Zeitschrift: Acta Tropica
Herausgeber: Schweizerisches Tropeninstitut (Basel)
Band: 12 (1955)
Heft: 4

Artikel: Miscellanea : Curculionid pests of tobacco in Southern Rhodesia
Autor: Bünzli, G.H. / Büttiker, W.W.
DOI: https://doi.org/10.5169/seals-310562

Curculionid Pests of Tobacco in Southern Rhodesia.

By G. H. BÜNZLI [1] and W. W. BÜTTIKER [1].

(Received April 18th, 1955.)

Observations were made in the 1951/52 season on the occurrence and habitat of Curculionid adults damaging young Virginia Tobacco. Some suggestions are offered for the efficient control of these pests by cultural and chemical methods.

Occurrence and damage done.

Every year a few outbreaks of the locally called "Gray Surface Beetle" are reported from various Tobacco growing districts of Southern Rhodesia. According to information (verbatim) obtained from M. C. Mossop, Chief Entomologist, Dept. Agr. S. Rhodesia, the following species have been recorded during the last 30 years as pests occasionally occurring in Southern Africa: *Mimaulus matabelensis* Mshl., *M. papulosus* Mshl., *M. sulcatifrons* Mshl., *M. testudo* Fhs., *M. thesii* Mshl., *Protostrophus mucronatus* Mshl., *P.* sp., *Analeurops cuthbertsoni* Mshl.

Ashby (1948) initiated the study on *Mimaulus testudo* and *M. thesii* as pests of Tobacco in S. Rhodesia.

In the season 1951/52 the incidence of heavy and extensive curculionid attacks on Tobacco increased very considerably so that an opportunity arose to survey the affected areas in order to gain first-hand information about these small, sub-globular, weevils (3-4 mm.) and to devise control measures.

Three species of Curculionidae were involved in the 1951/52 season i.e. *Mimaulus thesii* Mshl., *Protostrophus platyops* Mshl. (n.sp. 1953) and *Analeurops cuthbertsoni* Mshl., all of them attacking young Tobacco plants. The first two species were recorded in tobacco fields and the third was found to be confined to seed-beds only. *Mimaulus thesii* proved to be the most widely distributed species (Fig. 1) with a climax in the Hunyani catchment area, South of Salisbury, where it occurred alone, rarely associated with a few *Protostrophus* specimens. On the other hand, small percentages of *Mimaulus thesii* were also found to be present in large *Protostrophus* populations at Juliasdale, Inyanga.

The injury done by individual weevils to young, transplanted Tobacco mostly remains inconspicuous; the rasping action creates small, irregular edges or little holes in the bottom leaves, but only occasionally the succulent stem is carved through or the heart eaten out (Fig. 2).

Severe damage, however, results from the combined feeding of several weevils simultaneously present on an individual plant when eventually all the leaves and the stem are completely consumed. The ultimate effect often is similar to that brought about by the "Dusty and Black Surface Beetles": the Tenebrionidae *Gonocephalum* and *Zophosis* with which the weevils share the habit of also feeding on living, semi-dry and dry plant material, present on the surface of cultivated lands and natural veld.

To be regarded as general pests in young, transplanted Tobacco, a minimum population of at least 20,000 weevils per acre must be present. The maximum infestations recorded in the 1951/52 season varied between 50-70,000 linked up with almost complete destruction of fields within 1 to 3 weeks from trans-

[1] Formerly of the Research Staff of Tobacco Pest Control Research Scheme, Salisbury, Southern Rhodesia.

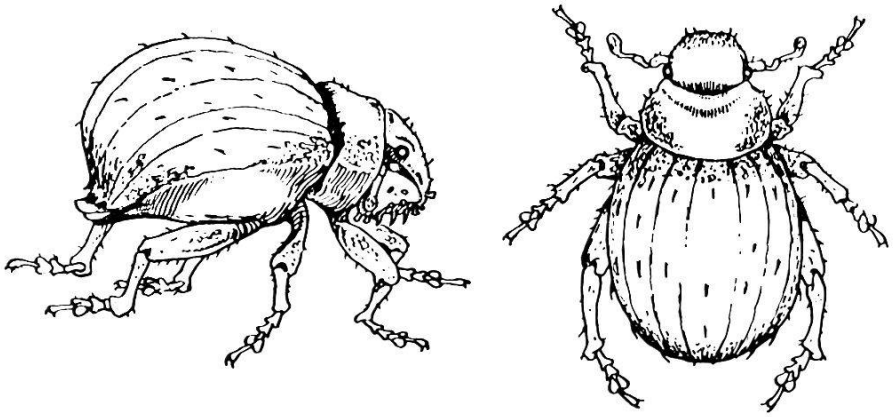

Fig. 1. Mimaulus thesii Mshl., adults, enlarged.

