

TECHNICAL MONOGRAPH No. 1

THRIPS GALLS AND GALL THRIPS

by

T. N. ANANTHAKRISHNAN



**ZOOLOGICAL SURVEY
OF INDIA**

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PREFACE

Insects are associated with plants in diverse ways and gall formation is one among the close biological interrelationships between the two. Thrips are well known gall formers, though they are next only to mites, cecidomyiids, chalcids, etc., in the extent and diversity of gall formation. The very fact that more than 325 species of thrips inhabit galls of plants belonging to more than 70 natural orders, provides sufficient justification for a study not only of the taxonomy of gall thrips, but also the nature of gall formation, the degree of complexity of the galls and the resulting structural anomalies involved and host specificity, contributing substantially to our understanding of both the gall makers as well as the galls concerned. All the above aspects have received sufficient attention in this work, which seeks to present for the first time a consolidated account meriting the title "THRIPS GALLS AND GALL THRIPS".

The introductory portion provides information on the geographic distribution of thrips galls, the natural orders of plants susceptible to gall formation as well as aspects of ecology dealing with gall associations and the degree of intraspecific diversity in gall thrips. This is followed by detailed accounts of the comparative morphology of some major thrips galls, keys to the principal types of thrips galls as well as the gall forming genera of the world. An attempt has been made to compile a three-way index — (a) species of gall thrips — host plant index, (b) host plant — gall thrips index and (c) host plants, thrips species and their natural orders.

It is difficult to express in adequate words my gratitude to Prof. M. S. Mani, School of Entomology, St. John's College, Agra for his painstaking efforts to critically go through the manuscript and for valuable suggestions. In enabling me to study the comparative morphology of plant galls, the constant, unfailing services rendered in the form of thoughtful discussions on anatomical interpretations by Mr. A. Raman of the Botany Department of the Loyola College, Madras, calls for sincere appreciation and thankfulness. My thanks are also due to Dr. K. Thotadri, Deputy Director, Botanical Survey of India, Calcutta for his critical perusal of the list of host plants appended.

T. N. ANANTHAKRISHNAN

INTRODUCTION

Thrips or Thysanoptera are minute insects (0.5 mm–11 mm) recognized by their fringed wings, protrusible bladders at the tips of tarsi, asymmetrical mouth parts with the right mandible vestigial, and a prepupal stage during post embryonic development. They are widely distributed and are largely phytophagous. Thrips are among the common gall insects, and their galls are particularly common in the tropics. While many thrips are true gall insects, others are habitually associated with galls of other thrips and other insect and mite galls. Thrips galls present a number of interesting problems in plant pathology, morphogenesis and ecology, of great fundamental importance. Though the bulk of thrips galls are caused by members of the suborder Tubulifera, some rather interesting galls are also produced by certain Terebrantia.

Galls include a variety of structural abnormalities or deformation from simple curling and rolling to complex deformities resulting in response to the feeding stimulus of thrips. The majority of thrips are more primitive gall makers and only young plants are receptive to gall formation. Although galls may be formed on any part of the plant, thrips are active gall makers mostly on the leaves, with very few instances of bud galls and stem galls. Though they give rise to varying degrees of leaf curling and crinkling, the typical gall forming habit is not as common among the Terebrantia as in the Tubulifera.

Thrips galls have been known since the beginning of the present century. Our knowledge of thrips galls and the thrips associated with them has been considerably increased by recent contributions. Rübsaamen (1902) was perhaps the first to describe typical thrips galls on the leaves of *Galium* and *Stellaria* from Europe. Gall thrips and thrips galls have since then attracted the attention of a number of eminent cecidologists like Karny (1911–1913, 1923), Docters van Leeuwen Reijnvaan (1911, 1926), Grevillius (1910), Houard (1922, 1923), Bagnall (1928, 1929), Moulton (1927), Takahashi (1934), Costa Lima (1935, 1937, 1938), Baudys and Krotchvil (1941), Wahlgren (1945) Priesner (1949), and others listed in the bibliography. In addition to these studies mainly on gall thrips, mention may also be made of the monumental works of Priesner (1949, 1953, 1968) on African and Oriental Thysanoptera in which a student of thysanopteran galls will find much information. Particularly his monograph on *Liothrips* includes many gall forming and gall inhabiting species from Java and Sumatra. Perhaps the most important contribution on the thrips galls and their thrips inhabitants is by Karny and Docters van Leeuwen Reijnvaan in a series of publications on Javanese flora in 1909 and 1911–1913. In recent years Mound (1970, 1971) concentrated his attention on Australian gall thrips. We owe our knowledge of thrips galls and gall thrips from India to the pioneer labours of Ramakrishna Ayyar (1928), while some thrips galls were also recorded by Sundar Raman (1924) Houard (1926), and Mani (1948, 1973). A concentrated effort at a study of thrips galls and gall thrips was made by Ananthakrishnan (1949–1977) when he described a number of new thrips galls on a variety of plants as well as new genera and species of gall thrips particularly during the period 1954–1977.

Rübsaamen (1902) described some gall-like malformations on *Galium verum*, *Stellaria media*, *Veronica chamaedrys* caused by *Physothrips basicornis*, *Frankliniella intonsa* and *Thrips tabaci* respectively. Grevillius (1910) described the anatomical peculiarities of the galls on *Stellaria media* in Europe, caused by *Tmetothrips subapterus*, *Taeniothrips atratus* and *Thrips tabaci* and considered them as pseudocecidia. Karny (1921) mentions of such gall-like anomalies on *Thunbergia fragrens* by *Anaphothrips involvens* and on tea leaves by *Danothrips theivorus*. Knetchel (1951) considered the anomalies caused by *Taeniothrips vulgatissimus* on *Krantia longiflora*, *Taeniothrips atratus* on *Silene vulgaris*, *Taeniothrips picipes* on *Digitalis ambigua* and *Thrips tabaci* on *Nicotiana tabacum* as galls. Baudys and Krotchvil (1941) report numerous Terebrantian galls from

Bohemia and Czechoslovakia indicating *Taeniothrips pini* causing galls on different species of pines, *Taeniothrips salacis* on *Salix alba*, *Taeniothrips atratus* on *Stellaria* spp., *Haplothrips aculeatus* on *Veronica chamaedrys* and *Taeniothrips firmus* on *Vicia cracca* and calls them as Pleurocecidia. A list of European Thysanopterocecidia is also provided. Franssen and Mantel (1967) record well developed leaf roll galls caused by *Anaphothrips euphorbiae* on *Euphorbia cyparissias* and by *Anaphothrips silvarum* on *Galium verum*. Numerous examples of such irregular responses on the parts of the plants caused by the concentrated feeding of several Terebrantia may be cited from Indian species, but they cannot be ranked along with true gall thrips involving typical leaf folds or rolls as exemplified by *Amphithrips argutus* producing leaf rolls in *Flacourtia* sp., and by species of *Aneurothrips* on *Cordia suaveolens* and *Cordia obliqua*.

Not all Tubulifera are associated with plant galls. It is interesting to remark that most species found in galls belong to the Hoplothripini. Some Haplothripini and a few Phlaeothripini also occur in different galls. Sakimura (1947) indicates, that over one hundred and ten species of twenty-five genera of Hoplothripini and thirty-five species of about a dozen genera of Haplothripini to be occurring in plant galls. As known at present, nearly three hundred species of about ninety genera of Tubulifera are found in galls. Almost 75% of the gall thrips belong to *Liothrips*, *Gynaikothrips*, *Liophlaeothrips*, *Eugynothrips*, *Eothrips* and *Mesothrips*. The geographical distribution of gall thrips presents certain interesting peculiarities. Though they are abundant in the tropics, the old world tropics appear to be particularly rich. The Neotropical areas are relatively poor. True gall forming Tubulifera may almost be said to be absent in Europe and North America. Cosmopolitan species of *Gynaikothrips* are, however, known from some of these regions. Southeast Asia, South Asia and Australia are apparently the areas of incidence of gall forming Tubulifera and nearly all known species occur in these regions. Some interesting forms are also known from the Ethiopian and Mediterranean regions. The fact that the greatest bulk of the gall thrips and thrips galls are known from Java is perhaps readily explained and it is here that Karny devoted a life time in their study. Karny and van Leeuwen (1913, 1914) report galls from 31 natural orders and made known 56 species of thrips from about 68 host plants from Java, of which the families Moraceae, Urticaceae, Piperaceae, Euphorbiaceae, Vitaceae, Myrtaceae appear major natural orders with gall producing plants such as species of *Ficus*, *Conocephalus*, *Piper*, *Vitis*, etc., harbouring the bulk of the gall thrips. Though most of these are dicotyledons, the families Liliaceae (*Smilax*), Araceae and rarely Gramineae have also been represented as susceptible to gall formation. This is true also with the family Gnetaceae, the species *Gnetum latifolium* being known to harbour about 5-6 species of thrips. van Leeuwen (1938) mentions galls by *Physothrips* on Pteridophytes in Netherland Indies, in the form of rolling of leaf margin on *Asplenium nidus*, *Pleopeltis superficialis* and *Pleopeltis pteropus*. Unstudied material of thrips from galls collected by Karny were subsequently studied by Priesner (1951, 1953, 1968) in particular, concentrating on the genera allied to *Liothrips* and *Eugynothrips* and more than a 100 species of *Liothrips* were recorded from Java and Sumatra. Neotropical regions are poor in gall thrips and Canizo (1945) has indicated a few gall species. True gall formers are mostly absent in North America, though a few cosmopolitan species like *Gynaikothrips uzeli* and *G. ficorum* are reported from nearby islands.

Over the last quarter of a century our knowledge of Indian gall thrips has been considerably enhanced due to the investigations of Ananthakrishnan and his colleagues. Among early Indian work, Karny (1927) and Ramakrishna (1928) made known about 17 species and as early as 1912 Hood described *Arrhenothrips ramakrishnae*, the *Mimusops* gall thrips from India. It is interesting to note that literature reports the earliest gall species from India as *Gynaikothrips ficorum* (1901). The work of Ananthakrishnan (1949-1977) has made known more than 110 species, the dominant families from India being Moraceae (*Ficus* sp.), Melastomaceae (*Memecylon* sp.), Araliaceae

(*Schefflera* sp.) and to some extent Combretaceae, Loranthaceae, Oleaceae, Myrtaceae and Rubiaceae. Though Bagnall (1928) and Moulton (1927) made known some of the gall thrips principally from *Acacia* sp., in Australia, it was left to Mound (1970, 1971) to make detailed investigations both of galls and gall thrips on the phyllodes from several species of *Acacia*. His work on "the gall forming thrips and allied species from *Acacia* trees in Australia" is indeed a notable contribution to the field of Thysanopteroecidia. From the Ethiopian region, comparatively few galls are on record and Karny (1922) records the two species *Gynaikothrips ebneri* and *G. williamsi* from *Acacia arabica* in Egypt. Zur Strassen (1960) describes a large series of *Vuilletia houardi* from *Gueira senegalensis* in Gambia and Priesner (1960) in his treatise on Thysanoptera of Egyptian deserts and Pitkin and Mound (1972) in their catalogue of West African thrips mention a few species inhabiting galls.

GALL ASSOCIATIONS

The gall thrips and their galls differ from most insect galls in a fundamental respect, viz., the astonishing numbers of individuals present in a single gall. In some galls, as for example, that of *Austrothrips cochinchinensis* on *Calycopteris floribundus* the number of individuals may vary from 200 to over 5000. The individuals most usually belong to more than one species and even, genera. They comprise various stages of larvae, pupae and adults. The species-complex of any thrips galls includes the primary species, which is perhaps the true initiating organism of the gall and other secondary species, some of which are inquilines, predators, etc. The number of individuals and the species composition are largely specific to the gall and are determined by complex factors. They also contribute largely to the nature and structure of the galls.

The immature and young galls contain eggs, larvae, pupae and adults of the gall thrips, the population of which depends on the nature of the gall. Few individuals occur in the smaller leaf rolls, more in leaf folds and still larger numbers in the non-leaf roll-fold types. In some galls such as those on *Memecylon lushingtoni* caused by *Byctothrips ayyari*, *Acacia leucophloea* caused by *Thilakothrips babuli* and *Loranthus elasticus* caused by *Phorinothrips loranthi*, we find usually very few associate species of thrips. Most thrips galls contain, however, one or more secondary species though often, relatively fewer than the primary gall maker. These secondary thrips species are true *inquilines* which are incapable of making galls by themselves, but are believed to be capable of inducing certain modifications in the galls of other thrips. The transition between an inquiline and a true gall species does not seem to be sharply defined. The cecidophagous habit is perhaps primary and not strictly secondary as in some inquilines at least. It seems also that in some cases the inquiline thrips was primarily a cecidogenetic species that has come to be secondarily specialized for life in the gall of another species. Some inquilines seem to have even advanced towards definitive parasitism on the primary cecidogenetic thrips species. Three of the commonest species of inquilines, which are also markedly polyphagous and are associated with many other species of thrips in their galls on diverse plants are the predatory *Androthrips flavipes*, and *Mesandrothrips inquilinus* from India and *Androthrips melastomae* from Java. Some inquilines are monophagous, restricted to particular galls. This, for instance is the case with *Androthrips ramachandrai* in the gall of *Calycopteris floribundus*, *Aeglothrips denticulus* in *Maytenus* sp. *Mesothrips melinocnemis* in *Pothos scandens* and *Coryciodothrips inquilinus* in *Terminalia chebula*. The galls resulting from the activity of more than one species of thrips in which it is difficult to distinguish the gall maker from the inquilines are called company galls. In comparison with the one thrips-one inquiline association, the company gall associations are not numerous. Occasionally we find two species almost equally numerous, where both the species may be involved in gall formation, as in galls of *Santalum album* caused by *Mesothrips manii* and *Crotonothrips davidi*, of

Schefflera racemosa by *Liothrips ramakrishnae* and *Liothrips associatus* and of *Memecylon* sp., by *Crotonothrips gallarum* and *Mesothrips cracens*. The best example of a gall containing several inquiline species, each although not very numerous, is the gall on *Ficus* from Samoa, with four species of *Euoplothrips*. Examples of monophagous gall species in Australian *Acacia* are *Kladothrips acaciae* on *Acacia harpophylla*, *K. augonsaxos* on *A. doratoxylon*, *K. ellobus* on *A. cambagei* and *K. rugosus* on *A. pendula*. But *Oncothrips tepperi*, a typically polyphagous species is known within the galls of several species of *Acacia* - *oswaldii*, *homalophylla*, *pendula*, *sclerophylla* (Mound, 1970). *Liothrips cognatus* is again polyphagous known from galls of *Medinella horsefieldi*, *M. laevifolia*, *M. verrucosa* and *Ardisia javanica* (Priesner, 1968). Following is a brief synopsis of various types of gall thrips associations (the primary gall species is represented by asterisk).

1. Single gall species	<i>Thilakothrips babuli</i> <i>Byctothrips ayyari</i> <i>Phorinothrips loranthe</i>	<i>Acacia leucophloea</i> (India) <i>Memecylon lushingtoni</i> (India) <i>Loranthus</i> sp. (India)
2. Gall species and one inquiline species	<i>Alocathrips hadrocerus</i> * <i>Aeglothrips denticulus</i> <i>Sphingothrips trachypogon</i> * <i>Synergothrips prolatus</i> <i>Austrothrips cochinchinensis</i> * <i>Androthrips ramachandrai</i> <i>Dixothrips onerosus</i> * <i>Coryciodothrips inquilinus</i> <i>Aneurothrips priesneri</i> * <i>Androthrips melastomae</i> <i>Liothrips karnyi</i> * <i>Androthrips flavipes</i>	<i>Maytenus senegalensis</i> (India) <i>Disopyros maritima</i> (India) <i>Calycopteris floribundus</i> (India) <i>Terminalia chebula</i> (India) <i>Cordia obliqua</i> (India) <i>Piper nigrum</i> (India)
3. Gall species and two or more inquiline species	<i>Arrhenothrips ramakrishnae</i> * <i>Androthrips flavipes</i> <i>Liophlaeothrips vichitravarna</i> <i>Gynaikothrips flaviantennatus</i> * <i>Androthrips flavipes</i> <i>Mesandrothrips inquilinus</i>	<i>Mimusops elengi</i> (India) <i>Casearia tomentosa</i> (India)
4. Two gall forming species not recognizable	<i>Mesothrips manii</i> * <i>Crotonothrips davidi</i> <i>Liothrips ramakrishnae</i> * <i>Liothrips associatus</i>	<i>Santalum album</i> (India) <i>Schefflera racemosa</i> (India)
5. Company galls involving more than 3 species in a gall	<i>Arrhenothrips dhumrapaksha</i> <i>Crotonothrips dhurgavadana</i> <i>Liothrips kannani</i> <i>Mesothrips bhimabahu</i> <i>Mesothrips apatelus</i> <i>Androthrips melastomae</i> <i>Haplothrips aculeatus</i> <i>Androthrips flavipes</i> <i>Mesandrothrips inquilinus</i> <i>Gynaikothrips hystrix</i> <i>Gynaikothrips hopkinsoni</i> <i>Dimorphothrips microchaetus</i> <i>D. solitus</i> <i>D. idoliceps</i> <i>Euolothrips buxtoni</i> <i>E. incognitus</i> <i>E. uncinatus</i>	<i>Ficus retusa</i> (India) <i>Ficus</i> sp. (Samoa & Tonga)

<i>Mesothrips extensivus</i>	}	<i>Mallotus philippinensis</i> (India)
<i>Liothrips brevisetosus</i>		
<i>Liothrips bosei</i>		
<i>Liothrips flavitibia</i>		
<i>Liothrips mucronis</i>		
<i>Mesothrips malloti</i>		
<i>Liothrips emulatus</i>	}	<i>Schefflera</i> sp. (India)
<i>Liothrips fragilis</i>		
<i>Liothrips retusus</i>		
<i>Gynaikothrips schefflericola</i>		
<i>Sacothrips malvus</i>	}	<i>Geijera parviflora</i> (Australia)
<i>S. ingens</i>		
<i>S. galbus</i>		
<i>Moultonoides geijerae</i>		
<i>Choleothrips percus</i>		
<i>Choleothrips geijerae</i>		
<i>Liothrips nuvosegnus</i>	}	<i>Conocephalus suaveolens</i> (Java)
<i>Liothrips racemosae</i>		
<i>Liothrips taurus</i>		
<i>Eugynothrips conocephali</i>		
<i>Eugynothrips persinula</i>		
<i>Liothrips fumipennis</i>		
<i>Aneurothrips punctipennis</i>		

In this work the term gall thrips is applied in a comprehensive sense, so as to include all the primary and secondary thrips occurring in a gall. Thrips are known to occur in galls of nearly 60 natural orders of plants. The Tubulifera appear as gall formers in Gymnosperms, and several types of their galls occur on the dicotyledons, but rarely on monocotyledons. We may recognize perhaps three categories of thrips in plants belonging (a) only one host plant in a family or natural order and hence monophagous, (b) 2-3 host plants per family or closely related families, (c) more than four, often infesting several plants in a natural order (polyphagous). Under the first category, in so far as has been known, may be included Asclepidaceae (*Secamone emetica*), Casuarinaceae (*Casuarina stricta*), Ebenaceae (*Diospyros maritima*), Dipterocarpaceae (*Dipterocarpus alatus*). Gnetaceae (*Gnetum latifolium*), Hippocrataceae (*Salacia oblongifolia*), Monimiaceae (*Tambourissa* sp.), Liliaceae (*Smilax* sp.), Flagellariaceae (*Susum anthelmithium*), Saxifragaceae (*Polyosma ilicifolia*), Rhamnaceae (*Ventilago* sp.), Samydaceae (*Casearia tomentosa*), Santalaceae (*Santalum album*), Proteaceae (*Hakia* sp.), Symplocaceae (*Symplocos* sp.), Tiliaceae (*Schoutenia ovata*), Pittosporiaceae (*Bursaria* sp.), Simarubaceae (*Balanites aegyptiaca*), Rutaceae (*Geijera parviflora*), etc.

Under the second category mentioned above may be included Myrsinaceae (*Ardisia* sp. and *Ardisia javana*), Celastraceae (*Maytenus* sp.) Lauraceae (*Litsea chinensis*, *Cinnamomum* sp.), Araceae (*Pothos scandens*, *Scindopsis* sp. and *Rhaphidophora* sp.), Sapotaceae (species of *Mimusops* and *Walsura piscidia*), Oleaceae (*Jasminum* sp. and *Linociera* sp.), Elaeocarpaceae (*Sloania sigum* and *Sloania javanica*), Boraginaceae (*Cordia obliqua* and *Cordia suaveolens*) and Loganiaceae (*Fagraea fastigata*, *F. litoralis* and *F. obovata*).

It is under the third category or polyphagous gall thrips that we come across the maximum number of species, with a few in Combretaceae, Loranthaceae and Vitaceae and reaching the maximum number in Moraceae, wherein several species of *Ficus* as well as of other genera more than 40 species are known. Next in order to Moraceae, we have Mimosae, Piperaceae, Myrtaceae, Melastomaceae, Urticaceae, Araliaceae and Euphorbiaceae, whose known host plants harbour several species of gall thrips.

Mention was made earlier, of the very common inquiline species *Androthrips flavipes*, *Androthrips melastomae* and *Mesandrothrips inquilius* in most of the galls. The

distribution of these inquilines in the different galls and their associate primary gall species are referred to below:

a. *Androthrips flavipes*

HOST PLANT	GALL FORMER
<i>Casearia tomentosa</i>	<i>Gynaikothrips flaviantennatus</i>
<i>Ficus retusa</i>	<i>Arrhenothrips dhumrapaksha</i>
<i>Ficus benjamina</i>	<i>Gynaikothrips uzeli</i>
	<i>Gynaikothrips microchaetus</i>
<i>Linociera</i> sp.	<i>Mesicothrips plicans</i>
<i>Mallotus philippinensis</i>	<i>Mesothrips extensivus</i>
<i>Maytenus senegalensis</i>	<i>Alocothrips hadrocerus</i>
<i>Memecylon edule</i>	<i>Crotonothrips dantahasta</i>
<i>Mimusops elengi</i>	<i>Arrhenothrips ramakrishnae</i>
<i>Pavetta hispidula</i>	<i>Teuchothrips longus</i>
<i>Planchonia valida</i>	<i>Cercothrips nigrodentatus</i>
<i>Piper nigrum</i>	<i>Liothrips karnyi</i>
<i>Piper</i> sp.	<i>Liothrips pallipes</i>
<i>Ventilago maderasapatana</i> .	<i>Schedothrips orientalis</i>
<i>Walsura piscidia</i>	<i>Psenothrips priesneri</i>
<i>Vitis</i> sp.	<i>Liothrips pallicrus</i>

b. *Mesandrothrips inquilinus* occurs generally in limited numbers with *Androthrips flavipes*.

c. *Androthrips melastomae*, a related species, is an equally well distributed inquiline in Java on *Gnetum latifolium*, *Ficus benjamina*, *Conocephalus suaveolens*, *Chavicea densa*, *Piper betle*, *Piper arcuatum*, *Mallotus philippinensis*, *Eugenia polyantha*, *Melastoma malabathricum*, *Ardisia cymosa*, *Cordia suaveolens*, and *Fagraea litoralis*.

Ananthakrishnan (1972) has shown that inquiline species which are always fewer in number than the gall formers, do not have the ability to form a gall independently, because concentrated extracts of these inquilines injected into growing tissues of a young *Mimusops* plants did not result in chlorosis, unlike the effect of the extracts of such gall makers as *Arrhenothrips ramakrishnae* which produced various degrees of chlorosis according to the concentration of the extracts.

Thrips not only occur as inquilines in thrips galls, but also as inquilines in the galls of other insects. Common examples of inquiline thrips are *Mallothrips indicus* in the gall of the psyllid *Trioza jambolanae*, *Haplothrips atriplicis* in the gall of *Asphondylia conglomerata*, *Dolichothrips inquilinus* in the gall of a psyllid on *Atriplex* sp., *Liothrips interlocatus* in psyllid galls of *Terminalia* sp., *Dactylotrips priscus* within galls of *Trichilogaster acacia-longifolia* on *Acacia floribunda*, *Liothrips devriesi* in the cecidomyiid gall of *Elatostemma sesquifolia*, etc. The inquiline *Androthrips ramachandrai* on *Calycopteris floribundus* is sparse in a green gall, and with the gradual drying up of the gall, while the population of the gall thrips *Austrothrips cochinchinensis* becomes progressively reduced, the number of *A. ramachandrai* rises at first, but in the completely dried up galls, both the thrips are replaced by 'successori' such as ants (*Crematogaster* and *Camponotus* spp.), coccids, spiders, mites, rarely other species of thrips, psocids, etc. In general, the succession of species in galls begins with dominance of the cecidozoan

in the earliest phases and with the ageing of the gall, occurs the entry of inquiline species, then the inquilines increase and cecidozoa decrease in older galls, followed by the invasion by successori, and the climax being the dominance of parasites and predators.

Thrips galls, like most other insect galls are also associated with a complex community, the size and composition of which varies with the plant bearing the gall, the gall thrips, other secondary species and nature of the gall. The community is particularly common in pouch galls, blister, rosette galls as well as fold galls, and seems to be limited in roll galls. The secondary organisms in thrips galls include other species of thrips, besides mites, ants, spiders, predatory bugs and beetles, parasitic wasps, fungi and bacteria. There is a regular and characteristic sequence in which these organisms appear: commencing from the increase in individuals of the gall thrips connected with the growth of the gall, there follows an invasion of predatory bugs and beetles, parasites and hyperparasites in the mature galls, culminating in the entry of ants, spiders and lepidopteran larvae in the old gall that has already started wilting after the escape of the gall thrips. One of the commonest species associated with thrips galls as predator is the anthocorid bug *Montandoniola moraguesi* which consumes, eggs, adults, and larvae in considerable numbers (Muraleedharan and Ananthakrishnan, 1971). This species is known from Japan, France, Italy, Spain, Egypt, S. America and the Orient. In India this species is known from many galls of different species, listed below:

PLANT SPECIES	PRIMARY GALL THRIPS
<i>Anogeissus</i> sp.	<i>Lygothrips jambuvasi</i>
<i>Casearia tomentosa</i>	<i>Gynaikothrips flaviantennatus</i>
<i>Calycopteris floribundus</i>	<i>Austrothrips cochinchinensis</i>
<i>Cordia obliqua</i>	<i>Aneurothrips priesneri</i>
<i>Ficus bengalensis</i>	<i>Gynaikothrips malabaricus</i>
<i>Ficus retusa</i>	<i>Gynaikothrips uzeli</i>
<i>Loranthus</i> sp.	<i>Phorinothrips loranthi</i>
<i>Mallotus philippinensis</i>	<i>Mesothrips extensivus</i>
<i>Maytenus senegalensis</i>	<i>Alocothrips hadrocerus</i>
<i>Memecylon edule</i>	<i>Crotonothrips dantahasta</i>
<i>Memecylon elasticus</i>	<i>Crotonothrips gallarum</i>
<i>Mimusops elengi</i>	<i>Arrhenothrips ramakrishnae</i>
<i>Pavetta hispidula</i>	<i>Teuchothrips longus</i>
<i>Piper nigrum</i>	<i>Liothrips karnyi</i>
<i>Planchonia valida</i>	<i>Cercothrips nigrodentatus</i>
<i>Pothos scandens</i>	<i>Tetradothrips foliiperda</i>
<i>Ventilago maderasapata</i>	<i>Schedothrips orientalis</i>
<i>Secamone emetica</i>	<i>Crotonothrips mimicus</i>
<i>Walsura piscidia</i>	<i>Psenothrips priesneri</i>
<i>Vitis</i> sp.	<i>Liothrips pallicrus</i>

POLYMORPHISM AND DEGREE OF INTRASPECIFIC DIVERSITY AMONG GALL THRIPS

It is well known that Thysanoptera exhibit more or less pronounced polymorphism and are also often characterized by a wide range of variability within

the limits of the same species. The variations exhibited by gall thrips in general, affect both sexes involving alary polymorphism and polychromatism. Very rarely do we come across more fundamental variations mostly confined only to one of the sexes, with the extreme forms in the particular sex showing incredible differences. On the basis of the differences of the wing size, four types of individuals may be recognized viz., the macropterous, hemimacropterous, brachypterous or micropterous and the apterous forms. Most of the free living, polyphagous and oligophagous as well as the cecidicolous species are invariably macropterous and do not generally show striking alary polymorphism. Remarkable examples of complete alary polymorphism as in *Oncothrips tepperi* and *Byctothrips ayyari* are rare. While the macropterous forms possess well developed eyes, ocelli, sense cones and sigmoid setae on the abdominal tergites in the Tubulifera, the truly apterous forms have the eyes reduced to a few ommatidia, absence of ocelli, shorter sense cones and a considerably reduced pterothorax and within Tubulifera the absence of sigmoid wing-retaining setae. Even within the limits of a single species showing alary polymorphism, the shape of the pterothorax may vary considerably, so that mesopraesternum differs in different forms. The pelta or the tergite of the first abdominal segment also shows similar peculiarities from the apterous to the macropterous individuals. In a population in which all types of alary polymorphism are found, there exists a condition between the brachypterous and the truly apterous forms in which the wings and ocelli are very much reduced and the sigmoid setae present as vestiges.

Gall thrips genera do not show such marked intraspecific diversity as the mycophagous Tubulifera in which oedymmerism and gynaecoidism are rather common in the males. Oedymmerism refers to the occurrence of extremely enlarged males, with several parts like the fore legs and their armature strikingly enlarged to the extent of being grotesque. Gynaecoidism involves the bare minimal development of structures, with all secondary sexual characters suppressed. Females also show considerable variation, the extreme forms being known as major and minor females. Very few gall thrips species show oedymmerism and gynaecoidism in the males to the degree developed in mycophagous Tubulifera. Intermediate forms are not uncommon between both the extremes in both the sexes. Striking examples of major females, with excessively enlarged fore femora often wider than the head, are met with in *Arrhenothrips*, *Mallothrips*, *Mesothrips*, *Byctothrips* etc. The difference between the two extremes in the females of these species is often so striking as to render difficult the correct identification of species, if one is not aware of the degree of diversity. In dealing with such diversities, we may broadly recognize the following categories:

- (a) Macropterous species, which show very little variation in both sexes, as in *Ayyarothrips*, *Dixothrips*, *Synergothrips*, etc.
- (b) Macropterous species, which show limited variation in both sexes, as in *Schedothrips*, *Phorinothrips*, etc.
- (c) Macropterous species, which show wider variation in the females than in the males as in *Androthrips*, *Arrhenothrips*, *Mallothrips*, *Warithrips*, *Mesothrips*, etc.
- (d) Macropterous species, showing considerable variation among the males and to a lesser extent in females as in *Sphingothrips trachypogon*.
- (e) Species with alary polymorphism (with secondary chromopolymorphism in the extreme forms) like the apterous, brachypterous, hemimacropterous and macropterous forms, more particularly in the females as in *Alocothrips*, *Byctothrips*, *Oncothrips*, etc.

In *Sphingothrips trachypogon* the oedymmerous males are characterized by strongly enlarged fore femora, fore tibiae with a conspicuous tooth-like appendage at the

apex at the inner margin, strong foretarsal tooth, heavier pronotum and strongly developed cheek setae. The forelegs with the tibial appendage, foretarsal tooth and cheek setae are but feebly developed in the gynaecoid males, which are about half the size of the oedymorous males.

All species of *Arrhenothrips* show great diversity among the females, the minor females being easily recognized by their small size. The range of diversity in *Arrhenothrips* species include the following: (a) prothorax may be shorter than head in the minor females, much longer than head in major females (b) postocular setae are nearly thrice as long in the major females (c) antennal segments 3 and 4, about 1.7 times as long in the minor females (d) antero-angular prothoracic setae may be vestigial to well developed and epimerals twice as long (e) forefemoral length may range upto thrice that in minor females and more than 4 times as wide (f) foretarsal tooth nearly twenty times as long as in the minor females where it may be very much reduced (g) forewings more than twice as long and basal wing setae thrice as long as those in the minor females (h) abdomen twice as wide at base and tube over 1.5 times as long. Very nearly the same condition has been reported by Mound (1971) in *Onychothrips arotrum* where the size variation is great and the relative lengths of some do not remain constant throughout the size range. In larger specimens the setae on tergite IX are about half as long as tube, while in the smaller specimens they are rarely one-third as long. Similarly the head is shorter than pronotum in large specimens, much smaller in smaller individuals. The variation in the fore-tibial tubercles show apparently negative allometry, being smaller in larger females and larger in smaller females. In *Grypothrips mantis* the largest female is twice as large as the smallest and Mound (1971) gives the range of variation in this species. In *Katothrips tityrus* the head is longer in oedymorous males than in the gynaecoid. Females occur both as macropterous and hemimacropterous forms, but males only as hemimacropterous. In *Byctothrips ayyari* all males are brachypterous and hemimacropterous and in *Austrothrips cochinchinensis* all males are apterous.

Alary polymorphism, with the degree of the development of the wing being correlated with allometric growth in other parts of the body along with apparent differences in the two sexes, is known at present in *Oncothrips tepperi* (= *Brithothrips fuscus*) (Mound 1969) and *Byctothrips ayyari* (Ananthakrishnan and Viswanathan, 1975). In *Oncothrips tepperi* the antennal segments are shorter and broader in the macropterous forms; the head shorter with lateral margins weakly concave in the micropterae, but parallel sided in the macropterae. The pronotum is also longer and much wider dorsally and with a median carina in the micropterae. The fore tibia are shorter and stouter in the micropterae, also having strong and stout fore tarsal tooth. The tube is longer and more slender in the macropterae.

In *Byctothrips ayyari* as in *Oncothrips tepperi*, there occurs a wide range of variation. The ratio of the head length/width is almost constant in the macropterous forms (1.4), while in the wingless and brachypterous counterparts it ranges from 1.2–1.4. The forefemoral length/width ratio is great in the macropterous forms (1.9), 1.8–1.9 in the hemimacropterous individuals and 1.5–1.9 in the wingless and the brachypterous ones. The prothoracic length/width ratio in the apterous and brachypterous individuals is 0.6–0.9, while it is 0.7–0.8 in the macropterous forms. Similarly the forefemoral/fore tibial length ratio in the wingless and brachypterous forms is 1.4–1.6 and 1.5–1.6 in the macropterae.

Genera in which the forefemora of the major females are conspicuously armed with strong teeth or tubercles are *Euoplothrips*, *Warithrips* and *Thaumatothrips*. Minor females of these genera show only minimum development of these structures and in certain cases a total absence of these structures. The foretibial and foretarsal teeth are also similarly reduced to hardly recognizable tubercles in such forms. Variations such as these tend to result in confusion in the correct identification of species.

THRIPS GALLS—THEIR NATURE AND CLASSIFICATION

Thrips galls occur on a great variety of plants, belonging to Gymnosperms, Dicotyledons and some Monocotyledons. Some families are apparently very rich in thrips galls and other families, though in common with mite and other insect galls, are poor in thrips galls. Araliaceae, Combretaceae, Euphorbiaceae, Mimosae, Moraceae, Myrtaceae, Piperaceae, Rubiaceae, Rutaceae, Urticeae and Vitaceae may be considered as among the dominant families of thrips galls. It seems curious that families like Compositae, Gramineae, etc., on which galls of mites, Diptera, Hymenoptera, etc., are abundant, have exceedingly few thrips galls. The factors which govern the occurrence and abundance of thrips galls in plants of various families are not fully understood, but are undoubtedly bound up with host selection and phylogeny of the gall thrips among other events.

A most striking peculiarity of thrips galls is the fact that the greatest majority of them arise on leaves and only exceedingly few bud and flowers galls are known. Rarely thrips galls occur on the shoot axis and only two such galls are known at present. Thrips galls may, therefore be described as almost exclusively leaf galls. This fact has an important correlation with the peculiarities of morphogenesis and monotonously similar types of galls, caused by very diverse thrips on different plants. Most thrips galls conform strictly to a characteristic pattern and are merely modifications of curling, folding, rolling and other related horizontal growth movements of the leaf-blade, so as to eventually enclose the thrips in the gall cavity, which nearly always communicates with the outside by a more or less well developed ostiole or a lateral slit. Taking into account the morphological modifications and pattern of enclosing the thrips in a cavity, thrips galls have certain superficial resemblance to some of the galls of aphids and eriophyid mites. The greatest bulk of thrips galls are leaf rolls and leaf-folds, but simple bag-like malformations to highly convolute pouch-galls are also known. The complexity of the gall depends not only on the species of thrips and plants, but also to a great extent on the number of individuals in the gall. Well defined, mature leaf folds of *Ficus retusa*, *F. benjamina* or *Mimusops elengi* may harbour as many as 25–200 young and adults, besides a very large number of eggs. Primitive leaf curls like those of *Planchonia valida* contain swarms of *Cercothrips nigrodentatus*, each leaf with more than 100 individuals of all stages, in addition to the associate species *Liothrips gracilis*. The leaf-rolls of *Ventilago maderaspatana*, *Walsura piscidia* and *Pavetta hispidula* also harbour countless numbers of adults and larvae. Complex galls such as that *Calycopteris floribundus* (2–8 cm large), often contain anywhere between 200 and 5000 individuals. The pouch galls of *Terminalia chebula* have an extremely dense population of thrips within them, as also those of some *Memecylon* sp., and the rosette gall of *Acacia*. The largest thrips gall produced by *Tolmetothrips granti* from the Solomon Islands, is a convoluted leaf gall, 15 cm in diameter and harbouring about 10,000 individuals of a single species. On the other hand, in the horn galls of *Schefflera racemosa*, where numerous galls arise on a single leaflet, hardly 1–5 individuals occur within a gall.

TYPES OF THRIPS GALLS

In view of the localised nature of the abnormal cell divisions and growth, gall formation involves varied growth movements—vertical, radial or tangential (Mani, 1973), on the nature of which different types of galls result as outgrowths, swellings, folds, rolls, pouches and so on. When confined solely to the epidermis, emergence galls result. More often the cecidogenetic centre exists superficially. In simple leaf fold galls as in *Mimusops elengi* the concentrated feeding by thrips on either side of the midrib initiates the leaf gall by suppressing the unfolding of the leaf rudiment inside the developing bud. Leaf fold galls reported by Karny (1911) from Java on

Piper sarmentosum indicate that thrips attack the tender leaves in the bud even before they have opened and get in between the folded halves of the blade. The leaf blade is heavily infested more on one side of the midrib than on the other, so that the former half rolls upward and the latter half curves over the rolled margin of the former like a sheath. Pronounced rugosities and coriaceous warts appear on either side of the midrib. In the leaf rolls of *Smilax*, thrips attack the part of the leaf blade adjoining the midrib and the two strong lateral veins that traverse the leaf from base to the apex. The infected parts curl up and heavy infestation causes the whole leaf roll to become twisted. The entire leaf blade may become rolled and spirally twisted, commencing obliquely from one margin at base to right across beyond the midrib to the other margin in the case of *Jasminum multiflorum*.

In the more complicated pouch galls of *Calycopteris floribundus*, a bud gall, the development of the growing point is checked by feeding activities of the adult thrips, resulting in a pocket-like structure (Rao, 1924). In the horn galls of *Schefflera*, the leaflets are infested just after they have expanded from the bud. The punctures made by thrips on the underside of leaves appear as transparent spots, which turn red and grow into tubular outgrowths 6–8 mm long in 6 days and a single female is known to induce the development of a number of galls on a leaf. With the growth of the tissues, the galls develop a tubular chamber 3–4 cm long (Docters van Leeuwen, 1956; Lewis, 1973). Mound (1970) mentions that in the phyllodes of *Acacia*, galls arise one on each phyllode as a result of feeding by thrips and the site of feeding becomes depressed below the surface and then develops into a hollow pouch. The lips of the pouch close and result in the development of galls.

Complexities arise in many galls, which are mainly leaf-rolls developing according to the type discussed earlier. In a species of *Memecylon* in which two opposite leaves are involved in rolling, numerous mostly bifid, papillose structures arise close together, giving the appearance of a blistered gall, often showing the gall cavity being composed of tiny compartments. A less complex condition is seen in the gall of *Loranthus* sp., in which the galls become more pinkish-red, fleshy and highly corrugate as well as tuberculate. In the hypophyllous galls of *Pavetta*, the rolling commences as marginal infoldings which gradually roll towards the midrib, become highly tuberculate and fleshy, losing their green colour and turning copper brown.

The galls caused by thrips are grouped under different types according to the mode of their development and morphological characters. Karny and van Leeuwen (1914) were the first to propose a classification which though basically sound, need modifications so as to include some of the recently described galls. Karny's grouping as enumerated by Mani (1964) is as follows:

- I. Mere curling of the two halves of the leaf blade on either side of the midrib, without the leaf margins coming into contact with each other; thrips occur exposed on the underside of the leaf; curling hypophyllous.

Examples: *Ardisia cymosa*, *Eugenia polyantha* (Plate I; Fig. 2), *Ficus glomerata*

- II. Folding epiphyllous with the margins on either side of the midrib meeting together and in contact.

1. Without any pronounced anatomical abnormalities.

Examples: *Ficus benjamina* (Plate II; Fig. 1 & Plate III; Fig. 1), *Ficus retusa*, *Ficus retusa-nitida*, *Mallotus philippinensis*, *Melastoma malabathricum-polyanthum*, *Veronica cineria*, etc.

2. With more or less pronounced swelling of the folded or curved leaf and characterized by conspicuous anatomical abnormalities.

Example: *Spatholobus litoralis*.

3. With swelling of the blade in the immediate vicinity of the infected vein, mostly the midrib.

Examples: *Piper betle*, *Piper nigrum* (Plate IV; Fig. 4), *Smilax* sp., etc.

III. Folding or rolling of the leaf blade either hypophyllous or epiphyllous and usually extending to the whole blade.

1. Without pronounced swelling of the blade.

Examples: *Cordia obliqua* (Plate IV; Fig. 1), *Eurya japonica*, *Ficus cuspidata*, *Justicia procumbens*, etc.

2. With more or less conspicuous swelling of the leaf blade.

Examples: *Loranthus pentandrus*, *Memecylon intermedium*, etc.

IV. Sac-like epiphyllous or hypophyllous out-pocketing or pouch galls, often with simultaneous rolling and curling of the blade.

Examples: *Aporosa microcalyx*, *Mallotus repandus*, *Schoutenia ovata*, *Vitis papillosa*.

V. Ceratoneon pouch-gall.

Example: *Schefflera elliptica* (Plate XV; Fig. 3).

VI. Emergence-galls.

Example: *Conocephalus suaveolens*.

