary* rudimentary, about 1 mm. in length. *Female flowers* “greenish”, just over 1 cm. long. *Receptacle* 1–2 mm. long, shortly funnel-shaped or sub-cylindrical. *Calyx* reddish or greenish, subcampanulate; the limb slightly shorter than the tube; lobes oblong-ovate, obtuse, entire. *Petals* inserted more than halfway up the tube, extending to the sinuses of the calyx-lobes, transparent, membranous, 1-nerved, short, oblong or elliptic-oblong, acute or subacute, apices curved outwards, entire. *Corona* 0. *Staminodes* free or connate at the extreme base, inserted at the base of the calyx, subulate or subulate-linear, with apices curved, hooked or tipped with abortive anthers. *Glands* 0. *Ovary* stipitate, ovoid or ellipsoid-ovoid, smooth; style fairly long, 3-branched, with the branches widening, terminating in a fleshy-papillate surface forming the stigma; ovules few, arising either in lower half or in upper half of the ovary. *Fruit* bright or coral red, roundish to ovoid, roundly and shallowly 3-lobed, about 1.5–3 cm. long, leathery, dehiscent, splitting into 3 (or 4?) valves; seeds roundish-heartshaped, regularly pitted. *Paschanthus repandus* Burch. Trav. 1, 543. *Modecca paschanthus* Harv. Flora Cap. 11, p. 500. *Jäggia repanda* Schinz. ‡ Verh. bot. Ver. Prov. Brand. 1888, 254. Fig. in Engl. Pflanzenwelt Afrikas IX. Bd. 111, Heft 2, 601. *Paschanthus Jäggii* Schinz.§

\* The present writer is inclined to endorse the view of Schinz (l.c.) who thought that this species does not fit in well into *Adenia* as in several respects it differs from it, viz. absence of corona, hermaphroditism, non-connate stamens absence of glands and insertion of the stamens. However, no critical attitude is justified as the writer has only studied a limited number of the species in the genus.

† Burchell described this species as having polygamous flowers. Schinz described *Jäggia*, which Harms places as synonymous with *Adenia*, as hermaphroditic, Harms gives for his sect. 1 *Paschanthus* (Burch.) Harms (*Jäggia*, Schinz): Flowers hermaphroditic, polygamous or dioecious. The present writer has not found polygamy or hermaphroditism of common occurrence.

‡ H. Schinz in Bull. Travaux de la Soc. Bot. Geneve XI (67) 1891 states, *P. repandus* Burch. (*Jäggia repanda* Schinz).

§ The publication in which this epithet appeared is not known. *Modecca repanda* Druce. Rep. Bot. Exch. Club, Brit. Isles 1916, 636, is given as a syn. in Kew Index, but the author has not seen this publication.

TRANSVAAL.—Zoutpansberg district: Vivo, 20.1.31, *Bremekamp* and *Schweickerdt* 206, ♂ (N & T). Near farm Chapudi between Zoutpan and Waterpoort, branches flexuous not climbing, leaves markedly glaucous, scattered specimens seen 26.11.32, *Obermeyer*, *Schweickerdt* and *Verdoorn* 246, ♀ (N & T). Botanical Reserve, Messina, 18.12.28, *Pole Evans* 2, ♀ (N), (2 sheets).

CAPE PROVINCE.—Barkly West district: At Motito, Febr. 1842, *Burchell* 2486/2, ♂, *type* (N). Windsorton 1150 M., Jan. 1910, *Marloth* 5840, ♂ & ♀ (N). Prieska district: Without precise locality rocky hillsides, greedily eaten by stock, 26.11.28 and 3.12.35 *Bryant* 345, ♀ (N).

BECHUANALAND.—Near Kuruman, Ga Mhani Mts. 1350 M, Febr. 1886, *Marloth* 1092, ♂ (N), 2 specimens.

SOUTH WEST AFRICA.—Windhoek, Nov. 1924, *Rogers* 29798, ♂ & ♀ (N & S). Ditto, *Rogers* 29723 and 29784 (T & S). Great Karasberg, Narudas Süd, middle slopes, straggling among rocks fairly common, Dec. 1912/Jan. 1913, *Pearson* 8166, ♂ & ♀ (N, C, & S). Okahandja, niedrige Acacienschsteppe, 27.1.07, *Dinter* 362, ♀ (S). Windhoek, Glimmerschieferberge, Dec. 1912, *Dinter* 4516, ♀. Waterberg: Quickborn, under thorn trees, Apr. 1929, *Bradfield* 75, ♀ (N). Near Karibib, 24.12.29, *Moss* 17893, ♀ (W). hills S.W. Gründoorn, erect 2-3 ft., in partial shade, *Pearson* 4276 (N).

3. *A. gummifera* (Harv.) Harms. Natürl. Pflanzenfam. Nachtrag 1, 255.\*

*Main stem* woody, cylindric, greyish, up to 7.5 cm. in diam., the nodes enlarging with age, climbing to tops of large forest trees ("liana"), profusely branched. *Branches* green, striate, climbing in the canopies of trees, very glaucous; branchlets often numerous. *Leaves* petioled, 4.3-10 cm. wide and 4-8.8 cm. long, varying from kidney-shaped to deeply 3-lobed; lobes usually shallow, rounded, entire, the median one oblong, triangular or broadly oblong-ovate, bases variously cordate, subtruncate or variously rounded; sinuses wide; undersurface paler, visibly net-veined, punctulate (gland dotted) on one or both surfaces; dots dense or scattered, same colour as leaf surface or black; glands, ? rarely present on under surface of leaf, solitary at the apex of the petiole; petiole 3.5-9 cm. long; stipules minute, scale-like or a scaly ridge, usually shrivelling away with age. *Inflorescence* usually fairly open (not reduced), 2-many-flowered; sidebranches of peduncle usually alternate, sometimes one or both undeveloped; peduncles of primary inflorescences 2-14 cm. long, usually terminating in a tendril, sometimes in a long pedicel; flowers "green" "cream", "yellowish". *Male flowers* about 1.5 cm. long. *Receptacle* 3-5 mm. long, narrowly subcylindric, abruptly widening at upper end or subfunnel-shaped or obconical. *Calyx-tube* under 2.5 mm. long, saucer-shaped or ring-shaped, one-third to one-fifth the length of the limb; lobes spreading, linear or narrowly oblong-ovate or oblong-elliptic or linear-ovate or oblong or subspathulate, obtuse to subacute, entire or slightly uneven at apices, faintly striped-splashed and remotely black-dotted (punctulate). *Petals* inserted at the sinuses of the calyx-tubes, resembling these and equalling them in length, or shorter or slightly longer, linear-oblongate, subspathulate, oblongate or linear or elliptic-oblong, more transparent and less punctulate than the calyx-lobes, crenate-dentate, uneven near the apices, acute to obtuse. *Corona* 0. *Stamens* arising from the centre of the receptacle, extending to beyond the middle of the calyx-lobes or nearly to their apices; free portions of filaments shortly subulate or linear-subulate, connate for almost half (or slightly more)

\* There is apparently a good deal of confusion as regards the relation between this species and *A. cissampeloides* (Planch) Harms, some regarding them as identical. Masters divides them, it would appear, as an Eastern and Western species and describes both as having the sepals inserted at the base of the calyx which definitely is not the case in the S.A. plant which invariably has the petals arising in the sinuses of the calyx-lobes and correctly described by Harvey in Fl. Cap. vol. 2, p. 500. Dr. H. G. Schweickerdt writing from Kew (Jan. 6, 1937) states: "*A. gummifera* (Harv.) Harms and *A. cissampeloides* (Planch) Harms are two good distinct species. I first believed them to be conspecific, but now am quite convinced that they are distinct; the venation differs."

their length at the base or almost free; anthers, linear, or linear-oblong, densely and minutely reddish-brown spotted; connective? usually "dotted" (punctulate). *Glands* 0. *Ovary* rudimentary, minute or overtopping the staminal tube. *Female flowers* about 5-6 mm. long or slightly longer. *Receptacle* minute, 1 mm. and under. *Calyx-tube* absent or practically so; sepals spreading, linear-oblong, ovate or ovate-oblong, faintly-striped-splashed and remotely black-dotted (punctulate), obtuse to subacute, entire. *Petals* inserted at the sinuses of the sepals, about half the length of these or shorter, linear, under  $\frac{1}{2}$  mm. wide, apices curved, transparent, with black "dots" few or absent. *Corona* 0. *Staminodes* short flat out-growths or toothlike, arising just at the base of the ovary stalk. *Glands* 0. *Ovary* sessile, or shortly stipitate, ovoid, smooth; style short or wanting; stigma of short reflexed lobes, arising abruptly from the narrowed apex of the ovary or as 3 expanded branches from a short style; ovules, several. *Fruit* "brownish-orange", up to 4 or 5 cm. long, ellipsoid, leathery, dehiscent, seed 4 mm. long somewhat flattened, subovate, regularly pitted. *Modecca gummifera* (Harv.) Harv. & Sond. Fl. Cap. II, 500. *Ophiocolon* (*M.*? *gummifera*) Harv Gen. S. Afr. Pl. Ed. 2, 121. *Ophiocolon gummifer* Mast. Oliv. Fl. Trop. Afr., II, 518. *Ophiocolon gummifera* (Harv. & Sond.) Mast. Nat. Pflanzenfam. Ed. I, III, ta., 83. *Adenia gummifera* Burtt Davy Fl. Pl. and Ferns, Tvl., & Swaz. 1, 222, and in Ann. Transvaal Museum III, 121.