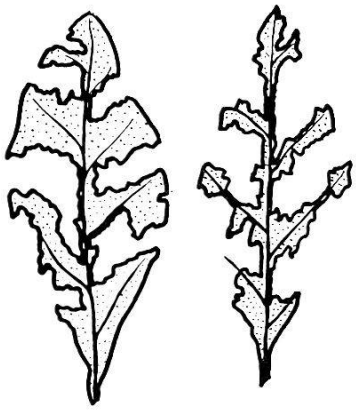

Fig. 2. Typical frass damage caused by *M. thesii* to young Tobacco leaves.

planting without leaving any chance of immediate and successful routine refilling.

In Southern Rhodesia *Mimaulus thesii* and *Protostrophus* sp. also are on record for having attacked Black Wattle *(Acacia molissima)* seedlings, sown Millets and Velvet (Mucuna) Beans. The former is also injurious to Cupressus transplants. *Mimaulus testudo* is known as an occasional pest of young Sunn Hemp *(Crotalaria juncea)* and Cotton.

The range of cultivated plants liable to be attacked in Southern Rhodesia by either of these weevils, is most probably much larger. The gray and small weevils being hidden in the soil surface or on the lower surface of the leaves, they are readily overlooked and the damage mistaken for that of Tenebrionid surface beetles or cutworms which often occur together with these Curculionidae.

According to Sir *Guy Marshall*, most of the very numerous *Protostrophus* species, recorded in the South African Union and described by him, are injurious to cultivated plants.

Field observations.

The emergence of the weevils above ground for feeding coincides with the onset of the rainy season, end October-beginning November. In the 1951/52 season the earliest reports of damaged Tobacco came in on the 16th November for *Protostrophus* and on the 12th November for *Mimaulus thesii* (11th November, 1948, *Ashby*).

Early Tobacco plantings are most severely hit and the damage all the more accentuated if a short spell of dry weather follows planting out when the

weevils concentrate for shelter and food near by and on the young transplants. Later plantings are by no means immune but since usually sturdier seedling plants are put out for medium and late plantings, the injurious effect of the weevils is less pronounced.

The weevils are most active during the hottest part of the day when they can be seen moving on the soil surface and on the Tobacco plants. On disturbing the weevils they sham death, in size and colour not easily to be distinguished from earth pellets. During the cooler hours of the day they remain in the uppermost layer of the soil or exposed on the surface, but preferably hidden on the under side of dead or living leaves.

The weevils are slow moving and rarely travel more than 5 to 8 yards.

The life-time of the *Mimaulus thesii* adult lasts, as far as could be ascertained by field observations, 2½-5½ months. The first dead weevils were traced end of January. By the middle of February 7.5% of the collected specimens proved to be dead. During March, the rate of natural mortality increased rapidly to 50% and more, on one of four localities frequently revisited, even to 100%. In Tobacco fields the weevils died off sooner than in the adjacent border lands.

From a batch of 46 weevils collected on the 14th March, 25 were dead and 21 alive. The latter, kept and fed in the laboratory, produced the following survival figures: April 16, May 13, June 11, July 2, of which one specimen (female) was alive at the time of writing (5th October). It seems unlikely that under natural conditions any weevils succeed in bridging the dry and relatively cool winter months.

Mating of *Mimaulus thesii* was observed only once in the field, never in the laboratory, 5 cm. below soil surface, under a Tobacco plant (9th February, 1950). Four eggs were obtained (26th December, 1951) from 3 females, kept in confinement for 16 days; 2 eggs hatched within 10 days but the young larvae did not survive. The eggs are globular, snow-white turning brownish, with a maximum diameter of 0.2-0.25 mm.

Ashby obtained eggs of *Mimaulus* in the insectory on the 2nd December, 1948.