These types discussed above fall into two main categories, viz., the leaf-roll and fold-galls and the non-leaf roll, fold-galls, each consisting of several distinct types (Ananthakrishnan and Jagadish, 1969):

I. LEAF ROLL/FOLD GALLS

1. Partial marginal leaf roll or curl on one or both margins. Example: *Gynaikothrips malabaricus* on *Ficus bengalensis* (Plate I; Fig. 3).
2. Marginal roll or fold, the rolled edge fusing with the leaf blade. Example: *Alocothrips hadrocerus* on *Maytenus senegalensis*. The roll-gall may become spirally twisted as in *Cordia obliqua* and *Cordia suaveolens* by species of *Aneurothrips*.
3. Complete margin-folds, the folded margin fused the whole length to form a continuous tube as in *Piper nigrum* (*Liothrips karnyi*) (Plate IV; Fig. 4) and *Anogeissus* sp. (Plate IV; Fig. 3), with a narrow convoluted infolding along the edges of the blade as caused by *Lygothrips jambuvasi*.
4. Typical leaf-folds with the two halves meeting closely around the margin as in *Mimusops elengi* (Plate II; Fig. 2 & 3) (*Arrhenothrips ramakrishnae*), *Ficus retusa* (*Arrhenothrips dhumrapaksha*), *Ficus benamina* (*Mesothrips jordani* and *Gynaikothrips bengalensis*).
5. Leaf rolled from one edge to another or one over the other as in *Casearia tomentosa* (*Gynaikothrips flaviantennatus*).

6. The leaf blade on either side of the midrib rolled inwards towards the midrib and forming a compact structure with a longitudinal slit in the middle, surface smooth or with swellings. Epiphyllus rolls as in *Ventilago* sp. (Plate VII), (*Schedothrips orientalis*), *Memecylon lushingtoni* (*Byctothrips ayyari*), *Memecylon edule* (Plate VIII; Fig. 1) (*Crotonothrips dantahasta*), *Eugenia axillaris* (*Mixothrips craigheadi*) and hypophyllous rolls of *Pavetta hispidula*. Very recently hypophyllous leaf rolls of *Artabotrys odoratissimus* (Anonaceae), was discovered by the author (Plate. .X). Sometimes these rolls may not be compact, but loose as in the leaf-rolls of *Mallotus philippinensis*.
7. Spiral leaf rolls on *Jasminum pubescens* by *Eothrips coimbatorensis*, with the gall cylindrical or elongate-fusiform, the rolling of the blade commencing obliquely from one margin at the base and extending right across beyond the midrib to the other margin.

II. NON-LEAF ROLL/FOLD GALLS

1. Strongly rugose hypophyllous curls of *Planchonia valida* (Plate I; Fig. 1) (*Cercothrips nigrodentatus*).
2. Emergence galls totally confined to the epidermis giving rise to elongate, hairy outgrowths on *Conocephalus suaveolens*.
3. Covering galls resulting from the growth of tissues around and above so as to enclose completely the thrips which are initially exposed. The only instance is a gall of an unidentified thrips from Eritrea, where the gall is a hypophyllus, subcephaliform or crateriform covering gall arising as fleshy outgrowths on the leaf of *Ilex mitis-erythraeus*.
4. Simple bag-like malformations on leaf of *Bridelia laurina* due to the failure of the leaf rudiments to open and simultaneous swelling of the leaf blade (New Caledonia).
5. Epiphyllous galls caused by *Cryptothrips conocephali* on leaf of *Conocephalus suaveolens* from Java.
6. (a) Pouch galls or bladder galls on the buds of *Calycoternis floribundus* (Plate XI; Fig. 3 & Plate XII; Fig. 1) (*Austrothrips cochinchinensis*) where the galls are globose, irregular, variable, convoluted, verrucose and unilocular, reaching a size of 5–8 cm when fully grown. These are axillary in position, being almost always found in the axils, and attaining rarely a terminal position and have walls thick, greenish, glabrous and coriaceous.
- (b) Pouch galls of *Terminalia chebula* (Plate XII; Fig. 4), sac-like, sub-globose, highly unevenly thick galls, 6–8, crowded, close to petiole, with a tendency for fusion of galls or with the petiole (*Dixothrips onerosus*).
- (c) Pouch galls on the phyllodes of *Acacia*, spherical (*Acacia aneura*), purse-like, a little longer than deep (*A. homalophylla*, *A. melanoxydon*, etc.), tubular pouch galls (also in *Acacia aneura*), flask-shaped galls with smooth exterior (*A. pendula* and laterally flattened, kidney-shaped galls (*A. cambagei*).
- (d) Largest pouch gall, convoluted leaf gall, 15 cm in diameter caused by *Tolmetothrips granti*, hanging from a *Ficus*.

7. Rosette galls as in *Acacia leucophloea* (Plate XI; fig. 4 & Plate XII; fig. 2) (*Thilakothrips babuli*), the axillary and terminal buds with the rudiments of leaves converted into a bunch of rosette-like structures, with leaflets considerably thickened, enlarged, curled, and rolled irregularly and 25–30 mm in diameter.
8. Blister galls caused by two leaflets or one, a highly modified form of a 'leaf roll', which when complete appears as a globose or a more elongate structure, fully blistered or papillose and partitioned or septate and caused on different species of *Memecylon* by *Crotonothrips gallarum* and *C. coorgensis* (Plate VIII; fig. 2). In *Secamone emetica* (Plate XII; fig. 3), the gall though blistered, appears more like a rosette (*Crotonothrips mimicus*).
9. Horn galls, very characteristic of various species of *Schefflera*. These are tubular outgrowths — epiphyllous or hypophyllous — show varied distribution on the leaf surface, being sometimes very crowded as in *S. racemosa* (Plate XV; figs. 1 & 2) and producing various types due to irregular fusion of adjacent horn galls. The galls on this are 9–12 mm long, tubular, cylindrical with uniform diameter in the early stages to diverse, bizarre morphological forms with 6–14 galls per leaflet. Complex galls 16–20 mm long and varying in and presenting all sorts of fleshy contortions and branchings so that the surface of the galls appear very much uneven and rugose. Leaflets bearing simple galls are elliptic-ovate, but in complex galls they become wavy, shrunken and distorted.
10. The leaf-blade on either side of the midrib becoming raised and fused all round to form a tube, leaving the margins of the lamina free on either side as in *Linociera* sp. (*Mesicothrips plicans*).
11. (a) Stem galls — knob-like twig galls (3.5 cm × 2.5 cm) on *Casuarina stricta* (*Thaumatothrips froggatti*) from Australia. Twigs swollen at some places, forming large knob-like thickenings, inside which are cavities which communicate with the exterior by small openings.
- (b) Small subspherical stem galls on *Acacia aneura* by *Onychothrips tepperi* from Australia.
- (c) Stem gall of *Microgyne macrophylla* produced by *Eurhynchothrips flavicornis* from Sierra Leone.

About 50% of the leaf galls are leaf rolls of one kind or another and 25% are leaf folds. Leaf curl galls amount to about 12%. Leaf rolls, folds and curls are generally associated with more or less pronounced swelling of the lamina, so that the surface of the gall is most usually never smooth. Only about 8% of the thrips galls known at present are typical pouch galls, which include also the so-called horn galls. The frequency of these types of galls in plants of different families and the number of species of gall thrips are indicated in Figs. 1 & 2.

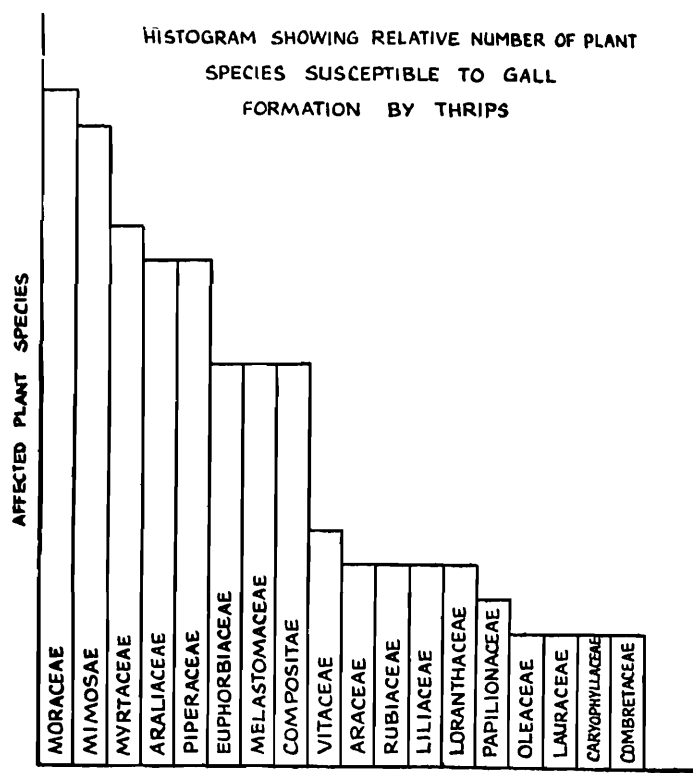


Fig. 1.

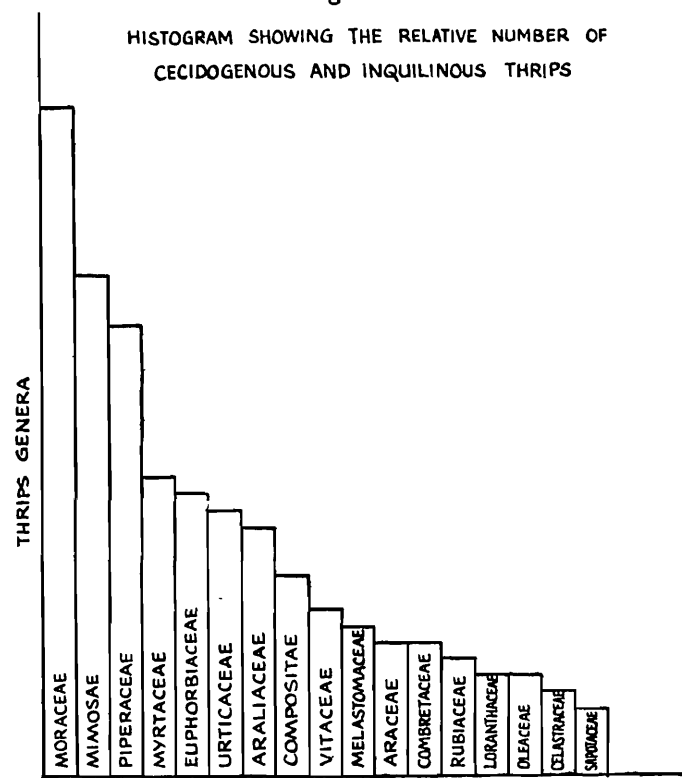


Fig. 2.

KEY TO THE PRINCIPAL TYPES OF THRIPS GALLS

1.	Leaf galls	...	...	...	...	...	2
—	Stem galls	...	...	...	...	...	34
2.	Leaf-bud galls	...	...	...	...	...	5
—	Galls on leaf proper	...	...	...	...	...	3

3.	Large, globose, greatly convolute, 30–40 mm thick. ...	...	<i>Calycopterus floribundus</i>	
—.	Gall not large, not globose or strongly convolute, but rosette-like or blistered. ...	...	...	4
4.	Axillary and terminal buds greatly enlarged, crumpled, rosettes of rolled in leaflets; 20–30 mm thick. ...	...	<i>Acacia leucophloea</i>	
—.	Rosette or blistered lobulate galls involving two opposite leaves in the bud. ...	...	<i>Secamone emetica</i>	
5.	Emergence galls with elongate hairy outgrowths ...	...	<i>Conocephalus suaveolens</i>	
—.	Non-emergence galls. ...	...	...	6
6.	Covering galls, hypophyllous, crateriform, arising as fleshy outgrowths ...	...	<i>Ilex mitis-erythraeus</i>	
—.	Non-covering galls. ...	...	...	7
7.	Simple or ceratoneon pouch galls, roll-gall or fold galls ...	...	...	8
—.	Tubular gall surrounding the midrib, margin of leaf free. ...	...	...	
8.	Sac-like, subglobose, irregularly thick-walled galls, 6–8 in number, crowded near petiole, or also extending to petiole. ...	...	<i>Terminalia chebula</i>	
—.	Galls only on the blade, simple pouches or out-pocketing, rarely occurring on phyllodes. ...	...	...	9
9.	Spherical pouch galls on phyllodes ...	...	<i>Acacia aneura</i>	
—.	Non-phyllode pouch galls ...	...	...	10
10.	Sac-like, often combined with epiphyllous or hypophyllous outpocketings, rolling and curling of blade; non-ceratonean galls. ...	...	<i>Aporosa microcalyx</i> <i>Schoutenia ovata</i> <i>Vitis pappillosa</i>	
—.	Ceratonean galls. ...	...	...	11
11.	Horn galls, epiphyllous or hypophyllous, simple, isolated, conical or finger-like outgrowths or irregularly fused into branched agglomerate masses. ...	...	<i>Schefflera</i> sp.	
—.	Non-horn galls, mostly leaf-folds or leaf-rolls, or leaf-fold in the early stages of infection, subsequently becoming rolled or rarely with structural complexities in later stages of rolling. ...	...	...	12
12.	Incomplete margin rolls or folds, epiphyllous or hypophyllous. ...	...	...	13
—.	Complete leaf folds, either margin folding or both halves of blade together forming a fold or distinct leaf rolls. ...	...	...	14
13.	Epiphyllous, incomplete margin roll gall, mostly straight or a little curved cylindrical tube, glabrous, 25–30 mm long, 3–4 mm thick. ...	...	<i>Maytenus senegalensis</i>	
—.	Epiphyllous, incomplete, margin roll galls, not cylindrically thickened, tending to roll inwards or rarely a simple marginal fold in the earlier stages. ...	...	<i>Cordia obliqua</i> <i>Cordia suaveolens</i>	
14.	Leaf folds ...	...	...	15
—.	Leaf rolls ...	...	...	19
15.	Complete folds confined only to the leaf margin. ...	...	...	16
—.	Typical leaf folds with the two halves meeting end to end ...	...	...	18
16.	Epiphyllous, straight, glabrous very much narrowed, but thickened marginal gall. ...	...	Gall by <i>Ayyarothrips abstrusus</i> on an unidentified plant.	
—.	Hypophyllous marginal fold galls. ...	...	...	17
17.	Almost straight marginal fold, swollen, rather fleshy, finely pubescent, rugose. ...	...	<i>Piper nigrum</i>	
—.	Highly convolute, wavy marginal fold gall, very much narrowed and finely tuberculate ...	...	<i>Anogeissus</i> sp.	
18.	Epiphyllous, crumpled, twisted thickened, irregularly, folded along the two halves, touching each other, margin wavy. ...	...	<i>Mimusops elengi</i>	
—.	Epiphyllous, glabrous, swollen, closely ridged, tuberculate, margins not wavy, halves meeting only along margin. ...	...	<i>Ficus benjamina</i>	
19.	Both halves of the leaf blade rolled or bent downwards, heavy infections resulting in a little loose rolling ...	...	<i>Ficus glomerata</i>	
—.	Typical leaf-rolls, epiphyllous or hypophyllous. ...	...	...	20
20.	Simple rolls involving whole leaf or the two halves rolled towards each other with a longitudinal slit in the middle. ...	...	...	21
—.	Other modifications including strong corrugations or depressions, protruberances or conspicuous tubercles on leaf rolls obliterating the real nature of rolls. ...	...	...	33

21. Simple continuous rolls from one margin of the blade to another.	...	...	22
— Hypophyllous or epiphyllous roll galls, both halves of the blade rolling towards the middle.	...	...	24
22. Simple, straight non-spiral rolls.	...	...	23
— Spirally twisted, verrucose, rugose, tuberculate, crinkled galls.	...	<i>Jasminum multiflorum</i>	
23. Loose leaf rolls, mature ones with yellow necrotic patches, non-pubescent.	...	<i>Pothos scandens</i>	
— Compactly rolled galls, finely pubescent and weakly tuberculate.	...	<i>Casearia tomentosa</i>	
24. Double-margin roll-galls of compound leaves.	...	...	25
— Double-margin roll-galls of simple leaves.	...	...	26
25. Hypophyllous rolls involving all the five leaflets slightly rugose, wrinkled, but not tuberculate.	...	<i>Tetrastigma lanceolarium</i>	
— Epiphyllous rolls showing very strong tissue hypertrophy, evident as pronounced swellings all over the gall.	...	<i>Walsura piscidia</i>	
26. Hypophyllous rolls	...	...	27
— Epiphyllous rolls	...	...	28
27. Margins wavy, irregularly tuberculate, with numerous localized thickenings, extreme cases with heavy swellings and turning coppery brown; appears as marginal roll or fold in the early stages.	...	<i>Pavetta hispidula</i>	
— Surface strongly rugose and tuberculate, not wavy, not fleshy with all veins more or less distinct.	...	<i>Piper sp.</i>	
28. Rolls often spirally twisted.	...	...	29
— Rolls not bent or twisted, often straight, soft or hard.	...	...	30
29. Infested parts of the blade rough, dotted with irregular pustules, without wrinkles, not tomentose.	...	<i>Smilax australis</i>	
— Strongly crinkled, wrinkled, tomentose, veins very conspicuous and weak mesophyll.	...	<i>Mallotus philippinensis</i>	
30. Smooth, hardened leaf-rolls, with a median longitudinal slit....	...	<i>Memecylon lushingtoni</i>	
— Soft, weakly rugose or with strongly developed necrotic patches.	...	...	31
31. Leaf with dark, tubercular necrotic patches.	...	<i>Memecylon edule</i>	
— Leaf roll without necrotic patches	...	...	32
32. Soft, weakly rugose rolls	...	<i>Ventilago maderasapatana</i>	
— Soft, smooth, glabrous rolls.	...	<i>Santalum album</i>	
33. Fleshy, wrinkled, tuberculate, often both pinkish spots all over, gall formed by paired leaves rolling over the other to form a single roll-gall.	...	<i>Loranthus sp.</i>	
— Secondary development of infoldings, septae and protruberances on primary leaf roll-galls of opposite leaves, blistered or rosette-like and with dark pinkish hue.	...	<i>Memecylon sp.</i>	
34. Knob-like locally, swollen twigs forming large, inside which are cavities communicating with the outside by small openings.	...	<i>Casuarina stricta</i>	
— Small, subspherical stem galls.	...	<i>Acacia aneura</i>	

MORPHOLOGY OF THRIPS GALLS

Thrips galls do not show striking abnormalities as in the galls of other insects. Generally the epidermal hypertrophy making up the bulk of the gall involves an excessive increase of parenchymatous elements. In some galls, inhibition of tissue differentiation results in the absence of the normal palisade as distinct from the spongy tissues and the gall is largely a mass of parenchyma without intercellular spaces. The pressure of neighbouring cells often interferes with the normal development that stomata undergo distortions, become enlarged and lose their ability to close and open. Excessive abnormality in the development of vascular elements also occurs in certain greatly swollen parenchymatous galls.

GENERAL STRUCTURE

The cells of the epidermis in many thrips galls generally retain their normal morphological characters, but in others show varying degrees of hypertrophy. The galls of *Maytenus*, *Mimusops*, *Cordia*, *Pavetta*, etc., show moderate hypertrophy of the epidermal cells due to repeated parallel divisions. Unaltered epidermal cells are reported by Karny and van Leeuwen (1913) in the hypoplastic galls of *Ficus benjamina*, *Ficus retusa* and *Fagraea litoralis*. In *Loranthus* they report that the cells of the upper side of the leaf become enlarged and thickened. Small papillose hairs grow out from the epidermal cells in *Maytenus*, though the hairs are mostly absent in thrips galls. On the contrary, the papillose crystalline hairs present in the normal leaf of *Cordia*, are absent in the galled leaves.

The typical structure of the guard cells is not seen in most thrips galls. Abnormal changes are common in the shape and size of the stomata. In the normal leaflets of *Schefflera*, for instance, numerous evenly distributed sunken stomata, with horizontal traversing bars along the guard cells form thickened rings around the sunken stomata. The upper side of the blade however, lacks stomata. The hypophyllous galls of *Schefflera* possess stomata on their outer surface and there also occurs a definite gradient, in their frequency, size and sunken nature from the base to apex. At the base of the galls, the stomata are greatly elongated, causing a disfiguration of stomatal pores, with the thickening bars highly dislocated and the surrounding cells pronounciably linear. In the middle of the galls, the elongation is less pronounced and the stomata are fewer. Both the length and the number of stomata are very much reduced at the apical regions and the sunken nature is not evident. In epiphyllous galls, the outer surface does not develop stomata, but on the inner surface they are sparsely distributed. Characteristically the stomata lack substomatal air chambers.

The cells of the palisade tissue of the gall are a little longer than in the normal leaf. The spongy cells do not seem to be structurally much altered. The chlorophyll is deplete in some of the primitive gall types, like those of *Ficus glomerata*, *Ardisia cymosa*, *Eugenia polyantha*, etc. In *Planchonia valida*, Karny and van Leeuwen (1913) report the stretching of mesophyll cells, enlarging the intercellular spaces. The fold gall of *Mimusops* shows absence of differentiation of palisade and spongy tissues. Parenchymatous cells are more or less closely packed, at the regions of the blades, while large branched air cavities are evident at the near vicinity of the midrib. Palisade cell show partitioning into 2-3 isodiametric cells and at certain places these are stretched parallel to the epidermis. Mesophyll cells in the case of *Cordia* galls are almost identical with the normal leaf structure, except for a little thickening of cell walls in the spongy tissue. Here again, as in *Mimusops*, large, much branched air cavities are seen. In the roll galls of *Cordia*, the structure of the mesophyll is rather so very different from that of the fold galls, that the cells of the palisade region are transversely divided into 2 or 3 isodiametric cells and the cells of the spongy mesophyll are considerably hypertrophied with increased wall thickenings. In extreme cases, the cells are very closely arranged, transformed into sclereids. In the fold galls of *Maytenus* the mesophyll is not differentiated into palisade and spongy tissues, but consists of closely arranged isodiametric cells. The palisade and lower part of the mesophyll show sclerosis. The bulk of the upper parenchyma above the stone cell zone is perhaps derived from subepidermal hypertrophy. In the very mature and advanced stages of galling, the entire mesophyll becomes more or less sclerenchymatous, with 3-5 layers of tannin cells bordering the gall cavity.

Mesophyll of galled leaves of *Casearia tomentosa* differs only in the size of the mesophyll cells. Palisade tissue of the galled leaves of *Loranthus* is not recognizable, but the upper 7-8 layers have dark brown inclusions, with the following two layers of isodiametric cells. Mesophyll cells are rich with starch and in between the

hypertrophied parenchyma are seen some scattered stone cells, which are also evident in normal leaves.

The double palisade and the loosely arranged spongy parenchyma cells do not occur in the galled leaves of *Pavetta*, excepting for 17–60 layers of closely arranged parenchyma cells. Here the cells are linearly elongated. The feeding sites are necrotised. In *Fagraea litoralis* gall, Karny and van Leeuwen (1913) described a slight increase to 20–23 layers of cells against the 16–17 layers in the mature leaf. Due to infection, the hypodermal cells are smaller and the mesophyll is made up of compact, isodiametric cells. The cells of the lower mesophyll are more spherical and exist with distinct intercellular spaces. Enormous increase in the mesophyll cells of 47–75 layers in the galls of *Calycopteris floribundus* leads to complete disorganisation of the leaf structure. This increase is not uniform, but restricted to specific areas. Similar to *Calycopteris* galls, the emergence galls of *Terminalia* and *Schefflera* show an increase in the number of layers of parenchyma, the number being however restricted and apparently specific, i.e., 25–40 layers in *Terminalia*, and 7–12 layers in the simple galls and 23–35 layers in the complex galls of *Schefflera*.

External to the layer of cells on which the thrips feed, a few layers of the mesophyll abound in tannin, as in the galls of *Mimusops*, *Cordia* and *Maytenus*. The occurrence of tanniniferous cells is a very striking feature known in many a thrips gall, though these cells are absent in some of the complex galls on *Schefflera*.

Vascular structure of thrips galls is not very much affected except for certain infections like those of *Maytenus* wherein cell proliferation results in an enormous increase of vascular tissues. In almost all the rest of the cases the vascular elements seem to show a more or less pronounced stretching. Karny and van Leeuwen (1913) found the vascular bundles in the gall of *Loranthus* considerably enlarged and complex. While the primary phloem elements are transformed into bast fibres, the phloem elements subsequently formed are very much thick walled. Complex galls like those of *Calycopteris* show long tracheary elements and pronounced hypertrophy of the vascular parenchyma. In the fistular galls of *Schefflera* of both simple and complex types, the tracheary elements are broader and exhibit closely packed elements showing annular to spiral thickenings through transitional stages. In most galls the tracheary elements become unusually elongated with distinctly spaced spiral thickenings.

GALL STRUCTURE IN RELATION TO GALL TYPES

It would be useful to discuss the effect of galling in the various leaf tissues in different types of thrips galls so as to obtain a comparative picture of the changes during gall formation. The nature of the galled tissues in the major gall types like leaf fold galls, partial and complete roll galls, pouch galls, emergence or ceratonean pouch galls are discussed below on the basis of studies on the galls of *Mimusops elengi*, *Cordia obliqua*, *Maytenus senegalensis*, *Casearia tomentosa*, *Secamone emetica*, *Pavetta hispidula*, *Calycopteris floribundus*, *Terminalia chebula*, *Loranthus* sp., and *Schefflera racemosa*.

(a) LEAF FOLD GALLS

In the morphologically simple types of galls like those of *Ficus glomerata*, *Ardisia cymosa* and *Eugenia polyantha* in which the two halves of the leaf blade are bent downwards without the margins touching each other, anatomical deviations are not very marked, except that the palisade cells are somewhat longer than the normal, and in the spongy parenchyma cells air spaces are not very evident and chlorophyll is absent. In *Planchonia valida*, there occurs a stretching of cells, with elongation of intercellular spaces.

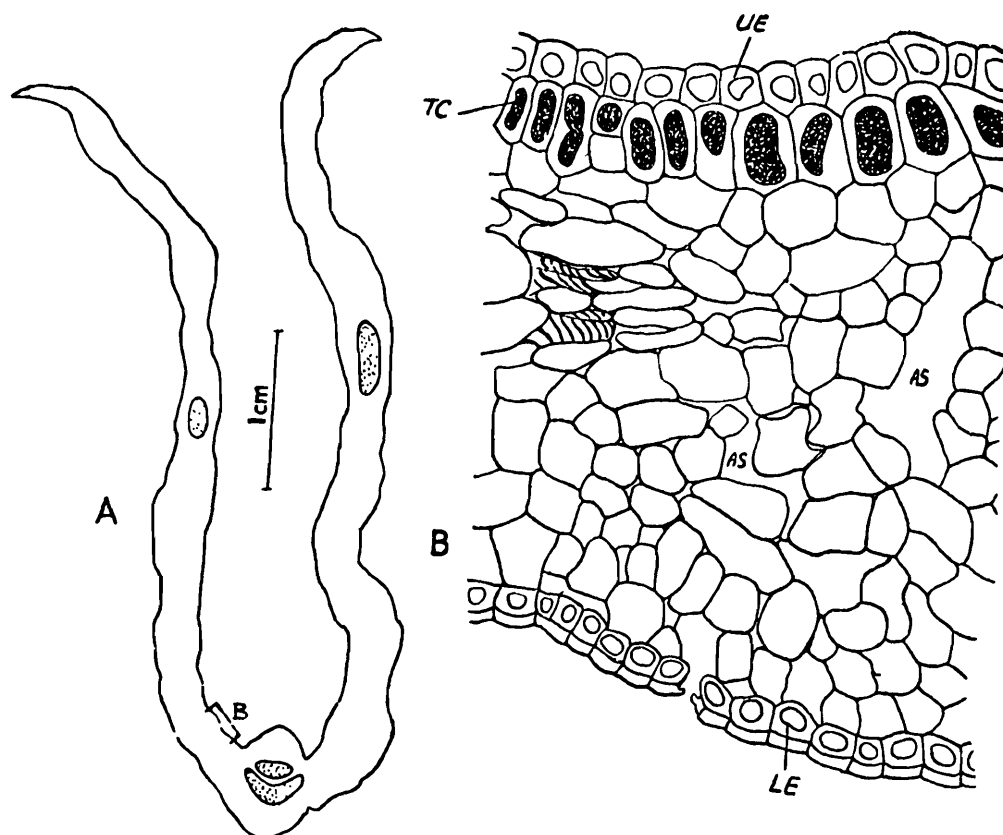


Fig. 3 (A) Transverse section of the gall on the leaves of *Mimosa elengi* induced by *Arrhenothrips ramakrishnae*.

(B) Marked portion in (A) enlarged. (UE) Upper Epidermis; (LE) Lower Epidermis; (AS) Air Spaces; (TC) Tannin containing Cell.

In simple leaf fold galls like *Mimosa elengi*, (Plate II; Figs. 2 & 3) the entire leaf is folded along the longitudinal axis, (Fig. 3) the two halves of the blade meeting. Early infections prior to the unfolding of young leaves result in concentrated feeding on either side of the midrib, producing a wavy or undulated effect on the leaf margins. Absence of differentiation of mesophyll is very evident in mature galls in which the infection occurs very early. Layers of parenchymatous cells more or less closely packed, without much intercellular spaces are very typical of the infested laminae. Large, branched air cavities are evident at the vicinity of the midrib. The cells seem to be very irregularly arranged and the palisade cells also show transverse divisions resulting in 2 to 3 isodiametric cells. On both sides of the midrib there, are certain longitudinally elongated parenchyma cells exhibiting anticlinal divisions, favouring the upward and lateral stretching of the blade. The sclerenchymatous cap associated with the midrib and major veins and the collenchyma around the vascular tissues are distinctly absent in the galls. Tannin containing cells are abundant along the upper few layers of the mesophyll, following the layer of feeding.

(b) PARTIAL OR COMPLETE LEAF ROLL GALLS

Depending upon the time of infection the galls of *Cordia* develop into folds or rolls. In very early infections, at the differentiation stage of the leaf, the galling is so intense that the leaf margin is rolled in, once or twice with high anatomical abnormality. If infection occurs on the differentiated leaf, it merely develops into folds with little structural changes. The leaf gall of *Cordia obliqua* does not extend over the entire margin, but usually develops one or two epiphyllous rolls (Fig. 4 A) or folds. Normal leaves of *Cordia* show the spongy parenchyma cells in about 5 to 6 cell rows, with a row of palisade cells along the adaxial side. Crystal bearing cells

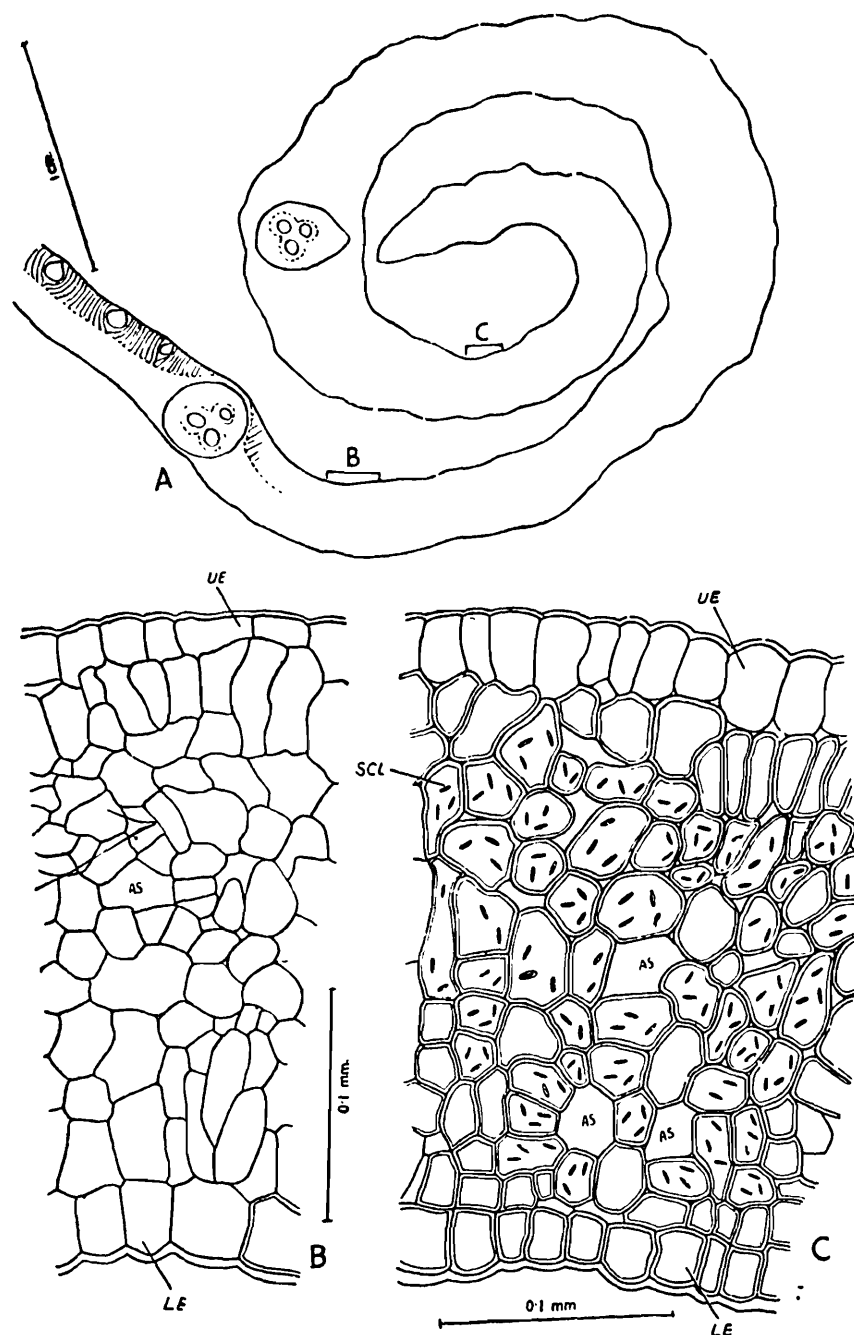


Fig. 4 (A) Transverse section of the gall on the leaves of *Cordia obliqua* induced by *Aneurothrips priesneri*. (B) & (C) Marked portions in (A) enlarged. (UE) Upper Epidermis; (LE) Lower Epidermis; (AS) Air Spaces; (SCL) Sclereids.

are evident in the hypodermis at regular intervals, as also short crystalline hairs which occur sparsely along the epidermis. A sclerenchymatous sheath encloses the minor veins, their fibres extending vertically between the upper and lower epidermis. The galled leaf of *Cordia* reveals neither differentiation of the palisade and spongy parenchyma, nor an increase in the number of cell layers. But an increase in the dimensions of the little differentiated mesophyll is very characteristic, indicating it as a hypoplasia gall, also showing very little hypertrophy occasionally. The vascular tissues remain unaffected and crystal cells and crystal hairs are absent. In the mature roll galls where the infection probably occurred very early, the mesophyll cells become completely sclerified and various types of sclereids could be observed, with various degrees of pitting and wall thickening (Fig. 4 B & C). In the fold galls where infection occurred late there is a partitioning of the palisade cells into 4-6

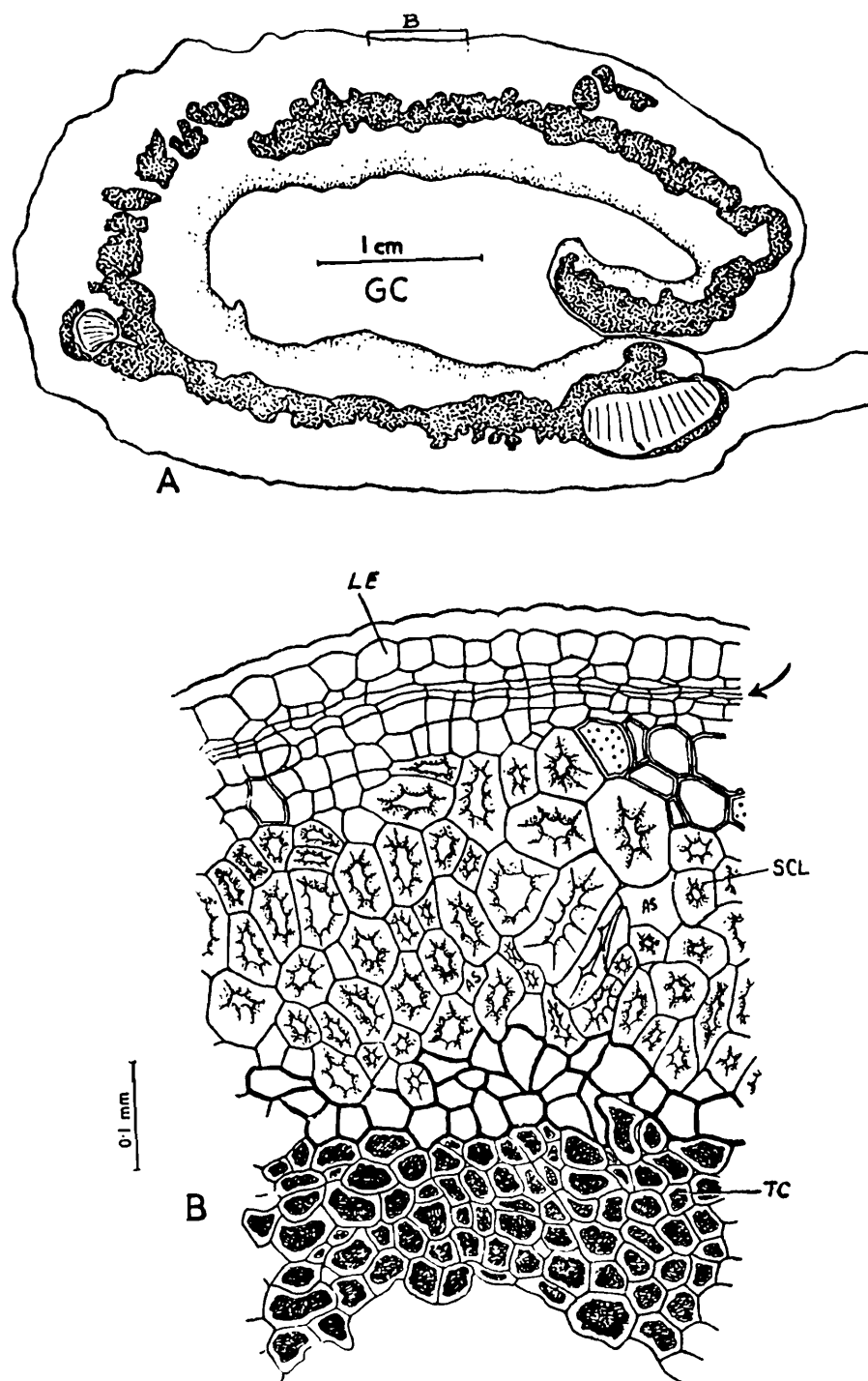


Fig. 5 (A) Transverse section of the gall on the leaves of *Maytenus senegalensis* induced by *Alocotrips hadrocerus*. (GC) Gall chamber.

(B) Marked portion in (A) enlarged. (LE) Lower Epidermis; (TC) Tanniferous Cells; (SCL) Sclereids; (AS) Air Spaces (arrow shows the division pattern).

smaller cells arranged in a linear row. In both types of galls in *Cordia*, the lower mesophyll cells are compact, lack tannin which are restricted only to the epidermis. As a result of sclerosis in the roll galls, the affected mesophyll cells generally lack intercellular spaces.

The galling in the coriaceous leaves of *Maytenus* results in partial folding of a part or whole of the blade or as in very advanced cases the two halves of the lamina become upturned into siphonous or tubular structure. The normal leaves of *Maytenus* possess a fairly thick cuticle, a palisade of two-layered short cells and a spongy tissue zone with large intercellular spaces. The vascular strands are more or less parallel (in transverse section) and each bundle is enveloped by a two-layered

fibrous sheath. Gallling results in an epiphyllous marginal fold on the longitudinal axis parallel with the midrib, more or less overriding it (Fig. 5A). The galled region of the leaf is enormously thickened due to the epidermal or subepidermal hypertrophy, very clearly evident, due to the parallel divisions in the region (Fig. 5B). The mesophyll of the gall zone is not recognizable into the palisade and spongy tissue systems, associated with the loss of air spaces, so that the mesophyll is compact. A very characteristic feature is the presence of a 2-3 layered strongly thickened stone cells extending in the form of a longitudinal strip. Due to the effect of feeding by thrips, the palisade and the lower part of mesophyll show sclerosis, while the bulk of the upper parenchyma above the stone cells zone is perhaps contributed by the subhypodermal hypertrophy. In the very mature and advanced stages of the gall, the entire mesophyll becomes more or less sclerotised retaining however the 3-5 layered tannin cells bordering the gall cavity. The stone cells have heavily thickened walls with numerous pits. In some cases where the vascular bundles are involved there is great increase of xylem elements due to proliferation of the precursor elements without affecting very much the phloem strands. However, the vessels do not otherwise show any great abnormality.

In the curling, folding or rolling of both halves of the laminae upwards, Karny and van Leeuwen (1913) discuss several types: (a) The typically hypoplastic galls in which the anatomical change is minimum or even absent as in *Ficus benjamina* and *Ficus retusa*, with the epidermis and subepidermis remaining unaltered. The spongy parenchyma cells are smaller and more closely packed so that air spaces are hardly seen (b) The gall tissues are very different from the normal as in the case of *Melastoma malabathricum*, *Eugenia polyantha* or to a limited extent as in the infolding of the leaves of *Piper retrofractum* where the palisade cells are unrecognizable, high enlargement of upper and subepidermal cells, air spaces enlarged three times along with a dimensional increase in the guard cells as well.

The tomentose soft leaves of *Casearia tomentosa* usually do not show great malformation or abnormal development as compared with those of *Maytenus* and *Cordia*. Normal rigid leaves have large patches of collenchyma and highly reduced mesophyll cells. Galled leaves show reduction in the size of the mesophyll cells and rarely lack divisions in adjacent areas.

Perhaps a more complicated effect is observable in the rolling of the two halves of the blade in *Loranthus* sp. The epiphyllous rolling is accompanied by a thickening of the blade and in most cases the two halves become affected. The galls have a strongly curved, wrinkled and corrugated appearance, the walls of the gall becoming hard. In the normal leaf the upper and lower epidermal cells are almost of similar size, followed by a layer of chlorophyll bearing cells and little differentiated palisade cells longer than wide, with cell corners rounded leaving intercellular spaces. The spongy parenchyma consists of 6-7 layers of cells with smaller intercellular spaces. The stomata possess well developed air spaces. In the gall (Fig. 6), the inner epidermis lining the gall cavity, i.e., the morphologically upper epidermis is well thickened and enlarged. The palisade tissue is not recognizable and what can be observed is only 7-8 layers of cells below the epidermis with brown inclusions. An additional double layer of isodiametric cells is also found. The lower epidermis of the leaf or the outer surface of the gall has also little differentiation. All the mesophyll cells are very rich in starch and between the large parenchyma cells, groups of very thick walled isodiametric stone cells are seen—a character that is also found in the normal leaf. The vascular bundles in the gall are considerably enlarged and complex, with the xylem comprising 5-12 rows. The phloem elements are thicker and form the bast fibres while the subsequent cells are not thick walled. At the time of infection, the young leaf is approximately 3-3.5 mm long and 2 mm wide, and 18 layers of cells are evident (Karny and Docters van Leeuwen, 1913).