TRANSVAAL.—Nelspruit district: At Kaapmuiden, Febr. 1923, *Thorncroft* 1199, in T.M. No. 23140, ♂ (T). Just outside Nelspruit, 2,700 ft. 26.10.30, *Liebenberg* 2636, ♂ (N). Barberton district: Highland Creek, climbing over trees 10-20 ft. high, 4,000 ft. 29.1.90, *Galpin* 782. Zoutpansberg district: Farm "Elsteg", 5 miles west of Louis Trichardt, Nov. 1932, *Obermeyer*, *Schweickerdt* and *Verdoorn* 355, ♀ (N & T). At Elim, Dec. 1930, *Obermeyer* 819, ♀ (T). Pisangkop, Febr. 1878, *Nelson* in T. 11159, ♀. Pietersburg district: Modjadjies, *Rogers* 18110 (W). Politsi, Dec. 1932, *Schweickerdt* 1039, ♂ (N). Tshakoma, Nov. 1931, *Obermeyer* 1063 (T). Magoebaskloof, Jan. 1933, *Murray* 761 (N). Lydenburg district: Mariepskop, Nov. 1925, *Fitzsimons* and *van Dam* in T. 30631, ♂. Sekukuni Location, Kloof, Western Spur on farm Magnets Heights 4,500 ft., 24.10.34, *Barnard* 128, ♂ (N).

NATAL AND ZULULAND.—Durban, Doonside, Dec. 1933, *Wyllie* in C. 23313, ♂. Berea, 150 ft., Dec. 1894, *Wood* 5502, ♂ (N). Ditto, 17.1.98, *Wood* 6662, ♂ & ♀ (N). Farm Fricdenau, Station Dumisa, 6.12.08, *Rudatis* 523, ♂. Without precise locality, *Gerrard* and *McKen* in C. 688, ♂. Pietermaritzburg: Umlalaas, 1.1.33, *Gerstner* in C. 22614.

CAPE PROVINCE.—In woods near Keimouth, 100 ft., Jan. 1892, *Flanagan* 1156, ♂ & ♀ (N). Port St. John, climbing over shrubs, 15 ft., Dec. 1896, *Galpin* 3461, ♀ (N). Umtata to Port St. Johns, Dec. 1927, *Blenkiron* in W. 16053. Kentani district: Valley, immense climbing plant, Jan. 1903, alt. 0, *Pegler* 869, ♂ (N).

#### 4. *A. hastata* (Harv.) Schinz. Bot. Jahrb. XV. Beibl. 33, 3.

*Root* not known? like in *A. digitata*. *Main stem*? absent. *Main branches* herbaceous, annual straggling, procumbent or climbing, striate, greyish or dark, sometimes glaucous, up to 4 mm. thick at the base and "250 cm. long or more",? arising from an underground? tuberlike rootstock; branchlets usually absent. *Leaves* petioled, 3-8 cm. long and broad, simple, entire, variously cordate-ovate to hastate\* (but the lateral lobes obtuse) with the median lobe lanceolate, acute or subobtuse; glands 2 (paired) at the apex of the petiole, variable, often 2 (paired) at the leaf apex, variable; petiole, 0.8-5.0 cm. long; stipules subulate and toothlike, 1.5-2.0 mm. long. *Inflorescence* axillary, varying much in size; peduncles usually terminating in tendrils, with sidebranches usually opposite and few-flowered. *Male flowers* 1.3-3.1 cm. long. *Receptacle* 3-8 mm. long, subcylindric, widening towards the apex, or obconical to subfunnel-shaped. *Calyx* tubular, widening upwards or

\* Peltate-ovate leaves were typical of *Gerstner* 2345 but were not observed in any other specimens.

subcampanulate, with the limb one-third to one-half the length of the tube; lobes ovate to orbicular or oblong, obtuse or subacute, with the 5 interiorly overlapping margins lacinate-lacerate and the remaining 5 entire. *Petals* inserted below (just above the corona) at, or above the middle of the calyx-tube, transparent to subtransparent, 1-nerved or 3-veined, linear-lanceolate, narrowed at the base, entire to remotely serrate (or distantly narrow-lobed) or subentire or fimbriate-lacinate (filiform processes) for two-thirds or more of their length, with the processes varying in length and density. *Corona* a sinuate circle of filiform processes, arising from a little above the base of the calyx-tube in groups or in a continuous circle; processes 0.75–3 mm. long, scattered to very dense. *Stamens* arising from the centre of the receptacle extending to the sinuses of the lobes or well below; free portions of the filaments subulate-linear; connate for one-fourth to two-fifths their length at the base, forming a shallow cup adnate to the calyx-tube (at 5 points) forming 5 narrow pockets or depressions; anthers linear-oblong to linear, with the connective not produced into a point, equalling or up to 1.5 times the length of the free filaments. *Glands* 5, arising from the base of the pockets (or depressions), approximately 1.5 mm. long, hidden in or protruding from the pockets, flattened, capitate or subcapitate, shortly linear to shortly oblong or spatulate. *Ovary* subterete, protruding slightly above the staminal cup or extending beyond the apices of the filaments. *Female flowers*, 1.2–1.8 cm. long, "white"?. *Receptacle* 1.5–2.5 mm. long, stout, shortly funnel-shaped or subfunnel-shaped. *Calyx* campanulate or nearly so, narrowed at the base; tube twice as long as the limb; lobes ovate to orbicular-ovate to oblong-ovate, obtuse to subacute with the 5 interiorly overlapping margins lacinate to lacerate, the remaining entire. *Petals* inserted at about the middle of (or just below) the calyx-tube, extending to about the sinuses of the calyx-lobes, narrowly linear-acute or linear-acuminate, slightly curved at the apices or straight, entire or remotely dentate, narrowly lobed in the upper half. *Corona* a circle of filiform processes or fimbriately lobed processes; processes 0.75–1.75 mm. long, arising from near the base of the calyx-tube. *Staminodes* arising from the centre of the receptacle, bases connate, forming a collar around the stalk or ovary, adnate to the extreme base of the calyx-tube (? or receptacle) forming 5 pockets or depressions, linear-subulate, curved or bent near the apices. *Glands* arising from the side of the depressions very small or up to 1 mm. long, flattened, variously capitate, shortly oblong or subpathulate. *Ovary* stipitate, ovoid or spherical, smooth; style fairly long, 3-branched; branches palmately widened, terminating in a fleshy-papillate surface (stigma); ovules numerous. *Fruit* "as large as an egg" (Harvey), and smaller, "green and white", roundish "pulpy", leathery, ? dehiscent; seed flattened, ovate-orbicular, pitted. *Modecca hastata* Harv. Thes., Cap. 11, 43, pl. 167. *Adenia Schlechteri* Harms Engl. Bot. Jahrb. 33, 150. *Adenia hastata* Burt Davy Ann. Transv. Museum III, 121.

TRANSVAAL.—Nelspruit district: Komatipoort, *Rogers* (? 12606) in T. 13273. Ditto, Nov. 1931, 1,000–2,000 ft., *Rogers* 12606, ♂ (S, B & N). Komatipoort, 14.12.97, *Schlechter* 11747 (N). Nelspruit, Dec. 1917, *Breyer*, T. 17956, ♂. Karino, 28.1.29, *Hutt* in N. 7870, ♀. Near Nelspruit, 24.1.06, *Cronje* in N. 1489, ♀. Barberton district: Barberton, Nov. 1915, *Rogers* 18369, ♂ (S). Barberton, Nov. 1931, *Smith* 7006, ♂ (N). Barberton, Sept./Oct. 1889, 2,300–3,000 ft. procumbent, 3–4 ft. long, in stonyground on hillsides among rocks, *Galpin* 563, ♂ & ♀ (B. & N). Hills near Barberton, climber, 3,000 ft., Aug. 1923, *Thorncroft* 2034, ♂ (N). Barberton, Oct. 1922, *Wager* in T. 23675, ♂. Barberton, Nov. 1931, *Smith* 7069 (N). Ditto, *Thorncroft* in C. 5980, ♂ & ♀. Ditto, Nov. 1909, *Williams* in T. 7643, ♀. Ditto, Oct. 1907, *Thorncroft* in T. 3923, ♀. Kruger National Park: Skukuza, in shade of *Acacia*, among rocks on N. bank of Sabi R., *Letty* 43, ♀ (N). ? district: Witsteen, growing in Div. Pl. Ind. Garden, *Hutchinson*, ♂ (N).

NATAL.—Without precise locality (? near Greytown), 29.10.31, *Pole Evans* 3836, ♀ (N). Nongoma district: Mahlabatini, between diabase, 18.11.37, *Gerstner* 2345, ♂ (N). Middle Umkuzi, on Mr. Nagels farm, 10.1.36, *Gerstner* 2895 (N).

5. *Adenia Wilmsii* Harms. Engl. Bot. Jahrb. 26 : 238.