The weevils appear to have few enemies. Formicinae- and Myrmicinae-ants, however, occasionally were observed to carry away *Mimaulus thesii*. Spiders with their cobweb, spun between the soil surface and prostrate Tobacco leaves, are considered to be habitual and thus useful predators.

Habitat.

The natural habitat of the Gray Surface Weevils is a particular variety of open veld, either virgin or secondary i.e. marginal vlei-land, covering sandy types of soil with pH-values varying between 6.0-7.6, and characterised by an apparent predominance of grasses.

From these original habitats, often very densely populated, *Mimaulus thesii* encroaches on slightly higher grounds, pH 5.4-7.4, where poor subterranean drainage conditions reveal themselves only in pronounced wet seasons.

On taking records of the non-cultivated areas immediately adjacent to Curculionid infested Tobacco fields, which invariably also harboured the weevils, it was found that the genuine habitat of *Mimaulus thesii* consists of a fairly dense ground vegetation, always including, in addition to the bulk of grasses, a fair, if not considerable, proportion of lower and low growing sedges and leguminous plants.

These comparatively complex plant communities, as typified below, offer, with their dense live and dead soil-covering strata, food and shelter, adequate for the successful breeding of the weevil.

Qualitative Analysis of Vegetation: (1): Virgin grass-veld, new tobacco-fields. (2): Fallow (old) fields. !: Particularly abundant species.

Cyperaceae:

(1!) *Fimbristylis exilis* R. + S., (1!) *Bulbostylis capillaris* (L.) Kunth. var. *trifida* (Clarke) Boekel., (1!) *Bulbostylis coleotricha* (Hochst) Clark or *B. puberula* Kunth, (1) (2!) *Cyperus amabilis* Vahl., (1) *Cyperus cristatus* (Kth) Matt f. et Kukenth. (*Kylinga cristata* Kth), (1) *Cyperus margaritaceus* Vahl., (1) (2!) *Cyperus rehmannianus* (Clarke) Boekel., (1) *Cyperus* cf. *melas* Ridley, (1) (2!) *Scirpus Hystrix* Thunb., (1) *Scirpus kyllingicides* (Rich.) Boekel, (1) *Ascolepis pusilla* Ridl., (1) *Ascolepis protea* Welw. var. *bellidiflora* Welw., (1) (2) *Fuirena leptostachya* Oliv., (1) *Lypocarpha pulcherrima* Ridley., (1) *Scleria Dregeana* Kunth, (1) *Xyris Hildebrandtii* Nilsson.

Gramineae:

(1!) *Aristida macilenta* Henrard, (1!) *Aristida leucophaea* Henrard, (1) *Eragrostis Brizoides* Nees, (1) *Loudetia simplex* (Nees) Hubbard, (1) (2!) *Cynodon dactylon* Pers., (2!) *Rhychelytrum repens* (Willd.) Hubbard, (2!) *Eleusine indica* Gaertn.

Leguminosae:

(1) (2!) *Desmodium dimorphum* Welw. ex. Bak., (1) (2!) *Rhynchosia monophylla* Schlecht var. *eylesii* Bak. f., (1) (2) *Indigofera hislopii* Bak., (2!) *Tephrosia reptans* Bak., (2) *Indigofera vicioides* Joub. et Spach., (2) *Indigofera viscosa* Lam. var., (2) *Crotalaria anthyllopsis* Welw.

Various dicotyledonae:

(1) *Polygala africana* Chodat, (1) *Lobelia decipiens* Sond., (1) *Commelina* var., (1) *Eriocaulon mutatum* N. E. Br., and related species, (1) *Utricularia firmula* Welw. ex. Oliver, and other species, (1) *Sesbania coerulescens* Harm., (2) *Gnaphalium* spec., (2) *Striga gesneroides* (Willd) Vatke, (2) *Striga lutea* Lour., (2) *Hibiscus cannabinus* L.

Dry Grasslands, predominant on the acid to acidic reacting (granitic) sand veld, with typical tall *Hyparrhenia* (Thatch grass) plant associations and upon which most of the high quality Rhodesian Tobacco is grown, produce incomplete soil cover and therefore are unsuitable breeding places. Open veld, including as components an abundance of *Themeda triandra* or *Sporobulus* varieties, are also exempt from *Mimaulus thesii*.

On the other hand, vleis [2] proper at the bottom of valleys and flats, in slightly rolling country with distinctly semi-humid soil conditions, pH values varying from 7.0-8.2, and very dense vegetation, are unsuitable for the breeding of the weevils.