The hypophyllous galls of *Pavetta* possess 17–60 layered parenchymatous mesophyll as a result of epidermal hypertrophy, losing the double palisade and the loosely arranged spongy mesophyll. The proliferation of parenchyma cells especially at the point of feeding of thrips results in characteristic elongation correlated with the downward rolling of the leaf margin. The points of feeding show necrotic changes and the vascular elements are elongated.

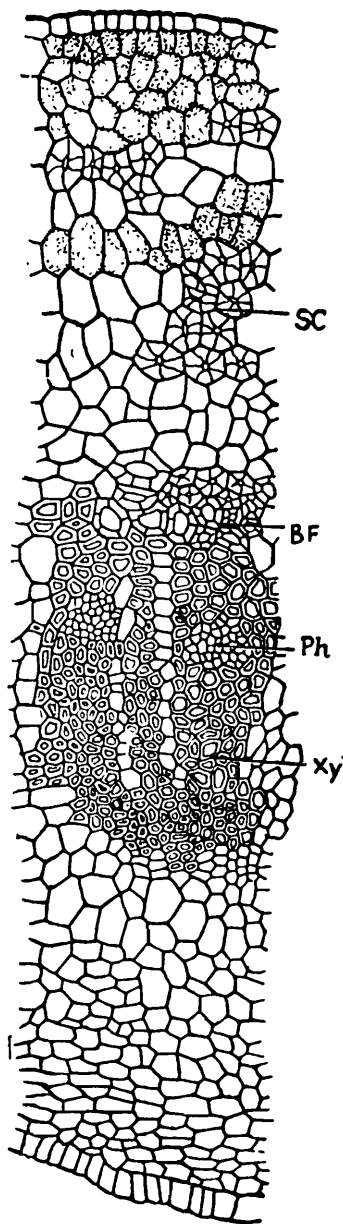


Fig. 6. Transverse section of the gall on the leaves of *Loranthus* (SC) Stone Cells; (BF) Bast Fibres; (Ph) Phloem; (Xy) Xylem.

Discussing briefly the nature of the tissues in some types of leaf rolls, Karny and van Leeuwen (1913) lay special emphasis on the rolls of *Fagraea litoralis*, *Loranthus pentandrus*, *Concocephalus suaveolens*, *Cyrtandra repens*, *Medinella horsfieldi* and *Memecylon intermedium* where leaf rolling is accompanied by the thickening of the leaf blade in a manner similar to that discussed earlier in *Loranthus*. In particular, in *Fagraea litoralis* the galled leaf has 20–23 layers of cells as against 16–17 layers in the normal matured leaf. The epidermis of both sides is little disturbed, though the cuticularization is rather weak. The hypodermal cells are smaller and the rest of the mesophyll tissue is completely made up of closely packed isodiametric parenchyma cells which are larger than in the normal leaf. In the vascular bundles, the sieve and tracheary elements are hypertrophied. The cells of the lower side are more

spherical with distinct intercellular spaces. The cells adjacent to the lower epidermis are smaller and possess chlorophyll. This is also a hyperplasy gall as in the case of *Loranthus*.

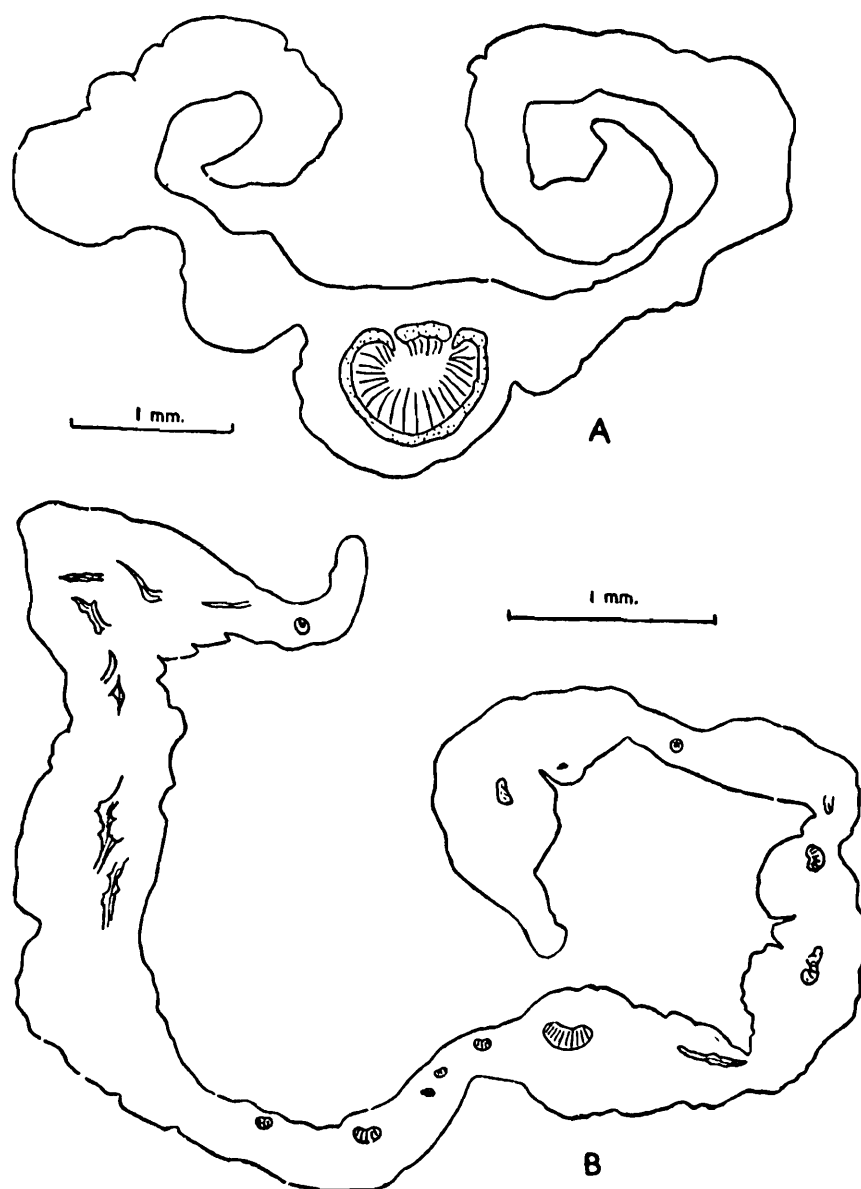


Fig. 7 (A) Transverse section of the leaf gall of *Walsura piscidia* induced by *Psenothrips priesneri*.

(B) Transverse section of the leaf gall of *Memecylon edule* induced by *Crotonothrips dantahasta*.

(c) POUCH GALLS

Passing on to the more complex galls we find a totally different picture from that presented earlier and this would be evident from galls of *Calycopteris floribundus*, *Terminalia chebula* and *Schefflera racemosa*. Galling in *Calycopteris* results in the enormous increase in the mesophyll cells resulting in the complete disorganization of the normal leaf structure. The mesophyll is increased to 47–75 layers of thin walled cells. Not all the areas in the gall present a similar increase. The parenchyma cells seem to differentiate into tracheary elements, the latter being mostly of the nature of long elements and the vascular parenchyma cells also appear highly affected by the enlargement. Tanniniferous cells are absent.

In the case of *Terminalia chebula*, it was earlier mentioned that the pouch galls are clustered close to the petiole on the underside of the blade. The galls invariably

fuse to form a composite mass. The pouches are made up of 25–40 layers of thin walled parenchyma cells. The inner surface is uneven, with a necrotic zone. Mechanical tissues are completely absent and vascularization of the gall is very weak.

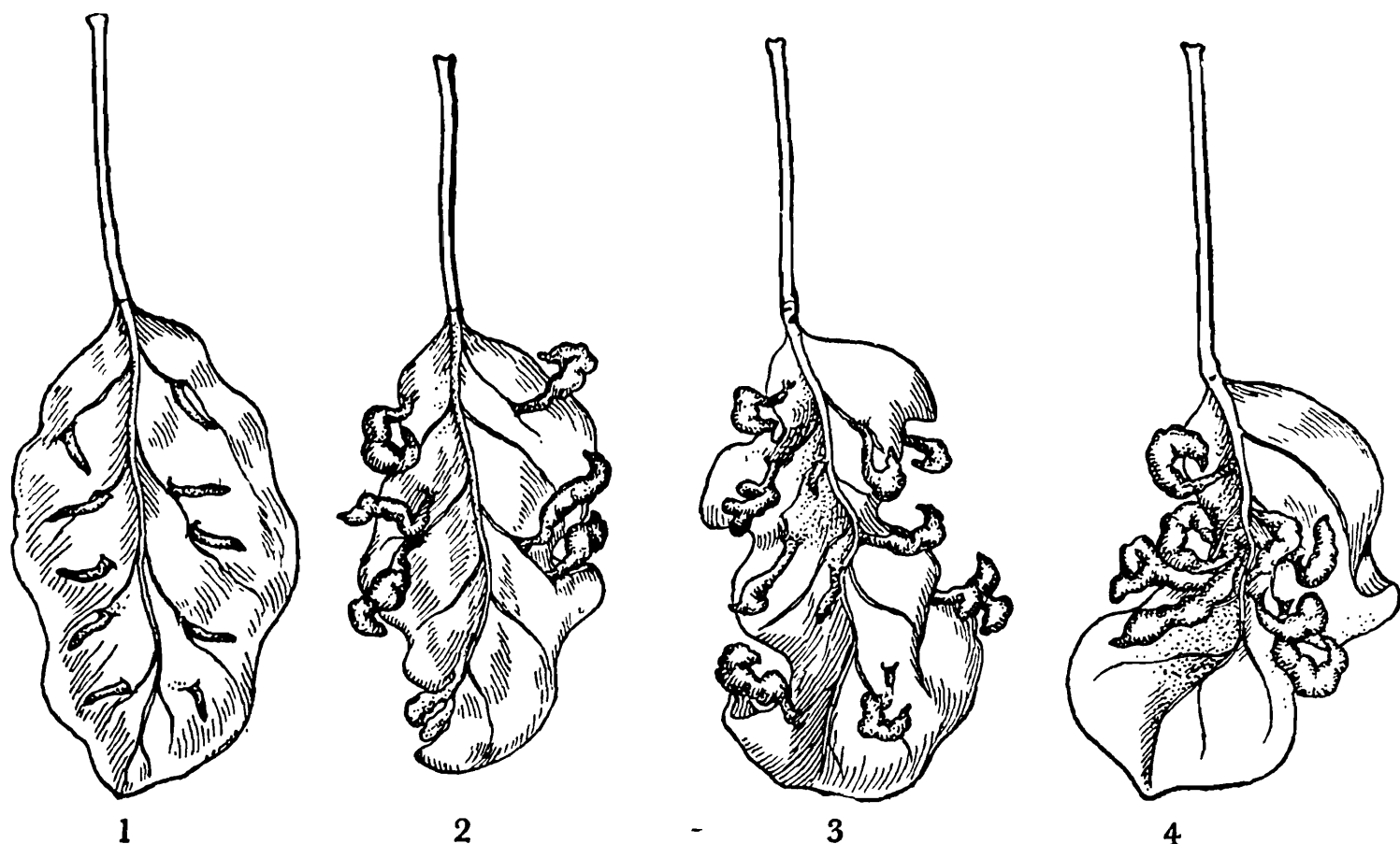


Fig. 8. Galls on the leaflets of *Schefflera racemosa* induced by *Liothrips ramakrishnae* and *L. associatus*.

A singular instance of complex galls is met with in *Schefflera racemosa* in which simple tube galls in the early stages is succeeded later by highly convolute fleshy galls (Fig. 8). A feature of interest is that the hypophyllous galls possess stomata on their outer surface and exhibit a definite gradient from base to apex in their frequency, size and sunken nature (Fig. 9). At the base of the galls the stomata are greatly elongated causing a distortment of the stomatal pores, with the thickening bars highly dislocated and the surrounding cells becoming more linear. A lesser degree of elongation of stomata is characteristic of the middle zone of the gall, with lesser stomatal frequency. Both the pore length and the number of stomata are much reduced at the apical regions, where the sunken nature is not also evident. In epiphyllous galls the outer surface of the galls does not show stomata, while on the inner surface we find scattered few. The simple tube galls (Fig. 10 A) show 7–12 layers of compactly arranged, elongated parenchyma cells with dense chloroplasts and vascular strands. The more complex, lobulated, fleshy and irregular galls (Fig. 10 B) have 25–35 layers of compact, isodiametric parenchyma cells with fewer chloroplasts and other inclusions. The vessels are broader and exhibit closely packed elements with annular and transitional types to spiral thickenings.

Discussing the impact of gall formation by thrips, on the various tissues with those of galls formed by other insects and mites, it has to be said that most thrips galls are morphologically simple. As discussed by Meyer (1969) they are *proso-plasmatic* and *extratissulaire* in which the insect is placed externally, i.e., not enclosed within the plant tissue. It is to be noted that most common thrips galls are roll or fold galls. In the roll galls the margin of the affected leaves are slightly rolled either abaxially or adaxially and in a few cases, the rolling may be intense, the

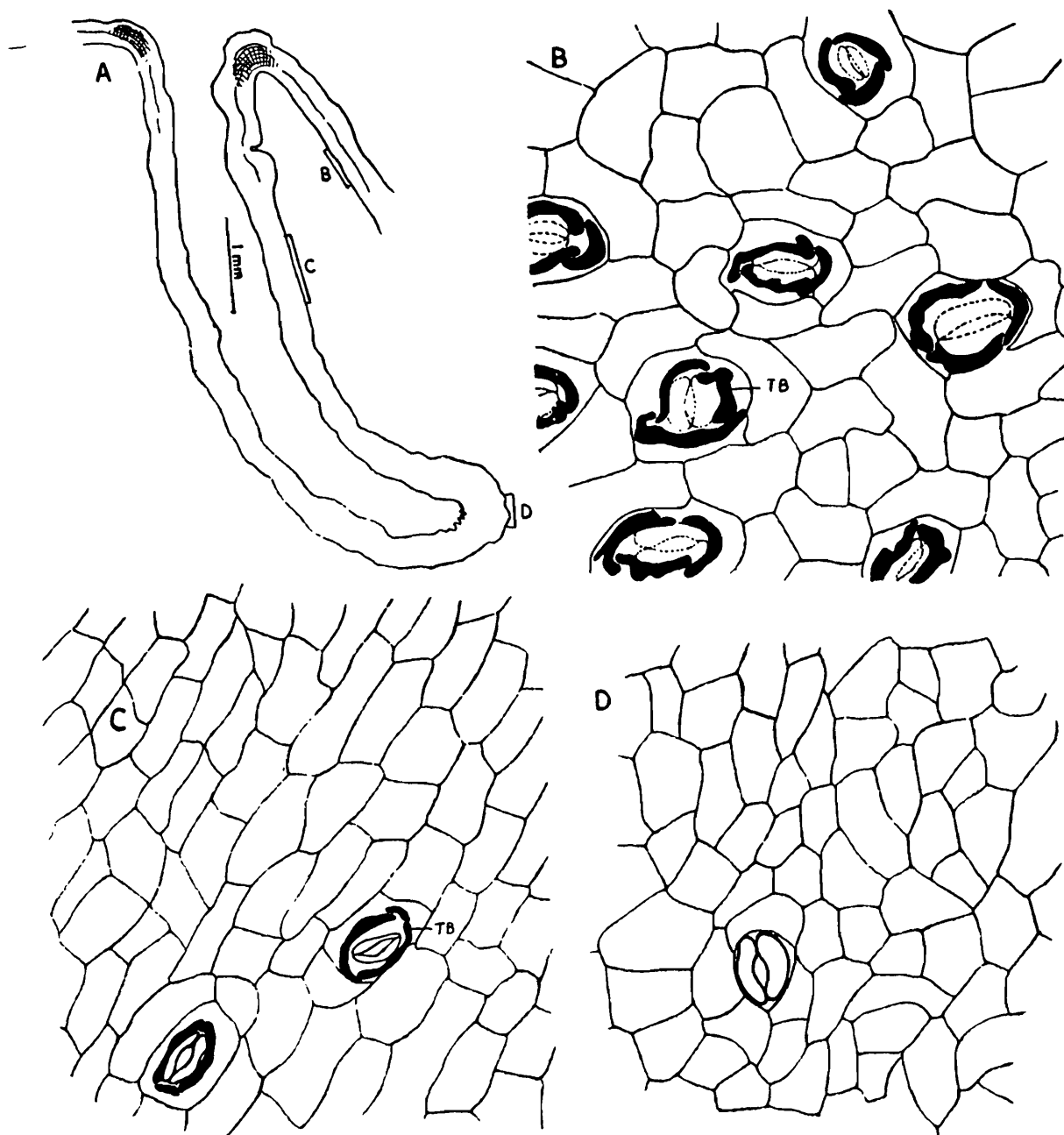


Fig. 9 (A) Longitudinal section of a hypophyllous pouch gall on the leaflets of *Schefflera*.
 (B, C & D) Morphological gradient of the stomata along the marked regions in (A).
 (TB) Traversing bars.

halves of the leaf blade becoming rolled one over the other, resulting in the rolling of the entire laminar half of the leaf, as in the case of *Maytenus*. Similarly, in leaf fold galls, the folding may be partial or complete — depending upon the intensity in terms of the population of thrips and time of infection. While the slight rolling or the partial folding may be the result of late infection, the more complete rolling or strong folding, involving far reaching structural anomalies, appear to result from an early infection by thrips. This condition is well illustrated by the fold and roll galls of *Cordia* (Krishnamurthy, *et al*, 1977.)

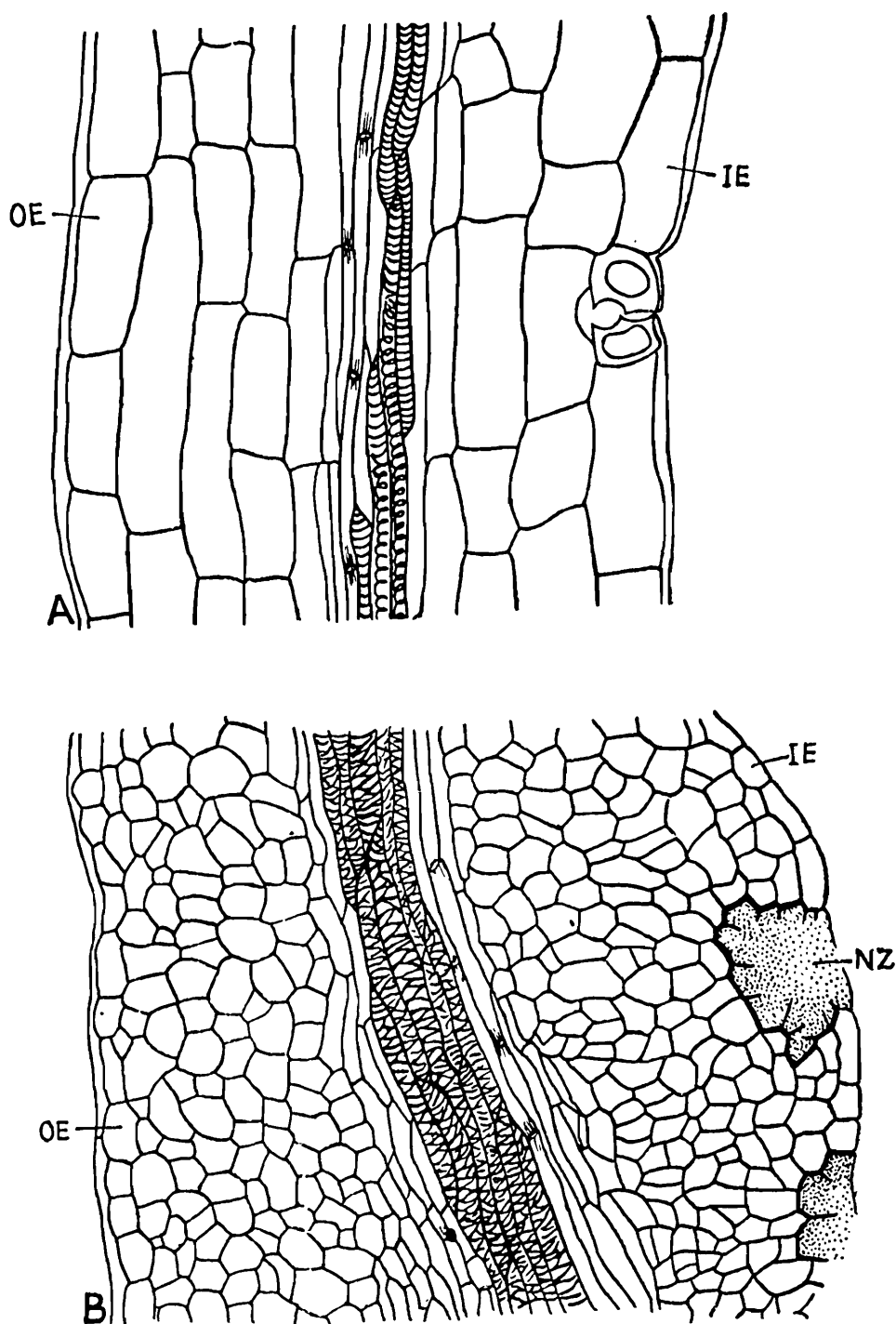


Fig. 10. Longitudinal sectional views of simple (A) and complex (B) galls of *Schefflera* induced by *Liothrips*. (IE) Inner Epidermis; (OE) Outer Epidermis; (NZ) Necrotic Zone.

It is not uncommon to find complex thrips galls like the ceratonean galls of *Schefflera* sp., by various species of *Liothrips*, the rosette galls of *Acacia leucophloea* by *Thilakothrips* and the suprapetiolar cephalonean pouch galls of *Terminalia chebula* by *Dixothrips onerosus*. These galls appear to be induced rather very early in the ontogeny of the organ concerned, with a concurrent complexity in the internal structure. In *Schefflera racemosa* where both simple and complex galls are known, the simple galls result by the infection of thrips on mature leaflets and the complex by the infection of young leaflets, a result of continued feeding activity (Krishnamurthy, *et al*, 1975). In spite of the external and internal complexities, the thrips galls share a very remarkable common feature, viz., the gall cavity communicates to the exterior either by a distinct ostiole as in *Schefflera*, *Terminalia* gall types or by a slit-like aperture as in the fold gall or roll galls of *Pavetta*, *Cordia* and fold galls such

as *Maytenus*. On the basis of the mode of development Karny and van Leeuwen (1913) divided the thrips galls into three major categories or groups (1) *hypoplasia*, resulting in the absence of or less differentiation than optimal—differentiation, resulting from the inhibition or suppression of normal differentiation, (2) *hyperplasia* or excessive growth, often resulting from hypertrophy, (3) hyper- or hypoplasied galls with varying intermediate conditions. In most of the galls, though the epidermal cells have undergone only a slight change, there is a considerable activity of regeneration shown by the subepidermal layer and partly by the epidermis as in the galls of *Piper*, *Loranthus*, *Maytenus* and *Mallotus*. Karny and van Leeuwen (1913) specifically indicate that in the galls of *Conocephalus* there is a non-differentiation of epidermis from the underlying tissues. Barring the exception of *Schefflera*, discussed earlier, and in *Maytenus* there is no significant distortion of the stomata among the thrips galls. Coming to the palisade cells in the more simple leaf galls, hypoplasia is evident in a few, though the tendency for hyperplasia is reflected in the galls of *Loranthus*, *Smilax*, *Fagraea* and *Vitis*. The spongy parenchyma cells become more or less rounded with intercellular spaces. In general, there is a tendency for the rupture of the vascular elements. The parenchyma cells of the xylem and phloem also tend to become hypertrophied, often with the development of a sclerenchymatous sheath around the vascular bundles. Generalization is however difficult in histological aspects and only differentiation in specific cases can be indicated as has been done earlier in this work. Karny and van Leeuwen (1913) has proposed a histological classification of thrips galls as follows:

- | | |
|---|------------------------|
| 1. Complete hypoplasia | <i>Ficus glomerata</i> |
| 2. Epidermis partly hypertrophied; Mesophyll partly hypoplasied | <i>Piper</i> sp. |
| 3. Epidermis partly hypertrophied; Mesophyll hyperplased | <i>Loranthus</i> sp. |
| 4. Epidermis hypertrophied or hyperplased and mesophyll hyperplased | <i>Aporosa</i> sp. |
| 5. Upper epidermis hypoplasied, lower epidermis hypertrophied, mesophyll partly hyperplased | <i>Mallotus</i> sp. |
| 6. Entirely hyperplased | <i>Schefflera</i> sp. |

The salivary secretions penetrating the plant tissues bear a positive relation to gall formation (Carter, 1963, Mani, 1964). The intensity of infection as evident by the population of thrips and the consequent stimulatory effects of the secretions are presumed to have also a direct bearing on the degree of structural complexity of the galls.

In the majority of thrips galls, feeding is often locally restricted to the surface layer of a particular portion of the infected organ, where the epidermal cells are densely filled with cytoplasmic contents and are prominently nucleated. These cells and some of the cells of the mesophyll within, constitute the feeding zone. This condition is somewhat comparable to the eriophyid galls in which also the feeding seems to be restricted to the surface. But unlike in mite galls, the epidermal proliferation does not produce a callous growth of erineal hairs among the thrips galls. As mentioned earlier in *Schefflera* and *Maytenus* the epidermal cells may not be morphologically distinct from the underlying cells. The feeding reaction of thrips on the surface layers brings about a distinct response in the epidermal and hypodermal layers and the phenomenon of epidermal hypertrophy and proliferation is a characteristic feature of thrips galls and rarely met with in eriophyid and dipteran galls. Some eriophyid galls (Arnold, 1968, 1970) and a few dipteran galls (Houard,

1924, Mani, 1964, Rohfritsch and Meyer, 1969), also exhibit this feature which is well pronounced in thrips galls indicate to be exceptional, 'as the epidermal cells are normally unsuited for cell division'. In an excellent review on gall mites and meristems, Arnold (1969) cites a similar interesting instance, reporting that "many mite galls arise as a result of cell divisions induced by the epidermis. This hyperplasy may be accompanied by some enlargement of the epidermal cells, but frequently hypertrophy may appear in cells at some distance from the epidermis. Generally mites do not actively penetrate the tissues underlying the epidermis, but exceptions to these have been reported (Kendall, 1930)". It is interesting to note this kind of tissue response in the thrips galls too. Sometimes the epidermal cells may develop chloroplasts which may be absent in the normal leaves; their cytology more or less resembles the 'nutritive zone' of the eriophyid galls of *Ulmus campestris* leaves (Westphal, 1972) and the dipteran galls of *Filipendula ulmariae* (Rohfritsch and Meyer, 1969). As regards the structure and frequency of the stomata, only in occasional instances like *Schefflera*, the stomatal frequency becomes much reduced in the affected regions. In a number of dipteran galls such as those of *Gnetum* (Swamy and Krishnamurthy, 1975), stomata develop on the infected leaves, which normally lack stomata. Such an instance is seen in the thrips galls of *Maytenus* where those on the upper surface differ in size from those on the lower surface. All the same, the tendency towards aggregation of stomata, with varying intensities per unit area, presence or absence of accessory cells are features not so far known in thrips galls, which are quite often evident in the leaf galls caused by midges (Meyer 1959, Krishnamurthy and Raman, 1972) by eriophyids and by fungi (Meyer, 1955).

The normal differentiation of mesophyll in the galled regions is very much wanting in most thrips galls, which exhibit an isodiametric, densely cytoplasmic more or less closely oriented parenchyma cells arranged in a few to many layers. These cells possess plastids, aiding photosynthesis without any obvious disturbance. Perhaps, due to early infection, the meristematic, undifferentiated parenchymatous bulk of the primordial plant organ does not further differentiate into palisade and spongy tissue systems, but only gives rise to parenchymatous cells in large numbers (Karny and van Leeuwen, 1913). This feature is displayed only in the affected parts, so that the unaffected parts in the same leaf show normal tissue morphology indicating the localised effect of thrips feeding. A feature of importance relates to the anticlinal divisions of the mesophyll (galled) parenchyma as in *Mimusops* and *Pavetta*, enabling longitudinal stretching of the gall in surface growth as in *Populus* galls by *Pemiphigus filaginis* (Küster, 1915). Due to differential feeding of the gall thrips in *Schefflera*, longitudinally extended tissue flaps are developed in the complex galls as a result of the meristematic activity of the gall parenchyma (Krishnamurthy, *et al*, 1975). Together with the hypertrophy of the epidermis, that of the differentiated parenchyma also contributes to cecidogenesis.

A common feature of dipteran and cynipid galls is the profuse development of mechanical tissues like sclerenchyma especially around the larval chambers. As for the mechanical tissues in the thrips galls, Karny and van Leeuwen (1913) record bast fibres and stone cells in the galls of *Loranthus*. At least three thrips galls are known to develop sclerenchyma and as in others, here also they develop from ordinary parenchyma cells of the organ in conformity with their original size and shape. For instance in the galls of *Cordia* the sclereids have the same appearance as the palisade and spongy cells of normal leaves, excepting for the secondary walls and simple pits. In *Maytenus* and *Secamone* they are very distinct, with the possession of very thick secondary walls with strong striations. The sclerenchyma in dipteran galls is often referred by some as 'protective zone'. In thrips galls of the open type, the development of sclerenchyma is merely a zone of resistance. In species like *Memecylon* the presence of mechanical tissue like collenchyma in the galled leaf blade has been observed. This appears to be of interest as this feature

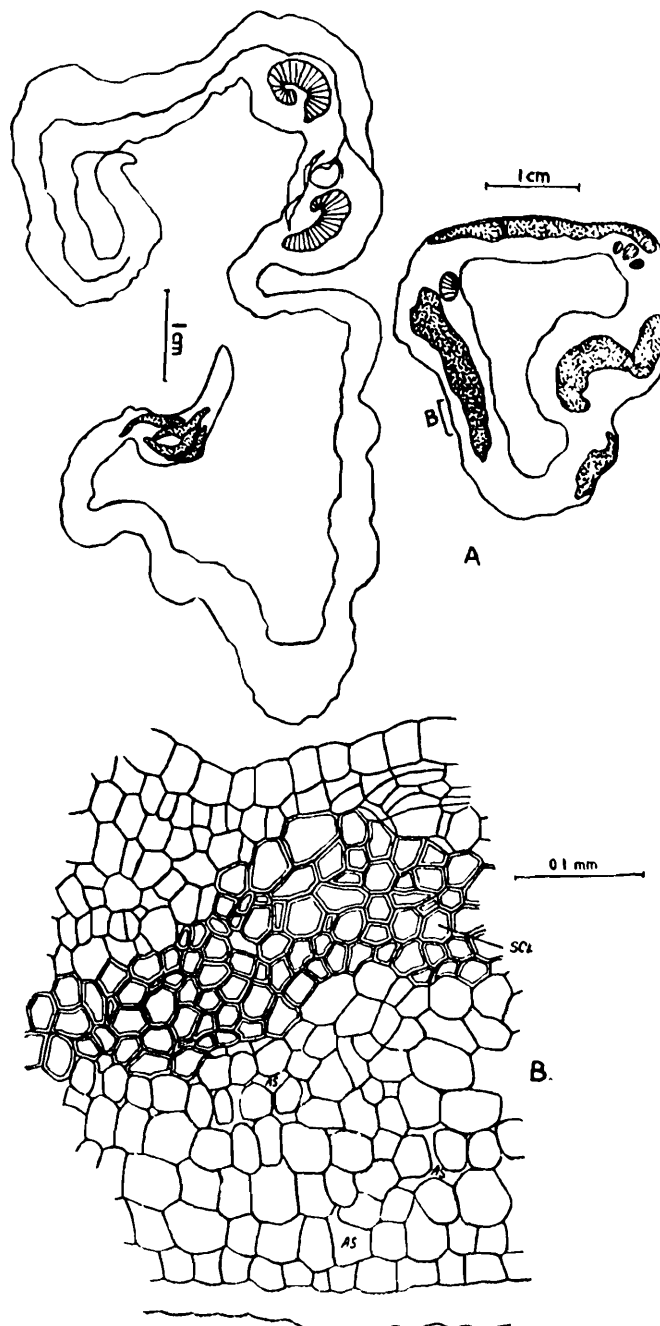


Fig. 11 (A) Transverse sections of the galls of *Secamone emetica* induced by *Crotonothrips mimicus*.
(B) A portion enlarged (SCL) Sclerenchyma.

is not shared by normal or galled leaves of any other group of insects. In transverse sections, the galled leaves show thick walled lamellar type of collenchyma in the mesophyll region. Similar instances are reported only in the nematode galls on aerial parts as in *Leontopodium alpinum*, but here again the development of collenchyma seems to be restricted only to the dermal surfaces (Mani, 1964).

The vascular elements are little disturbed in thrips galls and as indicated in *Schefflera*, the tracheary elements become considerably longer, showing annular to scalariform thickenings through the transitional patterns, in the complex galls. The phloem also shows considerable elongation and thinning when compared to the normal ones. In stray cases as in *Maytenus* and *Secamone*, the infection seems to be directly on the differentiating procambium, which shows proper vascular differentiation, but the entire vascular bundle becomes enlarged to an enormous extent at the gall sites with some structural deviation in the phloem tissue rather than in the xylem.

In the possession of increased tannin content in the surface cells and a few layers adjacent to it, thrips galls largely resemble the galls induced by other insects, bacteria and viruses (Mani, 1973). It has been suggested that the production of tannin and other phenolic compounds is a measure of resistance on the part of the plant tissues towards the salivary secretion injected by or diffused from the causal organisms, which produce polyphenol oxidase (Miles, 1968). In some cases, as a result of parallel periclinal divisions, a callus type of growth results, while in cases as in *Schefflera*, the wounding in the gall tissue shows only necrotic spots exhibiting the weak impact of the gall maker.

It is difficult to establish a distinct 'nutritive zone' in the open galls caused by thrips, though it is common to recognize the feeding area of the cecidozoa as the 'nutritive zone' which is characterized by physiological activities and cytological specialisation like meristematic zones, showing abundant cytoplasm with nuclear and nucleolar hypertrophy, richness of RNA, decreasing chondriosomes and abundant paraplast (Meyer, 1969). In thrips galls, first the wounding seems to be considerably less in the epidermal surface, though the penetration of the stylets may be deep; secondly the involvement of more than one individual of gall maker in gall formation and development and the localised activities of the insects restrict the recognition of a nutritive zone. The view of Arnold (1968) in the context of the mite galls would appear acceptable, and according to him "the nutritive layer is, however, less than adequate in such cases as the present one (mite gall on the leaves of *Urtica ferox*) where the growth of the gall is dependent on the activity of a meristematic layer surrounding the cecidogenetic organisms, however much the mites may benefit from this layer in the way of nutrition." This is definitely a positive feature in thrips galls though the epidermis and hypodermis show functional specialization.

GALL THRIPS GENERA OF THE WORLD

Over three hundred species of primary and secondary gall inhabiting Thysanoptera are known at present to occur in different plant galls from the various parts of the world. Two thirds of the number of species have been from the Orient and a third from India. As already indicated these species fall under about ninety genera, but mostly within the *Gynaikothrips*, *Liothrips*, *Liophlaeothrips*, *Mesothrips* which contain almost 50% of the total species associated with galls and the other genera contain comparatively few species each. Except for ten genera of Terebrantia, all other genera belong to the Tubulifera. In India the typical gall forming Terebrantia are confined only to the two genera *Amphithrips* and *Aneurothrips*. Recent experience in collecting thrips and their galls in India would seem to show that future explorations will bring to light many more gall species. Their distribution and ecology is perhaps in need of further elaboration, not to mention the several thrips complexes which also need careful taxonomic investigations.

An exhaustive key is provided for the world genera of gall thrips, preceded by a classified list of genera.

The following is a synopsis of gall-forming and gall-inhabiting genera of Thrips, which are discussed in this work.

LIST OF GENERA OF GALL THRIPS

SUBORDER TEREBRANTIA

Family THIRIPIDAE

Subfamily THIRIPINAE

Amphithrips Ananthakrishnan (Plate XXI; Fig. 2), *Aneurothrips* Karny (Plate XXI; Fig. 7), *Anaphothrips* Uzel, *Chaetanaphothrips* Priesner, *Danothrips* Bhatti, *Pteridothrips* Priesner, *Smeringothrips* Priesner, *Rhamphothrips* Karny, *Taeniothrips* Amyot & Serville, *Tmetothrips* Serville.

SUBORDER *TUBULIFERA*Family *PHLAEOTHIRIPIDAE*Subfamily *PHLAEOTHIRIPINAE*Tribe *PHLAEOTHIRIPINI* Priesner

Thilakothrips Ramakrishna (Plate XXII; Figs 1 & 2), *Leeuwenia* Karny.

Tribe *HAPLOTHIRIPINA*

Androthrips Karny, *Aeglothrips* Ananthakrishnan, *Dolichothrips* Karny, *Haplothrips* Amyot & Serville, *Karnyothrips* Hood, *Neoheegeria* Hood.

Tribe *HOPLOTHIRIPINI* PriesnerSubtribe *KLADOTHIRIPINA* Priesner

Alocothrips Priesner (Plate XXIV; Fig. 3), *Byctothrips* Ananthakrishnan, *Chelaeothrips* Karny, *Csirothrips* Mound (Plate XXV; Fig. 2), *Dactylothrips* Bagnall, *Dimorphothrips* Bagnall, *Empresmothrips* Karny, *Grypothrips* Karny, *Katothrips* Karny, *Kellyia* Bagnall, *Kladothrips* Froggatt (Plate XXVI; Fig. 1), *Koptothrips* Bagnall (Plate XXV; Figs. 3 & 4; Plate XXVI; Fig. 2), *Oncothrips* Karny (Plate XXV; Fig. 1), *Onychothrips* Karny, *Thaumatothrips* Karny, *Warithrips* Mound.

Subtribe *DACTYLOTHIRIPINA* Priesner

Dactylothrips Bagnall.

Subtribe *HOPLOTHIRIPINA* Priesner

Acaciothrips Priesner, *Aclystothrips* Ananthakrishnan, *Adelphothrips* Priesner, *Aliothrips* Priesner, *Arrhenothrips* Hood (Plate XXIV; Fig. 1), *Ayyarothrips* Ananthakrishnan (Plate XXIII; Fig. 1), *Austrothrips* Brethes, *Carius* Faure, *Corycidothrips* Ananthakrishnan (Plate XXIII; Fig. 4), *Chaetokarnyia* Priesner, *Crotonothrips* Ananthakrishnan, *Coryphothrips* Karny, *Dixothrips* Ananthakrishnan (Plate XXIII; Fig. 3), *Eothrips* Hood, *Eugynothrips* Priesner, *Eurhynchothrips* Bagnall, *Gynaikothrips* Karny, *Hoplothrips* Serville, *Kochummania* Ananthakrishnan (Plate XXII; Figs 3 & 4), *Liophlaeothrips* Priesner, *Liothrips* Uzel, *Lygothrips* Ananthakrishnan, *Mallothrips* Ramakrishna (Plate XXIV; Fig. 2), *Megeugynothrips* Priesner, *Mesicothrips* Priesner, *Mixothrips* Stannard, *Neocecidothrips* Bagnall, *Phasmothrips* Priesner, *Phrasterothrips* Priesner, *Phorinothrips* Ananthakrishnan, *Pnigmothrips* Priesner, *Prosanthrips* Priesner, *Psenothrips* Ananthakrishnan, *Rhynchothrips* Hood, *Sphingothrips* Ananthakrishnan, *Synergothrips* Ananthakrishnan, *Schedothrips* Ananthakrishnan, *Senegathrips* Bournier, *Syringothrips* Priesner, *Tetradothrips* Priesner (Plate XXIV; Fig. 4), *Teuchothrips* Hood, *Thlibothrips* Priesner, *Tolmetothrips* Priesner, *Vuilletia* Karny, *Xiphidothrips* Priesner, *Zelotothrips* Priesner.

Subtribe *CERCOTHRIPINA* Priesner

Cercothrips Hood.

Subtribe *MESOTHRIPINA* Priesner

Choleothrips Moulton, *Euoplothrips* Hood, *Mesothrips* Zimmermann, *Mesandrothrips* Priesner, *Moultonides* Kevan, *Sacothrips* Moulton (Plate XXVI; Fig. 3), *Sumatrothrips* Priesner.

KEY TO GENERA OF GALL THRIPS

- | | | | | |
|--|-----|-----|-----|------------------------------------|
| 1. Females with ovipositor, the terminal abdominal segment longitudinally split beneath, seldom tubular in females, usually bluntly rounded in males. Fore wings usually with fine microtrichia and a system of veins and cross veins with at least one longitudinal vein reaching apex, rarely absent. Larva II with antennal segments 3-6 with rings of microsetulae. Head with 5 pairs of dorsal setae (Suborder: Terebrantia). | ... | ... | ... | 2 |
| — Females without ovipositor. Terminal abdominal segments almost invariably tubular. Wings without pubescence and system of veins, atmost with a single reduced median vein. Larva II with antennal segments 3-6, subconical, smooth. Head with only 4 pairs of dorsal bristles. X abdominal segment with a pair of usually long anal setae (Suborder: Tubulifera). | ... | ... | ... | 9 |
| 2. Fore wings uniformly covered with microtrichia, without conspicuous veins, setae inconspicuous. Head transverse, somewhat reticulate. Antennae mostly 8-segmented, segments very short and thick, spinulae on both meso- and metasterna absent. Setae on abdominal apex, weak. Larva II with antennal segments almost transparent, except 1 and 2; segment 3 as long as wide. B1-B4 of IX segment of abdomen short, subequal. | ... | ... | ... | |
| | | | | Aneurothrips Karny |
| — Fore wings with fine pubescence and veins with setae; lower vein often with a regular series of setae. Setae on abdominal apex generally well developed. | ... | ... | ... | 3 |
| 3. Abdomen broad with dark, stout apical setae. | ... | ... | ... | 4 |
| — Apex of abdomen without stout setae | ... | ... | ... | 5 |
| 4. Head a little constricted behind eyes, cheeks arched. Antennal segment 4-6 pedicellate at base. Prothoracic hind angles with one long and one short seta. Abdominal segment IX with B1 shorter than B2. | ... | ... | ... | |
| | | | | Tmetothrips Serville |
| — Head not constricted behind eyes and antennal segments 4-6 not pedicellate. Setae on prothoracic hind angles almost subequal, long. Abdominal apex in females with dark, very strong and stout pointed setae, weaker in males. | ... | ... | ... | |
| | | | | Amphithrips Ananthakrishnan |
| 5. Antenna 9-segmented, style 3 segmented. Mouthcone very long and narrowly pointed, well surpassing the base of meso-sternum. Head small, posterior angles of prothorax with short and weak setae. | ... | ... | ... | |
| | | | | Rhamphothrips Karny |
| — Antennae 7 or 8-segmented, rarely segment 6 with an incomplete suture. Mouth cone short, rounded, never long and pointed. Males mostly with a pair of stout spines on dorsum of abdominal segment IX. | ... | ... | ... | 6 |
| 6. Head wider than long, with broad, conical mouth cone. Antennae 8-segmented. Prothorax with 7 pairs of setae along entire posterior margin, with outer postangulars longer. Setae on abdominal segments IX and X long. | ... | ... | ... | |
| | | | | Danothrips Bhatti |
| — Posteromarginal setae when present, always less than 7 pairs. | ... | ... | ... | 7 |
| 7. Antennae 8-segmented, sometimes segment 6 with an incomplete suture. Head not or moderately transverse. Pronotum without major setae, atmost with one moderately long postangular seta. Setae on wing veins weak and those on abdominal segments IX and X short* | ... | ... | ... | |
| | | | | Anaphothrips Uzel |
| — Prothorax with distinct major setae. Lower vein with numerous setae, often more than ten. | ... | ... | ... | 8 |
| 8. Segment 6 of antenna with an elongate sensory area. Inner prothoracic post-angular setae longer than outer. | ... | ... | ... | |
| | | | | Smeringothrips Priesner |
| — Segment 6 of antennae without elongate sensory area. | ... | ... | ... | 9 |

* Very recently Pitkin (1977) in his revision of the genus *Chaetanaphothrips* includes *C. deformans* which occurs in galls. This genus has trapezoidal pronotum and bulging eyes.