*Root* tuberlike, napiform or variously shaped, ? not rising above ground, up to 7 lbs. ? and over. *Main stem* ? always underground, an attenuated outgrowth from root or ? formed from accumulated remains of annual growths, woody. *Branches* herbaceous, annual, one or more from same rootstock or main stem, semi-erect or semi-procumbent up to 50 cm. and over. *Leaves* digitately compound, petioled ; lobes 7, occasionally 5, the median lobe often entire, but usually pinnati-lobed (1-2 pairs) at about the middle or below, 5-12 cm. long (? often less) ; the other lobes entire and simple, unequal in length ; glands absent on under-surface and usually also in the sinuses of the lobes ; petiole stout, usually long, 4-7 cm., with 2 large (occasionally 4) fleshy circular glands at the junction with the lobes, above ; stipules about 1-2 mm. long, toothlike. *Inflorescence* axillary ; peduncle stout, 4-5 cm. long, terminating in a normal flower ; main branches opposite or alternate, one or both sometimes rudimentary with the "terminal" flower (at the termination of the peduncle) ? always developed ; peduncle branches of normal stems 1-flowered, 2- to 3-flowered on reproductive shoots ; flowers yellowish. *Male flowers* about 2.5 cm. long. *Receptacle* 5-7 mm. long, linear, subcylindric widening upwards. *Calyx* salver-shaped or cylindrical-campanulate ; tube cylindric or narrowly obconical, sometimes abruptly narrowed above the base, one and one-half to twice the length of lobes ; lobes ovate or oblong-ovate or subelliptic, obtuse or subobtuse, interior margins entire or subentire. *Petals* inserted a little below the middle of the calyx-tube, extending a little or well beyond the sinuses of the lobes, membranous, transparent, palmately 3- or 5-veined, with sideveins in the latter usually few-branched, oblanceolate or elliptic-oblanceolate, subserrate in upper  $\frac{1}{2}$  or  $\frac{1}{3}$ , subobtuse. *Corona* of slender processes, 0.5-0.75 mm. long, arranged in a circle or sinuate ring just below the insertion of the petals. *Stamens* well overtopped by the petals, extending to just below the sinuses of the calyx-lobes, connate for half their length at the base ; filamental column adnate to the calyx-tube for  $\frac{1}{2}$  or its full length producing 5 pockets ; anthers equal in length or longer than the free filaments, apiculate. *Glands* arising from the base of the pockets, flattened, capitate ; stems short or almost absent. *Ovary* rudimentary, extending half way up the filamental column or its entire length. *Female flowers* not seen.

TRANSVAAL.—Lydenburg district : On High School grounds in Lydenburg, Oct./Nov. 1935, *Van Wyk*, ♂ & ♀ (N). Without precise date and locality (? at Lydenburg), *van Wyk* (N). Lydenburg, 1935, *Pons*, ♂ (N). Farm Rooidraai, 1/8" long stems, red loam soil, 7.12.35, *Liebenberg* 3488 (N). Ditto, *Liebenberg* 3496 (N).

6. *A. fruticosa* Burt Davy Man. Fl. P. & Ferns Tvl. & Swaz. 1, 36.

*Main (swollen) axis* tuberlike, flask-shaped, trunklike, fleshy, smooth, partly or mostly above ground, the latter green, up to over 2 metres, branched or unbranched at the base, ending in whiplike branches (Bremekamp). *Branches* climbing, striate, greyish-green, glaucous ; branchlets present in axils of tendrils. *Leaves* compound, digitately 3-lobed, rarely 5-lobed, petioled ; lobes petioluled to subsessile, the median about 1.7-6.5 cm. long and about the same width, the lateral and basal smaller, simple, entire, rotund, orbicular or orbicular-obovate, subtruncate, retuse or rounded at the apex ; glands absent on all parts of the leaf including the sinuses of the lobes (? always) with 1 large subreniform subpeltate gland at the apex of the petiole ; petiole 1-5.0 cm. long ; stipules, minute, toothlike,  $\frac{1}{2}$  mm. or less long ; tendrils sometimes strong or weak, sometimes breaking off giving the appearance of thorns. *Inflorescence* usually on axillary branchlets, in axils of leaves or tendrils, 1- to 3-flowered, usually alternate, sometimes one or both rudimentary ; peduncle wanting to 4 mm. long, terminating in a flower not a tendril ; tendrils without developed cymes, in axils of leaves, with or without bracts. *Male flowers* not seen, according to Burt Davy : *Sepals* imbricate (in bud about 8 mm. long). *Petals* free, membranaceous (about 1 cm. long and 2.5 mm. wide). *Stamens* 5-6, free ; filaments 2 mm. long ; anthers about

2.5 mm. long, laterally dehiscent. *Ovary* rudimentary, small. *Female flowers* "greenish", yellowish or "yellowish-green", about 8 mm. long. *Receptacle* subcylindric, 1 mm. long. *Calyx* subcampanulate; lobes semi-erect, 3-4 times as long as the tube, elliptic-oblong, obtuse, entire, with broad green longitudinal veins. *Petals* about  $\frac{1}{2}$  the length of the calyx lobes or slightly longer, arising from the sinuses of the latter but appearing also to be partly inserted on the tissue joining calyx-tube to staminal column, membranous, transparent, with 1 broad green vein, ovate-lanceolate, tapering towards the base in lower third, serrate-uneven in upper half. *Corona* a circular lacerated fringe with slender-branched filiform processes about 0.5 mm. long arising from the edge of the calyx-tube and from the tissue joining staminal tube to calyx-tube. *Staminodes* connate for half their length at the base, forming a column around the base of the ovary stalk; staminal column joined to the calyx-tube at 5 points by means of fleshy membranous tissue, forming 5 pockets with the free ends subulate and apices curved. *Glands* broad, flattened, arising at the base of the "pockets". *Ovary* stipitate, spherical, smooth; style short, 3-branched; branches long, terminating in shield-like fleshy-papillate structures forming the stigma; ovules few. *Fruit* yellowish, longitudinally unevenly banded with green, approximately 2 cm. long, roundish, leathery, dehiscent, splitting into 3 valves; seeds flat, suborbicular, regularly pitted. Bremekamp in Vegetationsbilder 1932; 23, 3, pl. 18.

TRANSVAAL.—Pietersburg district: On slopes 2 miles beyond Chuniespoort Hotel, pale green succulent flask-shaped, stems up to 4-5 ft. high, lounging against *Peltophorum*, several branches ascending and climbing in the tree, May 1935, *Obermeyer* and *Verdoorn* 10 (N & T). M'Phatlele's Location, climbing plant with swollen stem, 9.10.19, *Pole Evans* in N. 19885, ♀. Zoutpansberg district: Dongola Reserve, Messina, 15.9.34, *Pole Evans* 3747, ♀ (N). Lydenburg district: Sekukuni, farm Driekop, dry sandy loam, 3,500 ft., 17.12.36, *Barnard* 454B (N). Ditto, between crevices on "koppies", bole attains size of a 56-gal. barrel, 4 ft. high, 13.1.36, *Barnard* 454 (N).

7. **A. glauca** Schinz Bot. Jahrb. XV. Beibl. 33 Heft 1, 1-3.

*Main (swollen) axis* tuberlike, "urn-shaped" or irregular-shaped, fleshy, partly or, mostly above ground, the latter greyish, green beneath the skin, of various shapes and\* sizes, up to 2 ft. (or more?) high. *Branches?* divaricate, striate, glaucous, up to 5 mm. thick and about 150 cm. long, arising from attenuations of the main stem or directly from a flat surface; branchlets? usually few or absent, rarely well developed, resembling the branches but greener, glaucous. *Leaves* digitately compound, petioled; lobes 5, occasionally sub-petioluled, conduplicate, 1.5-6 cm. long, entire, with the margins thinly cartilagenous, elliptic, sub-orbicular, rotund or obovate, gradually or abruptly narrowed at the base, obtuse; glands absent on all parts of the leaf including sinuses of lobes, with 2-paired flaplike glands † at the base of the leaf; petiole 0.6-5 cm. long; stipules minute, toothlike, dark reddish-brown. *Inflorescence* usually axillary, peduncles opposite or alternate with 1- to 2-flowered sidebranches, occasionally many-flowered; peduncles usually terminating in tendrils, not infrequently in shorter or longer flower-bearing pedicels. *Male flowers* yellowish, about 3 cm. long. *Receptacle* 1.1-3.5 cm. long, usually about 1 cm. long, linear-subcylindric, gradually widening towards the apex. *Calyx-tube* obconical or subobconical,  $\frac{2}{5}$ - $\frac{1}{5}$  the length of the lobes; lobes semi-spreading, linear-oblong, sometimes broadening towards the apex to linear, or elliptic-oblong, obtuse or subobtuse, entire. *Petals* more than half the length of the calyx-lobes, arising from the sinuses of the calyx-lobes but appearing also to be partly inserted on the tissue joining staminal cup (tube) to calyx-tube, membranous, transparent, 1-nerved or palmately 3-veined, the median vein unbranched or remotely branched or branches absent with occasional stray veins, narrowly oblong-elliptic or linear-lanceolate tapering towards the base or ovate-lanceolate or lanceolate at both ends, acute to obtuse with curved or straight apices and margins remotely or unevenly

\* Sometimes with "neckline" protuberances from which the branches arise. (Smith 6271.)