Under natural conditions the weevils feed initially on living plant material, sprouting seeds, graminaceous and herbaceous shoots and leaves, later on, on semi-dry and completely dry vegetable matter on or near the ground.

In Tobacco fields, *Mimaulus thesii* was observed to eat, besides young Tobacco, young blades of Couch-Sorghum-Ripoko grasses and the seedling plants of *Hibiscus panduriformis*. Later on, when weeds have been removed by cultivation, old tussocks of grasses and sedges, very resistant to humification, invariably proved to be very attractive to them.

Protostrophus platyops in a completely destroyed Tobacco field, was found feeding, in November, practically on all weeds and regrowth, of perennials

[2] Vlei is the expression used in Southern and Central Africa for the valleys in slightly undulated lands.

i.e. *Senecio lasiorhizus, S. erubescens, helichrysum* and *nudifolium, Setaria, Annona* sp., *Wormskielda longipedunculata, Lantana*, whilst in the neighbouring not broken up land, on Gramineae and *Indigofera* varieties.

Insects sharing the natural habitat of *Mimaulus thesii* are Pentatomidae: *Euphodotus* sp. (frequent); *Aeliomorpha* sp. (infrequent); Reduviidae: *Stenolaemus marshalli* Dist. (seldom); Tenebrionidae: *Pogonobasis verucosa* Ev. var. (rare).

One locality (Juliasdale) with large populations of *Protostrophus platyops* Mshl. harboured the Curculionidae: *Mimaulus thesii* Mshl., *Brachycerus scelestus* Gyll., *Calodemas nickerli* Faust., *Rhadinocerus* sp., *Rhytirrhinus humerosus* Mshl., *Systates* sp.n. and *Tetrapus* sp.

List of Curculionidae collected from the Tobacco growing Districts during 1948-52.

Alcidodes lixiformis Mshl., *A. leucogrammus* Mshl., *Anaemerus tomentosus* Cl., *Apion flexuosum* Wagn., *Apopnictus* sp., *Blosyrus ipomoeae* Mshl., *Brachycerus agrestis* Mshl. (frequent), *B. Congestus* Gerst., *B. interstitialis* Pér., *B. moerens* Psc., *B. natalensis* Fhs., *B. scelestus* Gyll., *B. signifer* Mshl., *Calodemas nickerli* Fst., *Catamonus tristis* Mshl. (frequent), *Dereodes vagabundus* Fst., *Diaecoderus ater* Mshl., *Episus devylderi* Aur., *Eremnus* sp. (first record from North of Limpopo, *Marshall*, 1952), *Gasteroclisus cuneiformis* Qued., *Gonipterus scutellatus* Gyll. (introduced from Australia, attacking Eucalyptus), *Hipporrhinus bohemani* Fhs., *H. propinquus* Mshl., *Hoplitotrachelus spinifer* Lac., *Hypolixus haerens* Boh. (occasionally cutting young Cotton plants at ground level), *Larinus* sp. n.?, *Lixus teretiusculus* Boh., *Microcerus costalis* Fhs., *M. retusus* F., *Onychogymnus cinerus* Hartm., *Polyclaeis equestris* Boh., *P. longicornis* Fhs., *Rhadinocerus* sp., *Rhytirrhinus humerosus* Fhs. (rather frequent), *Sclerocardius africanus* Boh., *Siderodactylus flavescens* Gerst., *Sipalinus surivilli* Duviv., *Systates exaptus* Mshl. (occasionally severely attacking Maize and *Dolychos Lablab*), *Tanymecus destructor* Mshl. (feeding on Maize), *Tetrapus* sp.

None of these Weevils are harmful to Tobacco.

Control.

a) *Cultural measures:*

The study of local incidence of the weevils adduced evidence that only certain tracts of lands harbour the pests.

The ecological survey revealed that virgin lands bordering on vlei are prone to offer permanent habitat to the weevils. If such areas, in the granitic sand veld, are taken under Tobacco, it is in the first year that an attack of the weevils on the young transplants can occur. In the second year of Tobacco growing only a few weevils emerge in situ because the natural breeding ground has been abruptly destroyed. Only a slender belt on the borders of the cultivated area temporarily may be re-infested with weevils from outside.