- | | | | | | | |
|-----|--|-----|-----|-----|--------------------------------------|----|
| 9. | Prothorax with a long clubbed bristle on each side. Sense cones long and thin. Setae on abdominal segments IX and X very long. | ... | ... | ... | Pteridothrips Priesner | |
| —. | Prothorax without long clubbed setae. Sense cones moderately long. | ... | ... | ... | Taeniothrips Amyot & Serville | |
| 10. | General body surface irregularly tuberculate and strongly sculptured, with dorsum of head, thorax and legs clothed with clubbed setae. Major body setae long, infundibuliform and fimbriate. | ... | ... | ... | Thilakothrips Ramakrishna | |
| —. | Integument not tuberculate, though often with transverse or polygonal reticulation. | ... | ... | ... | | 11 |
| 11. | Prothorax heavy, fore femora enlarged, fore tibiae very short, mostly armed with a tubercle or tooth at least in the major forms. Fore wings mostly uniformly wide. | ... | ... | ... | | 12 |
| —. | Prothorax usually not heavy, as long as or shorter than head, rarely if heavy, fore tibiae not short; fore femora thin or expanded in one or both sexes; fore tarsus armed or unarmed in one or both sexes. Fore wings parallel sided or narrowed or constricted at middle. | ... | ... | ... | | 26 |
| 12. | Fore femora with a series of teeth or tubercles along inner margin in females. | ... | ... | ... | | 13 |
| —. | Fore femora unarmed. | ... | ... | ... | | 14 |
| 13. | Cheeks with a small tooth behind eyes and with 2-5 pairs of cheek setae. Head elongate with one pair of postoculars. Fore wings without double fringes. One pronotal seta on each side moderately long. | ... | ... | ... | Warithrips Mound | |
| —. | Head short, cheeks without tooth behind eyes and strong cheek setae. Two pairs of postoculars distinct. Pronotal setae very long. Fore-femora very stout, much stouter than head. | ... | ... | ... | Thaumatothrips Karny | |
| 14. | Maxillary stylets retracted oculad, closely placed, meeting or almost meeting each other. | ... | ... | ... | | 15 |
| —. | Maxillary stylets not closely placed, with or without a maxillary bridge. | ... | ... | ... | | 18 |
| 15. | Tube longer than head, narrowing to apex. B1-B3 of tergite IX subequal in both sexes. Fore tibiae with a small or large apical tubercle, reduced in males; fore tarsal tooth stout in females. | ... | ... | ... | Onychothrips Karny | |
| —. | Tube shorter than head or about as long. B2 of tergite IX of males shorter than B1 and B3. | ... | ... | ... | | 16 |
| 16. | Cheeks with a small tooth behind eyes and eight or nine pairs of stout cheek setae arising from small tubercles. Antero-marginal and midlateral prothoracic setae absent. Fore femora much enlarged in females. Fore wings without double fringes. Tube about as long as head. | ... | ... | ... | Csirothrips Mound | |
| —. | Cheeks smooth, without tooth behind eyes. | ... | ... | ... | | 17 |
| 17. | Postoculars absent. All pronotal setae vestigial except epimerals. Maxillary stylets placed about the middle of head, not meeting, though closely placed. Wing retaining setae often on large, finger-like tubercles. | ... | ... | ... | Dactylothrips Bagnall | |
| —. | Postoculars placed well behind eyes. Only anteroangulars and epimerals developed on pronotum. Maxillary stylets placed far oculad and meeting at middle. Wing retaining setae not placed on tubercles. Antennal segment 6 broadly truncate at apex, closely joined to 7. | ... | ... | ... | Empresmothrips Karny | |

18.	Mouth cone pointed. Antennal segments short and compact. Tube peculiarly shaped, longitudinally ribbed. ...	Alocothrips Priesner	
—.	Mouth cone always rounded, only labrum pointed. ...	...	19
19.	Maxillary bridge present. ...	...	20
—.	Maxillary bridge absent. ...	...	21
20.	Epimeral sutures frequently incomplete. Mesopraesternum very much reduced, fused with the anterior border of mesosternum. Postocular setae not placed far below eyes. Fore wings with double fringes. ...	Koptothrips Bagnall	
—.	Epimeral suture complete. Mesopraesternum reduced to two triangular plates. Postangulars placed far below eyes. Forewings with double fringes. B1, B2 of IX short, expanded. Sides of tube convex. ...	Katothrips Karny	
21.	Eyes flat, forwardly directed, cheeks convex, head produced in front with median ocellus at apex of production. Antennal segments short and thick. Fore tarsal tooth placed at the end of tarsus. ...	Chelaeothrips Karny	
—.	Fore tarsal tooth normal; eyes not flat. ...	...	22
22.	Head not elongate. Prothorax swollen or strongly enlarged, much longer than head. Fore femora strongly enlarged, with fore tibiae short and thick, with a distinct tooth in both sexes. Both alary polymorphism and sex-limited diversity distinct. ...	Byctothrips Ananthakrishnan	
—.	Prothorax not strongly enlarged ...	...	23
23.	Head much elongate, twice or more than twice as long as wide, narrowed behind eyes. Maxillary stylets not placed low in head. ...	...	24
—.	Head not twice as long as wide, shorter. Maxillary stylets placed low in head. Postocular and pronotal setae short, expanded. ...	Oncothrips Karny	
24.	Sternal areas of pronotum with large, chitinous islets. Postoculars absent or vestigial. Pronotal shield narrow, much longer than wide. Fore tibia very short and stout with an apical tubercle; fore tarsal tooth large, its length including the tarsus greater than the fore tibia. ...	Kladothrips Froggat	
—.	Pronotal sternal area without large, chitinous plates or islets. ...	...	25
25.	Head twice as long as wide; median ocellus on a strong conical projection. Antennal segment 1, large, sense cones long. Maxillary stylets very slender and placed very low in head. Fore femora expanded and fore tibiae expanded at apex. ...	Dimorphothrips Bagnall	
—.	Median ocellus not placed on conical projection. Antennal segment, 1 normal. Head more than twice as long, cheeks very much narrowed. Fore femora expanded in both sexes, fore tibiae also expanded at apex, with an apical tubercle. Fore wings with 20–30 double fringes. ...	Grypothrips Karny	
26.	Forewings uniformly wide, phlaeothripine, never constricted at middle. ...	...	27
—.	Fore wings narrowed at middle or constricted at middle, parallel-sided or more expanded beyond. ...	...	74
27.	Tube very much longer than head, being 1·3 to 3–4 times as long. ...	...	28
—.	Tube shorter, about as long as head to 1·2 times as long, more frequently shorter than head. ...	...	31
28.	Tube more than twice the head length. ...	...	29
—.	Tube less than twice as long as head, 1·3–1·6 times as long. ...	...	30

29. Head with a clear notch behind eyes. Body strongly reticulate. Tube 3-4 times as long as head, pilose. ... **Leeuwenia** Karny
- Head without notch behind eyes. Tube more than twice head length. Wings punctured or dotted. Lateral setae on abdomen peculiarly shaped, stout between base and middle and abruptly narrowed thereafter, elongate, lanceolate and hair-like. ... **Syringothrips** Priesner
30. Body strongly reticulate. Head and thorax with very long, stout, infundibuliform setae, arising from well developed raised prominences or tuberosities. Tube weakly pilose. Wings narrow. ... **Kochummania** Ananthakrishnan
- Body not strongly reticulate and without infundibuliform setae. Abdominal segments laterally flattened, their hind angles with a sharp spine. Wings broad. Tube not or sparsely pilose. ... **Cercothrips** Hood
31. Maxillary bridge very distinct. Head 1.3 times as long as wide and tube 1.2 times as long as head. Postocular and prothoracic setae short, epimerals well developed. ... **Carius** Faure
- Maxillary bridge absent. ... 32
32. Head longer than wide, cheeks spinose. Antennal segments elongate, narrow. Mouth cone pointed. Anterior pronotal angles with a group of spines. Double fringes on fore wing, 60. **Phasmothrips** Karny
- Prothorax without a group of spines at anterior angles. Double fringes far less in number, atmost 20. ... 33
33. Fore femora very much enlarged in females, often wider than head and fore tibiae often with a tooth or tubercle at apex. ... 34
- Fore femora not or moderately enlarged in both sexes, atmost enlarged in extreme males; sometimes not enlarged in both sexes, when fore tarsi are unarmed. ... 35
34. Mouth cone pointed. Maxillary stylets placed below postoculars, broadly separate. Fore tarsal tooth strongly developed, as also the fore tibial tubercle or tooth. ... **Arrhenothrips** Hood
- Mouth cone broadly rounded. Maxillary stylets oculad, meeting at middle. Fore tibial tooth or tubercle weak, but distinct. ... **Mallothrips** Ramakrishna
35. Females with moderately enlarged fore femora: fore tarsi unarmed; extreme males with excessively enlarged fore femora, sometimes with a tooth at apex, fore tibiae also sometimes armed, fore tarsi with a strong tooth, very much reduced in gynaeoid males. Mouth cone pointed to broadly rounded. ... **Hoplothrips** Serville
- Fore femora enlarged in both sexes. ... 36
36. Prothorax heavy. Cheeks crenulate and spinose. Fore tibia with a tubercle in the extreme males and fore tarsal tooth well developed in both sexes. Tube a little longer than head. ... **Psenothrips** Ananthakrishnan
- Fore femora not or moderately enlarged in both sexes, mostly enlarged only in the extreme males and if enlarged in both sexes, prothorax not heavy. Fore tarsi armed or unarmed in both sexes rarely females unarmed, males armed. ... 37
37. Intermediate antennal segments short and thick. Fore tarsi armed in both sexes. ... 38
- Intermediate antennal segments not short and thick. Fore tarsi mostly armed in one or both sexes, rarely unarmed. ... 40
38. Epimeral region of prothorax fused with epimeral plate. Maxillary stylets almost confined to mouth cone. Abdominal sternite VIII with 6 pairs of strong setae and VII with three pairs. Head 1.8 times as long as wide and cheeks a little incut behind eyes. ... **Ayyarothrips** Ananthakrishnan
- Epimeral region not fused with pronotal plate. Maxillary stylets not confined to mouth cone. Abdominal segments VII and VIII without strong spines. ... 39

39. Antennal segment 7 longer than 3, 4, 5. Mouth cone short, postoculars well behind eyes, very short. Pelta ovoid. Double fringes 8-10 and basal wing setae 3 in number. Tube shorter than head. **Lygothrips** Ananthakrishnan
- Antennal segment 7 not longer than 3, 4, 5. Postocular and prothoracic setae stout. Double fringes 17-20 and only 2 basal wing setae. Tube longer than head. **Dixothrips** Ananthakrishnan
40. Median ocellus placed on a long, conical process surpassing interantennal projection. Fore tarsi unarmed. **Coryphothrips** Karny
- Median ocellus not placed on a long, conical process; if placed it does not surpass interantennal projection. 41
41. Antennal segment 8 long and slender, often constricted at base. 42
- Antennal segment 8 not long and thin, not constricted at base; intermediate antennal segments thin and elongate or moderately short and thick. 45
42. Head not constricted at base. Postocular and prothoracic setae moderately long, not setiform. Fore tarsi unarmed in both sexes. Posterior ommatidia of eyes enlarged. **Thlibothrips** Priesner
- Head narrowed or concave at base, often with strong cheek setae. Fore tarsi mostly unarmed in females, males armed, rarely unarmed in both sexes. 43
43. Fore tarsi unarmed in both sexes. Postoculars vestigial. Head short, strongly narrowed and constricted at base. Fore tarsi with a distinct hamus. Epimerals very pronounced. **Pnigmothrips** Priesner
- Fore tarsi unarmed in females, males with a distinct tooth. 44
44. Antennal segment 8 very long and slender, constricted at base. Cheeks with conspicuous spines placed on warts. Postoculars very long and situated far back. All setae long and setiform. Tube as long as head. Fore tarsi of males with a strong curved tooth, of females unarmed. **Zelotothrips** Priesner
- Antennae long and slender, with long, setiform sense cones. Head little elongate, slightly concave at base, with posterior part of hind ocelli bearing a conspicuous pair of setae. All prothoracic setae very long, fore tarsi of males armed. **Chaetokarnya** Priesner
45. Head narrowest across eyes, which are forwardly directed. 46
- Head not narrowed across eyes, usually widest across eyes. 47
46. Head not constricted at base. Mouthcone heavy, elongate and narrowly rounded, maxillary stylets occluded, meeting at middle. Prothorax heavy, longer than head, with only the posterior setae developed, rest vestigial. **Corycidothrips** Ananthakrishnan
- Head narrowed across eyes as well as constricted at base. Postoculars very long and all prothoracic setae very well developed. Prothorax not heavy, as also mouthcone. **Tolmetothrips** Priesner
47. Head elongate, not constricted at base and with a very short production. Cheeks with a small notch behind eyes and densely set setae. Postoculars absent. Fore tarsus with a large dagger-like tooth in females. All prothoracic setae short, except epimerals long and spiniform. **Xiphidothrips** Priesner
- Head not produced. Fore tarsal tooth when present never dagger-like, but moderately developed or fore tarsi unarmed. 48
48. Cheeks constricted at base, often with a strong cheek setae 49
- Cheeks not constricted at base, rarely a little narrowed at base, or cheeks concave. 51

49. Head 1.6-1.7 times as long as wide. Mouthcone long and narrowly rounded. Maxillary stylets ocular. Postocular and prothoracic setae well developed. Fore tarsi of females unarmed, of males with a tooth ... **Synergothrips** Ananthakrishnan
- . Head shorter; mouthcone rounded, but more broadly rounded. ... 50
50. Fore femora in females moderately enlarged, strongly so in oedymorous males; fore tibia in extreme males with a distinct tooth at apex; fore tarsus of females with a hardly recognizable tooth, well developed in the males. Numerous double fringes on fore wing (34-38). ... **Sphingothrips** Ananthakrishnan
- . Fore femora not strongly enlarged in males, fore tibia without tooth or tubercle in both sexes and fore tarsal tooth well developed in both sexes. ... **Mesicothrips** Priesner
51. Head a little but distinctly concave along cheeks. Postoculars far back. Females with a very small fore tarsal tooth; males with a stronger one. ... **Megeugynothrips** Priesner
- . Cheeks not concave at middle ... 52
52. Postocular and all prothoracic setae and some abdominal setae very long and expanded. ... 53
- . Postocular and prothoracic setae not very long.... 55
53. Fore tarsal tooth hook-like, forwardly directed. Antennal segment 8 longer than 7. Abdomen reticulate.... **Senegathrips** Bournier
- . Fore tarsal tooth never hook-like. Antennal 8 always shorter than 7. ... 54
54. Body stout and heavy; head distinctly longer and pronotum heavy, much longer than head; fore tibia curved downwards, fore femora strongly enlarged in females and fore tarsi armed in both sexes as also mid and hind tarsi. ... **Vuilletia** Hood
- . Body not stout and heavy; pronotum not heavy, not longer than head. Fore tarsi unarmed, mid and hind tarsi also unarmed. Two pairs of epimeral setae. ... **Austrothrips** Brethes
55. B2 of abdominal segment IX short or long in both sexes. ... 56
- . B2 of IX always shorter than B1 and B3 in males, subequal in the females. ... 58
56. Epimerals about twice as long as postangulars. Head about as long as wide, not notched. B2 of IX of females short, nearly 1/2 as long as B1 and B3 (very rarely longer, when epimerals will always be longer than postangulars). Epimeral suture complete. Fore tarsi armed in both sexes (except in *C. dhirgavadana*, unarmed). ... **Crotonothrips** Ananthakrishnan
- . B2 of IX subequal in both sexes. ... 57
57. Cheeks incut behind eyes. Epimeral suture incomplete. No inner tarsal tooth in both sexes, but only a claw. Head more elongate. Postangulars not very much shorter. ... **Mixothrips** Stannard
- . Cheeks not incut behind eyes. Epimeral suture complete. Fore femora strongly enlarged in females and moderately so in males, fore tarsi with a well developed tooth in both sexes.... **Schedothrips** Ananthakrishnan
58. Head with a distinct notch behind the eyes. Prothoracic setae very long and pointed. Head as wide as long. Fore tarsi unarmed in females, males with a small tooth. Antennal 8 normal. Double fringes on wing absent. ... **Tetradothrips** Priesner
- . Head without notch behind eyes. ... 59

59. Antennal segments short and stout, 7 and 8 united; 4-7 pedicellate. Postocular and prothoracic setae short, tips dilate. Fore tarsi with a short tooth in both sexes. ... **Neocecidothrips** Bagnall
- Antennal segments not short and stout, 7 and 8 distinct. ... 60
60. B1 and B2 of abdominal IX in females always expanded apically. Fore femora enlarged in both sexes. ... **Liophlaeothrips** Priesner
- B1 and B2 of IX almost always pointed, rarely blunt, never expanded apically. ... 61
61. Antennal segment 3 with only one sense cone, 5-7 with long and well developed sense cones; mouthcone narrowly rounded. Fore femora enlarged in both sexes, more strongly enlarged in males and fore tarsal tooth blunt and directed forwards in both sexes. ... **Phorinothrips** Ananthakrishnan
- Fore tarsal tooth normal, not obliquely directed, or fore tarsi unarmed in both sexes. ... 62
62. Prothorax heavy, much longer than head. Fore tarsi unarmed in both sexes. ... **Rhynchothrips** Hood
- Prothorax not heavy, mostly shorter than head or at most as long. Fore tarsi armed or unarmed in one or both sexes. ... 63
63. Fore tarsi unarmed in both sexes, fore femora enlarged in both sexes, more strongly in males. Antennal segment 3 with a slight basal ring-like thickening. Mouthcone broadly rounded. Prothoracic setae long and pointed. Tube conical, strongly sclerotized, abruptly constricted at apex. ... **Prosantothrips** Priesner
- Fore tarsi armed in both sexes and segment 3 of antenna with-out ring-like thickening. Tube normal. ... 64
64. Antennal segments long and slender, in particular the pre-apical segments; segment 6 longer than 3, intermediate segments not constricted at apex or vasiform; sense cones long, slender, setiform. Fore tarsal tooth smaller in females; males with a triangular tooth. Prothoracic setae very long.... **Aliothrips** Priesner
- Antennal segments not long and slender, not vasiform and sense cones not setiform. ... 65
65. Head with 2 pairs of postoculars. ... 66
- Head with only one pair of postoculars. ... 68
66. Fore tarsi unarmed in both sexes. ... 67
- Fore tarsi armed in both sexes. Head a little narrowed and constricted at base. Mouth cone elongate, rounded. Tube much shorter than head. ... **Aclystothrips** Ananthakrishnan
67. Head elongate, a little constricted at base. Postoculars not placed in a transverse line. Median ocellus not placed on a strong hump and when present, not surpassing eyes. Mouth cone narrowly rounded at apex. Fore wings with more double fringes. ... **Adelphothrips** Priesner
- Head only a little longer, with a strongly developed ocellar hump surpassing eyes. Postoculars in a transverse row. Mouth cone more broadly rounded. Fore wings without or with very few double fringes. ... **Acaciothrips** Priesner
68. Fore tarsi unarmed in both sexes. ... 69
- Fore tarsi armed in both sexes or rarely females unarmed, males armed. ... 72
69. Head varying from a little wider than long to nearly twice as long. Antennal segments moderately long (subgenus *Liothrips* s.str.) to narrow and elongate and intermediate segments constricted at apex (subgenus *Phaenothrips* Priesner). Mouth cone broadly rounded to pointed. Mesopraesternum highly variable. Tube mostly a little shorter than head or as long, rarely a little longer. ... **Liothrips** Uzel
- Head mostly wider than long, rarely about as long as wide. ... 70

70. Two pairs of well developed epimeral setae present. Mouth cone more elongate, broadly rounded, labrum long and pointed. **Phrasterothrips** Priesner
- Only one pair of epimerals well developed. 71
71. Mouth cone broadly rounded, maxillary stylets retracted mesad, widely separate. Fore femora not enlarged in both sexes. Antennal segment 8 not constricted at base. ... **Eothrips** Hood
- Mouth cone pointed, maxillary stylets occluded. Segment 8 of antenna thin and distinctly constricted at base. ... **Eurhynchothrips** Bagnall
72. Fore tarsi armed in both sexes. 73
- Fore tarsi unarmed in females, armed in males. Antennal segments long and slender with long sense cones. Mouth cone broadly rounded. ... **Eugynothrips** Priesner
73. Antennal segments 5 and 6 obliquely truncate. Fore tarsi always with a well developed tooth. Mouth cone bluntly rounded. ... **Teuchothrips** Hood
- Intermediate antennal segments normal. Mouth cone very broadly rounded. Fore tarsi with a weak to strong tooth in both sexes. Pronotum often with twisted striae. ... **Gynaikothrips** Zimmerman
74. Wings narrowed at middle, parallel sided beyond base (Mesothripine), head distinctly constricted at base ... 75
- Wings distinctly constricted at middle, not parallel sided beyond middle (Haplothripine), head not constricted at base 81
75. Tube not longer than head in both sexes 76
- Tube longer than head in female 80
76. Fore femora armed 77
- Fore femora unarmed 78
77. Fore femora at middle with a pointed tooth; fore tibia with one or two tooth-like projections near middle; fore tarsi armed ... **Euoplothrips** Hood
- Fore femora strongly incrassate, more elongate with small tooth at middle of innermargin; fore tarsi with stout curved tooth and stout claw. Head long, more than twice as long as wide; parallel sided. Intermediate antennal segments oval, without pedicel. Mouthcone very short. Tube slightly incrassate at base, sides very slightly concave beyond base ... **Sumatrothrips** Priesner
78. Fore femora unarmed; fore tibiae of female with tubercle at apex. Posterior margin of vertex of female with a median projection internally. Lateral setae on abdominal segment IX about two third as long as tube. Male with glandular area on sternite VIII. Accessory setae on sternites arranged in a single transverse row. ... **Choleothrips** Moulton
- Fore femora and fore tibiae unarmed 79
79. Cheeks slightly spinose. Fore femora usually enlarged. Wings narrow. ... **Mesothrips** Zimmerman
- Cheeks smooth; mouthcone very short ... **Mesandrothrips** Priesner
80. Head broader across cheeks; cheeks convex. Antennal segments short. Postangulals and epimerals only well developed. Sternites IV and V with only one row of accessory setae. Male with glandular area on sternite VIII ... **Moultonides** Kevan
- Head broader across eyes; cheeks not convex. Antennal segments elongate. Anteromarginals very small, midlaterals usually longer than anteroangulals. Sternites II-VIII with numerous accessory setae arranged in more than one transverse row ... **Sacothrips** Moulton

81. Fore femora in females with a blunt tooth or hump at base, often crenulate or roughened distally; fore tibia with a flat scale at apex; fore tarsi armed **Androthrips** Karny
- . Fore femora unarmed 82
82. Fore tibia very short, without a scale at apex; fore tibia with a distinct tubercle **Aeglothrips** Ananthakrishnan
- . Fore tibia not very short, without any tubercle 83
83. Hind femora usually enlarged. Antennal segment 8 broad at base, 7 and 8 closely united. Tube setae long and fine, almost twice as long as tube. **Karnyothrips** Watson
- . Hind femora not enlarged 84
84. Mouthcone short and broad. Cephalic and pronotal bristles usually well developed. Epimerals mostly pointed or blunt **Haplothrips** Serville
- . Mouthcone long and pointed 85
85. Mouthcone triangular, pointed, reaching base of prosternum **Neoheegeria** Schmutz
- . Mouthcone distinctly biconcave. Head more elongate. Body long and slender; abdomen narrow and tapering. Fore femora a little enlarged; fore tarsus with a distinct tooth **Dolichothrips** Priesner

ALPHABETICAL INDEX OF SPECIES OF GALL THRIPS ALONG WITH THEIR HOST SPECIES

THRIPS	HOST	PLANT FAMILY
<i>Aclystothrips aberrans</i> Ananthakrishnan	<i>Ficus</i> sp.	Moraceae
<i>Aclystothrips priesneri</i> Ananthakrishnan	unknown	—
<i>Adelphothrips tristis</i> Priesner	<i>Vernonia</i> sp.	Compositae
<i>Aeglothrips denticulus</i> Ananthakrishnan	<i>Maytenus senegalensis</i>	Celastraceae
<i>Aliothrips elegantulus</i> Priesner	<i>Ficus recurva</i>	Moraceae
<i>Alocothrips hadrocerus</i> (Karny)	<i>Maytenus senegalensis</i>	Celastraceae
<i>Amphithrips argutus</i> Ananthakrishnan	<i>Flacourtia</i> sp.	Linaceae
<i>Anaphothrips marginemtorquens</i> (Karny)	<i>Elatostemma sesquifolium</i>	Urticaceae
<i>Anaphothrips euryae</i> (Karny)	<i>Eurya japonica</i>	Ternstroemiaceae
<i>Anaphothrips euphorbiae</i> Uzel.	<i>Euphorbia cyparissus</i>	Euphorbiaceae
<i>Anaphothrips innoxius</i> (Karny)	<i>Hewittia bicolor</i>	Convolvulaceae
<i>Anaphothrips leeuweni</i> (Karny)	unknown	—
<i>Anaphothrips silvarum</i> Priesner	<i>Galium verum</i>	Rubiaceae
<i>Androthrips flavipes</i> Schmutz	<i>Casearia tomentosa</i>	Samydaceae
	<i>Ficus benjamina</i>	Moraceae
	<i>Ficus retusa</i>	Moraceae
	<i>Mallotus philippinensis</i>	Euphorbiaceae
	<i>Memecylon edule</i>	Melastomaceae
	<i>Mimusops elengi</i>	Sapotaceae
	<i>Linociera</i> sp.	Oleaceae
	<i>Pavetta hispidula</i>	Rubiaceae
	<i>Piper nigrum</i>	Piperaceae
<i>Androthrips melastomae</i> Zimmermann	<i>Ardisia cymosa</i>	Compositae
	<i>Chavica densa</i>	Piperaceae
	<i>Conocephalus suaveolens</i>	Urticaceae
	<i>Cordia obliqua</i>	Boraginaceae
	<i>Cordia suaveolens</i>	Boraginaceae
	<i>Eugenia polyantha</i>	Myrtaceae
	<i>Fagraea litoralis</i>	Loganiaceae
	<i>Mallotus philippinensis</i>	Euphorbiaceae
	<i>Melastoma malabathricum</i>	Melastomaceae
	<i>Piper arcuatum</i>	Piperaceae
	<i>Piper betle</i>	Piperaceae
<i>Androthrips ochraceus</i> Karny	<i>Cordia suaveolens</i>	Boraginaceae
<i>Androthrips ramachandrai</i> Karny	<i>Calycopteris floribundus</i>	Combretaceae
<i>Aneurothrips priesneri</i> Bhatti	<i>Cordia obliqua</i>	Boraginaceae
<i>Aneurothrips punctipennis</i> Karny	<i>Cordia suaveolens</i>	Boraginaceae

THRIPS	HOST	PLANT FAMILY
<i>Arrhenothrips acuminatus</i> Ananthakrishnan	<i>Mimusops</i> sp.	Sapotaceae
<i>Arrhenothrips dhumrapaksha</i> Ramakrishna	<i>Ficus retusa</i>	Moraceae
<i>Arrhenothrips pacificus</i> Bianchi	unknown	—
<i>Arrhenothrips ramakrishnae</i> Hood	<i>Mimusops elengi</i>	Sapotaceae
<i>Austrothrips cochinchinensis</i> Karny	<i>Calycopteris floribundus</i>	Combretaceae
<i>Ayyarothrips abstrusus</i> Ananthakrishnan	unknown	—
<i>Byctothrips ayyari</i> Ananthakrishnan	<i>Memecylon lushingtoni</i>	Melastomaceae
<i>Carius malagassus</i> Faure	unknown	—
<i>Cercothrips priesneri</i> Pelikan	<i>Tapia</i> sp.	Capparidaceae
<i>Cercothrips nigrodentatus</i> (Karny)	<i>Planchonia valida</i>	Barringtoniaceae
<i>Chaetanaphothrips deformans</i>	unknown	—
<i>Chelaeothrips idoliiceps</i> Karny	<i>Ficus</i> sp.	Moraceae
<i>Chelaeothrips annamensis</i> Karny	unknown	—
<i>Chleothrips geijerae</i> (Moulton)	<i>Geijera parviflora</i>	Rutaceae
<i>Chleothrips percus</i> Mound	<i>Geijera parviflora</i>	Rutaceae
<i>Coryciodothrips inquilinus</i> Ananthakrishnan	<i>Terminalia chebula</i>	Combretaceae
<i>Coryphothrips trochiceps</i> Karny	<i>Dipterocarpus alatus</i>	Dipterocarpaceae
<i>Crotonothrips coorgensis</i> Ananthakrishnan	<i>Memecylon talbotianum</i>	Melastomaceae
<i>Crotonothrips dantahasta</i> (Ramakrishna)	<i>Memecylon edule</i>	Melastomaceae
<i>Crotonothrips davidi</i> (Ananthakrishnan)	<i>Santalum album</i>	Santalaceae
<i>Crotonothrips dissimilis</i> Ananthakrishnan	<i>Memecylon lawsoni</i>	Melastomaceae
<i>Crotonothrips memecylonicus</i> Ananthakrishnan	<i>Memecylon</i> sp.	Melastomaceae
<i>Crotonothrips mimicus</i> (Ananthakrishnan)	<i>Secamone emetica</i>	Asclepiadaceae
<i>Cryptothrips bursarius</i> Karny	<i>Cordia suaveolens</i>	Boraginaceae
<i>Cryptothrips biuncinatus</i> Karny	<i>Cordia suaveolens</i>	Boraginaceae
<i>Cryptothrips pachypterus</i> Karny	<i>Vitis papillosa</i>	Vitaceae
<i>Cryptothrips pusillus</i> Karny	<i>Dipterocarpus</i> sp.	Dipterocarpaceae
<i>Cryptothrips salicis</i> Jones	<i>Salix</i> sp.	Salicaceae
<i>Cryptothrips shavianus</i> Bagnall	<i>Acacia</i> sp.	Mimosae
<i>Dactylothrips priscus</i> (Girault)	<i>Acacia floribunda</i>	Mimosae
<i>Dactylothrips tasmani</i> Mound	<i>Acacia mearnsii</i>	Mimosae
<i>Danothrips theivorus</i> (Karny)	<i>Camellia thea</i>	Ternstroemiaceae
<i>Dimorphothrips idoliiceps</i> (Karny)	<i>Ficus</i> sp.	Moraceae
<i>Dimorphothrips microchaetus</i> Bagnall	<i>Ficus</i> sp.	Moraceae
<i>Dimorphothrips solitus</i> Bagnall	<i>Ficus</i> sp.	Moraceae
<i>Dixothrips onerosus</i> Ananthakrishnan	<i>Terminalia chebula</i>	Combretaceae
<i>Dolerothrips laticauda</i> Karny	<i>Schoutenia ovata</i>	Tiliaceae
<i>Dolerothrips nigricauda</i> Karny	<i>Hemicyclia serrata</i>	Euphorbiaceae
<i>Dolichothrips inquilinus</i> Ananthakrishnan	<i>Zizyphus</i> sp.	Rhamnaceae
<i>Dolichothrips longicollis</i> Karny	<i>Hemicyclia serrata</i>	Euphorbiaceae
	<i>Macaranga tenarius</i>	Euphorbiaceae
<i>Empresmothrips folii</i> Girault	<i>Tristania</i> sp.	Myrtaceae
<i>Empresmothrips fallax</i> (Bagnall)	<i>Eucalyptus</i> sp.	Myrtaceae
<i>Eothrips coimbatorensis</i> Ramakrishna	<i>Jasminum pubescens</i>	Oleaceae
<i>Eothrips crassicornis</i> (Karny)	unknown	—
<i>Eothrips laticauda</i> (Karny)	<i>Mallotus philippinensis</i>	Euphorbiaceae
<i>Eothrips schouteniae</i> Karny	<i>Schoutenia ovata</i>	Tiliaceae
<i>Eugynothrips adulator</i> Priesner	<i>Schefflera</i> sp.	Araliaceae
<i>Eugynothrips coarctatus</i> (Karny)	<i>Homalomena aromatica</i>	Araceae
<i>Eugynothrips conocephali</i> (Karny)	<i>Conocephalus suaveolens</i>	Urticaceae
<i>Eugynothrips convolens</i> (Karny)	<i>Gnetum latifolium</i>	Gnetaceae
<i>Eugynothrips decipiens</i> (Karny)	unknown	—
<i>Eugynothrips intorquens</i> (Karny)	<i>Smilax australis</i>	Liliaceae
<i>Eugynothrips manubrialis</i> Priesner	<i>Ardisia</i> sp.	Compositae
<i>Eugynothrips persimilis</i> (Karny)	<i>Conocephalus suaveolens</i>	Urticaceae
<i>Eugynothrips seticornis</i> (Karny)	<i>Gnetum latifolium</i>	Gnetaceae
<i>Eugynothrips sumatranus</i> Priesner	<i>Conocephalus</i> sp.	Urticaceae
<i>Eugynothrips susicola</i> Priesner	<i>Susum anthelminticum</i>	Flagellariaceae
<i>Eugynothrips smilacis</i> Priesner	<i>Smilax australis</i>	Liliaceae
<i>Eugynothrips tubifex</i> (Karny)	<i>Homalomena aromatica</i>	Araceae
<i>Eugynothrips umbricornis</i> Priesner	<i>Ardisia</i> sp.	Compositae
<i>Euoplothrips bagnalli</i> Hood	<i>Ficus</i> sp.	Moraceae

THRIPS	HOST	PLANT FAMILY
<i>Euoplothrips bagnalli</i> Hood	<i>Smilax australis</i>	Liliaceae
<i>Euoplothrips buxtoni</i> Bagnall	<i>Ficus</i> sp.	Moraceae
<i>Euoplothrips crassipes</i> Priesner	<i>Smilax australis</i>	Liliaceae
<i>Euoplothrips incognitus</i> Bagnall	<i>Ficus</i> sp.	Moraceae
<i>Euoplothrips uncinatus</i> Bagnall	<i>Ficus</i> sp.	Moraceae
<i>Eurhynchothrips flavicornis</i> Bagnall	<i>Microgyne macrophylla</i>	Compositae
<i>Gigantothrips afer</i> (Priesner)	<i>Ficus</i> sp.	Moraceae
<i>Gigantothrips elegans</i> Zimmermann	<i>Ficus</i> sp.	Moraceae
<i>Gigantothrips priesneri</i> (Pelikan)	<i>Tapia</i> sp.	Capparidaceae
<i>Gryplothrips mantis</i> Karny	<i>Acacia pendula</i>	Mimosae
<i>Gynaikothrips adusticornis</i> Karny	<i>Symplocos</i> sp.	Symplocaceae
<i>Gynaikothrips australis</i> Bagnall	<i>Ficus macrophylla</i>	Moraceae
<i>Gynaikothrips bengalensis</i> Ananthakrishnan	<i>Ficus bengalensis</i>	Moraceae
<i>Gynaikothrips endentatus</i> Priesner	<i>Ficus</i> sp.	Moraceae
<i>Gynaikothrips eugeniae</i> Priesner	<i>Eugenia</i> sp.	Myrtaceae
<i>Gynaikothrips ficorum</i> (Marchal)	<i>Ficus nitida</i>	Moraceae
	<i>Ficus retusa</i>	Moraceae
<i>Gynaikothrips ficus</i> (Faure)	<i>Ficus</i> sp.	Moraceae
<i>Gynaikothrips flaviantennatus</i> Moulton	<i>Casearia tomentosa</i>	Samydaceae
<i>Gynaikothrips hopkinsoni</i> Bagnall	<i>Ficus</i> sp.	Moraceae
<i>Gynaikothrips hystrix</i> Bagnall	<i>Ficus</i> sp.	Moraceae
<i>Gynaikothrips imitans</i> Karny	<i>Ficus cuspidata</i>	Moraceae
<i>Gynaikothrips insulsus</i> Priesner	<i>Ficus retusa</i>	Moraceae
<i>Gynaikothrips lividicornis</i> (Karny)	<i>Rhodamnia trinervia</i>	Myrtaceae
<i>Gynaikothrips longiceps</i> Karny	<i>Ficus benjamina</i>	Moraceae
<i>Gynaikothrips malabaricus</i> Ramakrishna	<i>Ficus bengalensis</i>	Moraceae
<i>Gynaikothrips microchaetus</i> Ananthakrishnan & Jagadish	<i>Ficus</i> sp.	Moraceae
<i>Gynaikothrips mikaniae</i> Priesner	<i>Mikania cordifolia</i>	—
<i>Gynaikothrips primitivus</i> Karny	<i>Symplocos</i> sp.	Symplocaceae
<i>Gynaikothrips retusae</i> Priesner	<i>Ficus</i> sp.	Moraceae
<i>Gynaikothrips satanas</i> Priesner	unknown	—
<i>Gynaikothrips schefflericola</i> Ananthakrishnan & Viswanathan	<i>Schefflera</i> sp.	Araliaceae
<i>Gynaikothrips simillimus</i> Karny	<i>Vitis pergamacea</i>	Vitaceae
<i>Gynaikothrips simulator</i> Priesner	<i>Ficus</i> sp.	Moraceae
<i>Gynaikothrips uzeli</i> Zimmermann	<i>Ficus retusa</i>	Moraceae
	<i>Ficus benjamina</i>	Moraceae
<i>Gynaikothrips victor</i> Priesner	<i>Ficus</i> sp.	Moraceae
<i>Gynaikothrips vitiivorus</i> Priesner	<i>Vitis shifunensis</i>	Vitaceae
<i>Haplothrips aculeatus</i> (Haliday)	<i>Ficus benjamina</i>	Moraceae
	<i>Melastoma malabathricum</i>	Melastomaceae
<i>Haplothrips atriplicis</i> Priesner	<i>Vernonia chamaedrys</i>	Compositae
<i>Haplothrips euphorbiae</i> Priesner	<i>Atriplex halinus</i>	Chenopodiaceae
<i>Haplothrips funipennis</i> Priesner	<i>Euphorbia hirta</i>	Euphorbiaceae
<i>Haplothrips fuscipennis</i> Moulton	<i>Polygonum chinensis</i>	Polygonaceae
<i>Haplothrips gallarum</i>	<i>Piper futokadsura</i>	Piperaceae
<i>Haplothrips ochradeni</i> Priesner	<i>Tamarix articulata</i>	Tamariscaceae
<i>Haplothrips dignus</i> Bianchi	<i>Ochradenia baccatus</i>	—
<i>Haplothrips</i> (<i>Odonotoplothrips</i>) <i>cleistanthi</i> Bournier	unknown	—
	<i>Cleistanthus</i> sp.	Euphorbiaceae
<i>Katothrips hyrum</i> Mound	<i>Acacia</i> sp.	Mimosae
<i>Katothrips pendulae</i> Mound	<i>Acacia pendula</i>	Mimosae
<i>Katothrips tityrus</i> (Girault)	<i>Acacia longifolia</i>	Mimosae
<i>Katothrips yamma</i> Mound	<i>Acacia cambageni</i>	Mimosae
<i>Kellyia biadenes</i> Mound	unknown	—
<i>Kellyia hoodianus</i> (Bagnall)	<i>Acacia elater</i>	Mimosae
<i>Kladothrips augonsaxos</i> Moulton	<i>Acacia doratoxylon</i>	Mimosae
<i>Kladothrips acaciae</i> (Moulton)	<i>Acacia harpophylla</i>	Mimosae
<i>Kladothrips ellobus</i> Mound	<i>Acacia cambagei</i>	Mimosae