† Schinz (l.c.) refers to 1, 2 or 3 glands "oberhalb der Achselprodukt" but the writer has found only bracts enveloping a bud.

serrate or dentate in the upper third or two-thirds. *Corona* of a few filiform processes, about 0.5 mm. long (very rarely 1.5 mm. long), arising from around the base of the petals partly or entirely from the edge of the tissue joining staminal cup to calyx-tube. *Stamens* much overtopped by the petals, extending about half way up the calyx-lobes, free portions of filaments subulate or linear-subulate, of varying length, connective produced into a point, connate for half to two-thirds their length at the base forming an obconical cup adnate to the calyx-tube at 5 points producing 5 narrow pockets; anthers short, broad, or linear-oblong, equalling the free filaments in length or occasionally up to 4 or 5 times their length. *Glands* 0. *Ovary* rudimentary, 2 mm. long. *Female flowers* yellowish, about 1.4 cm. long. *Receptacle* approximately 2.4 mm. long, shortly funnel-shaped or narrowly subcylindric. *Calyx-tube* subcylindric to cup-shaped, one-third to one-fifth the length of the lobes; lobes semi-spreading or subspathulate or obovate or oblong or linear, elliptic-oblong, obtuse to sub-obtuse, entire. *Petals* about half the length of the calyx-lobes, arising from the sinuses of the latter but appearing also to be partly inserted on the tissue joining calyx-tube to staminal tube, membranous, transparent, 1-veined, with sometimes remote branches or an occasional stray vein, oblanceolate to linear-elliptic to lanceolate in upper one-third to one-half, gradually tapering towards the base, acute to truncate-toothed, with curved or straight apices and margins subentire or remotely serrate-uneven in upper parts. *Corona* of a few filiform processes about 5 mm. long, arising from around the base of the petals, partly or entirely from the edge of the tissue joining staminal tube (cup) to calyx tube. *Staminodes* connate for half or more of their length at the base to form a wide tube or collar around the ovary stalk; adnate to the calyx-tube at 5 points forming 5 narrow pockets with the free filaments subulate-tapering, sharply curved at the apices or with rudimentary anthers. *Glands* 0. *Ovary* stipitate, ovoid to orbicular, or rarely somewhat 4-sided, smooth or with transverse raised bands; style short, 3-branched, \* the branches widening upwards terminating in a papillate-fleshy stigma; ovules? few. *Fruit*? orange to yellow-coloured, roundish to ovoid, roundly and shallowly 3 (-4) lobed, leathery, ? usually dehiscent, splitting into 3 (4) valves. *Seeds* flat, roundish-heartshaped, regularly pitted. *Modecca glauca*, Schinz. Bot. Jahrb. XV. Beiblatt 33, I.

TRANSVAAL.—Waterberg district: Warmbaths, 8.12.04, *Burt Davy* 2622, ♀ (N & B). Near Pienaars River, 52 miles west of Warmbaths on hills, Sept. 1932, *Smuts* 355, ♀ (N). Vierentwintig Riviere, Jan. 1920, *Rogers* in T. 20816. Vygeboompoort, Sept. 1913, *van Dam* in T. 13191. Ditto, Oct. 1913, in T. 13715, ♀. Farm Roodepoort No. 15, Palala Rd., rocky ridge, large epigeal tuber with 18" stems, 6.12.31, *Galpin* 11606, ♀ (N & B). Farm Doornfontein No. 1807, amongst felsite rocks, fleshy stem 1½ ft. high and 6" diameter, 19.2.24, *Galpin* 9164 (N). Olifants Poort, 9 miles N.E. of Nylstroom, climbing up stem, of trees, on hillside, 6.12.34, *Galpin* 13195 (N).† Potgietersrust district: Farm Nooitgedacht near Naboomspruit, amongst rocks on mountain top, stems trailing from large epigeal tuber, 18.10.31, *Galpin* 11605, ♀ (N). Potgietersrust, June 1916, *Rogers* 18827, ♂ (N & B). Kwarriehoek School, everywhere, particularly between rocks and extended rock outcrops, *Steyn* 37, ♂ (N). On Temby Downs, epigeal portion of tuber conical 15" high, malachite green, stems slender climbing 10 ft. up tree stems, 2,900 ft., 18.11.34, *Galpin* 13197, ♀ (N). Pretoria district: On summit of Daspoort range near Fairy Glen, 4,700 ft., 6.10.33, *Mogg* 14130, ♂ (N). Wonderboom, Mar. 1924, *van Dam* in T. 25042. Premier Mine, Aug. 1924, *Verdoorn* (N). Ditto, Dec. 1919, *Rogers* 25027 (T). Ditto, 4,000 ft., *Menzies*. Flats beyond Silverton, 12.10.19, *Phillips* 3021, ♀ (N). Derdepoort, 7.10.28, *Mogg* 15386, ♂ & ♀ (N). Magaliesberg, May 1920, *Marloth* 9508, ♂ (N). Foot of Magaliesberg on farm "Grafheim", 4 miles west of Wonderboom Poort, growing on rocky but loose

\* In *Smuts* 355 there were 4 style branches and 4 placentae on the flowers examined.

† On farm "Grafenheim" along lower N. slopes of the Magaliesberg growing under *Ehretia rigida* bush in shady places and widely climbing among the branches of its support, rootstock a large tuber of globose to obovoid shape and partly buried in the loose black sandy soil . . . the exposed part often acquiring a highly polished surface, being thus very shiny and green . . . "vern. name 'Bobbejaan'", Oct. 1933, *Smith* 6841 ♂ (N).

sandy soil, stems up to 4 ft. with 2 or 3 necklike protuberances from which the stems arise, up to 50 lb. in weight, stems sprawling over other plants such as *Ochna pulchra* and *Burkea africana*, 31.7.32 C., 4,200 ft., *Smith* 6271, ♂ (N).<sup>\*</sup> Without precise locality, growing in Stellenbosch University Garden, Oct. 1928, *Marloth* in N. 16416, ♀. Ditto, Div. Pl. Ind. Gardens, *Verdoorn* (N). Ditto, from Onderstepoort poisonous plant garden, Nov. 1934, *Liebenberg* 3222, ♀ (N). Ditto, 1932, *Steyn* AS; 9.11.32.

8. *Adenia digitata* (Harv.) Engl. Bot. Jahrb. XIV. 375.

*Root* tuberlike, subnapiform or variously shaped, appearing above ground (green) with subterranean obstruction, up to about 30 lb. ? and over. *Main stem* usually underground, from accumulated remains of annual growths, usually under 20 cm. long, and 15.0 mm. thick, woody. *Branches* herbaceous, annual, striate, climbing, up to 180 cms. long and ? more, and about 6.0 mm. thick, usually arising singly from a tuber. *Leaves* digitately compound, petioled; lobes usually 5, occasionally 3, (sub) or pinnatilobed or pinnatisect sometimes petioluled or simple, narrowly linear or linear lanceolate or ovate or elliptic-lanceolate, entire, unequal in length; central lobes 2.0 (? 1.5†)–16 cm. long; glands on lower surface circular or slightly oblong, usually present at all sinuses of primary lobes and of the lowermost secondary lobes of the primary central lobe, sometimes present at all sinuses of lower secondary lobes, occasionally absent in some of the sinuses of primary lobes or on the lower surfaces of simple lobes; petiole 0.5–7.5 cm. long with 2 paired glands above, at the apex; stipules minute toothlike, rarely up to 3 mm. *Inflorescence* axillary, two primary branches opposite or alternate, often 1-few-flowered, usually 4–8 flowered, rarely many flowered (18–20‡); peduncles absent or almost so, to 6.5 cms. long, always ending in tendrils; flowers whitish, bright-greenish, pink tinted or creamy or yellowish. *Male flowers* 1.5–3.5 cm. long. *Receptacle* 3–9.5 mm. long, linear-subcylindric, widening upwards or funnelshaped. *Calyx* subcampanulate or campanulate; tube subcylindric widening upwards or obconical sometimes with a slight constriction just above the base, equal in length to the lobes or up to 3 times their length; lobes elliptic-ovate or oblong-ovate or broadly ovate (or-bicular-ovate) or oblong ovate; obtuse to subacute, interior margins lacerate-laciniate, very rarely entire or subentire. *Petals* inserted near the base of the calyx tube, rarely near the middle thereof, extending to the sinuses of the calyx lobes or a little below or well above; membranous, transparent, palmately 3-veined with the sideveins entire or few-branched; oblanceolate-acuminate, oblanceolate or linear-oblanceolate or broadly oblanceolate or elliptic-ovate with narrowed bases or lanceolate in upper half, cuneate-tapering in lower half; acute to obtuse, upper  $\frac{2}{3}$  or  $\frac{1}{3}$  serrate or serrulate or denticulate (dentate)—laciniate or serrate-denticulate, rarely entire or subentire. *Corona* sometimes absent or nearly so, of slender processes 0.5–0.75 mm. long, rarely over 1 mm.; arising in a continuous sinuate ring rarely in groups from between the bases of the petals, sometimes subpapillate at the upper ends. *Stamens* usually overtopped by the calyx tube and petals, extending below or beyond the sinuses of the calyx lobes, connate for half their length, rarely up to  $\frac{2}{3}$  their length; the filamental column adnate to the calyx tube in its lower half very rarely only at the base or for its full length, producing 5 pockets; anthers shorter or longer than the filaments, apiculate, loosely adhering at these points. *Glands* usually about 0.5–0.75 mm. long, arising from the base of the "pockets", flattened, capitate, variously shaped. *Female flowers* 1.5–2.5 cm. long. *Receptacle* 2–6.5 mm. long, subcylindric widening upwards or funnelshaped, sometimes also widened at the base. *Calyx* campanulate; tube obconical or subcylindric widening upwards, as long as the lobes or up to double their length; lobes ovate or broadly oblong-ovate, or narrowly oblong or

\* Without precise locality, Waterberg dist. vine w. large thick tuberous rootstock, 9.11.28. *Repton* 96 ♀ (N).