Old lands, for several years under fallow, to which the topographical-pedological requirements for the habitat of the weevils apply, and which are replanted to Tobacco, are again liable to produce the pests in the first year, on account of the re-established dense vegetation during the rested period.

Old lands under rotational cropping, situated in the critical areas, but never clean weeded, proved to be susceptible to slight to moderate weevil attacks if, in the year prior to planting of Tobacco, leguminous plants such as Beans or Sunn-Hemp, have been grown.

The only empirical method so far adopted by a few experienced Tobacco growers for the checking of the "Gray Surface Beetles" consists in early and repeated hand-hoeing as soon as the first damaged tobacco plants have betrayed the presence of the weevils. Extensive disturbance and burying of the small insects materially helps to keep the pest at bay.

In order to avert a Curculionid attack, it is advocated to plough up the lands in November-December and to keep them under bare fallow up to the next following planting season. Deprived of food, the weevils are starved out, their power of locomotion being restricted to a few yards only. Merely a limited migration to the non-cultivated border lands takes place.

Since, however, this cultural method of preparing the intended Tobacco lands well ahead of planting, has gradually been abandoned during the last three decades and replaced by breaking up the soil much nearer or quite close to planting, the risk of severe weevil attacks generally has been enhanced. The rather recent practice, for instance, to disc-harrow by power traction old lands to be replanted to Tobacco, one or two weeks only prior to planting into flat ground or in shallow ridges, is on certain grasslands with a thick and vegetational cover, instrumental in creating the pest.

Late and thorough burning in November of the specified areas, followed by ploughing for December planting, proved to give a fair control of the weevils, the majority of the already emerged adult weevils being scorched. As a rule, however, a heavy and homogeneous burn cannot be achieved at this belated time of the year because the vegetation has already resumed new growth.

The burning of the veld during the dry winter months most probably has only limited effect on the soil-borne larvae. It was observed that burning of thick layers of trash in sugar cane fields in Mozambique did not harm the shallow situated larvae of the scarabeid beetle, *Heteronychus Licas* Klug.

Discriminate burning of old grass lands, which contains plenty of tussocks of grasses and sedges and a thick mat of undecomposed fibrous plant material, combined with some drainage are most liable to efficiently destroy the permanent habitat of the weevils.

If, for certain reasons, the preparation of the lands liable to be infested by the weevils and to be planted in Tobacco, fall short of the desiderata described above, it is strongly advocated to put out sturdy seedling plants with a well hardened stem, leaving a clear neck between the soil surface and the lowest leaves. Deep setting with the heart of the plant level with the ground is dangerous. For filling in weevil affected stands, vigorous plants only should be used.

b) *Chemical Control.*

Preliminary experiments with BHC, DDT and Parathion have been carried out by *Ashby* (1948) who apparently used *Mimaulus testudo* for testing in the Laboratory.

In the 1951/52 season a series of actual field experiments were set up, the results of which apply to *Mimaulus thesii.*

1. On the 6th November, one day prior to planting up an old land, Chlordane-emulsion 0.1% active ingredient, was applied at the rate of 100 c.c. to shallow bottomed plant stations of one section of a field in which an imminent weevil attack had been ascertained beforehand. In another similar section of the same field, Chlordane 0.1% was applied one day after planting. One intermediary strip received no treatment.

On the 28th November the counts were made of the stabilised stands.

	Application of Chlordane prior to planting	after planting	No treatment
% Stand	94.6	90.5	22.5% stand

The pre-treatment yielded very good control. The slightly inferior results obtained with the post-treatment was due to pouring the emulsion on the stem of the Tobacco plants only instead of wetting a disc-like surface area as was done in the pre-treatment.

In the non-treated section almost all of the plants of the excessively reduced stand were more or less severely injured but eventually recovered from the setback.

The kill of the weevils in the Chlordane-treated sections varied between 70 to 90% which proved to be sufficient for keeping their populations below the dangerous pest-level.

2. In a second weevil experiment, on virgin land disc-harrowed only, at the beginning of November and planted on the 27th November, Chlordane-emulsion 0.1% was applied 6 days after planting, all round the plants and into the vacant stations; the loss in stand, due to *Mimaulus*, had already risen to 30%. The field was refilled on the same day. On the 27th December counts were taken. In the non-treated areas where a further second filling in had to be done, the final stand was brought up to 82.5% whereas in two treated areas the stand reached an average of 98.5%.