THRIPS	HOST	PLANT FAMILY
<i>Kladothrips rugosus</i> Froggatt	<i>Acacia pendula</i>	Mimosae
<i>Kochummania excelsa</i> Ananthakrishnan	<i>Litsea</i> sp.	Lauraceae
<i>Koptothrips distritus</i> Mound	<i>Acacia pendula</i>	Mimosae
	<i>Acacia oswaldii</i>	Mimosae
<i>Koptothrips flavicornis</i> Bagnall	<i>Acacia pendula</i>	Mimosae
	<i>Acacia oswaldii</i>	Mimosae
<i>Koptothrips xenus</i> Mound	<i>Acacia cambagei</i>	Mimosae
<i>Koptothrips zelus</i> Mound	<i>Acacia harpophylla</i>	Mimosae
<i>Leeuwenia aculeatrix</i> Karny	<i>Eugenia</i> sp.	Myrtaceae
<i>Leeuwenia coelatrix</i> Karny	<i>Eugenia</i> sp.	Myrtaceae
<i>Leeuwenia coriaceus</i> Karny	<i>Eugenia</i> sp.	Myrtaceae
<i>Leeuwenia ramakrishnae</i> Ananthakrishnan & Jagadish	<i>Eugenia</i> sp.	Myrtaceae
<i>Leeuwenia gladiatrix</i> Karny	<i>Eugenia polyantha</i>	Myrtaceae
<i>Leeuwenia pasanii</i> (Mukaigawa)	<i>Eugenia</i> sp.	Myrtaceae
<i>Leeuwenia vorax</i> Ananthakrishnan	<i>Eugenia</i> sp.	Myrtaceae
<i>Leptothrips angusticollis</i> Karny	undetermined	Anonaceae
<i>Liophlaeothrips ablusus</i> Ananthakrishnan	undetermined	Urticaceae
<i>Liophlaeothrips cecidii</i> Ananthakrishnan	<i>Morinda</i> sp.	Rubiaceae
<i>Liophlaeothrips curtus</i> Ananthakrishnan & Jagadish	<i>Argyrea</i> sp.	Convolvulaceae
<i>Liophlaeothrips longus</i> (Schmutz)	<i>Pavetta indica</i>	Rubiaceae
<i>Liophlaeothrips segnis</i> Ananthakrishnan & Jagadish	undetermined	Rubiaceae
<i>Liophlaeothrips vichitravarna</i> (Ramakrishna)	<i>Mimusops elengi</i>	Sapotaceae
<i>Liothrips acuminatus</i> Priesner	<i>Piper</i> sp.	Piperaceae
<i>Liothrips adusticornus</i> (Karny)	<i>Gnetum latifolium</i>	Gnetaceae
<i>Liothrips amulens</i> Priesner	<i>Piper arcudatum</i>	Piperaceae
<i>Liothrips aequilus</i> Ananthakrishnan & Jagadish	<i>Eugenia</i> sp.	Myrtaceae
<i>Liothrips africanus</i> Vuillelt	<i>Guiera senegalensis</i>	Combretaceae
<i>Liothrips anogeissus</i> Priesner	<i>Anogeissus leiocarpus</i>	Combretaceae
<i>Liothrips assimilans</i> Priesner	<i>Elatostemma</i> sp.	Urticaceae
<i>Liothrips associatus</i> Ananthakrishnan & Jagadish	<i>Schefflera racemosa</i>	Araliaceae
<i>Liothrips astutus</i> Priesner	<i>Scindaspis</i> sp.	Araceae
<i>Liothrips ater</i> Ananthakrishnan & Jagadish	<i>Piper</i> sp.	Piperaceae
<i>Liothrips baccati</i> Priesner	<i>Piper baccatum</i>	Piperaceae
<i>Liothrips brevitubus</i> Karny	<i>Mallotus repandus</i>	Euphorbiaceae
<i>Liothrips bosei</i> Moulton	<i>Mallotus philippinensis</i>	Euphorbiaceae
<i>Liothrips chaviceae</i> (Karny)	<i>Piper retrofractus</i>	Piperaceae
	<i>Melastoma malabathricum</i>	Melastomaceae
<i>Liothrips claripennis</i> (Karny)	<i>Medinella</i> sp.	Melastomaceae
<i>Liothrips collustratus</i> Priesner	<i>Elatostemma strigosum</i>	Urticaceae
<i>Liothrips comparandus</i> Priesner	<i>Fagraea fastigata</i>	Loganiaceae
<i>Liothrips confusus</i> Priesner	<i>Piper</i> sp.	Piperaceae
<i>Liothrips crassipes</i> (Karny)	<i>Piper</i> sp.	Piperaceae
<i>Liothrips cuspidatae</i> Priesner	<i>Ficus cuspidata</i>	Moraceae
<i>Liothrips daetymon</i> (Karny)	<i>Eugenia polyantha</i>	Myrtaceae
<i>Liothrips devriesi</i> (Karny)	<i>Elatostemma sesquifolia</i>	Urticaceae
<i>Liothrips dux</i> Priesner	<i>Ardisia</i> sp.	Compositae
<i>Liothrips emulatus</i> Ananthakrishnan	<i>Schefflera</i> sp.	Araliaceae
<i>Liothrips esakii</i> (Takahashi)	<i>Ficus retusa</i>	Moraceae
<i>Liothrips eugeniae</i> Ananthakrishnan	<i>Eugenia</i> sp.	Myrtaceae
<i>Liothrips exiguus</i> Priesner	<i>Piper</i> sp.	Piperaceae
<i>Liothrips extractus</i> Priesner	<i>Vitis lanceolaria</i>	Vitaceae
<i>Liothrips fagraeae</i> Priesner	<i>Fagraea obovata</i>	Loganiaceae
<i>Liothrips ficarius</i> (Priesner)	<i>Ficus benjamina</i>	Moraceae
<i>Liothrips flavitibia</i> (Moulton)	<i>Mallotus philippinensis</i>	Euphorbiaceae
<i>Liothrips fragilis</i> Ananthakrishnan	<i>Schefflera</i> sp.	Araliaceae
<i>Liothrips fraudulentus</i> Priesner	<i>Schefflera</i> sp.	Araliaceae
<i>Liothrips fumicornis</i> Priesner	<i>Piper</i> sp.	Piperaceae
<i>Liothrips gracilis</i> Priesner	<i>Planchonia valida</i>	Barringtoniaceae
	<i>Barringtonia speciosa</i>	Barringtoniaceae
<i>Liothrips gymnosporiae</i> Priesner	<i>Maytenus senegalensis</i>	Celastraceae

THRIPS	HOST	PLANT FAMILY
<i>Liothrips gynopogoni</i> Priesner	<i>Gynopogon reinwardtii</i>	Apocynaceae
<i>Liothrips habitator</i> Priesner	<i>Ficus</i> sp.	Moraceae
<i>Liothrips heptapleurii</i> (Karny)	<i>Schefflera odorata</i>	Araliaceae
<i>Liothrips heptapleuricola</i> Takahashi	<i>Schefflera</i> sp.	Araliaceae
<i>Liothrips heptapleurinus</i> Priesner	<i>Schefflera</i> sp.	Araliaceae
<i>Liothrips hradecensis</i> (Uzel)	<i>Ficus</i> sp.	Moraceae
<i>Liothrips ingratus</i> Priesner	<i>Elatostemma</i> sp.	Urticaceae
<i>Liothrips interlocatus</i> (Karny)	<i>Terminalia</i> sp.	Euphorbiaceae
<i>Liothrips inquilinus</i> Ananthakrishnan & Jagadish	<i>Eugenia</i> sp.	Myrtaceae
<i>Liothrips insidiosus</i> Priesner	<i>Piper</i> sp.	Piperaceae
<i>Liothrips jacobsoni</i> Priesner	<i>Schefflera</i> sp.	Araliaceae
<i>Liothrips kannani</i> (Moulton)	unknown	—
<i>Liothrips karnyi</i> (Bagnall)	<i>Piper nigrum</i>	Piperaceae
<i>Liothrips kolliensis</i> Ananthakrishnan	undetermined	Urticaceae
<i>Liothrips kuwanii</i> (Moulton)	<i>Piper futokadsura</i>	Piperaceae
	<i>Smilax</i> sp.	Liliaceae
<i>Liothrips latro</i> Priesner	<i>Ardisia</i> sp.	Compositae
<i>Liothrips liliaceae</i> (Priesner)	<i>Smilax</i> sp.	Liliaceae
<i>Liothrips litoralis</i> (Karny)	<i>Fagraea litoralis</i>	Loganiaceae
<i>Liothrips longiceps</i> (Karny)	<i>Piper</i> sp.	Piperaceae
<i>Liothrips longicollis</i> (Karny)	<i>Ficus punctata</i>	Moraceae
<i>Liothrips loranthei</i> Priesner	<i>Loranthus schultzei</i>	Loranthaceae
<i>Liothrips macropanacis</i> Priesner	<i>Schefflera polybotrya</i>	Araliaceae
<i>Liothrips malabaricus</i> Ananthakrishnan & Jagadish	<i>Macaranga</i> sp.	Euphorbiaceae
<i>Liothrips melaleuca</i> Girault	<i>Melaleuca leucodendron</i>	Myrtaceae
<i>Liothrips mexicanus</i> Crawford	<i>Fagus</i> sp.	Fagaceae
<i>Liothrips miniati</i> Priesner	<i>Piper minatum</i>	Piperaceae
<i>Liothrips mirabilis</i> (Schmutz)	<i>Piper</i> sp.	Piperaceae
	<i>Pavetta hispidula</i>	Rubiaceae
<i>Liothrips mucronis</i> Ananthakrishnan & Jagadish	<i>Mallotus philippinensis</i>	Euphorbiaceae
<i>Liothrips nanus</i> Ananthakrishnan	<i>Jasminum</i> sp.	Oleaceae
<i>Liothrips nervisequus</i> (Karny)	<i>Conocephalus suaveolens</i>	Urticaceae
<i>Liothrips nigripes</i> (Karny)	<i>Eugenia polyantha</i>	Myrtaceae
<i>Liothrips oculatus</i> Priesner	<i>Lasianthus pimparea</i>	Rubiaceae
<i>Liothrips pallipes</i> Priesner	<i>Piper sarmentosum</i>	Piperaceae
<i>Liothrips piperinus</i> Priesner	<i>Piper futokasura</i>	Piperaceae
<i>Liothrips polybotryae</i> Priesner	<i>Schefflera polybotrya</i>	Araliaceae
	<i>Schefflera scandus</i>	Araliaceae
<i>Liothrips polyosminus</i> Priesner	<i>Polyosma ilicifolia</i>	Saxifragaceae
<i>Liothrips postocularis</i> Priesner	<i>Maytenus senegalensis</i>	Celastraceae
<i>Liothrips praetermissus</i> Priesner	<i>Fagraea litoralis</i>	Loganiaceae
<i>Liothrips ramakrishnae</i> Ananthakrishnan & Jagadish	<i>Schefflera racemosa</i>	Araliaceae
<i>Liothrips rectaginis</i> (Karny)	<i>Vernonia eleagnifolia</i>	Compositae
<i>Liothrips retusus</i> Ananthakrishnan	<i>Schefflera</i> sp.	Araliaceae
<i>Liothrips racemosae</i> Priesner	<i>Conocephalus suaveolens</i>	Urticaceae
<i>Liothrips retrofracti</i> Priesner	<i>Piper retrofractus</i>	Piperaceae
<i>Liothrips reynavaanae</i> Priesner	<i>Piper</i> sp.	Piperaceae
<i>Liothrips rhipidophorae</i> Priesner	<i>Rhaphidophora foraminifera</i>	Araceae
<i>Liothrips rubiae</i> Priesner	<i>Rubia cordifolia</i>	Rubiaceae
<i>Liothrips sarmentosi</i> Priesner	<i>Piper sarmentosum</i>	Piperaceae
<i>Liothrips smeeanus</i> Zurstrassen	unknown	—
<i>Liothrips schefflera</i> Priesner	<i>Schefflera scandens</i>	Araliaceae
<i>Liothrips simillimus</i> Priesner	<i>Tetrastigma mutabile</i>	Vitaceae
<i>Liothrips spectabilis</i> Ananthakrishnan	<i>Loranthus</i> sp.	Loranthaceae
<i>Liothrips strigosus</i> Ananthakrishnan & Jagadish	<i>Cinnamomum</i> sp.	Lauraceae
<i>Liothrips subtilis</i> Ananthakrishnan	<i>Schefflera</i> sp.	Araliaceae
<i>Liothrips takahashii</i> (Moulton)	<i>Ficus retusa</i>	Moraceae
<i>Liothrips taurus</i> (Karny)	<i>Conocephalus suaveolens</i>	Urticaceae
<i>Liothrips tetrastigmae</i> Priesner	<i>Tetrastigma pergamaceum</i>	Vitaceae
<i>Liothrips tibialis</i> Priesner	<i>Piper</i> sp.	Piperaceae
<i>Liothrips tristis</i> (Karny)	<i>Litsea chinensis</i>	Lauraceae

THRIPS	HOST	PLANT FAMILY
<i>Liothrips trybomii</i> (Karny)	<i>Aporosa microcalyx</i>	Euphorbiaceae
<i>Liothrips variabilis</i> Ananthakrishnan & Jagadish	<i>Piper</i> sp.	Piperaceae
<i>Liothrips viticola</i> (Karny)	<i>Vitis lanceolaria</i>	Vitaceae
<i>Liothrips willcocksi</i> Priesner	undetermined	Simarubaceae
<i>Megeugynothrips efflatouni</i> Priesner	<i>Balanites aegyptiaca</i>	Simarubaceae
<i>Mesandrothrips inquilinus</i> (Priesner)	<i>Ficus retusa</i>	Moraceae
<i>Mesothrips plicans</i> Priesner	<i>Linociera</i> sp.	Oleaceae
<i>Mesothrips apatelus</i> Karny	<i>Ficus retusa</i>	Moraceae
<i>Mesothrips bhimabahu</i> Ramakrishna	<i>Ficus bengalensis</i>	Moraceae
<i>Mesothrips breviceps</i> Karny	<i>Ardisia cymosa</i>	Compositae
<i>Mesothrips constrictus</i> (Karny)	<i>Ficus benjamina</i>	Moraceae
	<i>Schoutenia ovata</i>	Tiliaceae
<i>Mesothrips cracens</i> Ananthakrishnan	<i>Memecylon</i> sp.	Melastomaceae
<i>Mesothrips crassicornis</i> (Karny)	<i>Loranthus praelongus</i>	Loranthaceae
<i>Mesothrips elaeocarpi</i> Ananthakrishnan	<i>Elaeocarpus stipularis</i>	Elaeocarpaceae
<i>Mesothrips jasmini</i> (Karny)	<i>Jasminum pubescens</i>	Oleaceae
<i>Mesothrips jordani</i> Zimmermann	<i>Melastoma malabathricum</i>	Melastomaceae
	<i>Ficus bengalensis</i>	Moraceae
<i>Mesothrips fulmeki</i> Ananthakrishnan	unknown	—
<i>Mesothrips latifolii</i> Karny	<i>Gnetum latifolium</i>	Gnetaceae
<i>Mesothrips leeuweni</i> Karny	<i>Conocephalus naucleifer</i> mis	Urticaceae
	<i>Conocephalus suaveolens</i>	Urticaceae
<i>Mesothrips longisetis</i> Karny	<i>Melastoma malabathricum</i>	Melastomaceae
<i>Mesothrips malloti</i>	<i>Mallotus philippinensis</i>	Euphorbiaceae
<i>Mesothrips manii</i> Ananthakrishnan	<i>Santalum album</i>	Santalaceae
<i>Mesothrips melinocnemis</i> Karny	<i>Pothos scandens</i>	Araceae
<i>Mesothrips memecylonicus</i> Ananthakrishnan	<i>Memecylon nudus</i>	Melastomaceae
<i>Mesothrips mendax</i> Karny	<i>Mallotus philippinensis</i>	Euphorbiaceae
<i>Mesothrips orientalis</i> Ananthakrishnan	<i>Ficus</i> sp.	Moraceae
<i>Mesothrips parvus</i> Schmtuz	<i>Ficus pilosa</i>	Moraceae
<i>Mesothrips pycles</i> Karny	<i>Eugenia</i> sp.	Myrtaceae
<i>Mesothrips schouteniae</i> Karny	<i>Schoutenia ovata</i>	Tiliaceae
<i>Mesothrips ustulatus</i> Karny	<i>Memecylon</i> sp.	Melastomaceae
<i>Mesothrips vitis</i> Ananthakrishnan	<i>Vitis</i> sp.	Vitaceae
<i>Mimothrips longicornis</i> (Bagnall)	unknown	—
<i>Mixothrips craigheadi</i> Stannard	<i>Eugenia axillaris</i>	Myrtaceae
	<i>Myrcia</i> sp.	Myrtaceae
<i>Mixothrips priesneri</i> Stannard	<i>Eugenia axillaris</i>	Myrtaceae
	<i>Myrcia</i> sp.	Myrtaceae
<i>Moultonoides geijerae</i> (Moulton)	<i>Geijera parviflora</i>	Rutaceae
<i>Neoecidothrips bursariae</i> (Moulton)	<i>Bursaria</i> sp.	Pittosporaceae
<i>Onychothrips hakeae</i> Bagnall	<i>Hakea</i> sp.	Proteaceae
<i>Pachythrips subapterus</i> (Haliday)	<i>Stellaria media</i>	Caryophyllaceae
<i>Phasmothrips asparatus</i> Priesner	<i>Stellaria graminea</i>	Caryophyllaceae
<i>Phorinothrips loranhi</i> Ananthakrishnan	<i>Sloanea javanica</i>	Elaeocarpaceae
<i>Phorinothrips minusculus</i> Ananthakrishnan	<i>Loranthus elasticus</i>	Loranthaceae
<i>Physothrips ulmifoliorum</i> Uzel	<i>Loranthus</i> sp.	Loranthaceae
<i>Prosantothrips hyalopterus</i> (Karny)	<i>Salacia obloysfolia</i>	Hippocrataceae
<i>Psenothrips priesneri</i> Ananthakrishnan	<i>Hymenodictyon parviflorum</i>	Rubiaceae
<i>Pteridothrips pteridicola</i> (Karny)	<i>Walsura piscidia</i>	Meliaceae
	<i>Ficus</i> sp.	Moraceae
<i>Rhopalothripoides brunneus</i> (Bagnal)	<i>Acacia dealbata</i>	Mimosae
<i>Rhyncothrips annulosus</i> Priesner	<i>Vassinia aculeata</i>	Compositae
<i>Rhyncothrips raoensis</i> Ramakrishna	<i>Mallotus philippinensis</i>	Euphorbiaceae
<i>Sacothrips bicolor</i> Moulton	<i>Geijera parviflora</i>	Rutaceae
<i>Sacothrips catheter</i> Mound	<i>Geijera parviflora</i>	Rutaceae
<i>Sacothrips corycidis</i> Mound	<i>Geijera parviflora</i>	Rutaceae
<i>Sacothrips galbus</i> Mound	<i>Geijera parviflora</i>	Rutaceae
<i>Sacothrips ingens</i> Mound	<i>Geijera parviflora</i>	Rutaceae

THRIPS	HOST	PLANT FAMILY
<i>Sacothrips milvus</i> Mound	<i>Geijera parviflora</i>	Rutaceae
<i>Schedothrips orientalis</i> Ananthakrishnan	<i>Ventilago maderasapatana</i>	Rhamnaceae
<i>Schedothrips tumidus</i> Ananthakrishnan	<i>Ventilago</i> sp.	Rhamnaceae
<i>Senegothrips coutini</i> Bournier	<i>Geijera senegalensis</i>	Combretaceae
<i>Smeringothrips salaciae</i> Priesner	<i>Salacia oblongifolia</i>	Hippocrataceae
<i>Sphingothrips trachypogon</i> (Karny)	<i>Diospyros maritima</i>	Ebenaceae
<i>Sumatrothrips filiceps</i> Priesner	<i>Mallotus philippinensis</i>	Euphorbiaceae
<i>Synergothrips prolatus</i> Ananthakrishnan	<i>Diospyros maritima</i>	Ebenaceae
<i>Syringothrips gallicola</i> Priesner	<i>Sloanea sigum</i>	Elaeocarpaceae
<i>Taeniothrips atratus</i> (Haliday)	<i>Stellaria media</i>	Caryophyllaceae
	<i>Stellaria gramina</i>	Caryophyllaceae
	<i>Stellaria uliginosa</i>	Caryophyllaceae
<i>Taeniothrips basicornis</i> (Reuter)	<i>Lathyrus pratensis</i>	Leguminosae
	<i>Coronilla varia</i>	
<i>Taeniothrips firmus</i> (Uzel)	<i>Vicia cracca</i>	Leguminosae
	<i>Vicia tenuifolia</i>	Leguminosae
<i>Taeniothrips frici</i> (Uzel)	<i>Leontodon autumnalis</i>	Compositae
<i>Taeniothrips hospes</i> (Karny)	<i>Elatostemma sesquifolium</i>	Urticaceae
<i>Taeniothrips laricivorus</i> Kratochvil	<i>Larix decidua</i>	Pinaceae
<i>Taeniothrips nigripilosus</i> Uzel	<i>Achillea millifolium</i>	Compositae
<i>Taeniothrips pini</i> (Uzel)	<i>Pinus sylvestris</i>	Pinaceae
	<i>Pinus pumilio</i>	Pinaceae
<i>Taeniothrips salicis</i> Reuter	<i>Salix alba</i>	Salicaceae
<i>Taeniothrips vulgatissimus</i> (Haliday)	<i>Krantia arvensis</i>	Dipsacaceae
<i>Tetradothrips foliiperda</i> (Karny)	<i>Pothos scandens</i>	Araceae
<i>Teuchothrips brevis</i> (Bagnall)	<i>Piper</i> sp.	Piperaceae
<i>Teuchothrips pithecolobii</i> Hood	<i>Pithecolobium dulce</i>	Caesalpineae
<i>Teuchothrips bursaricola</i> Priesner	<i>Geijera parviflora</i>	Rutaceae
	<i>Bursaria spinosa</i>	Pittosporaceae
<i>Teuchothrips longus</i> (Schmutz)	<i>Pavetta hispidula</i>	Rubiaceae
	<i>Hymenodictyon</i> sp.	Rubiaceae
<i>Teuchothrips minor</i> Bagnell	<i>Malaleuca</i> sp.	Myrtaceae
<i>Teuchothrips sodalis</i> Bagnall	<i>Melaleuca</i> sp.	Myrtaceae
<i>Thaumatothrips froggatti</i> Karny	<i>Casuarina stricta</i>	Casuarinaceae
<i>Thilakothrips babuli</i>	<i>Acacia leucophloea</i>	Mimosae
<i>Thlibothrips atavus</i> (Karny)	unknown	—
<i>Thlibothrips nigricaudus</i> (Karny)	<i>Hemicyclia sepiania</i>	Euphorbiaceae
<i>Vuilletia houardi</i> (Vuillet)	<i>Tambourissa</i> sp.	Monimiaceae
<i>Xiphidothrips tambourisae</i> Priesner	<i>Tambourissa</i> sp.	Monimiaceae
<i>Zelotothrips fuscipennis</i> (Karny)	<i>Spatholobus littoralis</i>	Leguminosae

PLANT FAMILY—THRIPS INDEX

THRIPS SPECIES	HOST PLANT	DISTRIBUTION
ACANTHACEAE		
<i>Anaphothrips involvens</i>	<i>Thunbergia fragrans</i> Roxb.	Malaya
ANONACEAE		
<i>Leptothrips angusticollis</i>	undetermined plant	Java
<i>Hoplothrips leeuweni</i>	undetermined plant	
<i>Androthrips melastomae</i>	undetermined plant	
APOCYNACEAE		
<i>Liothrips gynopogoni</i>	<i>Gynopogon reinwardtii</i>	Sumatra
<i>Taeniothrips antennalis</i>	undetermined plant	Java
ARACEAE		
<i>Eugynothrips coarctatus</i>	<i>Homalomena aromatica</i> Schott.	Java
<i>Eugynothrips decipiens</i>	<i>Schismatoglottis calyptrata</i> Zool. & Mor.	Java

SPECIES	HOST PLANT	DISTRIBUTION
<i>Eugynothrips tubifex</i>	<i>Homalomena aromatica</i>	Java
<i>Liothrips astutus</i>	<i>Scindaspus</i> sp.	Java
<i>Liothrips rhapsiphorae</i>	<i>Rhaphidophora foraminifera</i> Engel.	Sumatra
<i>Mesothrips melinocnemis</i>	<i>Pothos scandens</i> Linn.	India
<i>Tetradothrips folliiperda</i>	<i>Pothos scandens</i> Linn.	India
ARALIACEAE		
<i>Eugynothrips adulator</i>	<i>Schefflera</i> sp.	Sumatra
<i>Liothrips associatus</i>	<i>Schefflera racemosa</i> Harms.	India
<i>Liothrips consimilis</i>	<i>Schefflera</i> sp.	India
<i>Liothrips heptapleuri</i>	<i>Schefflera odorata</i> Merrill & Rolfe	Java, Sumatra
<i>Liothrips fraudulentus</i>	<i>Schefflera</i> sp.	Sumatra
<i>Liothrips jacobsoni</i>	<i>Schefflera</i> sp.	Sumatra
<i>Liothrips heptapleuricola</i>	<i>Schefflera</i> sp.	Taiwan
<i>Liothrips heptapleurinus</i>	<i>Schefflera</i> sp.	Taiwan
<i>Liothrips macropanacis</i>	<i>Schefflera polybotrya</i> (Miq.) Vig.	Java
<i>Liothrips ramakrishnae</i>	<i>Schefflera racemosa</i> Harms.	India
<i>Liothrips retusus</i>	<i>Schefflera</i> sp.	India
<i>Liothrips schefflerae</i>	<i>Schefflera scandens</i> (Bl.) Vig.	Java
<i>Liothrips subtilis</i>	<i>Schefflera</i> sp.	India
<i>Liothrips emulatus</i>	<i>Schefflera</i> sp.	India
<i>Gynaikothrips schefflericola</i>	<i>Schefflera</i> sp.	India
BORAGINACEAE		
<i>Androthrips melastomae</i>	<i>Cordia obliqua</i> Willd.	Java, India
<i>Aneurothrips priesneri</i>	<i>Cordia obliqua</i>	India
<i>Aneurothrips punctipennis</i>	<i>Cordia dichotoma</i> Forst.f. (= <i>Cordia suaveolens</i>)	Java
BURSERACEAE		
Undetermined species	undetermined gall	Singapore
CARYOPHYLLACEAE		
<i>Pachythrips subapterus</i>	<i>Stellaria media</i> Linn.	Europe
<i>Taeniothrips atratus</i>	<i>Stellaria graminea</i> Linn.	Europe
<i>Haplothrips cottei</i>	<i>Stellaria media</i> Linn.	Europe
	<i>Dianthus caryophyllus</i> Linn.	Senegal
CASUARINACEAE		
<i>Thaumatothrips froggatti</i> Karny	<i>Casuarina stricta</i>	Australia
CELASTRACEAE		
<i>Aeglothrips denticulus</i>	<i>Maytenus senegalensis</i> (Lam.) Excell.	India
<i>Alocothrips hadrocercus</i>	<i>Maytenus senegalensis</i> (Lam.) Excell.	India
<i>Liothrips gymnosporiae</i>	<i>Maytenus senegalensis</i> (Lam.) Excell.	Egypt
<i>Liothrips indicus</i>	<i>Maytenus</i> sp.	India
<i>Liothrips postocularis</i>	<i>Maytenus senegalensis</i> (Lam.) Excell.	Egypt
CHENOPODIACEAE		
<i>Haplothrips atriplicis</i>	<i>Atriplex halimus</i> Linn.	Jordan
COMBRETACEAE		
<i>Androthrips ramachandrai</i>	<i>Calycopteris floribundus</i> Lamk.	India, Thailand
<i>Austrothrips cochinchinensis</i>	<i>Calycopteris floribundus</i> Lamk.	India, Thailand
<i>Coryciodothrips inquilinus</i>	<i>Terminalia chebula</i> Retz.	India
<i>Dioxothrips onerosus</i>	<i>Terminalia chebula</i> Retz.	India
<i>Liothrips africanus</i>	<i>Gueira senegalensis</i> Lam.	Mali, Senegal, Gambia, Nigeria
<i>Liothrips interlocatus</i>	<i>Terminalia</i> sp.	India
<i>Senegathrips contini</i>	<i>Guiera senegalensis</i> Lam.	Senegal
<i>Vuilletia houardi</i>	<i>Gueira senegalensis</i> Lam.	Nigeria

SPECIES	HOST PLANT	DISTRIBUTION
COMPOSITAE		
<i>Adelphothrips tristis</i>	<i>Vernonia</i> sp.	Java
<i>Eurhynchothrips flavicornis</i>	<i>Microgyne macrophylla</i>	Sierra Leone
	<i>Vernonia arborea</i> Ham.	Java
<i>Liothrips rectaginis</i>	<i>Vernonia eleagnifolia</i>	Sierra Leone
<i>Taeniothrips frici</i>	<i>Leontodon autumnalis</i> Linn.	Europe
<i>Taeniothrips nigripilosus</i>	<i>Achillea millefolium</i> Linn.	Europe
CONVOLVULACEAE		
<i>Liophlaeothrips curtus</i>	<i>Argyreia</i> sp.	India
DIPSACEAE		
<i>Taeniothrips vulgatissimus</i>	<i>Krantia arvensis</i> Coult.	Europe
DIPTEROCARPACEAE		
<i>Coryphothrips trochiceps</i>	<i>Dipterocarpus alatus</i> Roxb.	Java
<i>Cryptothrips pusillus</i>	<i>Dipterocarpus crinitus</i> Dyer.	Java
EBENACEAE		
<i>Sphingothrips trachypogon</i>	<i>Diospyros maritima</i> Bl.	Java, India
<i>Synergothrips prolatus</i>	<i>Diospyros maritima</i> Bl.	Java, India
ELAEOCARPACEAE		
<i>Phasmothrips asparatus</i>	<i>Sloanea javanica</i> (Miq.) Szysz. ex. K. Schum.	Java
<i>Syringothrips gallicola</i>	<i>Sloanea sigum</i> (Bl.) K. Schum.	Java
EUPHORBIACEAE		
<i>Anaphothrips euphorbiae</i>	<i>Euphorbia cyparissia</i> Linn.	Europe
	<i>Euphorbia amygdaloides</i> Linn.	Europe
<i>Androthrips flavipes</i>	<i>Euphorbia virgata</i> Naldst. et Kit.	Europe
	<i>Mallotus philippinensis</i> (Lamk.) Muell. Arg.	India
<i>Dolichothrips longicollis</i>	<i>Hemicyclia serrata</i> J. J. Smith	
	<i>Macaranga tanarius</i> Muell. Arg.	Java
<i>Eothrips laticauda</i>	<i>Mallotus philippinensis</i>	Thailand
<i>Haplothrips euphorbiae</i>	<i>Euphorbia hirta</i> Linn.	Sumatra, India
<i>Liothrips brevitubus</i>	<i>Mallotus repandus</i> Muell.	India, Taiwan, Java
<i>Liothrips bosei</i>	<i>Mallotus philippinensis</i>	India
<i>Liothrips extensivus</i>	<i>Mallotus philippinensis</i>	India
<i>Liothrips flavitibia</i>	<i>Mallotus philippinensis</i>	India
<i>Liothrips interlocatus</i>	<i>Macaranga</i> sp.	India
<i>Liothrips malabaricus</i>	<i>Macaranga</i> sp.	India
<i>Liothrips mucronis</i>	<i>Mallotus philippinensis</i>	India
<i>Liothrips trybomi</i>	<i>Aporosa microcalyx</i> Hassk.	Java
Undetermined	<i>Aporosa benthamiana</i> Hk. f.	Singapore
<i>Paramesothrips mendax</i>	<i>Mallotus philippinensis</i>	Indochina
<i>Rhynchothrips raoensis</i>	<i>Mallotus philippinensis</i>	India
<i>Sumatrothrips filiceps</i>	<i>Mallotus philippinensis</i>	Sumatra
FLAGELLARIACEAE		
<i>Eugynothrips susicola</i>	<i>Susum anthelminticum</i> Bl.	Java
GESNERIACEAE		
<i>Empresmothrips fallax</i>	<i>Erythraea australis</i> R. Br.	Australia
GNETACEAE		
<i>Androthrips melastomae</i>	<i>Gnetum latifolium</i> Bl.	Java
<i>Dolerothrips gneticola</i>	<i>Gnetum latifolium</i> Bl.	Java
<i>Gynaikothrips convolvens</i>	<i>Gnetum latifolium</i> Bl.	Java
<i>Liothrips adusticornis</i>	<i>Gnetum latifolium</i> Bl.	Java
<i>Mesothrips latifolii</i>	<i>Gnetum latifolium</i> Bl.	Java

SPECIES	HOST PLANT	DISTRIBUTION
GUTTIFERAE		
<i>Eurhynchothrips messuicola</i>	<i>Mesua ferrea</i> Linn.	Malaya
HIPPOCRATACEAE		
<i>Liothrips claripennis</i>	<i>Salacia oblongifolia</i> Bl.	Java
<i>Smeringothrips salaciae</i>	<i>Salacia oblongifolia</i> Bl.	Sumatra
LAURACEAE		
<i>Kochummania excelsa</i>	<i>Litsea</i> sp.	India
<i>Liothrips strigosus</i>	<i>Cinnamomum</i> sp.	India
<i>Liothrips tristis</i>	<i>Litsea chinensis</i> Lamk.	Java
Undetermined	<i>Endiandra</i> sp.	Singapore
LILIACEAE		
<i>Dolerothrips gemmiperda</i>	<i>Dracaena elliptica</i> Thunb.	Java
<i>Euoplothrips bagnalli</i>	<i>Smilax</i> sp.	Australia
<i>Euoplothrips australis</i>	<i>Smilax</i> sp.	Australia
<i>Euoplothrips crassipes</i>	<i>Smilax australis</i> R. Br.	Australia
<i>Eugynothrips intorquens</i>	<i>Smilax australis</i> R. Br.	Australia
<i>Eugynothrips intorquens smilacinus</i>	<i>Smilax</i> sp.	Java, Sumatra, Taiwan
<i>Liothrips kuwanii</i>	<i>Smilax</i> sp.	Taiwan
<i>Liothrips liliaceae</i>	<i>Smilax</i> sp.	Taiwan
LOGANIACEAE		
<i>Liothrips comparandus</i>	<i>Fagraea fastigata</i> Bl.	Java
<i>Liothrips fagraeae</i>	<i>Fagraea litoralis</i>	Java
<i>Liothrips litoralis</i>	<i>Fagraea ceilanica</i> Thunb. (= <i>Fagraea obovata</i> Wall.)	Java
LORANTHACEAE		
<i>Dolichothrips annulicornis</i>	<i>Loranthus praelongus</i> Bl.	Java
<i>Liothrips loranthe</i>	<i>Loranthus schultessi</i> Bl.	Sumatra
<i>Liothrips spectabilis</i>	<i>Loranthus</i> sp.	India
<i>Mesothrips crassicornis</i>	<i>Loranthus pentandrus</i> Linn.	Java
<i>Phorinothrips loranthe</i>	<i>Loranthus elasticus</i>	India
<i>Phorinothrips minusculus</i>	<i>Loranthus</i> sp.	India
MELASTOMACEAE		
<i>Byctothrips ayyari</i>	<i>Memecylon lushingtoni</i> Gamble	India
<i>Crotonothrips coorgensis</i>	<i>Memecylon</i> sp.	India
<i>Crotonothrips dantahasta</i>	<i>Memecylon edule</i>	India
<i>Crotonothrips dissimilis</i>	<i>Memecylon</i> sp.	India
<i>Crotonothrips memecylonicus</i>	<i>Memecylon</i> sp.	India
<i>Crotonothrips cracens</i>	<i>Memecylon</i> sp.	India
<i>Gynaikothrips leeuweni</i>	<i>Melastoma malabathricum</i> Linn.	Thailand, Indochina
<i>Liothrips cognatus</i>	<i>Medinella horsefieldii</i> Miq.	Java
	<i>Medinella laurifolia</i> (Bl.) Bl.	Java
	<i>Medinella verrucosa</i> (Bl.) Bl.	Java
<i>Mesothrips ustulatus</i>	<i>Memecylon</i> sp.	Thailand, Indochina
MELIACEAE		
<i>Psenothrips priesneri</i>	<i>Walsura piscida</i> Roxb.	India
MIMOSAE		
<i>Acaciothrips ebneri</i>	<i>Acacia nilotica</i> (Linn.) De.	Egypt
<i>Cryptothrips shavianus</i>	<i>Acacia linearis</i> Sims.	Australia
<i>Csirothrips watsoni</i>	<i>Acacia aneura</i> Muell.	Australia
<i>Dactylothrips priscus</i>	<i>Acacia</i> sp.	Australia
<i>Dactylothrips tasmani</i>	<i>Acacia mearnsii</i> De Wild	Australia
<i>Gryptothrips mantis</i>	<i>Acacia pendula</i> A. Cunn. ex G. Don	Australia

SPECIES	HOST PLANT	DISTRIBUTION
<i>Gynaikothrips lividicornis</i>	<i>Pithecellobium dulce</i> (Roxb.) Benth.	Java
<i>Katothrips hyrum</i>	<i>Acacia</i> sp.	Australia
<i>Katothrips pendulae</i>	<i>Acacia pendula</i> A. Cunn. ex D. Don	Australia
<i>Katothrips yamma</i>	<i>Acacia cambagei</i> R.T. Baker	Australia
<i>Kellyia hoodianus</i>	<i>Acacia elata</i> Cunn. ex. Benth.	Australia
<i>Kladothrips acaciae</i>	<i>Acacia harpophylla</i> F. Muell.	Australia
<i>Kladothrips augonsaxos</i>	<i>Acacia doratoxylon</i> A. Cunn.	Australia
<i>Kladothrips ellobus</i>	<i>Acacia cambagei</i> R.T. Baker	Australia
<i>Kladothrips rugosus</i>	<i>Acacia pendula</i> A. Cunn. ex. G.Dm	Australia
<i>Koptothrips dyskritus</i>	<i>Acacia pendula</i> A. Cunn. ex. G.Dm	
	<i>Acacia oswaldii</i> F. Muell.	Australia
<i>Koptothrips flavicornis</i>	<i>Acacia oswaldii</i> F. Muell	
	<i>A. pendula</i> A. Cunn. ex. D. Don	Australia
<i>Koptothrips xelus</i>	<i>Acacia harpophylla</i> F. Muell.	Australia
<i>Koptothrips xenus</i>	<i>Acacia cambagei</i> R.T. Baker	Australia
<i>Liophlaeothrips acaciae</i>	<i>Acacia nilotica</i> (Linn.) Del.	Egypt
<i>Liothrips willcocksi</i>	<i>Acacia nilotica</i>	Egypt
<i>Oncothrips antennatus</i>	<i>Acacia aneura</i> Muell.	Australia
<i>Oncothrips habrus</i>	<i>Acacia pendula</i> F. Muell. ex G.Don.	Australia
<i>Oncothrips rodwayi</i>	<i>Acacia melanoxylon</i> Br.	Australia
<i>Oncothrips tepperi</i>	<i>Acacia oswaldi</i> F. Muell.	Australia
	<i>Acacia homalophylla</i> A. Cunn. ex. G. Don.	
	<i>Acacia pendula</i> A. Cunn. ex. G. Don.	
<i>Oncothrips tepperi</i>	<i>Acacia aneura</i> Muell.	Australia
	<i>Acacia brachystachya</i> Benth.	
<i>Teuchothrips pithecolobii</i>	<i>Pithecolobium dulce</i> (Roxb.) Benth.	Mexico
<i>Thilakothrips babuli</i>	<i>Acacia leucophloaea</i> (Roxb.) Wild.	India
<i>Warithrips acaciae</i>	<i>Acacia doratoxylon</i> A. Cunn.	Australia

MORACEAE

<i>Aliothrips elegantulus</i>	<i>Ficus recurva</i> Bl.	Java
<i>Androthrips flavipes</i>	<i>Ficus benjamina</i> Linn.	India
<i>Arrhenothrips dhumrapaksha</i>	<i>Ficus retusa</i> Linn.	India
<i>Cercothrips afer</i>	<i>Ficus</i> sp.	Egypt
<i>Chelaeothrips idoliceps</i>	<i>Ficus</i> sp.	Fiji
<i>Crotonothrips dhigavadana</i>	<i>Ficus</i> sp.	India
<i>Dimorphothrips idoliceps</i>	<i>Ficus</i> sp.	Samoa
<i>Dimorphothrips microchaetus</i>	<i>Ficus</i> sp.	Samoa
<i>Dimorphothrips solitus</i>	<i>Ficus</i> sp.	Samoa
<i>Euoplothrips bagnalli</i>	<i>Ficus</i> sp.	N. Australia
<i>Euoplothrips buxtoni</i>	<i>Ficus</i> sp.	Tonga
<i>Euoplothrips incognitus</i>	<i>Ficus</i> sp.	Tonga
<i>Euoplothrips uncinatus</i>	<i>Ficus</i> sp.	Samoa
<i>Gynaikothrips australis</i>	<i>Ficus macrophylla</i> Desf.	Australia
<i>Gynaikothrips bengalensis</i>	<i>Ficus bengalensis</i> Linn.	India
<i>Gynaikothrips edentatus</i>	<i>Ficus</i> sp.	Sumatra
<i>Gynaikothrips ficorum</i>	<i>Ficus nitida</i> Thunb.	
	<i>Ficus retusa</i> Linn.	Cosmopolitan
<i>Gynaikothrips ficus</i>	<i>Ficus</i> sp.	South Africa
<i>Gynaikothrips hopkinsoni</i>	<i>Ficus</i> sp.	Samoa
<i>Gynaikothrips hystrix</i>	<i>Ficus</i> sp.	Tonga
<i>Gynaikothrips imitans</i>	<i>Ficus cuspidata</i> Reinw.	Java
<i>Gynaikothrips insulsus</i>	<i>Ficus retusa</i> Linn.	Taiwan
<i>Gynaikothrips longiceps</i>	<i>Ficus benjamina</i> Linn.	Thailand and Indochina
<i>Gynaikothrips malabaricus</i>	<i>Ficus bengalensis</i> Linn.	India
<i>Gynaikothrips microchaetus</i>	<i>Ficus</i> sp.	Sumatra
<i>Gynaikothrips retusae</i>	<i>Ficus</i> sp.	Sumatra
<i>Gynaikothrips simulator</i>	<i>Ficus</i> sp.	Sumatra
<i>Gynaikothrips uzeli</i>	<i>Ficus retusa</i> Linn.	
	<i>Ficus benjamina</i> Linn.	Cosmopolitan
<i>Gynaikothrips victor</i>	<i>Ficus</i> sp.	Sumatra
<i>Haplothrips aculeatus</i>	<i>Ficus benjamina</i> Linn.	Java
<i>Liothrips cuspidatae</i>	<i>Ficus cuspidata</i> Reinw.	Sumatra