† Some flowering specimens have central lobes 1.5 cm. long, though it is not known whether they are full grown. In the Fehrson specimens (type of *A. multiflora* Pott.) the leaves are much shorter.

‡ In *Eyles* 3243 in Herb. Bolus (from Rhodesia), Fig. 15, the inflorescence is approximately 40-flowered.

broadly lanceolate, acute to obtuse with interior margins entire, very rarely subentire. *Petals* inserted near the middle or near the base of the calyx tube, extending to the sinuses of the lobes or below or above; membranous, transparent, 1 veined, very rarely 3-veined, oblanceolate or lanceolate to ovate-lanceolate in upper  $\frac{1}{2}$  with lower  $\frac{1}{2}$  gradually tapering towards the base, linear-lanceolate, narrowed at the base, or linear-oblanceolate or narrowly elliptic, entire, sometimes remotely toothed towards the apices, very rarely lacinate in upper  $\frac{1}{2}$  or  $\frac{1}{3}$ ; acute to subobtuse or acuminate. *Corona* rarely absent or nearly so, of slender appendages about 0.5–0.75 mm. or less long, arising in groups in a circle or in a sinuate ring from near the base of the calyx tube or higher, sometimes subpapillate at their upper ends. *Staminodes* partly connate, the free portions linear-subulate or subulate, or linear-sub-spathulate, as long or longer than the rest, curving outwards and inwards or vice versa, with apices incurved, shorter, as long as or longer than the ovary stalk; the staminal collar adnate for a short distance or more of its length to the calyx tube forming 5 pockets or depressions. *Glands* flattened, capitate, variously shaped; stems erect, rarely recurved, short and broad or long, heads usually large, concave or level above, rarely bilobed. *Ovary* stipitate, ovate to obicular or oblong or ellipsoid, smooth or prominently veined, rarely furrowed or ridged or uneven; style 3-branched, very rarely 2-branched, the unbranched portion up to  $\frac{2}{3}$  the length of the ovary or almost absent; stigma pufflike, woolly fleshy; ovules numerous. *Fruit* "orange" "brilliant orange", "yellow"? "crimson", "red-purplish" ovoid-oblong or ellipsoid, 3-valved, dehiscent; seeds flattened, roundish-subpear-shaped, regularly pitted. *Adenia senensis* (Kl.) Engl. *Bot. Jahrb.* 14 (1892), 375. *Adenia digitata* Burt Davy *Ann. Transv. Mus.* 111. 121.—*Modecca digitata* Harv. *Thes. Cap.* p. 8. *A. multiflora* Potts *Ann. Transv. Mus.* V. 235. *Clemanthus senensis* Klotsch, *Peters Reise Mosamb. Bot.* 143. *Modecca senensis* Mast. *Oliv. Fl. Trop. Afr.* 11, 517. *Adenia angustisecta*\* Burt Davy. *Kew. Bull.* 1921. 280. *Adenia stenophylla* Harms. *Eng. Bot. Jahrb.* XXVI, 238. *Adenia Buchananii* Harms. ex Engler in *Engl. Pflanzenw. Afr.* 111, 2. (Engl. and Drude *Veg. d. Erde* IX) 605, (1921) in obs.

TRANSVAAL.—Pretoria district: Middelkop farm near Pienaars River, C. 3680 fts Jan. 1926, *Smith* 2120, ♀ (N). Hartebeestpoort, *Jackson*, ♀ (N). Rooikop, 5.1.36, *Smut. and Gillett* 3450, ♀ (N). Pienaars River Station, Oct. 1932, *Osborne* in N. 2639, ♂ (2 sheets). Without precise locality, 23.1.23, *Osborne* in N. Rust-der-Winter, Jan. 1936, *Pole Evans* 3886, ♀ (N). Strubenskop, 18.1.36, *Munro* in N, ♀. Farm Zeekoegat, Swingbridge, 27.1.34, *Schweickerdt* 1090, ♀ (N). Bon Accord, W. Pyramid Hill, 12 M. north of Pretoria, 4,200 ft., 6.4.32, *Mogg* 12388, ♀ (N). From Onderstepoort Poisonous Plant garden Nov. 1934, *Liebenberg* 3224, ♀, 3223, (n). Pretoria, Febr. 1912 *Rogers* in T. 12041. Without precise locality Magaliesberg *Zeyher* (S.). Brooklyn, Mar. 1914, *Pott.* 4826 (T). Hammanskraal, hard deep compact clay, 17.10.34, *de Lange* 76, ♂ (N). Baviaanspoort, Febr. 1914, *Fehrson* in T. 13768, ♂ (T.), 3 sheets. Hammanskraal, red gravel, 17.10.34, *von Malitz*, 60 (N). Potgietersrust district; ? at Potgietersrust 3.11.08, *Leendertz* 6007, ♂ (A & T). ? Potgietersrust, 21.12.28, *Govt. Analyst* in N. 7817, ♀. "Mosdene" near Naboomspruit, loam formation climbing over bushes, 10.11.19, *Galpin* 477 M, ♂ (N). Ditto, 25.2.19, *Galpin* 142 M, ♀ (N & S). Ditto, in *Acacia* veld stems 1–2 M. areolate, climbing up bushes, fls. creamy tuber very large, 3,800 ft. 21.11.34, *Galpin* 13196, ♀ (N.) Rustenburg district; Brits, 29.12.27, *Watt and Brandwyk* 2045, ♀ (N). Ditto, 17.11.27, *Watt and Brandwyk* 2038, ♀ (N). Farm Welgevonden, 3,200 ft. 8.12.34, *Mogg* 14609, ♂ (N). Brits, 20.12.27, *De Ridder* in N. 7504, ♀ (2 sheets). Middelburg district; Niebo, Oct. 1921, *Rogers* 24853, ♂ (T). Potchefstroom district; on experimental farm, 5.1.31, *Theron* 5, ♀ (N). Bechuanaland; Mochudi, May 1914, *Rogers* (W). Saberones, 10.12.36, *Watt and Brandwyk* 1683, ♀ (N). Mochudi, Jan. 1915, *Harbor* in T. 17027, ♀. Lydenburg district; Farm Schoonoord, Sukukuni, poisonous, black clay soil between norite boulders, 4,000 ft. 8.3.37, *Burnard* 229 A. Foothills, Camp

\* *A. angustisecta* Engl. & Harms ex Engler, *Pflanzenwelt Afr.* III, 2 (1921), p. 605, in obs. was the original name for *A. stenodactyla* Harms which now stands as Burt Davy published his description first, necessitating Harms to change his epithet.

HB. Schoonoord 4,500 ft., 3.12.33, *Barnard* 229, ♀. Farm Korenvelden near Sukukuni, tuber topshaped, poisonous, 3,500 ft., 3.12.34, *Barnard* 153 (6 sheets). Ibid, small bulb, poisonous, used by natives, 3,000 ft., 8.11.34, *Barnard* 155. Ibid, 3,000 ft., 13.3.35, *Barnard* 305, ♀, all in N. Ohrigstad valley, 23.10.08, *Mundy*, in Bolus Herb. 4,700, ♀. Barberton District; without precise locality (? at Barberton), Nov. 1931, *Smith* 7019, ♀ (N). On road to Carolina (? from Barberton) ± 4,000 ft., 5.10.30, *Bremekamp* in T. 28575, ♂. Glenthorpe farm, 1.11.11, *Scheuble* in T. 10908, ♂. Without precise locality (? at Barberton) Jan. 1908, *De Beer* in T. 4940, ♂. Dry hillsides at Barberton, twining on shrubs, 2,000–2,800 ft., 1889 A.D., *Galpin* 677, ♂ & ♀ (N. 2 sheets), T & S.). ? at Barberton, 2,900 ft., 21.11.88, *Thorncroft* 15, ♂ (B). Ditto, Nov. 1909 *Williams* in T. 7645, ♀. Hyslops Creek, trailing, 2,500 ft., Apr. 1926, *Thorncroft* 2141, ♂ (N). Nelspruit district; Northern slopes of Amajuba mt., Schagen, climbing on trees, etc. stems several ft. long, 3,000 ft., Dec. 1934, *Liebenberg* 3362, ♀ (N). Ditto grown at Div. Pl. Ind. gardens, Pretoria, 19.1.37. Same locality, long stems, climbing, bulb 10–12 cm. diam. turbinate, 3,000 ft., 28.12.33 *Liebenberg* 3056, ♀ (N). At Schagen just off main road, 16 M. from Nelspruit, tuberous topshaped rootstock 15 cm. diam., climbing, stems several ft. long, 2,500 ft., Dec. 1934, *Liebenberg* 3301, ♂ & ♀, (N). Ditto, ♀ grown at D.P.I. gardens Pretoria, 19.1.37. From same locality but grown at D.P.I. gardens, *Liebenberg* 3055, ♀, (N). On farm Suidwalliskraal, on main road Nelspruit–Machadodorp, stems several ft. long, climbing, 2,800 ft., Dec. 1934, *Liebenberg* 3366, ♀ (N). On Research Station, Nelspruit, long stems climbing up trees, 2,375 ft., 1.11.30, *Liebenberg* 2544, ♀ (N). Plaston, climbing herb, 3,000 ft., Oct. 1931, *Holt* 75, ♂ (N). White River, Oct. 1919, *Rogers* 23288, ♀ (U & N). Doornkraal, 28.12.23 *Stubbs* ♀ (N). Mayfern, (grown at D.P.I. gardens, Pretoria), April 1929, *Mogg* 8182, ♀ (N), (2 sheets). Pietersburg district; Tzaneen, 8.12.36, *Hattingh* PS. 227, ♀ (N). Rooikoppies, Politsi, climber open parts of forest, Dec. 1932, *Schweickerdt* 1037, ♂ & ♀ (N. & T.), 4 sheets. Wood-bush, de Hoek, Dec. 1931, *Schweickerdt* in T. 30164, ♂, 2 sheets. Haenertsburg, Nov. 1913, *Pott* in T. 13368, ♂. Westfalia Estate, 17.11.36, *Pole Evans* 3983, (N.). Haenertsburg, Nov. 1917, *Moss and Rogers* 884, ♀ (U.), 2 sheets. Zoutpansberg district; Elim, Dec. 1930, *Obermeyer*, in T. 29287 and 29288, ♀. Louis Trichardt, Dec. 1922, *Breyer* in T. 24215, ♂. Tshakoma, Nov. 1931, *Obermeyer* in T. 30349, ♀. Pigeon Hole, 28.10.18, *McCallum* 70, ♀ (N). The Downs, Nov. 1918, *Rogers* 21937, ♀. (A, B. & T.). Middelburg district, Tautesberg, 9.11.33, *Young* A. 247, ♂ & ♀ (T), 3 sheets. Natal: Vryheid districts; Oct. 1905, *Sim* 2922, ♀ (B), 2 sheets. At Roman Catholic Miss. Stat. on Inkawana, on the Vryheid side of Besters Spruit, between diabase, strictly dioecious, 3 ft. high, ♂ flowers yellow, ♀ flowers green, poisonous, abundant. 4,000 ft., 20.10.37, *Gerstner* 2330 and 2331. ♂ & ♀ (N.). Nongoma district; at Nongoma, native name Umbulele (=poisonous plant), 20.1.38, *Gerstner* 2896 (N). Kruger National Park; Baiandbai, 24.11.32, *Lang* in T. 32154, ♂. Ditto, 25.11.32, *Lang* in T. 32153, ♀.