3. A first year land, ploughed up late, was planted on the 27. 11. after an experimental treatment had been made (14. 11.) against False Wireworms with—

a) Chlordane 5% Dust, 30 lbs. applied in conjunction with 150 lbs. Standard Fertilizer A—15 lbs. Nitrate of Soda per acre.

b) Chlordane Suspension 3 lbs. active ingredient per acre.

It soon emerged that the stand began to show casualties not due to a failure of Chlordane in checking the False Wireworms, but to an infestation with the surface bound *Mimaulus thesii* which had reduced the stands of the experimental plots by 24% and 25% as against 31% and 32% loss in the check plots.

Results:	21. 11. Final stand	Applied by spoon	21. 11. Final stand
Chlordane 3% Dust		*Chlordane conc. Emulsion*	
I. 40 lbs. (1.2 lbs. a.i./acre)	94%	1 cc. 2.3% (0.25 lb. a.i./acre)	91 %
Check plot (1)	89%	Check plots (2)	86.5%
II. 40 lbs. (1.2 lbs. a.i./acre)	97%	2 ccs. (0.50 lb. a.i./acre)	93 %
Check plots (3)	88%	Check plots (2)	79 %
Dieldrin 5% Dust			
I. 20 lbs./acre	98%	4 ccs. (1.00 lb. a.i./acre)	93 %
Check plot (1)	88%	Check plots (2)	82 %
II. 20 lbs./acre	94%	14.5 ccs. (3.6 lbs. a.i./acre)	95 %
		Check plot (1)	85 %
Aldrin 5% Dust			
20 lbs./acre	90%	(no phytotoxic effect.)	
Check plots (2)	84%		

The experimental plots were re-treated with 0.1% Chlordane-emulsion on the 3. 12. whereas the farmer used, a few days later, for the whole of the affected field, a 0.2% emulsion, 100 c.c. per plant station, before filling in on the 10. 12.

A re-inspection of the field on 27. 12. showed in the experimental plots stands of 98% and 99%, the land treated by the farmer 99%, against 82% and 83% stands in the experimental check plots, which were refilled once more on the 20. 12.

4. Old land, 1st year replanted, was treated with chemicals on the 10. 1. 1952 one day prior to planting, against a light Whitegrub and *Mimaulus thesii* infestation traced beforehand.

In the Bromley District an attempt was made to ward off an imminent threat of a weevil attack to a virgin land planting, by dipping the pulled seedlings, except the roots, in a suspension containing 0.25% DDT and 0.075% Parathion. This apparently more economical procedure proved to be a failure, but spraying with the same suspension, of the plants and soil around them, resulted in a stand of 80% without refilling, the loss being caused by the initial attack of *Mimaulus* and a protracted hidden attack of False Wireworms.

The same applies for the pre-treatment with Chlordane-emulsion directed against False Wireworms when later, after planting, Cutworms emerge as a secondary pest.

Conclusion.

a) The weevil pests in Tobacco can be averted by adopting certain cultural methods.

b) Evidence has been produced that the treatment with Chlordane 0.1% Emulsion immediately before or after planting, is the most reliable method of combatting *Mimaulus*. Special care has to be taken to spread the liquid over as large a disc as possible round each planting station.

References.

Ashby, D. G. (1948). "Report (unpublished) on infestation of Tobacco by *Mimaulus* sp.", Tobacco Pest Control Research Scheme, Salisbury, S. Rhodesia.

Marshall, A. K. (1953). New Curculionidae (Coleopt.) from Southern Africa. — Ann. Mag. Nat. Hist., Ser. 12, *6*, 321. May.

Acknowledgements.

The authors thankfully record the assistance received from Dr. *E. Parry Jones* for having made available some weevil specimens; Sir *Guy A. K. Marshall*, London, for his valuable correspondence exchanged with us, as well as for the identification of practically all the Curculionidae mentioned and the description and naming of the new species *Protostrophus platyops;* Dr. *N. C. E. Miller,* Commonwealth Inst. Ent., British Museum, London, for the identification of the Hemiptera; Mr. *M. C. Mossop,* Chief Entomologist, Dept. Agr. Salisbury (S. Rhodesia); and Prof. Dr. *W. Koch,* Custodian of the Herbarium, Federal Institute of Technology, Zürich, Switzerland, for the identification of almost all the plants quoted.