SPECIES	HOST PLANT	DISTRIBUTION
<i>Liothrips hradcensis</i>	<i>Ficus</i> sp.	India
<i>Liothrips longicornis</i>	<i>Ficus punctata</i> Thumb.	Java
<i>Liothrips takahashii</i>	<i>Ficus retusa</i> Linn.	India
<i>Mesandrothrips inquilinus</i>	<i>Ficus retusa</i> Linn.	India
<i>Mesothrips apatelus</i>	<i>Ficus retusa</i> Linn.	India
<i>Mesothrips bhimabahu</i>	<i>Ficus bengalensis</i> Linn.	India
<i>Mesothrips constrictus</i>	<i>Ficus benjamina</i> Linn.	Thailand and Indochina
	<i>Ficus retusa</i> Linn.	Java
<i>Mesothrips parvus</i>	<i>Ficus pilosa</i> Reinw.	India and Java
<i>Mesothrips jordani</i>	<i>Ficus bengalensis</i> Linn.	
MONIMIACEAE		
<i>Xiphidothrips tambourissae</i>	<i>Tambourissa</i> sp.	Mauritius
MYRSINACEAE		
<i>Eugynothrips manubrialis</i>	<i>Ardisia javanica</i> Bl.	Sumatra
<i>Engynothrips umbricornis</i>	<i>Ardisia javanica</i> Bl.	Java
<i>Liothrips cognatus</i>	<i>Ardisia javanica</i> Bl.	Sumatra
<i>Liothrips dux</i>	<i>Ardisia</i> sp.	Sumatra
<i>Liothrips latro</i>	<i>Ardisia</i> sp.	Java
<i>Mesothrips breviceps</i>	<i>Ardisia cymosa</i> Bl.	Java, Malaya
MYRTACEAE		
<i>Androthrips melastomae</i>	<i>Polyantha</i> sp.	Java, India
<i>Empresmothrips folii</i>	<i>Tristarria</i> sp.	Australia
<i>Gynaikothrips lividicornis</i>	<i>Rhodamnia cineria</i> Jack.	Indochina
<i>Leeuwenia gladiatrix</i>	<i>Eugenia</i> sp.	Java
<i>Leeuwenia pasanii</i>	<i>Eugenia</i> sp.	Japan
<i>Leeuwenia vorax</i>	<i>Eugenia</i> sp.	India
<i>Liothrips aequilus</i>	<i>Eugenia</i> sp.	India
<i>Liothrips daetymon</i>	<i>Eugenia polyantha</i> Wt.	Saigon
<i>Liothrips eugeniae</i>	<i>Eugenia</i> sp.	India
<i>Liothrips inquilinus</i>	<i>Eugenia</i> sp.	India
<i>Liothrips kannani</i>	<i>Eugenia</i> sp.	
<i>Liothrips melaleucae</i>	<i>Melaleuca leucadendron</i> Linn.	Australia
<i>Liothrips nigripes</i>	<i>Melaleuca tenuicuspis</i>	Java
<i>Mallothrips indicus</i>	<i>Syzigium cuminum</i> (Linn.) Skeels	India
<i>Mesothrips pyctes</i>	<i>Eugenia</i> sp.	Java
<i>Mixothrips craighedi</i>	<i>Eugenia axillaris</i> Vell	Brazil, S. America,
	<i>Myrcia</i> sp.	Brazil
<i>Teuchothrips minor</i>	<i>Melaleuca</i> sp.	Australia
<i>Teuchothrips sodalis</i>	<i>Melaleuca</i> sp.	Australia
OLEACEAE		
<i>Androthrips flavipes</i>	<i>Linociera</i> sp.	India
<i>Eothrips coimbatorensis</i>	<i>Jasminum multiflorum</i> . (Burm. f.) T. Anders.	India
	<i>Jasminum pubescens</i> Brildd.)	
<i>Liothrips nanus</i>	<i>Jasminum</i> sp.	India
<i>Mesothrips jasmini</i>	<i>Jasminum multiflorum</i>	Java
<i>Mesicothrips plicans</i>	<i>Linociera</i> sp.	India
PAPILIONACEAE		
<i>Cryptothrips fuscipennis</i>	<i>Spatholobus littoralis</i> Hassk.	Java
<i>Taeniothrips firmus</i>	<i>Vicia cracea</i> Benth.	
	<i>Vicia tenuifolia</i> Ben Roth.	Europe
<i>Taeniothrips basicornis</i>	<i>Lathyrus pratensis</i> Linn.	Europe
	<i>Coronilla varia</i> Linn.	
PINACEAE		
<i>Taeniothrips lancivorus</i>	<i>Larix decidua</i>	Europe
<i>Taeniothrips pini</i>	<i>Pinus sylvestris</i> Linn.	Europe
	<i>Pinus pumilio</i> Haenke	

SPECIES	HOST PLANT	DISTRIBUTION
PIPERACEAE		
<i>Androthrips flavipes</i>	<i>Piper</i> sp.	India, Java
<i>Androthrips melastomae</i>	<i>Piper</i> sp.	India, Java
<i>Karnyothrips fuscipennis</i>	<i>Piper</i> sp.	Taiwan
<i>Liothrips acuminatus</i>	<i>Piper</i> sp.	Java
<i>Liothrips baccati</i>	<i>Piper baccatum</i> Bl.	Java
<i>Liothrips aemulans</i>	<i>Piper arcuatum</i> Bl.	Java
<i>Liothrips ater</i>	<i>Piper</i> sp.	India
<i>Liothrips chaviceae</i>	<i>Chavica densa</i> Miq.	
	<i>Piper arcuatum</i> Bl.	Java
	<i>Piper retrofractum</i> Vahl.	
<i>Liothrips crassipes</i>	<i>Piper nigrum</i> Linn.	Java
	<i>Piper betle</i> Linn.	Sumatra
<i>Liothrips confusus</i>	<i>Piper</i> sp.	Java
<i>Liothrips exiguus</i>	<i>Piper</i> sp.	Java
<i>Liothrips exiguus falsus</i>	<i>Piper</i> sp.	Java
<i>Liothrips fumicornis</i>	<i>Piper</i> sp.	Java
<i>Liothrips insidiosus</i>	<i>Piper</i> sp.	Java
<i>Liothrips karnyi</i>	<i>Piper nigrum</i> Linn.	India
<i>Liothrips longiceps</i>	<i>Piper</i> sp.	Java
<i>Liothrips miniati</i>	<i>Piper miniatum</i> Bl.	Java
<i>Liothrips mirabilis</i>	<i>Piper</i> sp.	Sri Lanka
<i>Liothrips kuwanii</i>	<i>Piper futokadsura</i> Sieb.	Taiwan
	<i>Piper recurvum</i> Bl.	
	<i>Piper muricatum</i> Bl.	Java
<i>Liothrips pallipes</i>	<i>Piper betle</i> Linn.	Celebes
	<i>Piper nigrum</i> Linn.	W. Borneo
	<i>Piper retrofractum</i> Vahl.	Java
	<i>Piper sarmentosum</i> Roxb. ex. Hunter	India
<i>Liothrips piperinus</i>	<i>Piper futokadsura</i> Sieb.	Taiwan
<i>Liothrips retrofracti</i>	<i>Piper retrofractum</i> Vahl.	Java
<i>Liothrips sarmentosi</i>	<i>Piper sarmentosum</i> Roxb. ex. Hunter	Java
<i>Liothrips reynvaanae</i>	<i>Piper</i> sp.	Java
<i>Liothrips tibialis</i>	<i>Piper</i> sp.	India
<i>Liothrips variabilis</i>	<i>Piper</i> sp.	India
<i>Teuchothrips brevis</i>	<i>Piper</i> sp.	Sri Lanka
POLYPODIACEAE		
<i>Pteridothrips pteridicola</i>	<i>Polypodium pteropus</i> Bl.	Java
POLYGONACEAE		
Undetermined	<i>Polygonum convolvulus</i> Linn.	Java
PITTOSPORACEAE		
<i>Neocecidothrips bursariae</i>	<i>Bursaria</i> sp.	Australia
<i>Teuchothrips bursariicola</i>	<i>Bursaria spinosa</i> Car.	Australia
PROTEACEAE		
<i>Onychothrips hakeae</i>	<i>Hakea</i> sp.	Australia
RUBIACEAE		
<i>Gynaikothrips leeuweni</i>	<i>Pavetta indica</i> Linn.	Java
<i>Liothrips mirabilis</i>	<i>Pavetta hispidula</i> Linn.	Sri Lanka
<i>Liothrips oculatus</i>	<i>Lasianthus purpureus</i> Bl.	Java
<i>Liophlaeothrips cecidii</i>	<i>Morinda</i> sp.	India
<i>Liophlaeothrips pavettae</i>	<i>Pavetta</i> sp.	India
<i>Liophlaeothrips segnis</i>	undetermined	India
<i>Teuchothrips longus</i>	<i>Pavetta hispidula</i> Linn.	India
	<i>Randia</i> sp.	Australia

SPECIES	HOST PLANT	DISTRIBUTION
RUTACEAE		
<i>Choleothrips geijerae</i>	<i>Geijera parviflora</i> Lind.	Australia
<i>Choleothrips percus</i>	<i>Geijera parviflora</i> Lind.	
<i>Moultonides geijerae</i>	<i>Geijera parviflora</i> Lind.	
<i>Sacothrips bicolor</i>	<i>Geijera parviflora</i> Lind.	
<i>Sacothrips catheter</i>	<i>Geijera parviflora</i> Lind.	
<i>Sacothrips corycidis</i>	<i>Geijera parviflora</i> Lind.	
<i>Sacothrips milvus</i>	<i>Geijera parviflora</i> Lind.	
<i>Sacothrips ingens</i>	<i>Geijera parviflora</i> Lind.	
<i>Sacothrips galbus</i>	<i>Geijera parviflora</i> Lind.	
<i>Teuchothrips bursariicola</i>	<i>Geijera parviflora</i> Lind.	
RHAMNACEAE		
<i>Schedothrips orientalis</i>	<i>Ventilago maderasapatana</i>	India
<i>Schedothrips tumidus</i>	<i>Ventilago maderasapatana</i>	India
<i>Dolicholepta inquilinus</i>	<i>Zizyphus</i> sp.	India
SALICACEAE		
Undetermined	<i>Salix</i> sp.	Europe
SAMYDACEAE		
<i>Gynaikothrips flaviantennatus</i>	<i>Casearia tomentosa</i> Roxb.	India
<i>Mesandrothrips inquilinus</i>	<i>Casearia tomentosa</i> Roxb.	India
<i>Androthrips flavipes</i>	<i>Casearia tomentosa</i> Roxb.	India
SANTALACEAE		
<i>Crotonothrips davidi</i>	<i>Santalum album</i> Linn.	India
<i>Mesothrips manii</i>	<i>Santalum album</i> Linn.	India
SAPOTACEAE		
<i>Arrhenothrips acuminatus</i>	<i>Mimusops</i> sp.	India
<i>Arrhenothrips ramakrishnae</i>	<i>Mimusops elengi</i> Linn.	India
<i>Liophlaeothrips vichitravarna</i>	<i>Mimusops elengi</i> Linn.	India
<i>Androthrips flavipes</i>	<i>Mimusops elengi</i> Linn.	India
SAXIFRAGACEAE		
<i>Liothrips polyosminus</i>	<i>Polyosma ilicifolia</i> Bl.	Java
SCROPHULARIACEAE		
<i>Haplothrips aculeatus</i>	<i>Veronica chamaedrys</i> Linn.	Europe
	<i>Veronica longifolia</i> Linn.	
SIMARUBACEAE		
<i>Liothrips willcocksi</i>	<i>Balanites aegyptiaca</i> Wall.	Egypt
<i>Megeugynothrips efflatouni</i>	<i>Balanites aegyptiaca</i> Wall.	Egypt
SYMPLOCACEAE		
<i>Gynaikothrips adusticornis</i>	unknown	Thailand and Indochina
<i>Gynaikothrips efflatouni</i>	<i>Symplocos</i> sp.	
TERNSTROEMIACEAE		
<i>Dolerothrips atavus</i>	<i>Eurya japonica</i> Thunb.	Java
<i>Rhamphothrips fasciatus</i>	<i>Eurya japonica</i> Thunb.	Java
<i>Euthrips euryae</i>	<i>Eurya japonica</i> Thunb.	Java
TILIACEAE		
<i>Dolichothrips laticauda</i>	<i>Schoutenia ovata</i> Korth.	Java
<i>Eothrips schouteniae</i>	<i>Schoutenia ovata</i> Korth.	Java
<i>Mesothrips schouteniae</i>	<i>Schoutenia ovata</i> Korth.	Java, Thailand
<i>Mesothrips constrictus</i>	<i>Schoutenia ovata</i> Korth.	Java

SPECIES	HOST PLANT	DISTRIBUTION
URTICACEAE		
<i>Eugynothrips conocephali</i>	<i>Conocephalus suaveolens</i> Bl.	Java
<i>Eugynothrips persimilis</i>	<i>Conocephalus suaveolens</i> Bl.	
<i>Cryptothrips biuncinatus</i>	<i>Conocephalus suaveolens</i> Bl.	
<i>Eugynothrips sumatranus</i>	<i>Conocephalus</i> sp.	Sumatra
<i>Cryptothrips bursarius</i>	<i>Conocephalus suaveolens</i> Bl.	Java
<i>Liophlaeothrips ablusus</i>	unidentified	India
<i>Liothrips assimilaris</i>	<i>Elatostemma</i> sp.	Sumatra
<i>Liothrips collustratus</i>	<i>Elatostemma strigosum</i> (Bl.) Hassk.	Java
<i>Liothrips devriesi</i>	<i>Elatostemma integrifolium</i> (D. Don) Wedd.	Java
	(= <i>Elatostemma sesquifolium</i> Hass.)	
<i>Liothrips ingratus</i>	<i>Elatostemma</i> sp.	Sumatra
<i>Liothrips kolliensis</i>	unidentified	India
<i>Liothrips nervisequus</i>	<i>Conocephalus suaveolens</i> Bl.	Java
<i>Liothrips racemosae</i>	<i>Conocephalus suaveolens</i> Bl.	
<i>Liothrips taurus</i>	<i>Conocephalus suaveolens</i> Bl.	
<i>Mesothrips leeuweni</i>	<i>Conocephalus naucleiformis</i> Lindl.	Java
<i>Androthrips ochraceus</i>	<i>Conocephalus</i> sp.	Java
VERBENACEAE		
Undetermined	<i>Vitex heterophylla</i>	—
VITACEAE		
<i>Cryptothrips pachypterus</i>	<i>Tetrastigma papillosum</i> (Bl.) Planch.	Java
<i>Gynaikothrips vitivorus</i>	<i>Vitis shifunensis</i> Hayaba	Taiwan
<i>Gynaikothrips simillimus</i>	<i>Tetrastigma dichotomum</i> (Bl.) Planch (= <i>Vitis pergamacea</i> (Bl.) Miq.)	Java
<i>Liothrips extractus</i>	<i>Tetrastigma lanceolarium</i> (Roxb.) Planch.	Celebes
<i>Liothrips pallicrus</i>	<i>Tetrastigma lanceolarium</i> (Roxb.) Planch.	Sumatra, India
<i>Liothrips simillimus</i>	<i>Tetrastigma pergamaceum</i> (Bl.) Planch.	Java
<i>Liothrips tetrastigmae</i>	<i>Tetrastigma mutabile</i> (Bl.) Planch.	Java
<i>Liothrips viticola</i>	<i>Tetrastigma lanceolarium</i> (Roxb.) Planch.	Java, India
<i>Mesothrips picticornis</i>	<i>Tetrastigma lanceolarium</i> (Roxb.) Planch.	Java
<i>Mesandrothrips inquilinus</i>	<i>Vitis shifunensis</i> Hayata.	Taiwan

ALPHABETICAL INDEX OF HOST PLANT—GALL THRIPS SPECIES

HOST PLANT	THRIPS SPECIES
<i>Acacia aneura</i> Muell	<i>Csirothrips watsoni</i> <i>Oncothrips antennatus</i> <i>Oncothrips arotum</i> <i>Onychothrips tepperi</i> <i>Liothrips willcocksii</i>
<i>Acacia nilotica</i> (Linn.) Del. (= <i>Acacia arabica</i> (Lamk.) Willd.)	
<i>Acacia brachystachya</i> Benth	<i>Onychothrips tepperi</i>
<i>Acacia cambagei</i>	<i>Koptothrips xenus</i> <i>Katothrips yamma</i> <i>Kladothrips ellobus</i> <i>Rhopalothripoides brunneus</i> <i>Kladothrips augonsaxos</i> <i>Warithrips acaciae</i> <i>Kellyia hoodianus</i>
<i>Acacia dealbata</i> Link	
<i>Acacia doratoxylon</i> Meissn.	
<i>Acacia elata</i> Cunn. ex Benth.	

HOST PLANT	THRIPS SPECIES
<i>Acacia harpophylla</i> Muell.	<i>Kladothrips acaciae</i> <i>Koptothrips zelus</i> <i>Oncothrips tepperi</i> <i>Thilakothrips babuli</i> <i>Dactylothrips tasmani</i> <i>Liophlaeothrips acaciae</i> <i>Acathothrips ebneri</i> <i>Koptothrips dyskritus</i> <i>Koptothrips flavicornis</i> <i>Oncothrips tepperi</i> <i>Koptothrips pendulae</i> <i>Koptothrips dyskritus</i> <i>Koptothrips flavicornis</i> <i>Oncothrips habrus</i> <i>Oncothrips tepperi</i> <i>Taeniothrips nigripilosus</i> <i>Lygothrips jambuvasi</i> undetermined thrips <i>Liothrips trybomi</i> <i>Mesothrips breviceps</i> <i>Egynothrips manubrialis</i> <i>Eugynothrips umbricornis</i> <i>Liothrips cognatus</i> <i>Liothrips dux</i> <i>Liothrips latro</i> <i>Haplothrips atriplicis</i>
<i>Acacia homalophylla</i> Cunn. <i>Acacia leucophloea</i> (Roxb.) Willd. <i>Acacia mearnsii</i> <i>Acacia nilotica</i> Delile	
<i>Acacia oswaldii</i> Muell	
<i>Acacia pendula</i> Cunn.	
<i>Achillea millifolium</i> Linn. <i>Anogeissus</i> sp. <i>Aporosa benthamina</i> Hk.f. <i>Aporosa microcalyx</i> Hassk <i>Ardisia cymosa</i> Blatt. <i>Ardisia javana</i> A.Dc.	
<i>Ardisia</i> sp.	
<i>Atriplex halimus</i> Linn. *	
<i>Balanites aegyptiaca</i> Wall.	<i>Megeugynothrips effloutoni</i> <i>Liothrips willcocksi</i> <i>Gigantothrips seshadrii</i> <i>Neocecidothrips bursariae</i> <i>Teuchothrips bursariicola</i>
<i>Barringtonia speciosa</i> Linn. <i>Bursaria</i> sp. <i>Bursaria spinosa</i> Cav.lc.	
<i>Calycopteris floribundus</i> Lam.	<i>Androthrips ramachandrai</i> <i>Austrothrips cochinchinensis</i> <i>Androthrips flavipes</i> <i>Gynaikothrips flaviantennatus</i> <i>Rhynchothrips annulosus</i> <i>Thaumatothrips froggatti</i> <i>Liothrips strigosus</i> <i>Hoplothrips</i> (<i>Odoplothrips</i>) <i>cleistanthi</i> <i>Eugynothrips sumatranus</i> <i>Androthrips ochraceus</i> <i>Cryptothrips bursarius</i> <i>Cryptothrips binucinatus</i> <i>Eugynothrips conocephali</i> <i>Eugynothrips persimilis</i> <i>Liothrips fumipennis</i> <i>Liothrips nervisequus</i> <i>Liothrips racemosae</i> <i>Liothrips taurus</i> <i>Aneurothrips priesneri</i> <i>Androthrips melastomae</i> <i>Aneurothrips punctipennis</i> <i>Androthrips melastomae</i>
<i>Casearia tomentosa</i> Roxb.	
<i>Cassinia aculeata</i> Cunn. <i>Casuarina stricta</i> Miq. <i>Cinnamomum</i> sp. <i>Cleistathus</i> sp. <i>Conocephalus</i> sp. <i>Conocephalus suaveolens</i> Blume	
<i>Cordia obliqua</i> Willd.	
<i>Cordia suaveolens</i> Blume	
<i>Dianthus caryophylloides</i> Schult. <i>Diospyros maritima</i> Blume	<i>Haplothrips cottei</i> <i>Sphingothrips trachypogon</i> <i>Synergothrips prolatus</i> <i>Coryphothrips trochiceps</i> <i>Cryptothrips pusillus</i> <i>Dolerothrips gemmipeda</i> <i>Liothrips assimilans</i> <i>Liothrips ingratus</i> <i>Liothrips devriesi</i> <i>Liothrips collustratus</i>
<i>Dipterocarpus alatus</i> Roxb. <i>Dipterocarpus crinitis</i> Dyer <i>Dracaena elliptica</i> Thumb. <i>Elatostemma</i> sp.	
<i>Elatostemma sesquifolium</i> Hassk. <i>Elatostemma strigosum</i> Hassk.	

HOST PLANT	THRIPS SPECIES
<i>Endiandra</i> sp.	undetermined thrips
<i>Erythraea australis</i> R.	<i>Empresmothrips fallax</i>
<i>Eugenia axillaris</i> Willd.	<i>Mixothrips craigheadi</i>
<i>Eugenia polyantha</i> Wight	<i>Leeuwenia gladiatrix</i>
	<i>Liothrips daetymon</i>
<i>Eugenia tenuis</i> Duthie	<i>Mesothrips pyctus</i>
	<i>Liothrips nigripes</i>
<i>Eugenia</i> sp.	<i>Leeuwenia pasanii</i>
	<i>Liothrips aequilus</i>
	<i>Liothrips inquilinus</i>
	<i>Liothrips eugeniae</i>
	<i>Liothrips kannani</i>
<i>Euphorbia hirta</i> Linn.	<i>Haplothrips euphorbiae</i>
<i>Euphorbia amygdaloides</i> Linn.	<i>Anaphothrips euphorbiae</i>
<i>Euphorbia cyparissus</i>	<i>Anaphothrips euphorbiae</i>
<i>Euphorbia virgata</i> L.	<i>Anaphothrips euphorbiae</i>
<i>Eurya japonica</i> Thumb.	<i>Dolerothrips atavus</i>
	<i>Euthrips euryae</i>
	<i>Rhamphothrips fasciatus</i>
<i>Fagraea fastigiata</i> Blume	<i>Liothrips comparandus</i>
<i>Fagraea litoralis</i> Bhume	<i>Liothrips litoralis</i>
<i>Fagraea obovata</i> Wall	<i>Liothrips fagraeae</i>
<i>Ficus bengalensis</i> Linn.	<i>Gynaikothrips bengalensis</i>
	<i>Gynaikothrips malabaricus</i>
	<i>Gigantothrips elegans</i>
	<i>Mesothrips bhimabahu</i>
<i>Ficus benjamina</i> Linn.	<i>Gynaikothrips longiceps</i>
	<i>Haplothrips aculeatus</i>
	<i>Mesothrips constrictus</i>
<i>Ficus cuspidata</i> Reinw.	<i>Gynaikothrips imitans</i>
	<i>Liothrips cuspidatae</i>
<i>Ficus macrophylla</i> Roxb.	<i>Gynaikothrips australis</i>
<i>Ficus nitida</i> Thunb.	<i>Gynaikothrips ficorum</i>
<i>Ficus pilosa</i> Reinw.	<i>Mesothrips parvus</i>
<i>Ficus punctata</i> Thunb.	<i>Liothrips longicornis</i>
<i>Ficus recurva</i> Blatt.	<i>Aliothrips elegantulus</i>
<i>Ficus retusa</i> Linn.	<i>Androthrips flavipes</i>
	<i>Arrhenothrips dhumrapaksha</i>
	<i>Gynaikothrips ficorum</i>
	<i>Gynaikothrips insulsus</i>
	<i>Liothrips takahashii</i>
	<i>Gynaikothrips uzeli</i>
	<i>Mesothrips apatelus</i>
	<i>Mesothrips constrictus</i>
	<i>Mesandrothrips inquilinus</i>
<i>Ficus</i> sp.	<i>Dimorphothrips idoliceps</i>
	<i>Dimorphothrips microchaetus</i>
	<i>Dimorphothrips solitus</i>
	<i>Gynaikothrips edentatus</i>
	<i>Gynaikothrips ficus</i>
	<i>Gynaikothrips microchaetus</i>
	<i>Gynaikothrips retusae</i>
	<i>Gynaikothrips simulator</i>
	<i>Gynaikothrips hystrix</i>
	<i>Euoplothrips bagnalli</i>
	<i>Euoplothrips buxtoni</i>
	<i>Euoplothrips incognitus</i>
	<i>Liothrips habitator</i>
	<i>Liothrips hradeensis</i>
<i>Galium crucialba</i> (Linn.)	<i>Anaphothrips silvarum</i>
<i>Galium verum</i>	<i>Anaphothrips silvarum</i>

HOST PLANT	THRIPS SPECIES
<i>Geijera parviflora</i> Lindl.	<i>Chleothrips geijerae</i> <i>Chleothrips percnus</i> <i>Moultonides geijerae</i> <i>Sacothrips bicolor</i> <i>Sacothrips catheter</i> <i>Sacothrips corycidis</i> <i>Sacothrips milvus</i> <i>Sacothrips ingens</i> <i>Sacothrips galbus</i> <i>Teuchothrips bursariicola</i> <i>Dolerothrips secticornis</i> <i>Gynaikothrips convolvens</i> <i>Liothrips adusticornis</i> <i>Liothrips africanus</i> <i>Senegathrips contini</i> <i>Vuilletia houardi</i> <i>Liothrips gymnosporiae</i> <i>Liothrips postocularis</i> <i>Liothrips gynopogoni</i> <i>Taeniothrips antennatus</i>
<i>Gnetum latifolium</i> Parlat.	
<i>Guiera senegalensis</i> Lam.	
<i>Gymnosporia</i> sp. (= <i>Maytenus</i> sp.) <i>Gynopogon reinwardtii</i>	
<i>Hakea</i> sp. <i>Hemicyclia piaria</i> Wight & Arnold	<i>Onychothrips hakeae</i> <i>Dolichothrips longicollis</i> <i>Thlibothrips nigricaudus</i> <i>Eugynothrips coarctatus</i> <i>Eugynothrips tubifex</i> undetermined
<i>Homalomena aromatica</i> Schott.	
<i>Hymenodictyon</i> sp.	
<i>Jasminum pubescens</i> Willd.	<i>Eothrips coimbatorensis</i> <i>Mesothrips jasmini</i> <i>Liothrips nanus</i>
<i>Jasminum</i> sp.	
<i>Krantia arvensis</i> Coult.	<i>Taeniothrips vulgatissimus</i>
<i>Larix decidua</i> Mill. <i>Lasianthus purpureus</i> Blume <i>Linociera</i> sp.	<i>Taeniothrips laricivorus</i> <i>Liothrips oculatus</i> <i>Androthrips flavipes</i> <i>Mesicothrips plicans</i> <i>Liothrips tristis</i> <i>Kochummania excelsa</i> <i>Mesothrips crassicornis</i> <i>Dolichothrips annulicornis</i> <i>Liothrips loranhi</i> <i>Phorinothrips loranhi</i> <i>Phorinothrips minusculus</i>
<i>Litsaea chinensis</i> Lamk. <i>Litsea</i> sp. <i>Loranthus pentandrus</i> Linn. <i>Loranthus praelongus</i> Blume <i>Loranthus schultsii</i> Bl. <i>Loranthus</i> sp.	
<i>Macaranga tanarius</i> Muell. <i>Macaranga</i> sp.	<i>Dolichothrips longicollis</i> <i>Liothrips interolocatus</i> <i>Liothrips malabaricus</i> <i>Androthrips flavipes</i> <i>Eothrips laticauda</i> <i>Liothrips mucronis</i> <i>Liothrips flavitibia</i> <i>Liothrips bosei</i> <i>Mesothrips extensivus</i> <i>Mesothrips malloti</i> <i>Mesothrips mendax</i> <i>Rhynchothrips raoensis</i> <i>Sumatrothrips filiceps</i> <i>Liothrips brevitubus</i> <i>Aeglothrips denticulus</i> <i>Alocothrips hadrocerus</i> <i>Liothrips indicus</i> <i>Liothrips cognatus</i> <i>Liothrips cognatus</i> <i>Liothrips cognatus</i>
<i>Mallotus philippinensis</i> Muell.	
<i>Mallotus repandus</i> Muell. <i>Maytenus senegalensis</i>	
<i>Maytenus</i> sp. <i>Mediniella horsfieldii</i> Miq. <i>Mediniella laurifolia</i> Blume <i>Mediniella verrucosa</i> Blume	

HOST PLANT	THRIPS SPECIES
<i>Melaleuca leucadendron</i> Linn	<i>Liothrips melaleucae</i>
<i>Melaleuca</i> sp.	<i>Teuthothrips minor</i>
	<i>Teuthothrips sodalis</i>
<i>Melastoma malabathricum</i> Linn.	<i>Androthrips melastomae</i>
	<i>Haplothrips aculeatus</i>
	<i>Gynaikothrips leeuweni</i>
	<i>Liothrips chaviceae</i>
	<i>Liothrips longirostris</i>
	<i>Mesothrips longisetis</i>
	<i>Mesothrips jordani</i>
<i>Memecylon edule</i> Roxb.	<i>Androthrips flavipes</i>
<i>Memecylon lushingtoni</i>	<i>Crotonothrips dantahasta</i>
<i>Memecylon</i> sp.	<i>Byctothrips ayyari</i>
	<i>Crotonothrips coorgensis</i>
	<i>Crotonothrips dissimilis</i>
	<i>Crotonothrips memecylonicus</i>
<i>Messua ferrea</i> Linn.	<i>Eurhynchothrips messuicola</i>
<i>Microgyne macrophylla</i>	<i>Eurhynchothrips flavicornis</i>
<i>Mimusops</i> sp.	<i>Arrhenothrips acuminatus</i>
	<i>Arrhenothrips ramakrishnae</i>
	<i>Androthrips flavipes</i>
<i>Morinda</i> sp.	<i>Liophlaeothrips vichitravarna</i>
<i>Myrcia</i> sp.	<i>Liophlaeothrips cecidii</i>
	<i>Phasterothrips conducens</i>
<i>Pavetta hispidula</i> Hiern	<i>Liothrips mirabilis</i>
<i>Pavetta indica</i> Burm.	<i>Teuthothrips longus</i>
<i>Piper arcuatum</i> Blume	<i>Liophlaeothrips longus</i>
<i>Piper baccatum</i> Blume.	<i>Liothrips aemulens</i>
<i>Piper belle</i> Linn.	<i>Liothrips chaviceae</i>
	<i>Liothrips baccati</i>
	<i>Liothrips crassipes</i>
<i>Piper futokadsura</i> Sief.	<i>Liothrips pallipes</i>
	<i>Liothrips kuwani</i>
<i>Piper minatum</i> Blume	<i>Liothrips piperinus</i>
<i>Piper muricatum</i> Blume	<i>Liothrips miniati</i>
<i>Piper nigrum</i> Linn.	<i>Liothrips kuwanii</i>
	<i>Liothrips karnyi</i>
<i>Piper recurvum</i> Blume	<i>Liothrips pallipes</i>
<i>Piper retrofractum</i> Vahl.	<i>Liothrips kuwanii</i>
	<i>Liothrips chaviceae</i>
	<i>Liothrips pallipes</i>
<i>Piper sarmentosum</i> Roxb.	<i>Liothrips retrofacti</i>
	<i>Liothrips pallipes</i>
<i>Piper</i> sp.	<i>Liothrips sarmentosi</i>
	<i>Liothrips acuminatus</i>
	<i>Liothrips ater</i>
	<i>Liothrips confusus</i>
	<i>Liothrips exiguus</i>
	<i>Liothrips exiguus falsus</i>
	<i>Liothrips longiceps</i>
	<i>Liothrips reynvaanae</i>
	<i>Liothrips variabilis</i>
	<i>Liothrips tibialis</i>
	<i>Liothrips mirabilis</i>
	<i>Liothrips fumicornis</i>
	<i>Liothrips insidiosus</i>
<i>Pithecolobium dulce</i> Benth	<i>Haplothrips fuscipennis</i>
<i>Planchonia valida</i> Blume	<i>Teuthothrips brevis</i>
	<i>Teuthothrips pithecolobii</i>
	<i>Cercothrips nigrodentatus</i>
<i>Polygonum chinense</i> Linn.	<i>Liothrips gracilis</i>
<i>Polyosma ilicifolia</i> Bl.	<i>Haplothrips fumipennis</i>
<i>Pothos scandens</i> Linn.	<i>Liothrips polyosominus</i>
	<i>Mesothrips melinocnemis</i>
	<i>Tetradothrips foliiperda</i>

HOST PLANT	THRIPS SPECIES
<i>Rhaphidophora graminifera</i>	<i>Liothrips raphidophorae</i>
<i>Rhodamnia trivervia</i> Bl.	<i>Gynaikothrips lividicornis</i>
<i>Salacia oblongifolia</i> Blume	<i>Liothrips claripennis</i>
<i>Santalum album</i> Linn.	<i>Smeringothrips salaciae</i>
<i>Schefflera odorata</i>	<i>Crotonothrips davidi</i>
<i>Schefflera odorata</i>	<i>Mesothrips manii</i>
<i>Schefflera polybotrya</i>	<i>Liothrips heptapleuri</i>
<i>Schefflera racemosa</i> Harms.	<i>Liothrips heptapleuri</i>
<i>Schefflera scandens</i>	<i>Liothrips macropanacis</i>
<i>Schefflera</i> sp.	<i>Liothrips associatus</i>
	<i>Liothrips ramakrishnae</i>
	<i>Liothrips schefflerae</i>
	<i>Eugynothrips adulator</i>
	<i>Liothrips consimilis</i>
	<i>Liothrips fraudulentus</i>
	<i>Liothrips heptapleurinus</i>
	<i>Liothrips heptapleuricola</i>
	<i>Liothrips jacobsoni</i>
	<i>Liothrips retusus</i>
	<i>Liothrips subtilis</i>
<i>Schoutenia ovata</i> Korth.	<i>Gynaikothrips schefflericola</i>
	<i>Dolichothrips laticauda</i>
	<i>Eothrips schouteniae</i>
	<i>Mesothrips constrictus</i>
	<i>Mesothrips schouteniae</i>
<i>Secamone emetica</i> R.Br.	<i>Crotonothrips mimicus</i>
<i>Sloanea sigum</i>	<i>Syringothrips gallicola</i>
<i>Sloanea javanica</i>	<i>Phasmothrips asparatus</i>
<i>Smilax australis</i>	<i>Eugynothrips australis</i>
	<i>Eugynothrips intorquens</i>
	<i>Euoplothrips bagnalli</i>
	<i>Euoplothrips crassipes</i>
	<i>Eugynothrips smilacinus</i>
<i>Spatholobus litoralis</i> Hassk	<i>Cryptothrips fuscipennis</i>
<i>Stellaria graminea</i> Linn.	<i>Pachythrips subapterus</i>
<i>Stellaria media</i> Wight	<i>Tmetothrips subaptera</i>
	<i>Taeniothrips atratus</i>
<i>Stellaria uliginosa</i> Murr.	<i>Thrips tabaci</i>
<i>Susum anthelminticum</i> Bl.	<i>Eugynothrips susciola</i>
<i>Syzigium cuminum</i>	<i>Mallothrips indicus</i>
<i>Tapia</i> sp.	<i>Cercothrips priesneri</i>
<i>Tambourissa</i> sp.	<i>Xiphidothrips tambourissae</i>
<i>Terminalia chebula</i> Retz.	<i>Coryciodothrips inquilinus</i>
	<i>Dixothrips onerosus</i>
<i>Terminalia</i> sp.	<i>Liothrips interlocatus</i>
<i>Thunbergia fragrans</i> Roxb.	<i>Anaphothrips involvens</i>
<i>Tristania</i> sp.	<i>Empresmothrips folii</i>
<i>Tetrastigma mutabilis</i>	<i>Liothrips tetrastigmae</i>
<i>Tetrastigma pergamaceum</i>	<i>Liothrips simillimus</i>
<i>Ventilago maderaspatana</i>	<i>Schedothrips orientalis</i>
	<i>Schedothrips tumidus</i>
<i>Vernonia elaeagnifolia</i> DC	<i>Liothrips rectaginis</i>
<i>Vernonia arborea</i> Ham.	<i>Eurhynchothrips flavicornis</i>
<i>Vernonia</i> sp.	<i>Adelphothrips tristis</i>
<i>Vitis lanceolaria</i> Laws	<i>Liothrips extractus</i>
	<i>Liothrips pallicus</i>
	<i>Liothrips viticola</i>
	<i>Mesothrips picticornis</i>
<i>Vitis papillosa</i>	<i>Cryptothrips pachypterus</i>
<i>Vitis pergamacea</i> Miq.	<i>Gynaikothrips simillimus</i>
<i>Vitis shifunensis</i>	<i>Vitis vitivorus</i>
	<i>Mesandrothrips inquilinus</i>

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* Numerous references pertaining to gall thrips species have also been included to provide a complete list.

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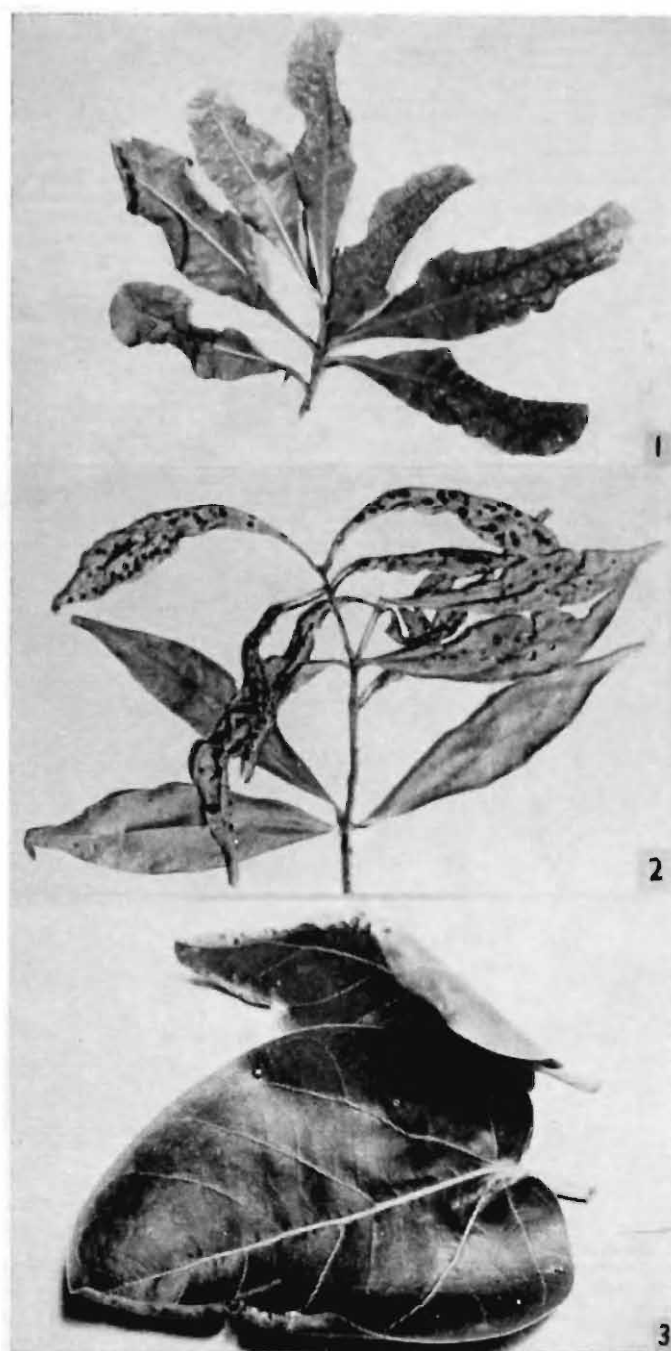


Plate I

- Fig. 1. Simple downward leaf curling of *Planchonia valida* induced by *Cercothrips nigrodentatus*.
Fig. 2. Leaf galls of *Eugenia* sp., induced by *Leeuwenia vorax*.
Fig. 3. Partial marginal leaf roll or curl galls of *Ficus bengalensis* induced by *Gynaikothrips malabaricus*.

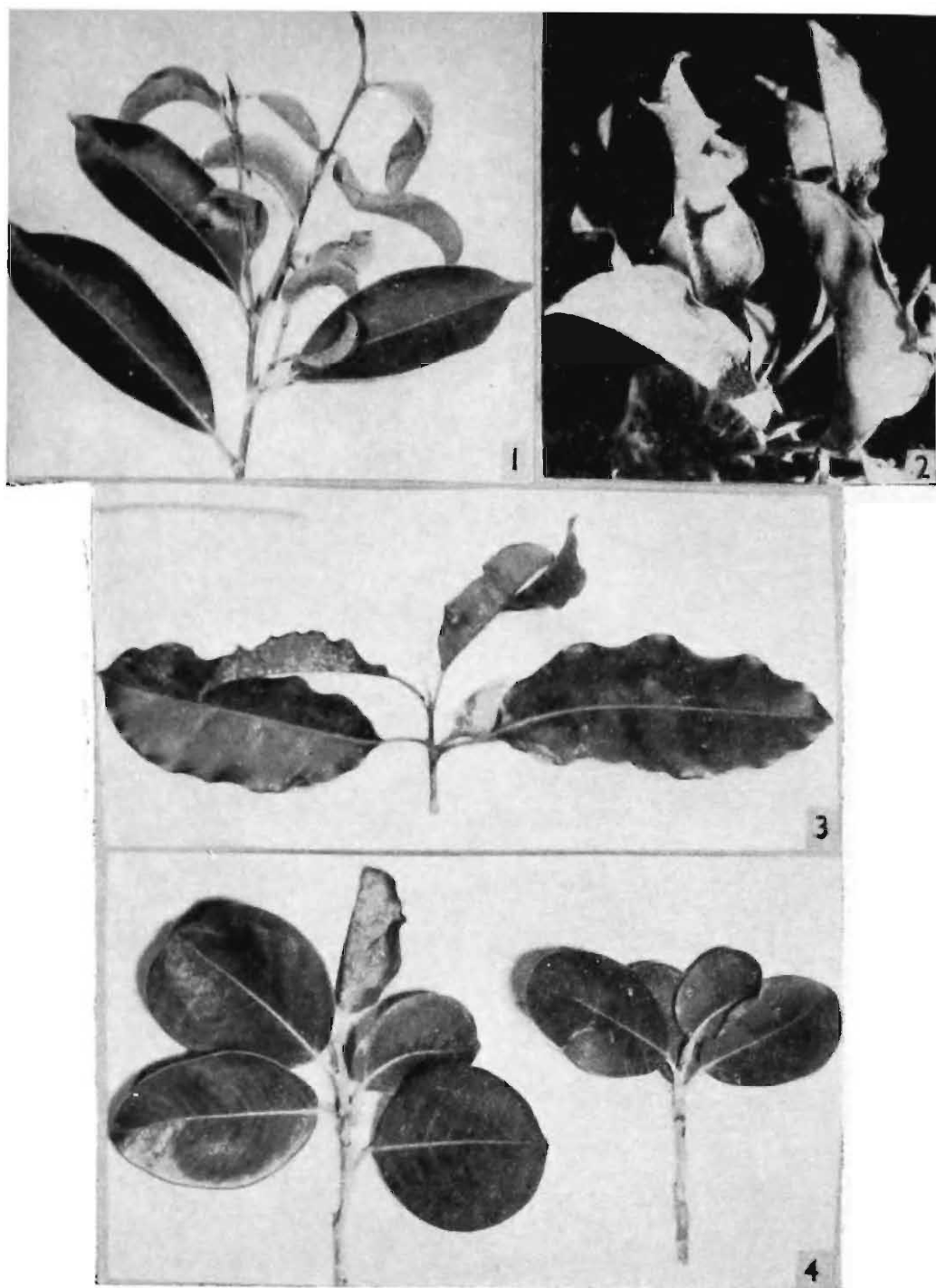


Plate II

Fig. 1. Leaf-fold galls of *Ficus benjamina* induced by *Gynaikothrips uzeli*.

Figs. 2 & 3. Leaf-fold galls of *Mimusops elengi* induced by *Arrhenothrips ramakrishnae*.