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Plate 1.—*A. fruticosa* Burt Davy. At Naauwpoort, near Pietersburg, Transvaal.

[Photo by H. Lang.]



Plate 2.—*A. fruticosa* Burt Davy. At Naauwpoort, near Pietersburg, Transvaal.

[Photo by H. Lang.]



Plate 3.—*A. spinosa* Burt Davy. At Nuanuupoort, near Pietersburg, Transvaal.  
[Photo by H. Lang.]



Plate 4.—*A. glauca* Schinz. From Fairy Glen, near Pretoria. The light portion and below this was underground.

]Photo by *H. King*.



Plate 5.—Flowers of *A. glauca* Schinz.

[Photo by H. Lang.]



Plate 6.—Fruits of *A. digitata* (Harv.) Engl.

[Photo by H. Lang.]

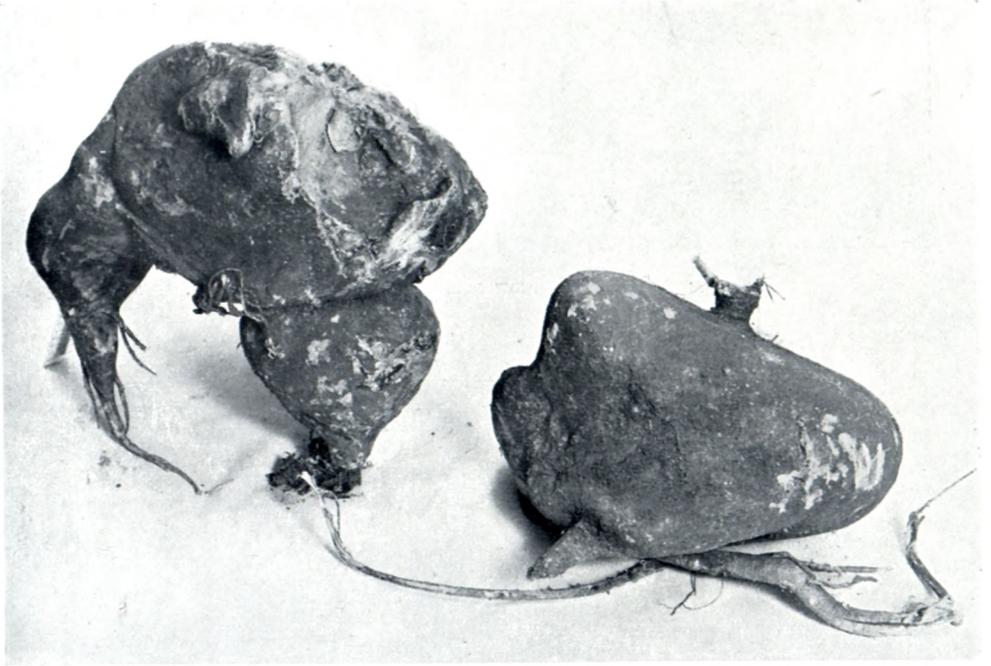


Plate 7.—Two tubers of *A. digitata* (Harv.) Engl., found side by side at Baviaanspoort, outside Pretoria. The one was partly exposed and green; the other was underground.

[Photo by H. King.]



Plate 8.—A photo of the type specimen of *A. digitata* (Harv.) Engl.  
 [Photo by courtesy of Kew Herb.]

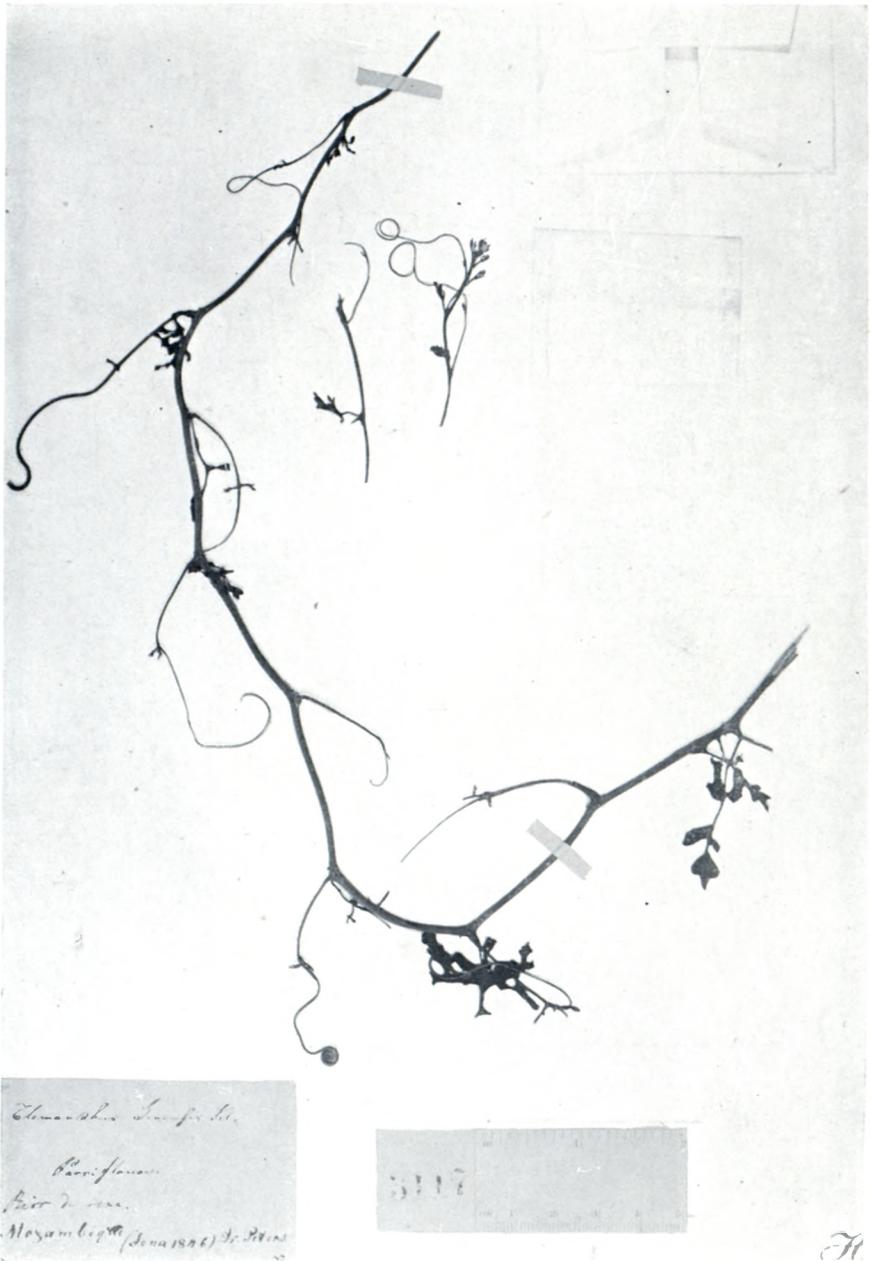


Plate 9.—Photo of one of the type specimens of *Clemanthus senensis* Kl. ([*A. senensis* (Kl.) Engl.]. These specimens were collected at “Rios de Senna” and therefore was very likely the same locality where Kirk later collected his specimens (plates 12–14) which Masters described as *A. senensis*, Mast.