Fig. 4. Galls on *Ficus* sp., (leaf-fold gall by *Gynaikothrips uzeli*, marginal galls by *Gynaikothrips microchaetus*).

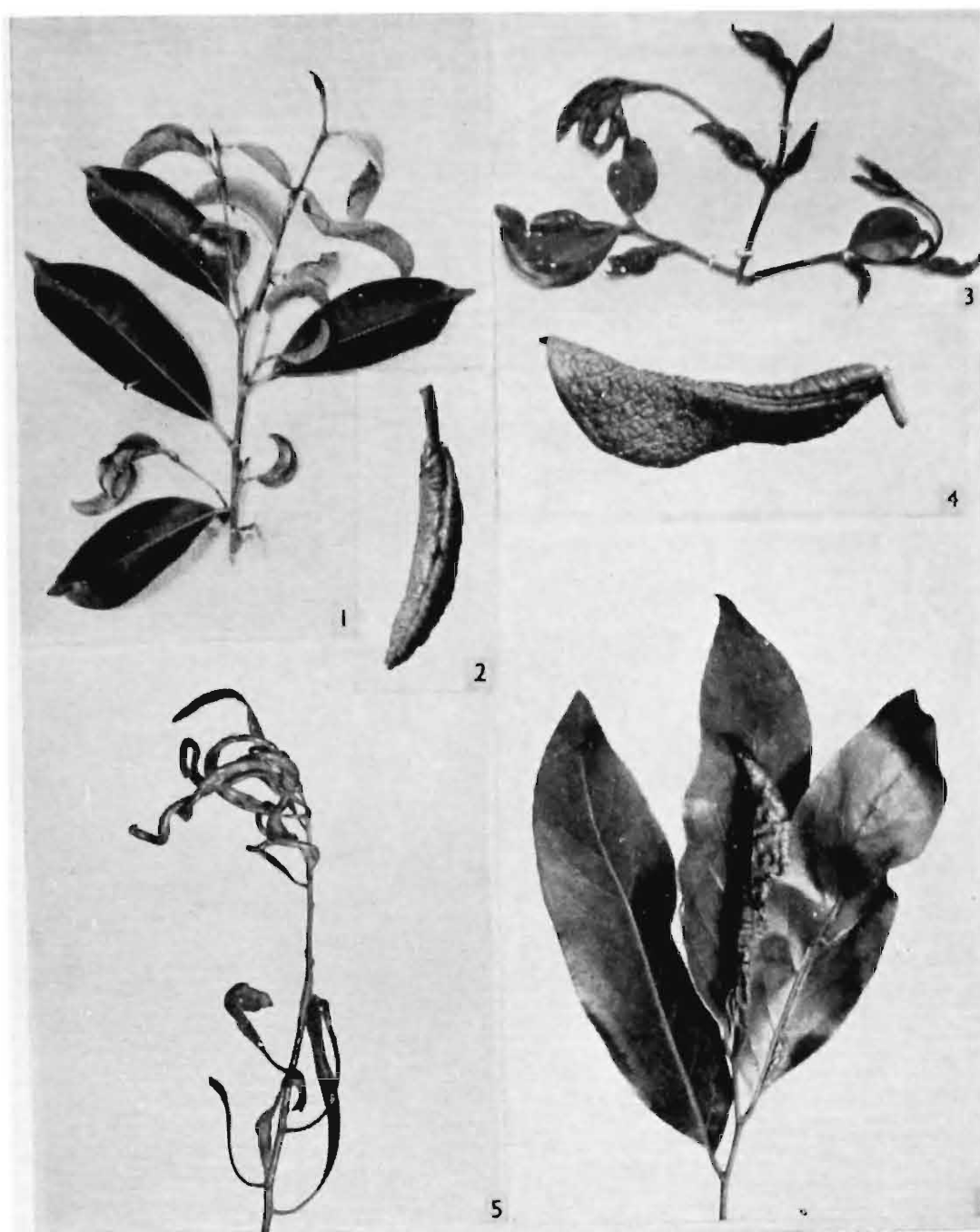


Plate III

- Fig. 1. Leaf-fold galls of *Ficus benjamina* induced *Gynaikothrips uzeli*.
 Figs. 2 & 4. Enlarged individual galls of *Ficus benjamina* induced by *Gynaikothrips uzeli*.
 Fig. 3. Leaf-roll gall of *Santalum album* induced by *Mesothrips manii*.
 Fig. 5. Leaf galls on an unidentified plant caused by *Eothrips crassicornis*.
 Fig. 6. Leaf galls of *Casearia tomentosa* induced by *Gynaikothrips flaviantennatus*.

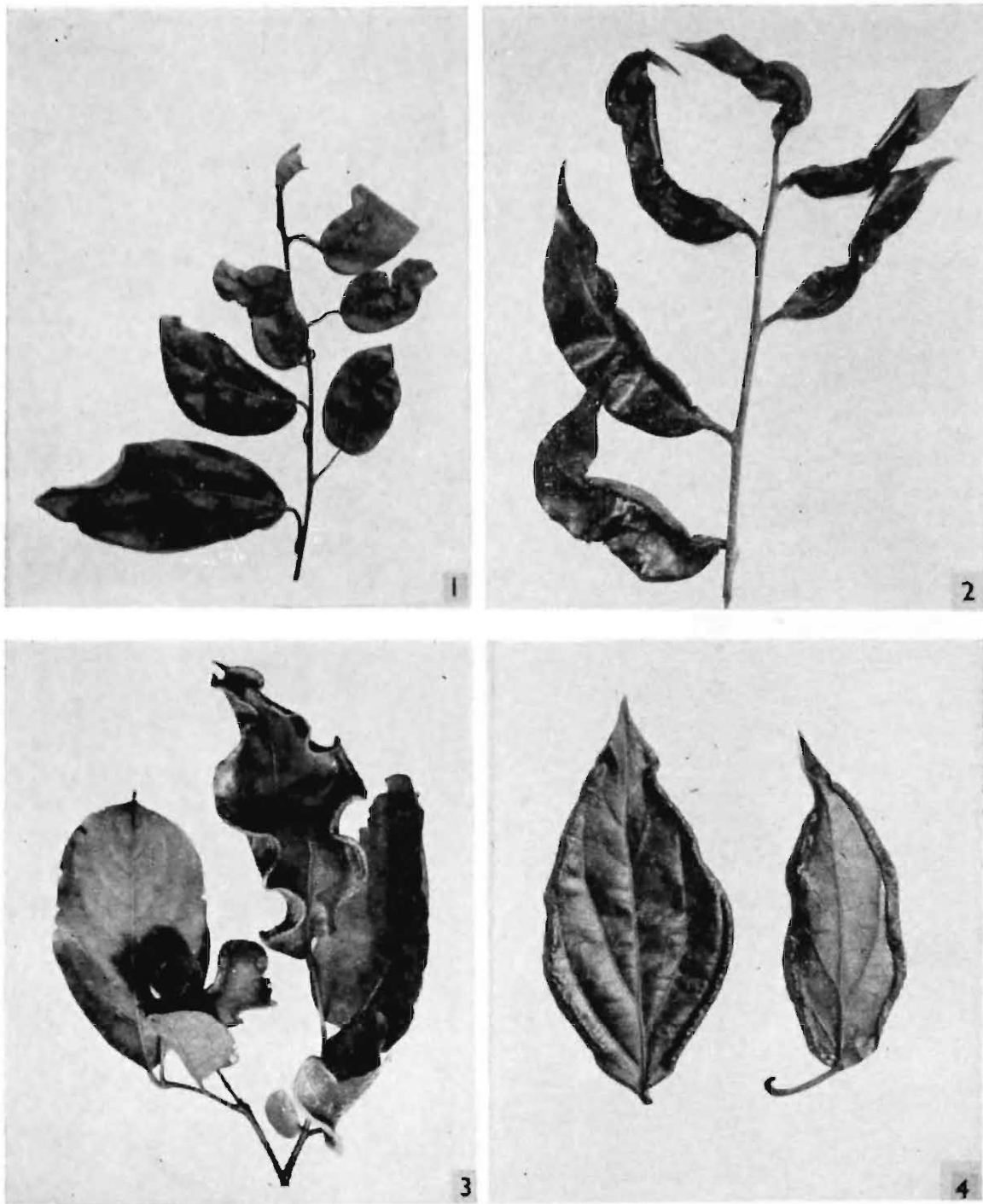


Plate IV

- Fig. 1. Leaf marginal roll galls of *Cordia obliqua* induced by *Aneurothrips priesneri*.
Fig. 2. Leaf galls of *Maytenus senegalensis* induced by *Alocothrips hadrocerus*.
Fig. 3. Hypophyllous marginal fold galls of *Anogeissus* sp., induced by *Lygothrips jambuvasi*.
Fig. 4. Epiphyllous roll galls of *Piper nigrum* caused by *Liothrips karnyi*.

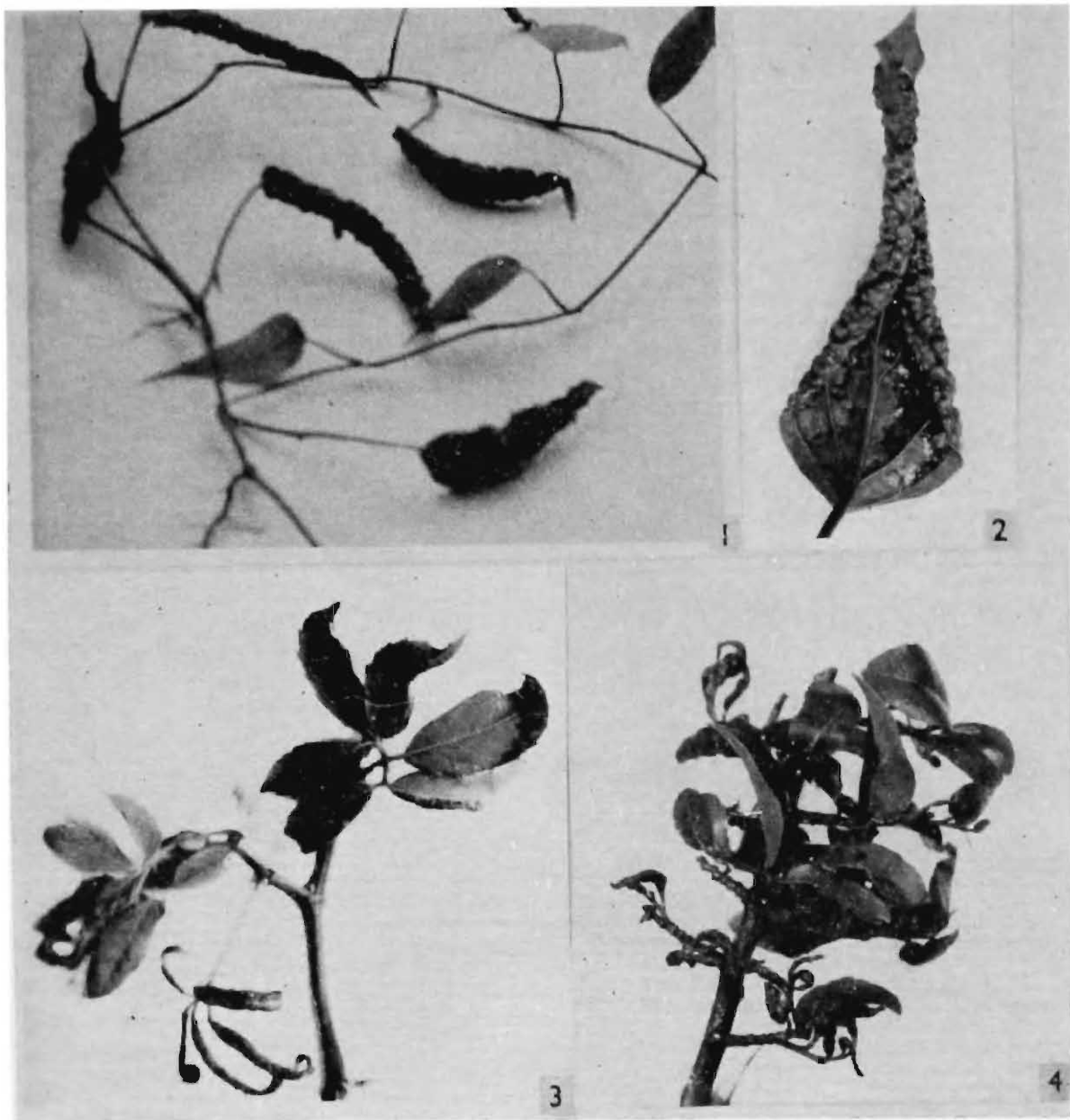


Plate V

- Fig. 1. Leaf-roll galls of wild pepper caused by *Liothrips pallipes*.
Fig. 2. Leaf-roll gall of wild pepper caused by *Gynaikothrips malabaricus*.
Fig. 3. Leaf galls of *Vitis lanceolaria* induced by *Liothrips viticola*.
Fig. 4. Leaf galls of an unidentified host induced by *Amphithrips argutus*.

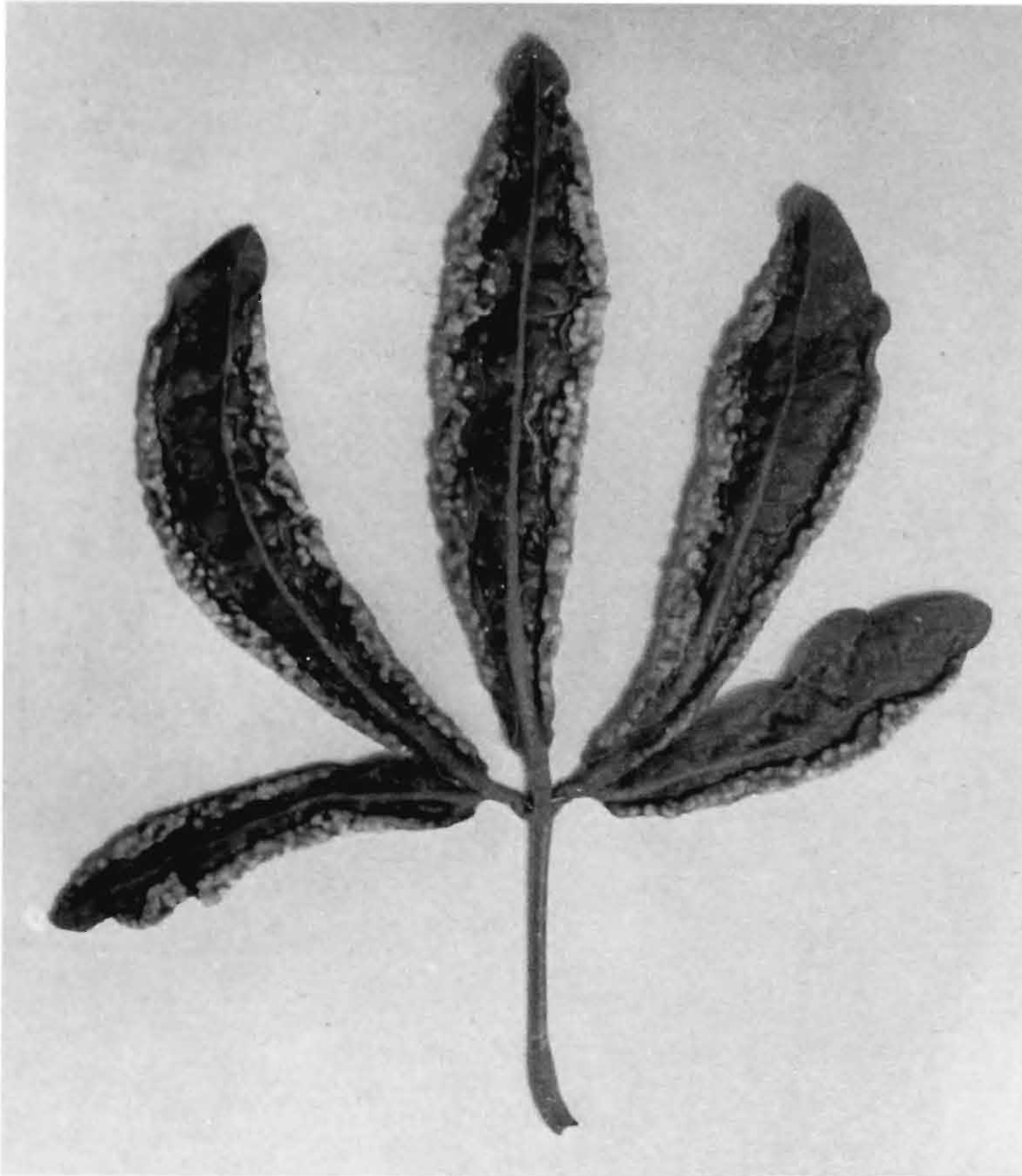


Plate VI

Marginal roll galls on the leaflets of *Vitis* sp., caused by *Phorinothrips* sp.

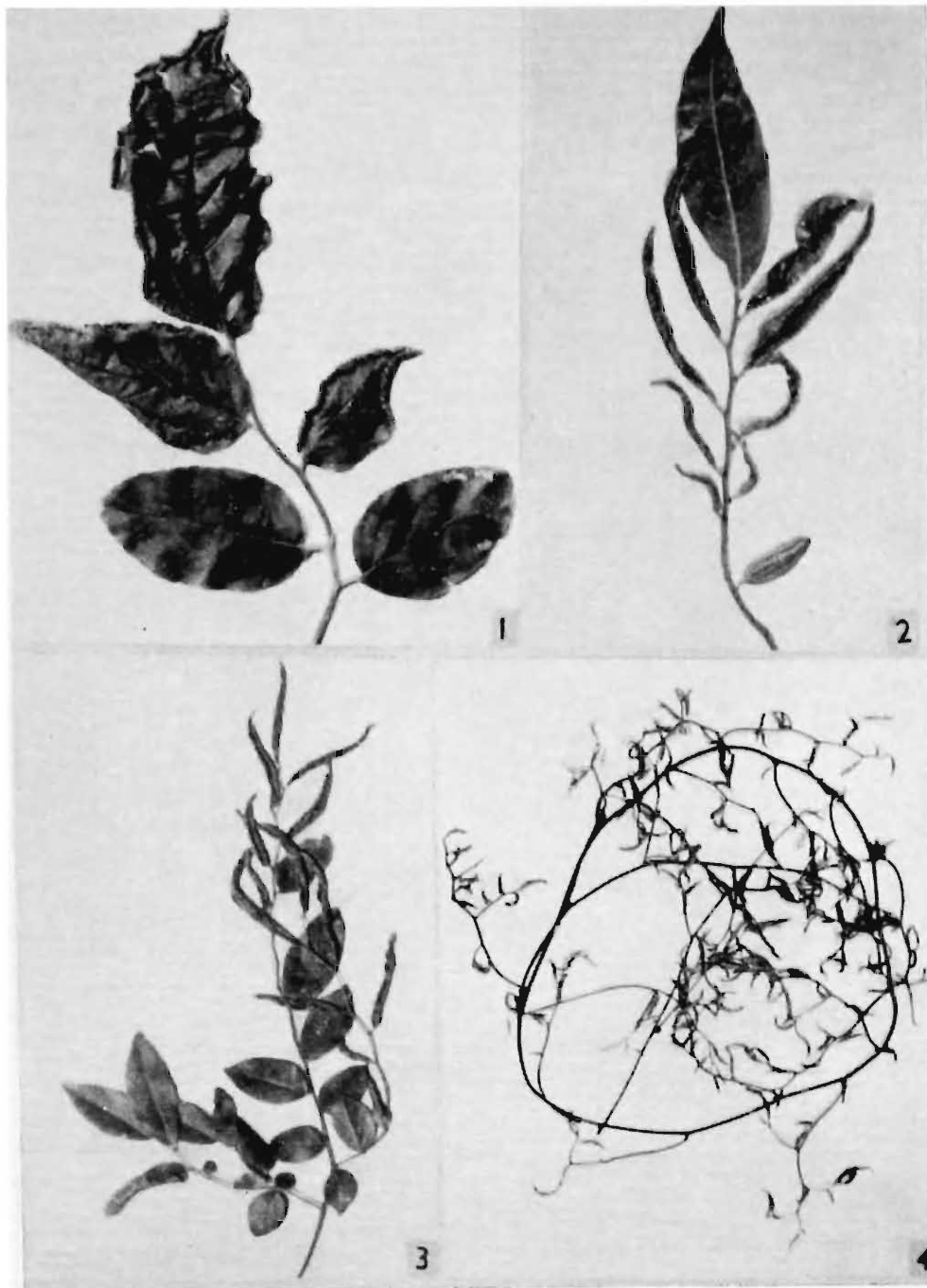


Plate VII

Figs. 1-4. Marginal galls on the leaves of *Ventilago maderasapatana* caused by *Schedothrips orientalis*.

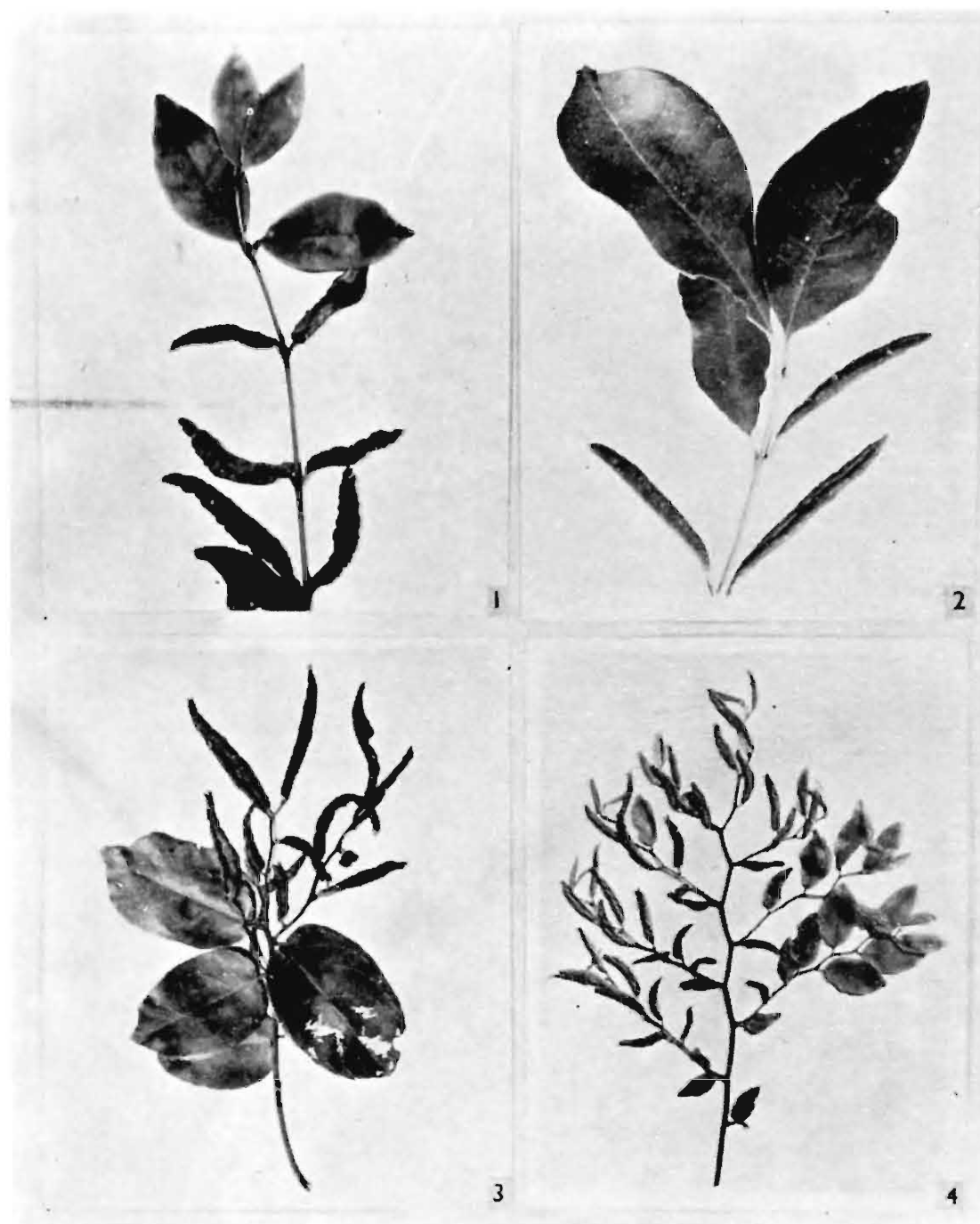


Plate VIII

Fig. 1. Leaf galls of *Memecylon edule* induced by *Cortonothis dantahasra*.

Fig. 2. Leaf galls of *Memecylon* sp., caused by *Crontonothrips coorgensis*.

Figs. 3 & 4. Leaf-marginal roll gall of *Ventilago maderaspatana* caused by *Schedothrips orientalis*.

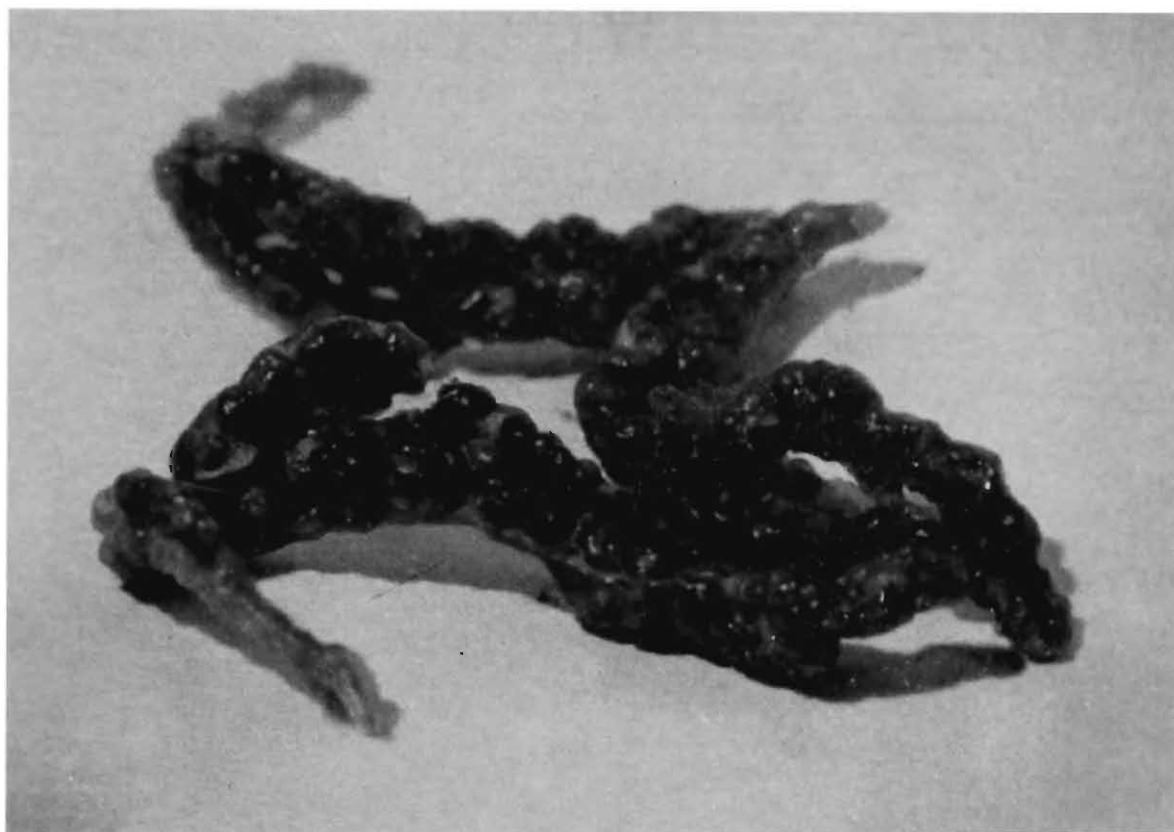


Plate IX

Enlarged leaf galls of *Walsura piscidia* induced by *Psenothrips priesneri*.



Plate X

Leaf galls on *Artabotrys* sp., induced by *Liothrips* sp.

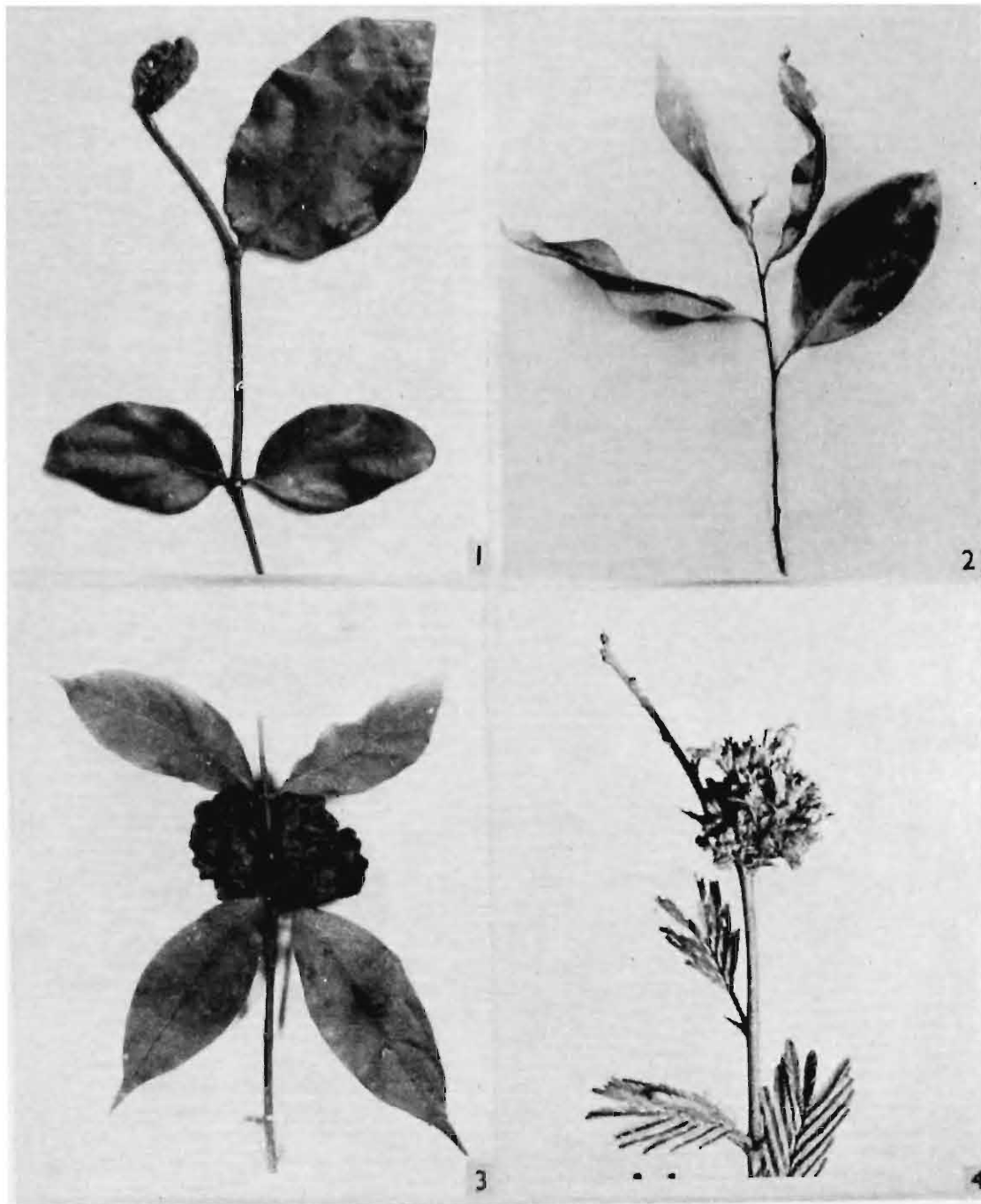


Plate XI

- Fig. 1. Galls on *Loranthus elastica* caused by *Phorinothrips loranthei*.
Fig. 2. Leaf galls of *Linociera* sp., induced by *Mesicothrips plicans*.
Fig. 3. Pouch galls of *Calycotris floribunda* induced by *Austrothrips cochichinensis*.
Fig. 4. Rosette gall of *Acacia leucophloea* induced by *Thilakothrips babuli*.

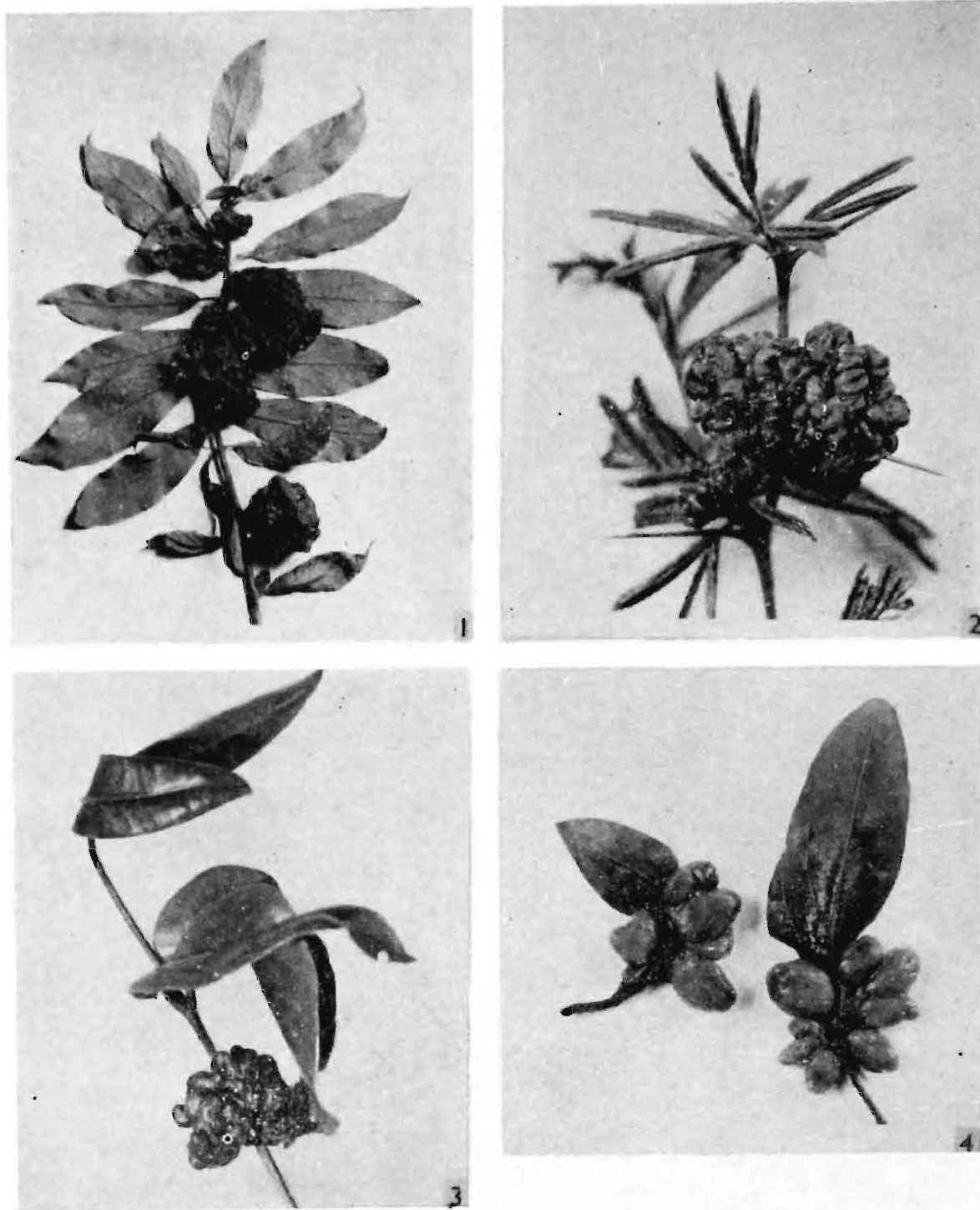


Plate XII

- Fig. 1. Pouch galls of *Calycotris floribunda* induced by *Austrothrips cochinchinensis*.
Fig. 2. Rosette galls of *Acacia leucophloea* caused by *Thilakothrips babuli*.
Fig. 3. Blister galls on the leaves of *Secamone emetica* induced by *Phaeothrips mimicus*.
Fig. 4. Galls on *Terminalia chebula* caused by *Dixothrips onerosus*.



Plate XIII

Enlarged view of blister galls of *Secamone* sp. caused by *Crotonothrips gallarum*.

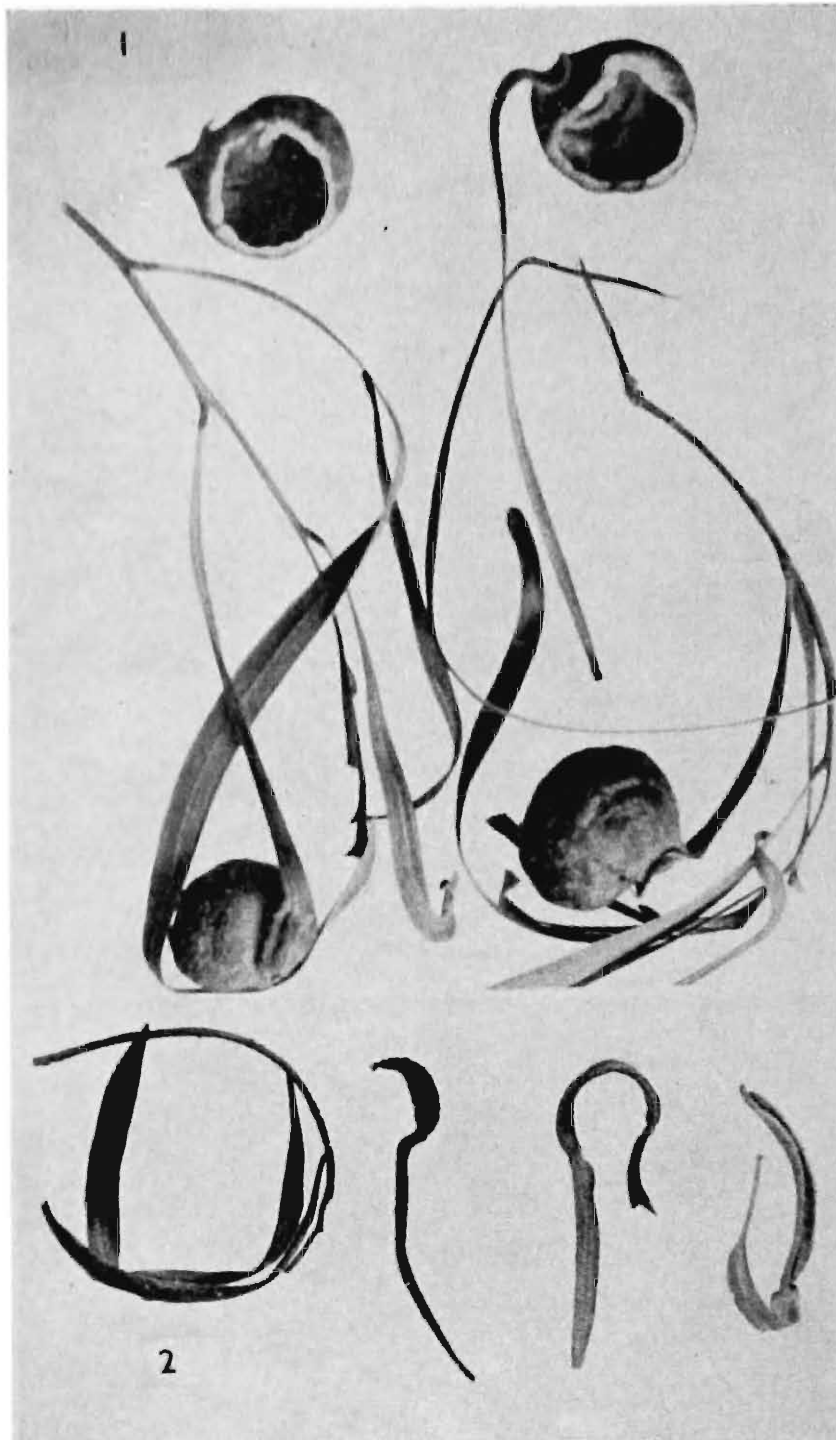


Plate XIV

Fig. 1. Spherical galls on *Acacia doratoxylon*.

Fig. 2. Rolled leaf galls on *Geijera parviflora* (after Moulton, 1927).

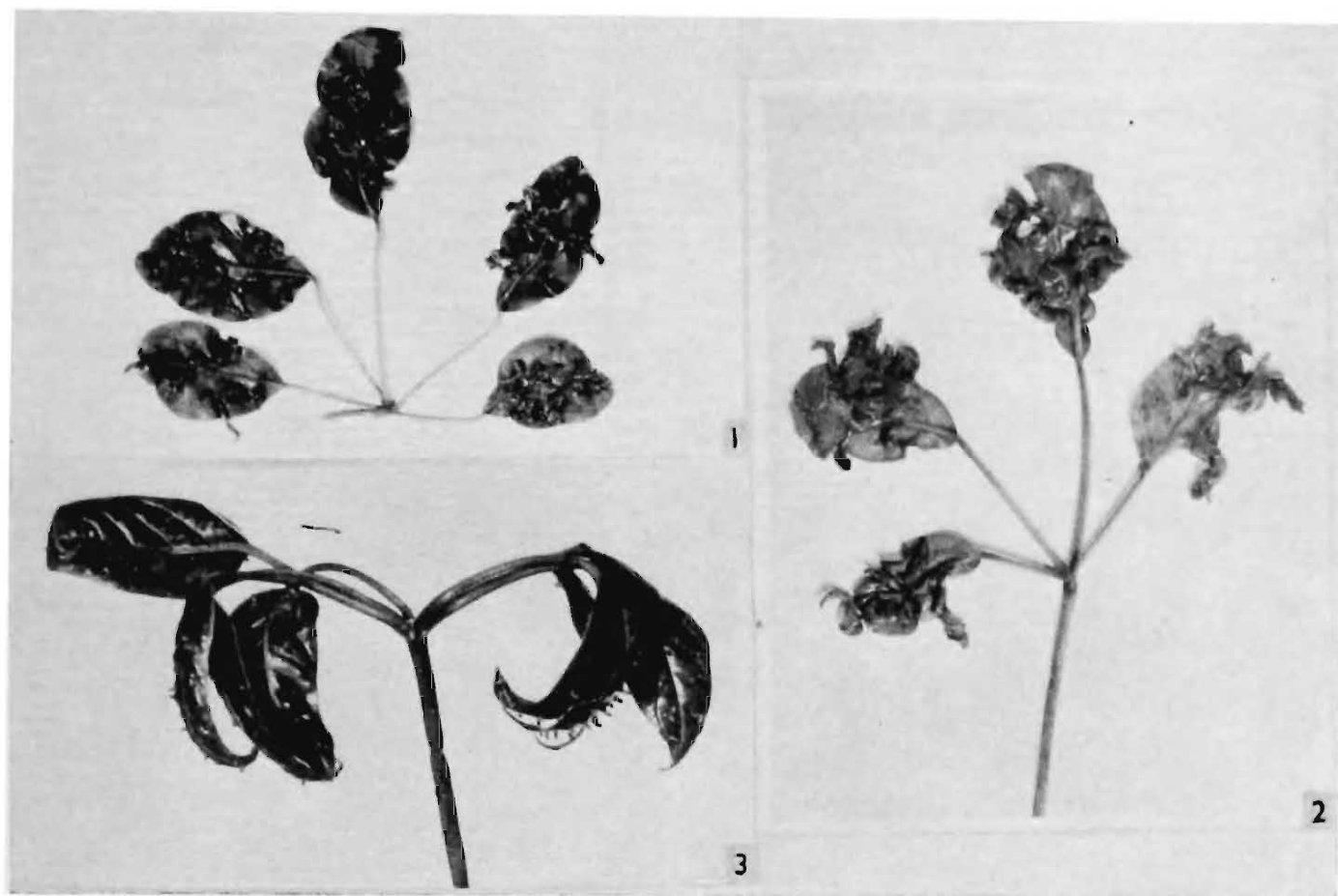


Plate XV

Figs. 1 & 2. Horn galls on leaf of *Schefflera racemosa* caused by *Liothrips ramakrishnae* and *Liothrips associatus*.

Fig. 3. Galls of *Schefflera elliptica*.

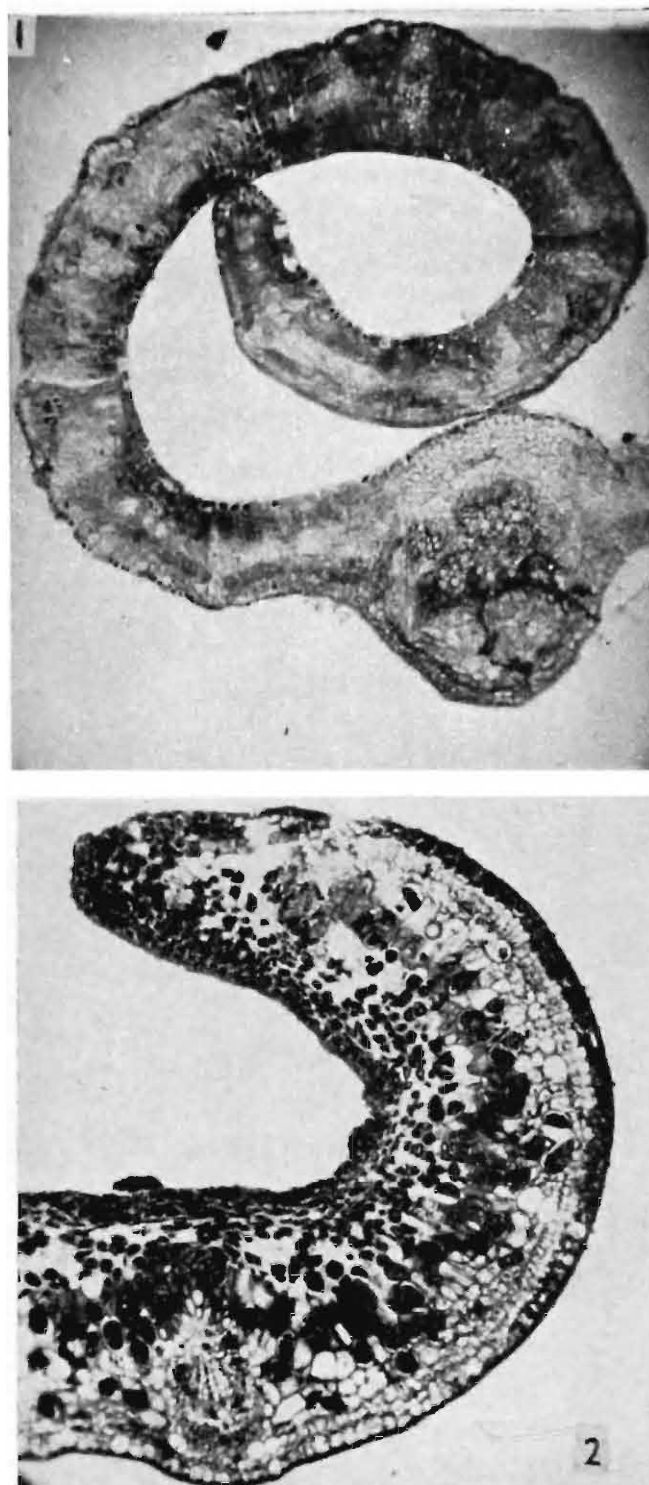


Plate XVI

- Fig. 1. Section of marginal leaf roll of *Cordia* sp. caused by *Aneurothrips priesneri*.
Fig. 2. Section of marginal leaf roll galls of *Maytenus senegalensis*.

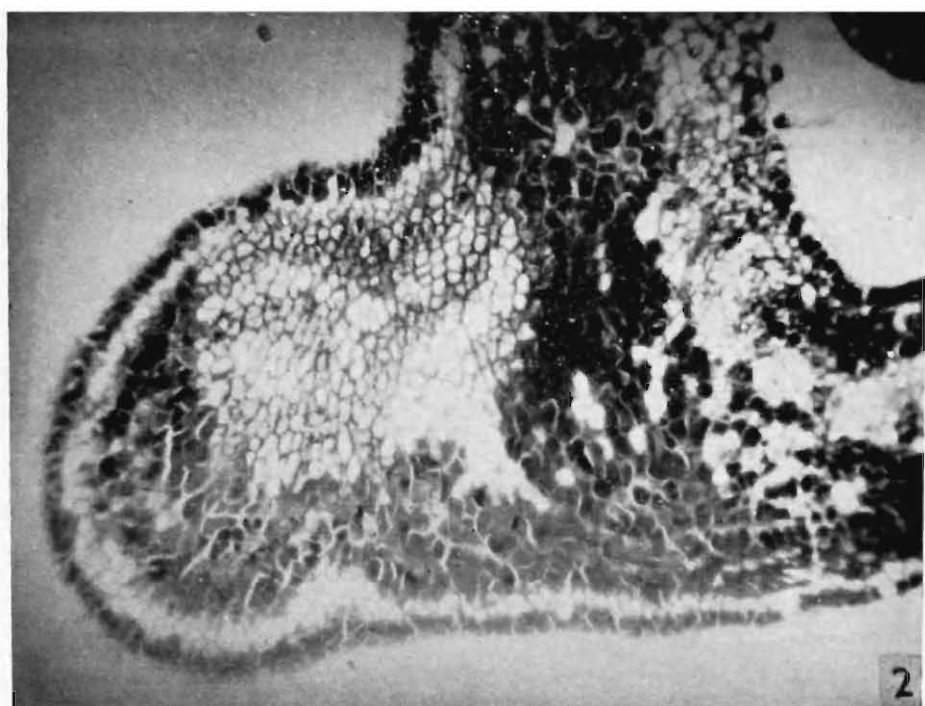
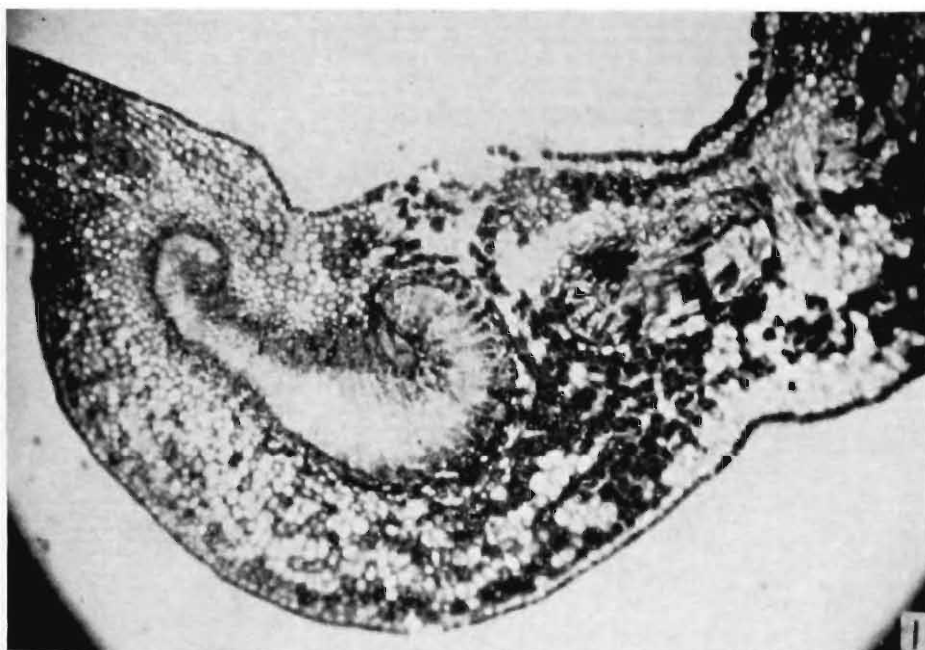


Plate XVII

Figs. 1 & 2. Portions of the galls in transverse sections of *Secamone emetica*.

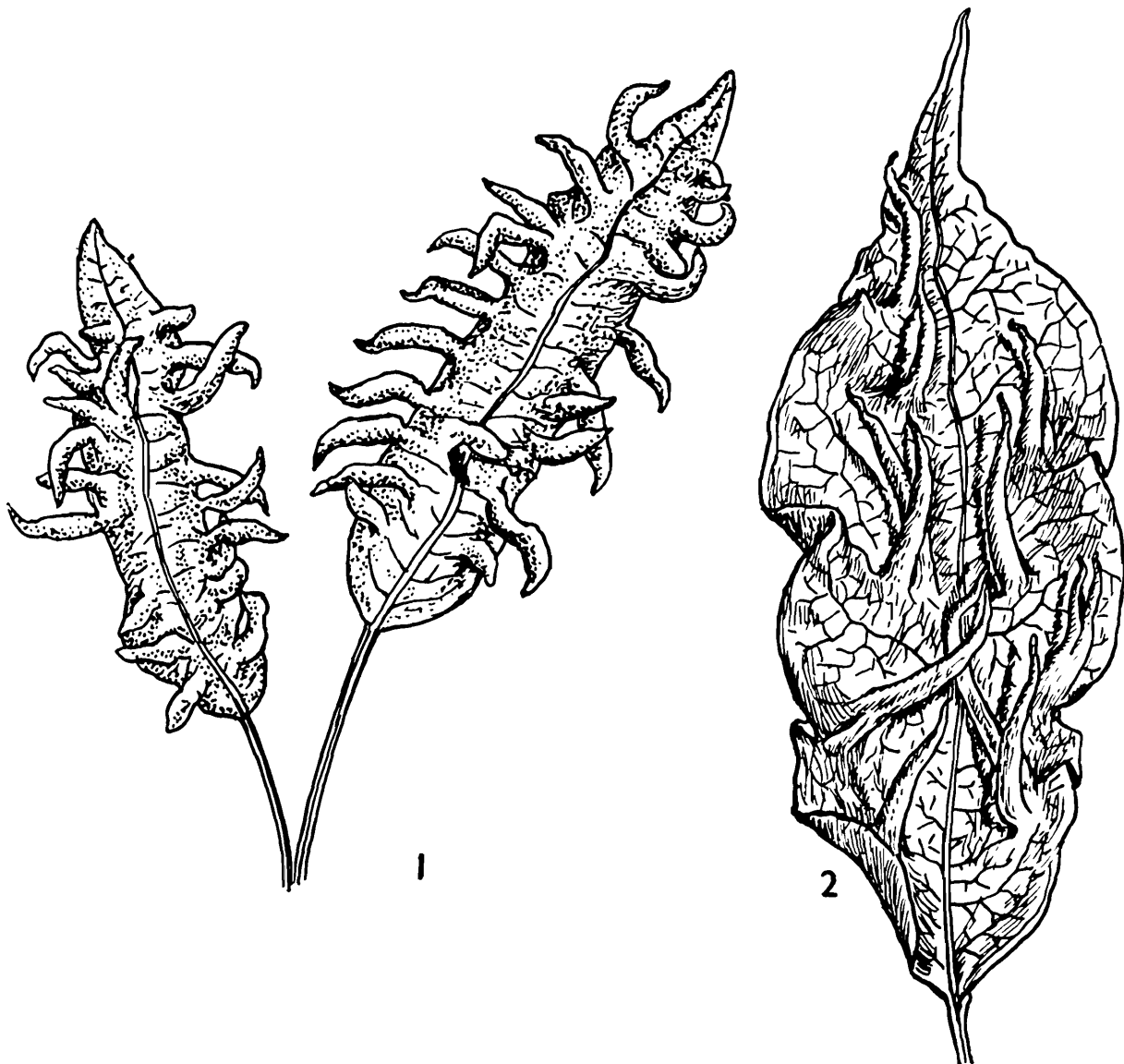


Plate XVIII

Ceratoneon pouch galls on *Schefflera* sp.

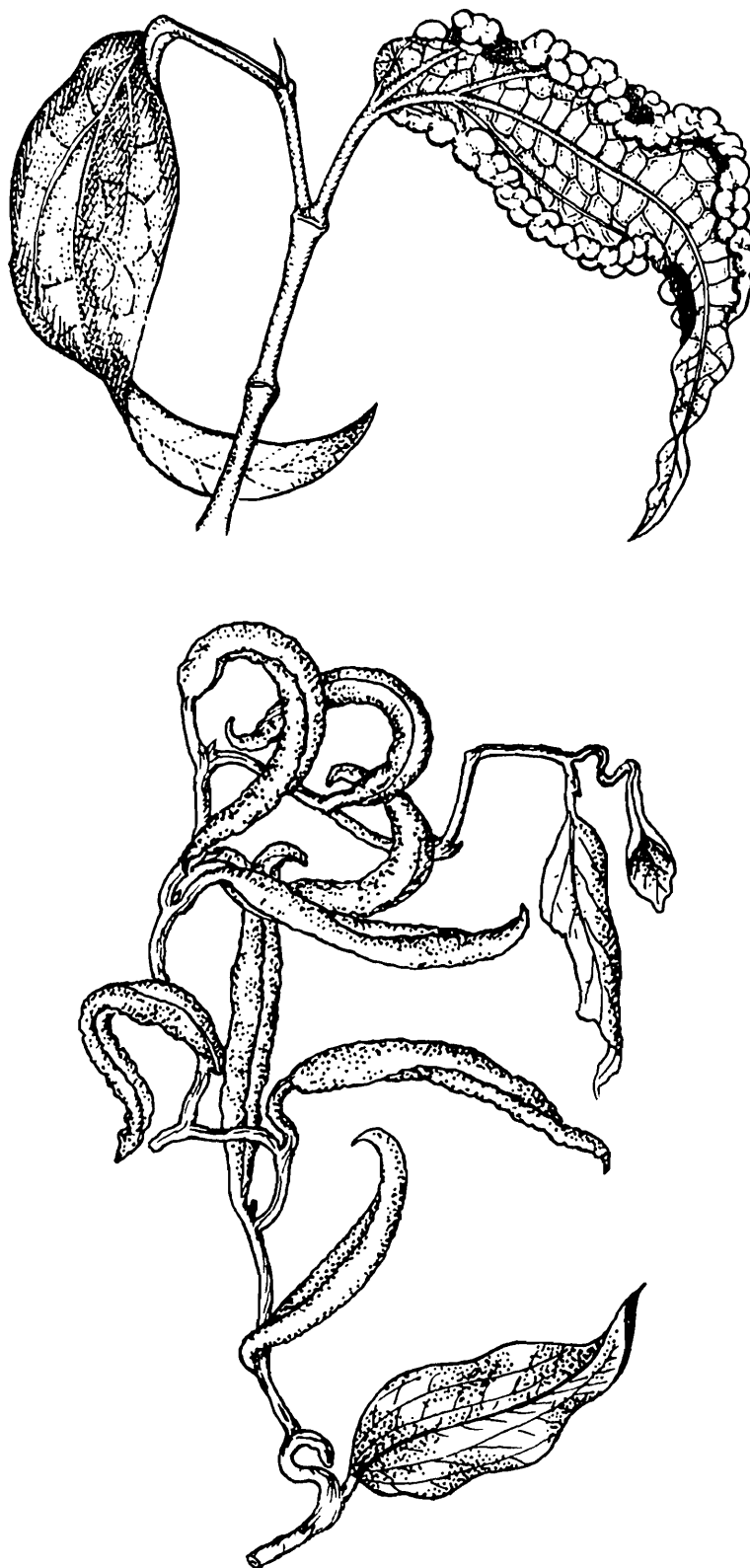


Plate XIX

- (above) Leaf galls of *Piper futokadsura* by *Gymaikothrips kuwanai*.
(below) Leaf galls on *Smilax* sp., induced by *Eugynothrips* sp.

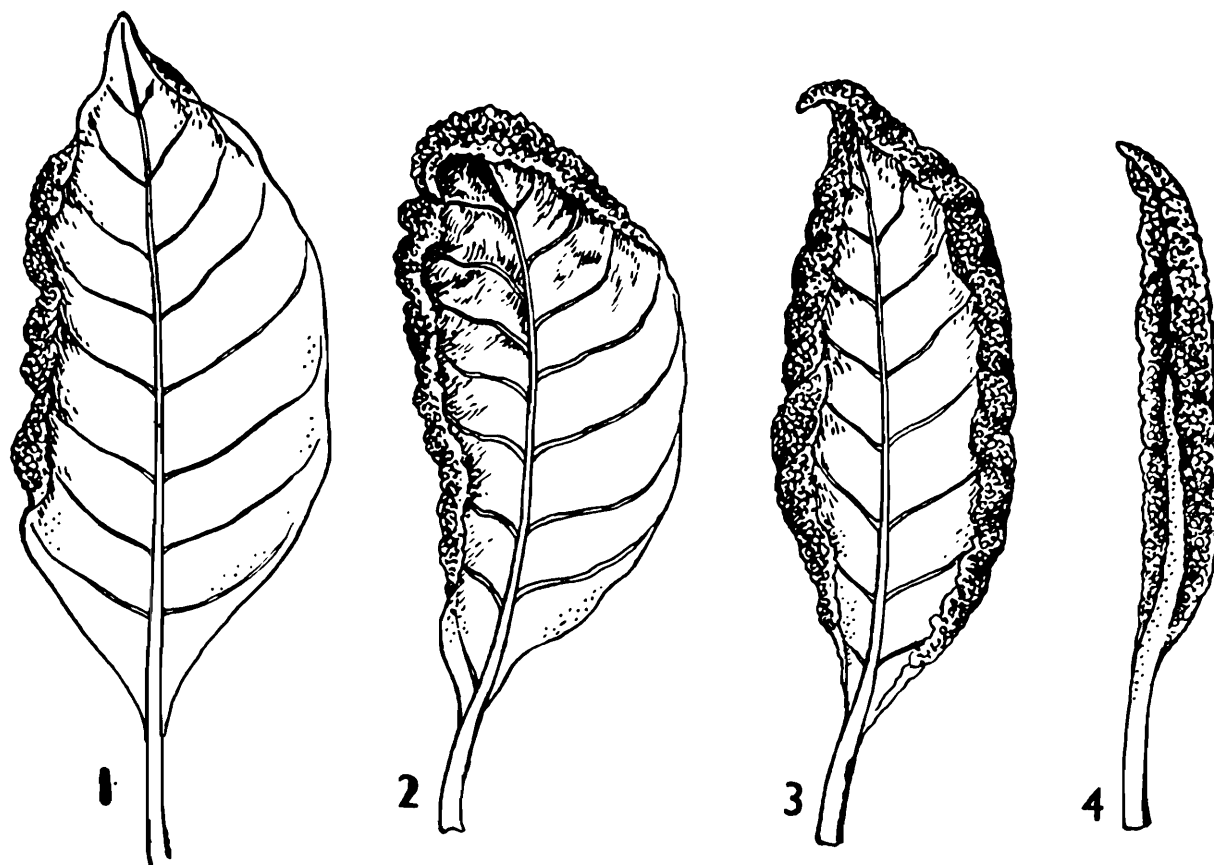


Plate XX

Development of the galls of *Pavetta hispidula*.

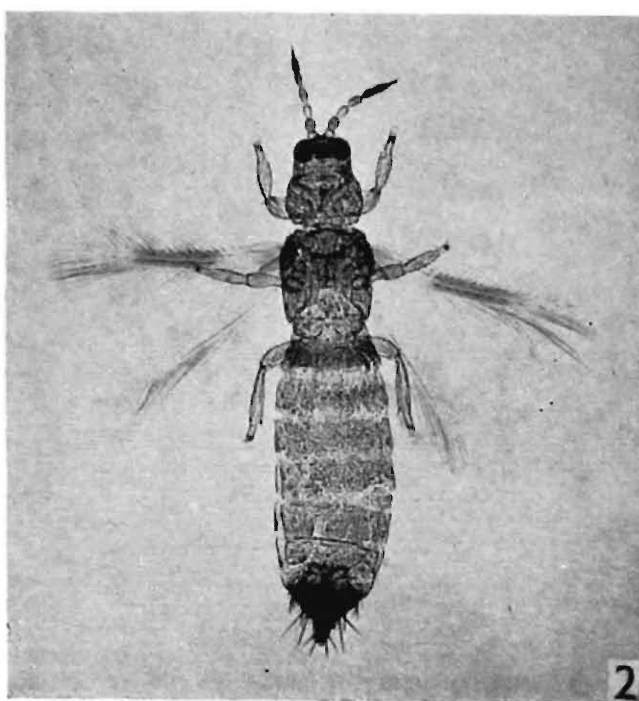
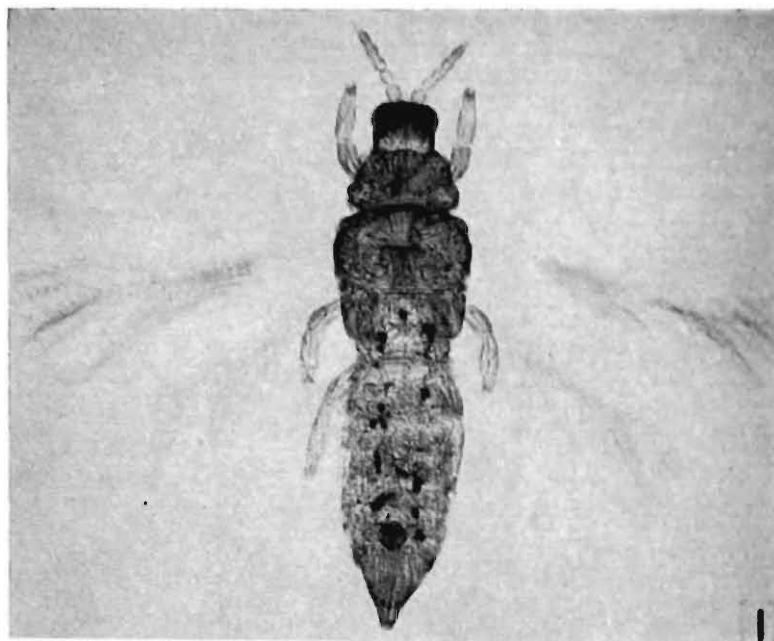


Plate XXI

Fig. 1. *Aneurothrips priesneri*.

Fig. 2. *Amphithrips argutus*.

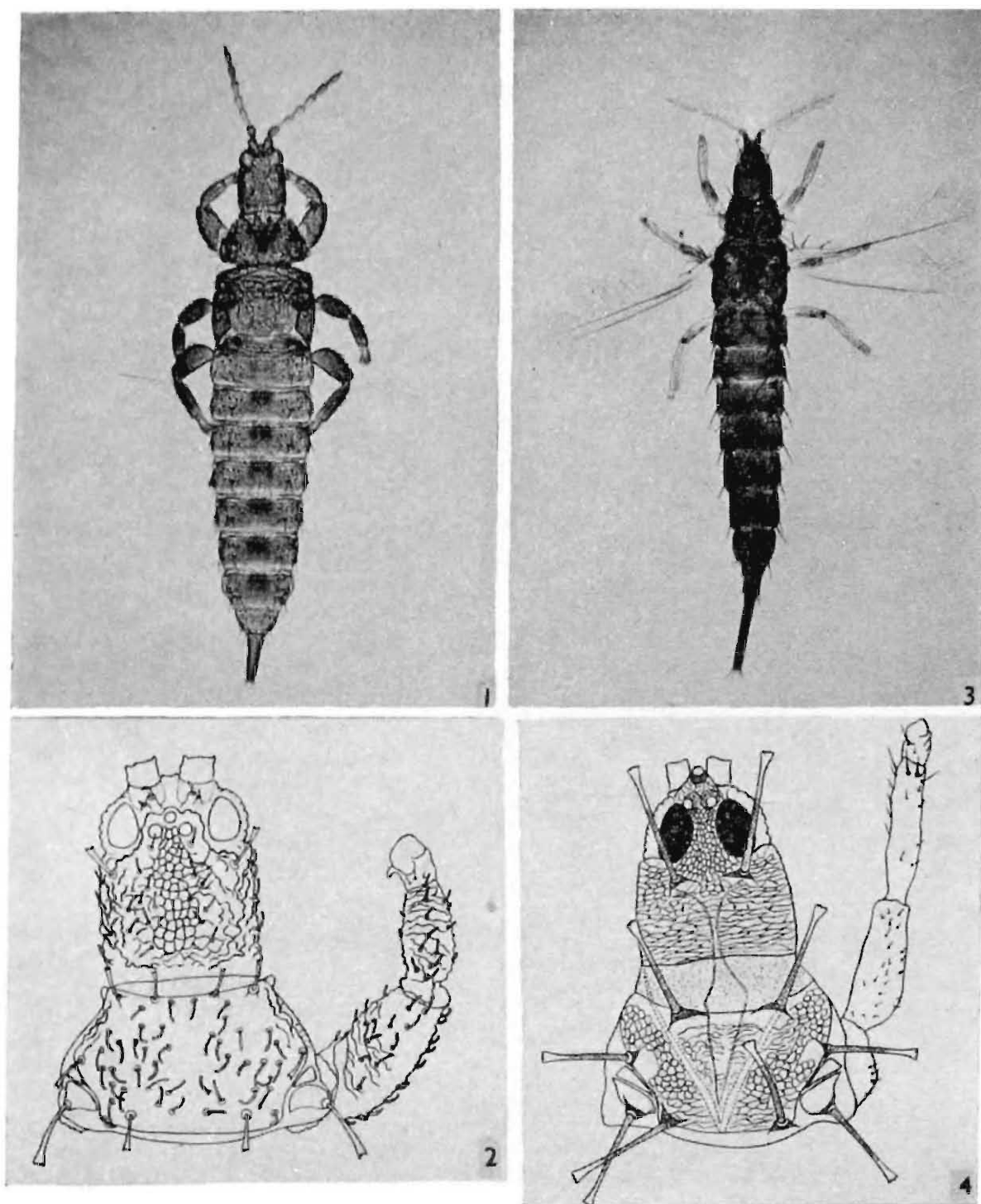


Plate XXII

Figs. 1 & 2. *Thilakothrips babuli*

Figs. 3 & 4. *Kochummania excelsa*.

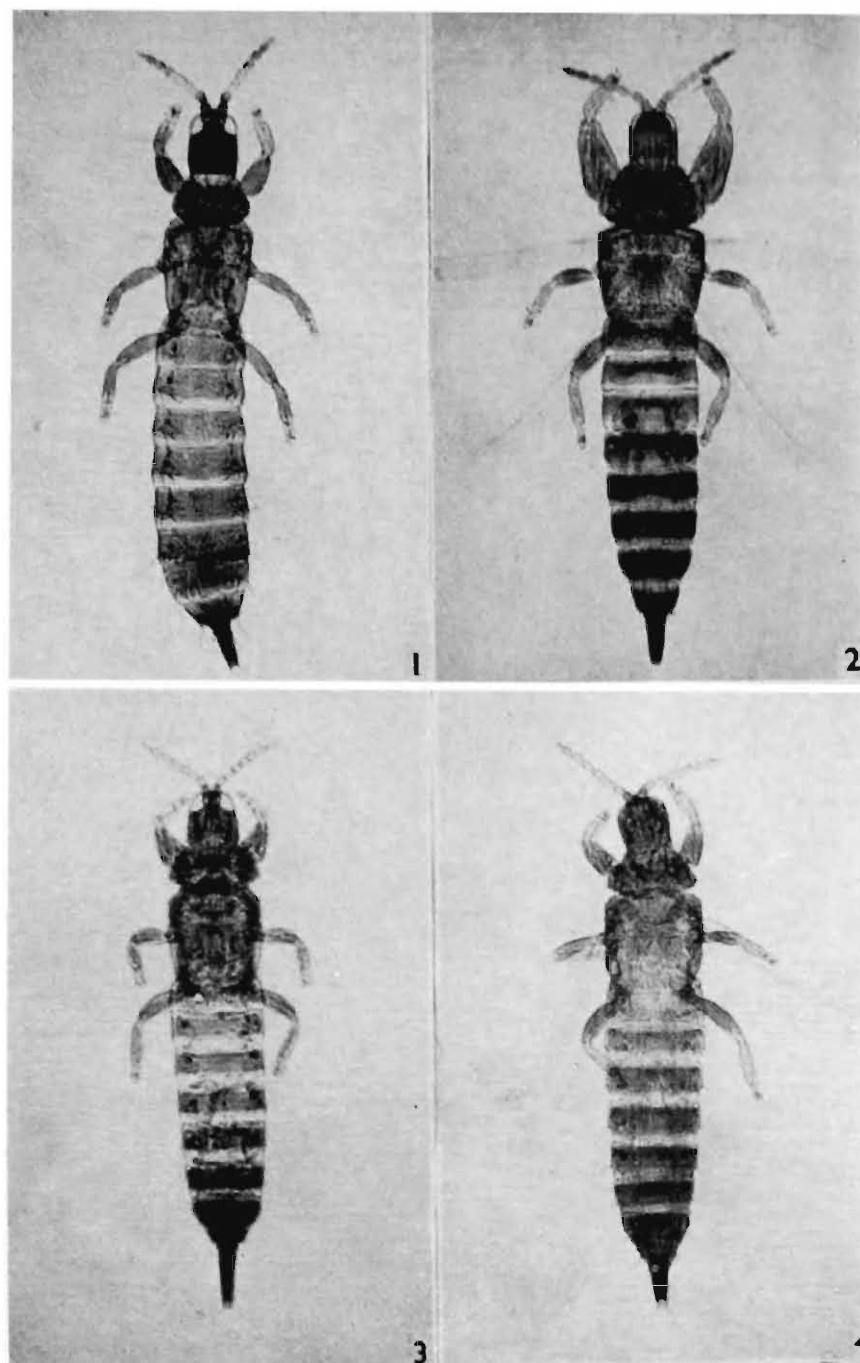


Plate XXIII

Fig. 1. *Ayyarothrips abstrusus*.

Fig. 2. *Byctothrips ayyari*.

Fig. 3. *Dixothrips onerosus*.

Fig. 4. *Corycidthrips inquilinus*.

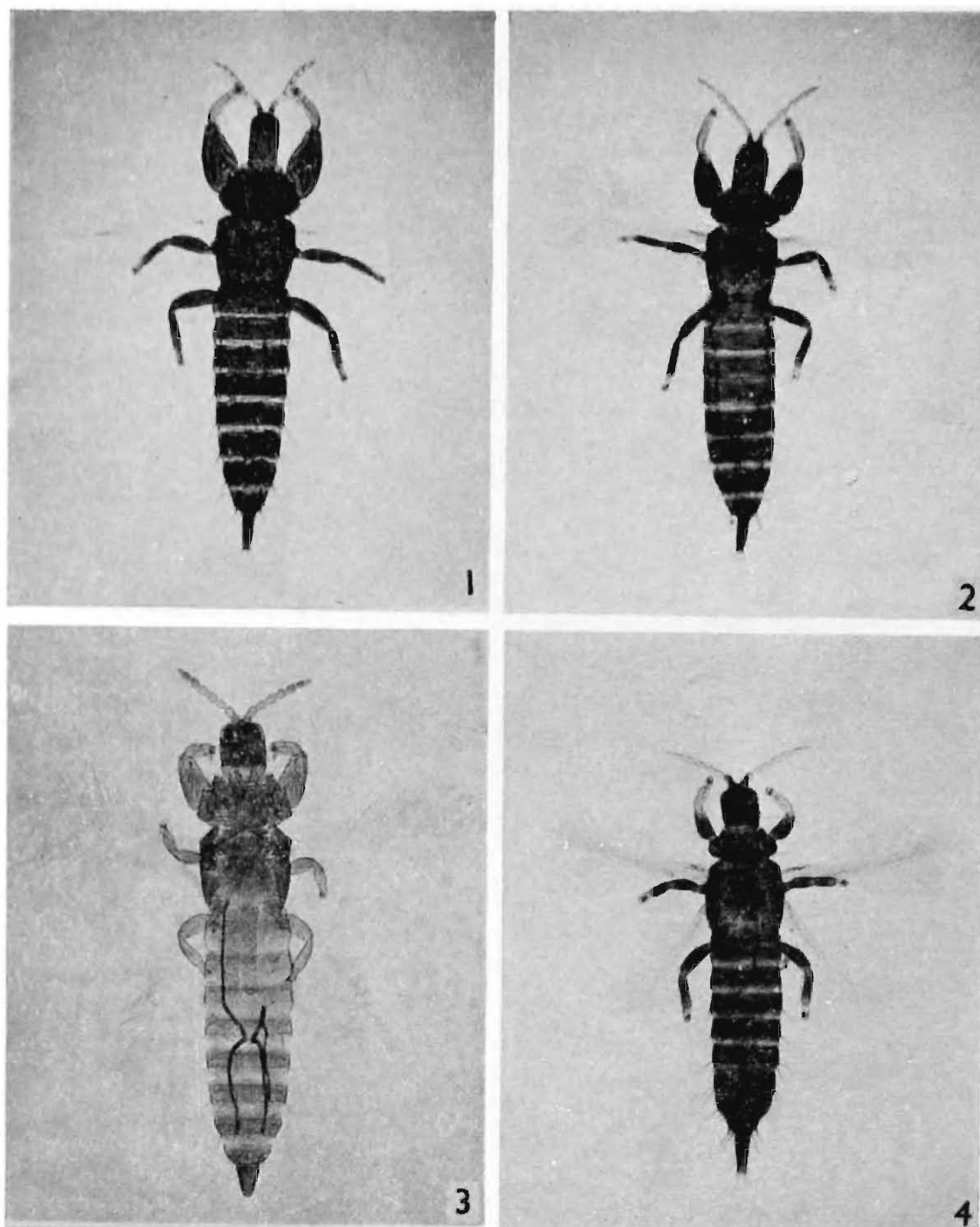


Plate XXIV

- Fig. 1. *Arrhenothrips rantakrishnae*.
Fig. 2. *Mallothrips indicus*.
Fig. 3. *Allothrips hadrocerus*.
Fig. 4. *Tetradothrips foliiperda*.

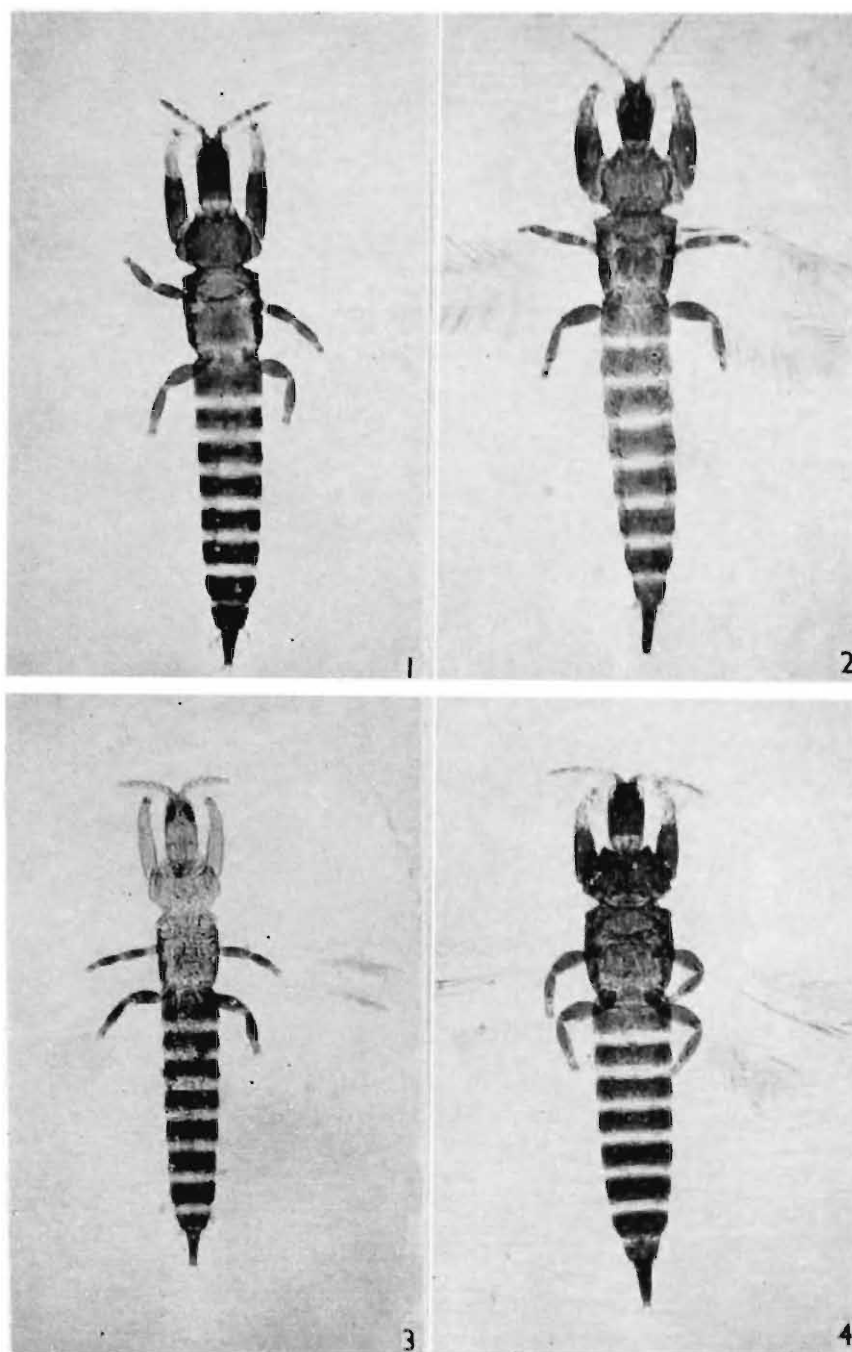


Plate XXV

- Fig. 1. *Oncothrips tepperi*.
Fig. 2. *Csirothrips watsoni*.
Fig. 3. *Koptothrips flavicornis*.
Fig. 4. *Koptothrips dyskritus*.

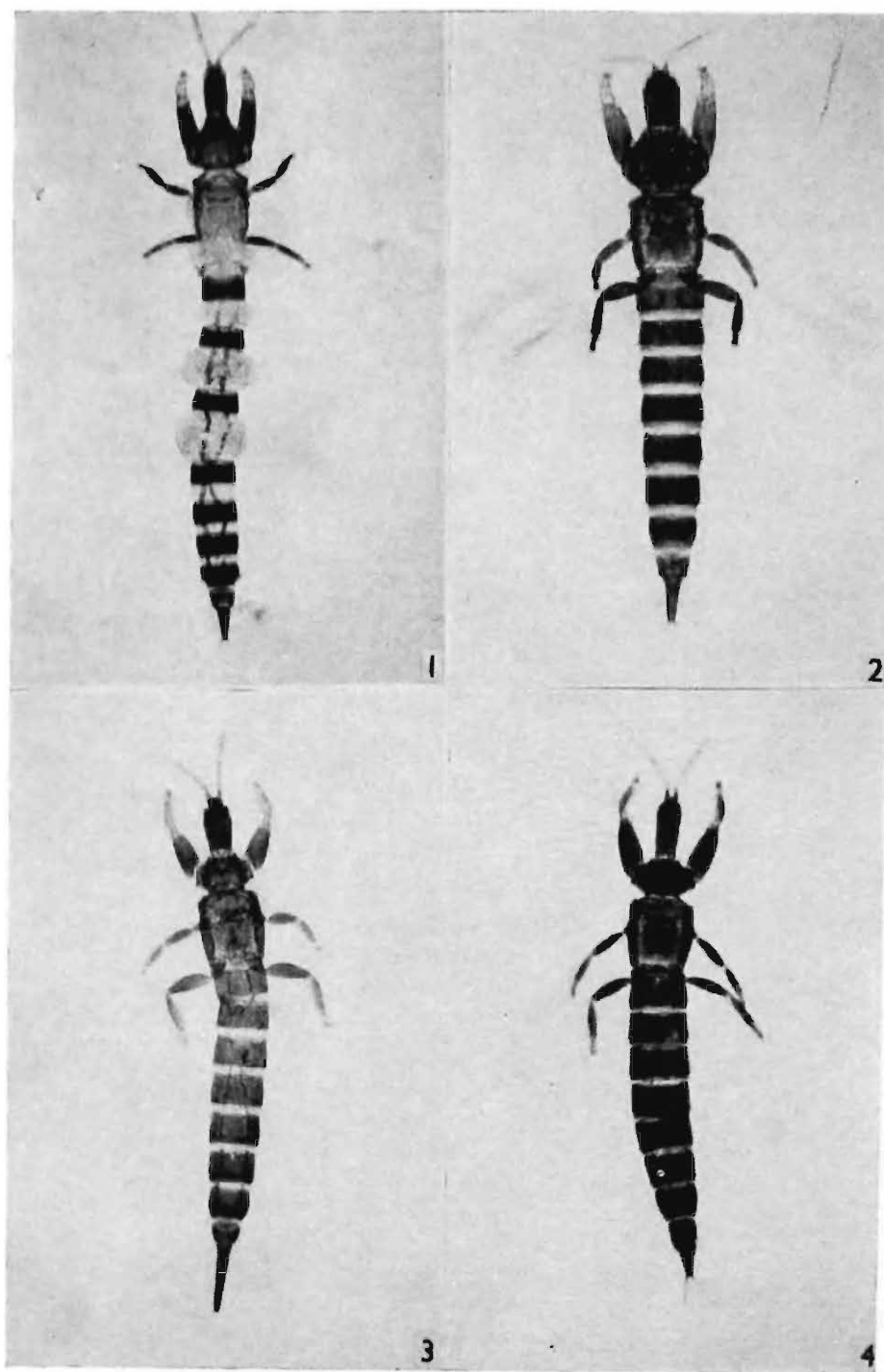


Plate XXVI

- Fig. 1. *Kladothrips rugosus*.
Fig. 2. *Koptothrips zelus*.
Fig. 3. *Sacothrips* sp.
Fig. 4. *Gryporthrips* sp.