[Photo by courtesy of Berlin Herb.]

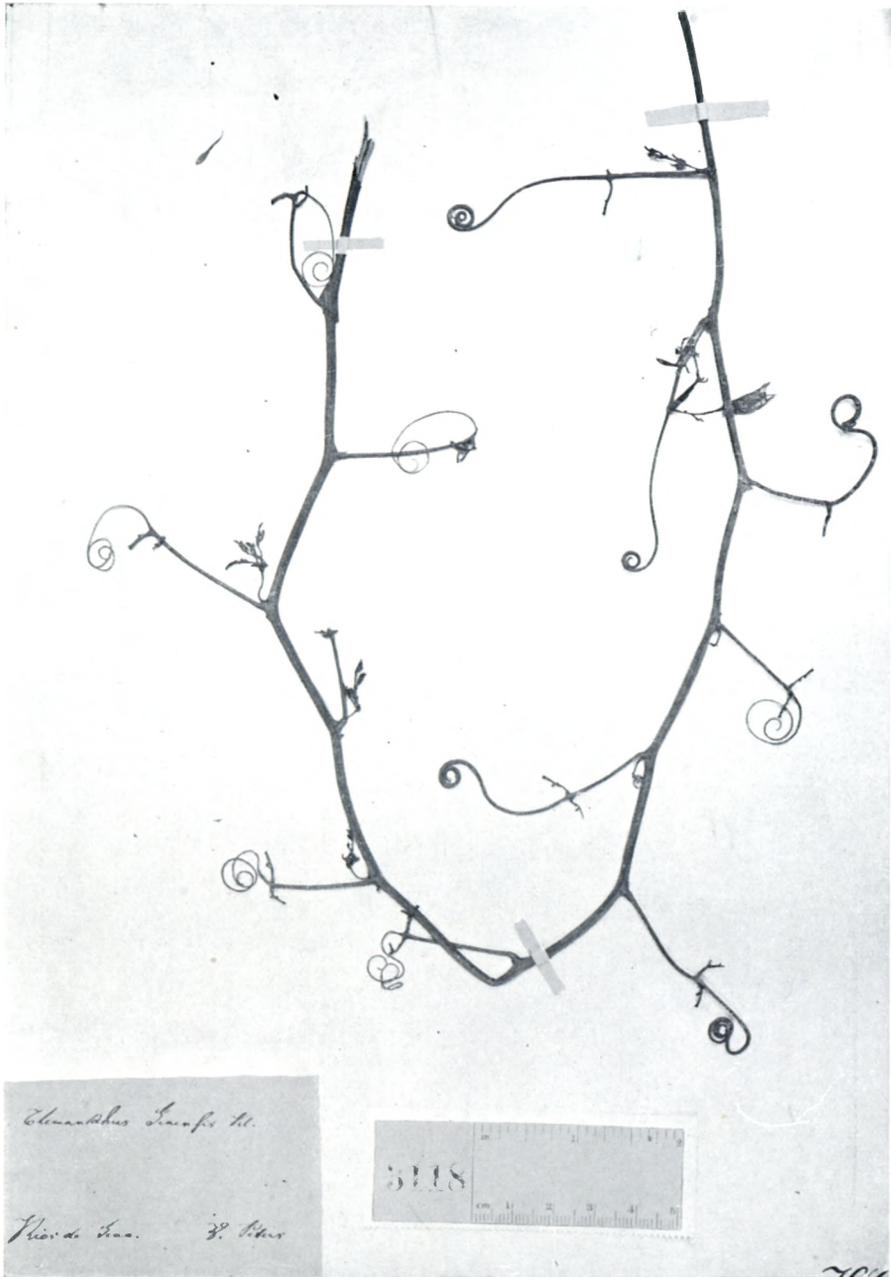


Plate 10.—Photo of one of the type specimens of *Clemanthus senensis* Kl.  
[*A. senensis* (Kl.) Engl.]

[Photo by courtesy of Berlin Herb.]



Plate 11.—Photo of the type specimen of *A. Buchanani* Harms.

[Photo by courtesy of Berlin Herb.]



Plate 12.—Photo of one of the specimens collected by Dr. Kirk at Senna, Zambezi, and from which Masters (Fl. Trop. Afr. Vol. 2) described *A. senensis* Mast. Practically all lobes are entire. [Photo by courtesy of Kew Herb.]



Plate 13.—Photo of one of the specimens collected by Dr. Krik at Senna, Zambezi, and from which Masters (F. Trop. Vol. 2) described *A. senensis* Mast. Practically all the median and side lobes are lobed.

[Photo by courtesy of Kew Herb.]

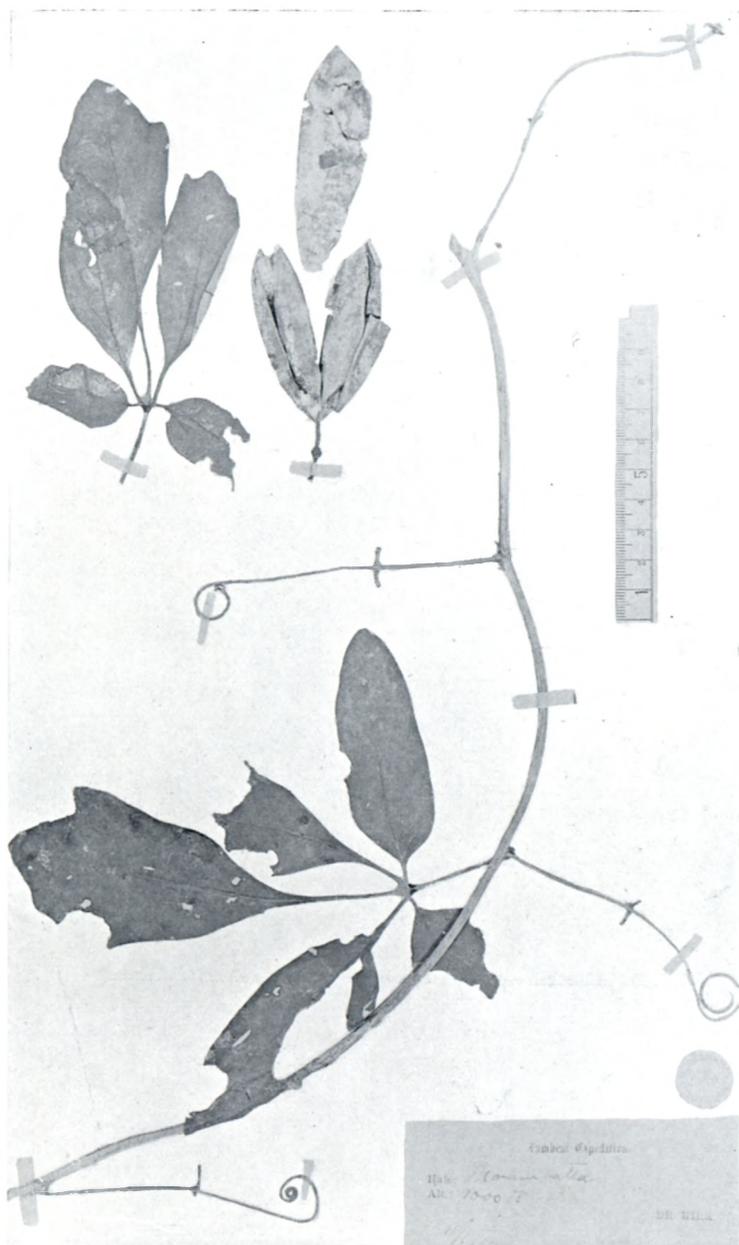


Plate 14.—Photos of one of the specimens collected by Dr. Kirk at Senna, Zambezi, and from which Masters (Fl. Trop. Afr. Vol. 2) described *A. senensis* Mast. The median lobes are only slightly lobed.

[Photo by courtesy of Kew Herb.]

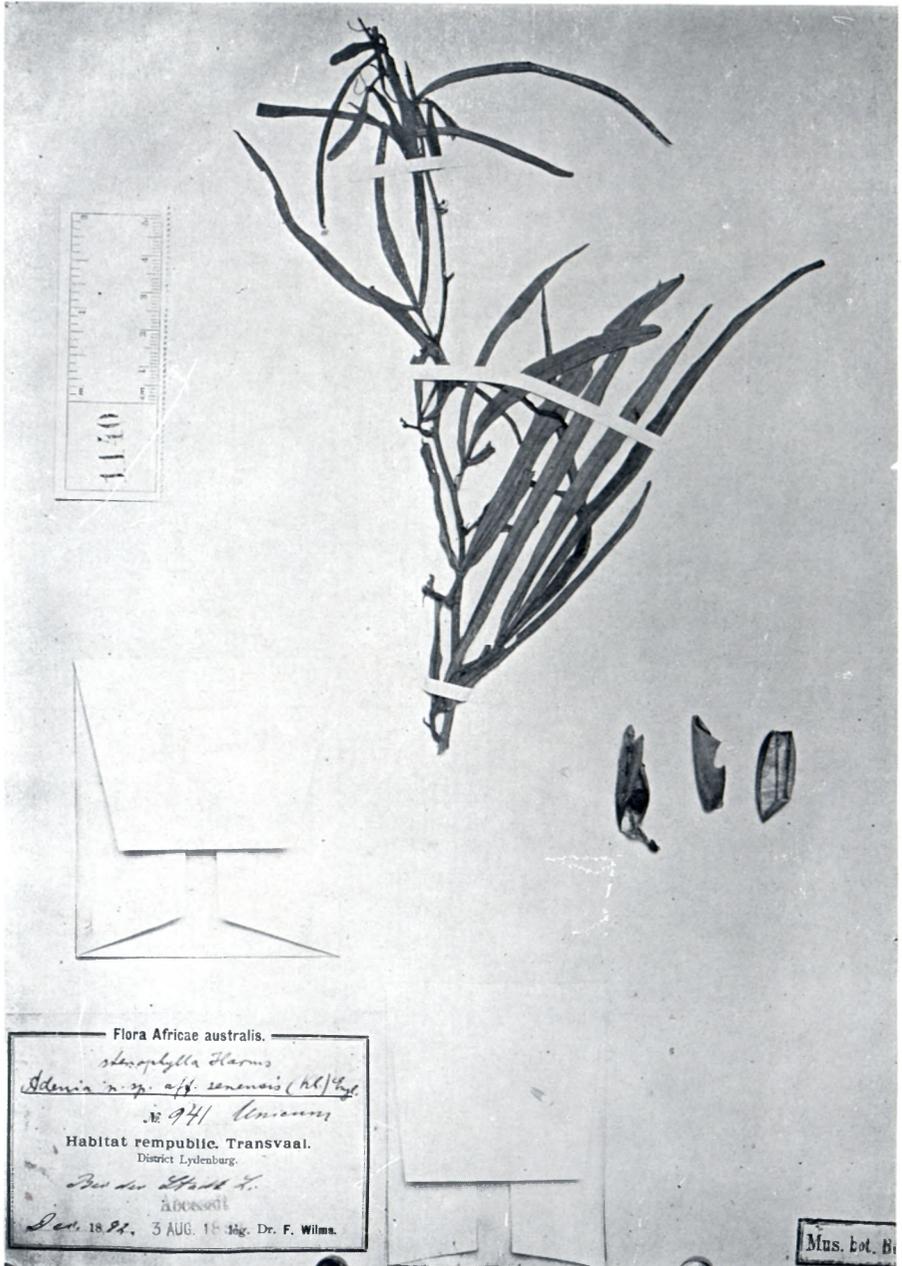


Plate 15.—Photo of the type specimen of *A. stenophylla* Harms.

Photo by courtesy of Berlin Herb.

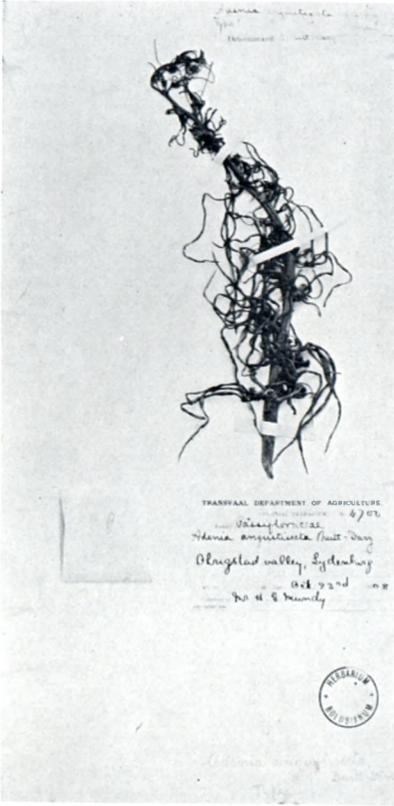


Plate 16.



Plate 17.

Plate 16.—A photo of Mundy in Bolus Herb. 4700, ♀, from Ohrigstad valley. It is the type specimen of *A. angustisecta* Burt-Davy. In morphology of floral structures it resembles *A. digitata* and in leaf form it links up with other Lydenburg specimens (plate 17, etc.).

Plate 17.—A photo of Barnard 153 (1), showing 3-1 and 5-lobed leaves (entire).

[Photos by H. King.]



Plate 18.

Plate 18.—A photo of Barnard 155, showing all 5-lobed leaves (entire). *A. stenophylla* Harms (plate 15) fits in here.

Plate 19.—A photo. of Barnard 155 (collected leaves). All Barnard specimens are from Sukukuni, not very far from Lydenburg.



Plate 19.

[Photos by H. King.]



Plate 20.



Plate 21.

Plates 20 and 21.—These are photos of other Barnard specimens showing various degrees of lobing in the direction of the typical *A. digitata*.

[Photos by H. King.]



Plate 22.

Plate 22.—This is a photo of another Barnard specimen showing various degrees of lobing in the direction of the typical *A. digitata*.



Plate 23.

Plate 23.—A photo of Schweickerdt in Trans. Mus. Herb. 30164, ♂. In leaf-shape it resembles the previous. The inflorescence is more elaborate. [Photo by H. King.]

HERBARIUM TRANSVAAL MUSEUM.  
 no. 30164  
*Adiantum digitatum* (Horn)  
 Sw. H. Schweickerdt  
 Dec 1931  
 from woodlands Natal



Plate 24.

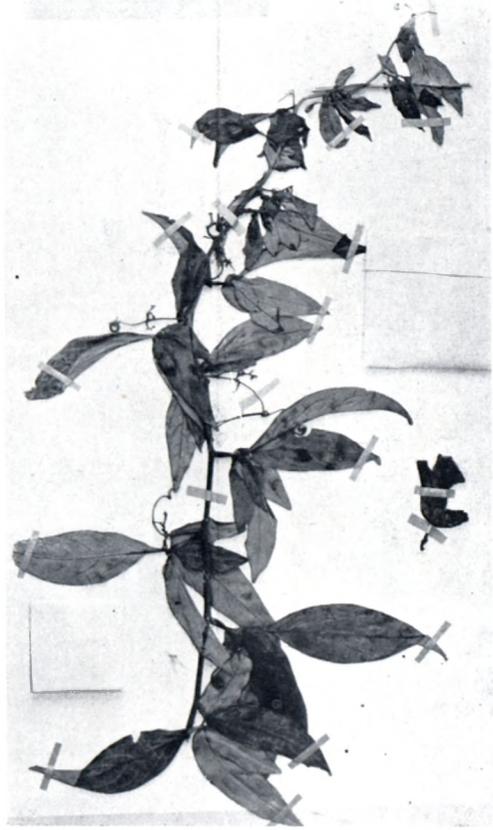


Plate 25.

Plate 24.—A photo of Liebenberg 3362. This links up with plate 23.

Plate 25.—A photo of Liebenberg 3366. This is from the same locality as that of plate 24, but from a different habitat, showing no lobing. *[Photo by H. King.]*



Plate 26.—A photo of a specimen from the same tuber as Liebenberg 3366 (plate 25) but grown at the gardens of the Division of Plant Industry, at Pretoria. The specimen shows characteristic lobing. It is identical to Liebenberg 3362 when grown at the D.P.I. gardens, but the latter was not used as it would not have made such a good photo.

[Photos by H. King.]



Plate 27.



Plate 28.

Plates 27 and 28.—Photos of Galpin 677 (2 sheets), showing variation of the lobing. These link up with plate 26.

[Photos by H. King.]



Plate 29.—Photo of Williams in Trans. Mus.  
Herb. 7645, ♀.

These link up with plate 28. Compare these with the photo of the type specimen (plate 8).

[Photos by H. King.]



Plate 30.—Photo. of Smith 7019, ♀.





Plate 33.—A photo of Thorncroft 15, ♂. This links up with Liebenberg 3366 and 3362 (plates 24 to 26).

[Photo by H. King.]

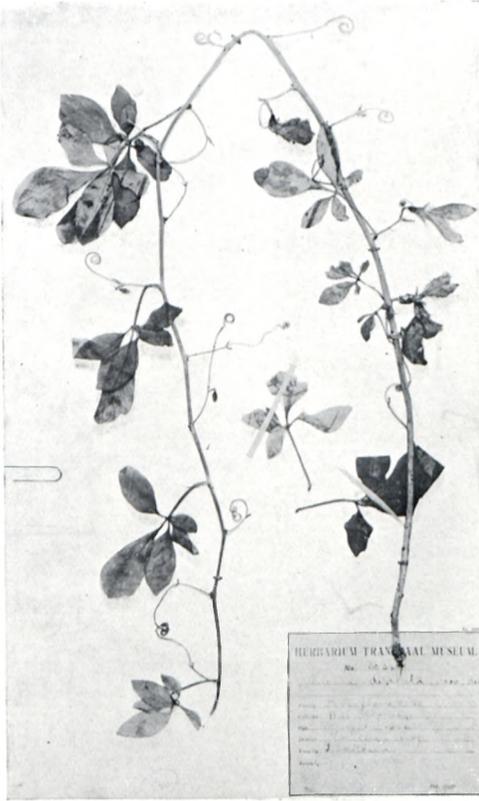


Plate 34.

Photo of Obermeyer in Trans. Mus. Herb. 29287, ♀.

Photo of Obermeyer in Trans. Mus. Herb. 30349, ♀.

These link up with plate 33 and is where *A. senensis* Masters (plates 12, 13 and 14) fits in.

Compare the flowers on plate 34 with those on plates 33 and 23.



Plate 35.



Plate 36.—Photo of Barnard 229, ♀. This links up with plates 34 and 35 and this is clearly also where *A. Buchanani* Harms (plate 11) fits in.