UNESCO: Man and the Biosphere National Committee for Sri Lanka.

Publication No: 4

A HAND BOOK

to the

FUNGI PARASITIC ON THE PLANTS OF SRI LANKA.

by Umarany Coomaraswamy

Department of Botany University of Colombo, Colombo 3, Sri Lanka.

with illustrations

by Suneetha Medis & Padma Arulgnanam.

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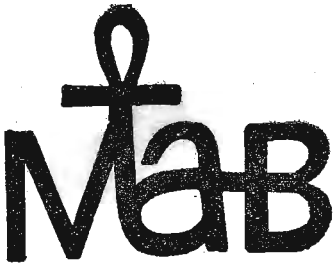

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Publications
of
UNESCO-MAB National Committee for Sri Lanka

The absence of Handbooks and Guides to most groups of plants and animals of Sri Lanka has limited the development of interest in our flora and fauna, and this has also been a very serious handicap to ecological studies in the island.

The UNESCO-MAB Committee set up jointly by the Ministries of Science and Education is sponsoring therefore the publication of Check Lists of Species and Handbooks to the identification of Genera of various groups of Plants and Animals. The committee welcomes any additions and corrections and suggestions for improvement of these publications.

B. A. Abeywickrama
Chairman MAB Committee

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7. A HAND BOOK TO THE SOIL FUNGI OF SRI LANKA
   Umarany Coomaraswamy & R. N. de Fonseka

CONTENTS

PREFACE

Mushrooms and molds have been known to man for thousands of years, but as living growing plants they have been studied only a little more than two centuries (Micheli in Nova Plantarum Genera in 1729). The earliest record of Sri Lanka fungi is in 1783 (Houttuyn, *Peziza Ceylonsche* and *Peziza lembosa*). Subsequent works by mycologists, including Petch (1913, 1925), and Petch and Bisby (1950) have now raised their number to about 640 genera with over 2000 species. References to the Sri Lanka fungi are found scattered in general works on fungi, in scientific journals and in the local annual reports of the Agriculture Department and Research Institutes. No comprehensive account of the fungus flora of Sri Lanka has however still been published. This handbook is expected to meet this need and is the first in a series of guides to the identification of various groups of plants and animals in the island, sponsored by the UNESCO—MAB National Committee for Sri Lanka.

Plant diseases are recognised today as being the principal factor limiting food production. This hand book is therefore devoted to the parasitic fungi on the plants of Sri Lanka. The fungi recorded by Petch on the undetermined substrata such as 'palm', 'bark' etc, those that are epiphytic on plants, and those that are parasitic on other fungi are also included. Their number, however, is very small. This is intended to be only a preliminary guide. The author will gladly appreciate any suggestions regarding omissions and errors for the improvement of this work.

In this book an attempt has been made to present the existing data relating to each species in a manner that would serve as a complete and a comprehensive reference work on the fungi found on local plants. It is specially intended for all persons interested in plant diseases, be they persons engaged in Agriculture, Horticulture, Research or Teaching.

Morphological data serving to identify the genera and the geographical distribution have been provided. Species causing diseases in the economically important crops and the symptoms have been mentioned. The detailed diagnostic symptoms have been excluded since they are given in the admirable handbook by Dr. D. V. W. Abeygunawardene — "The diseases of Cultivated Plants." Wherever possible the local species have been illustrated. A few of them are original drawings but many have been adapted from standard works largely from Barnett (1955), Engler and Prantl (1928), Clements and Shears (1954), and Dennis (1960). The Classification and arrangement of the genera follow the schemes set forth by Ainsworth (1963) and Ainsworth, Sparrow and Sussman (1973). After each generic description the local species with their recorded hosts are given. The letters P and A with figures, after each specific name refer to the page in Petch and Bisby, The Fungi of Ceylon (1950), and to Abeygunawardene: The Diseases of the Cultivated Plants (1969), respectively. Elsewhere full references are given. Keys to the classes, orders and genera are based on Ainsworth (1973) and Clements and Shears (1955). For the convenience of the users a glossary of the terms is given at the end of the text.

Grateful acknowledgement is made to Prof. R. N. de Fonseka and Mr. M. A. B. Jansen (Department of Botany, Colombo Campus) for the assistance during the preparation of this handbook. I am indebted to Prof. B. A. Abeywickrama and Dr. D.V. W. Abeygunawardene who read the manuscripts and made many valuable suggestions.

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INTRODUCTION

Fungi are used in a large number of industrial processes. The production of fermented beverages and vinegar, and leavening of bread through the activities of wild yeasts are traditional processes which have come down to us from time immemorial. With appropriate methodology the isolation of specific strains and their improvements have enabled man to upgrade the quality and increase the outputs of alcohol (spirits) and various other industrial products, e.g. vitamins of the B-complex (Marmite).

One of the most dramatic stories of the century was the discovery of the antibiotic, penicillin (from *Penicillium notatum*) by Alexander Fleming in the late twenties. This led to the founding of the new industry of antibiotics, which has saved millions of lives.

Certain cheeses are ripened with the aid of moulds. Citric and gluconic acids of commercial importance as well as some other organic acids and enzymes of lesser importance are produced chiefly by common fungi such as *Aspergillus* sp., *Rhizopus* sp. and *Penicillium* sp. In the soil they are important for maintaining fertility. A few of the wild larger fungi such as mushrooms (*Agaricus*, *Cantharellus*, *Boletus*, *Schizophyllum* and *Volvariella*), puffballs (*Lycoperdon*), truffles (*Tuber*), and morels (*Morchella*) are used as food. The straw mushroom (*Volvariella*) is cultivated here to some extent. Nutritional requirements of certain fungi are utilised in various methods of biological assay.

On the other hand some activities of fungi are harmful to mankind. A few, e.g. *Candida albicans*, cause diseases in man and domestic animals. Still others are responsible for the spoilage of food stuffs, textiles, timber, leather, rubber and other organic substances.

Many cause serious diseases in economically important cultivated plants. In Sri Lanka agriculture is and will continue to remain the dominant industry of the country. The diseases now claim a considerable proportion of our potential agricultural output. The disease which has had the greatest impact on the economy of Sri Lanka is the leaf rust of Coffee (*Hemileia vastatrix*, first recorded in 1869) which crippled and finally destroyed the coffee industry in the last quarter of the 19th century. 'Blister Blight' of Tea, by far the most dangerous pathological affliction of the tea crop appeared in 1946. With timely control measures, however, debilitation of the plant was successfully combated. Some of the other more important diseases are Rice blast (*Piricularia oryzae*, first recorded in 1920), leaf fall of rubber (*Oidium heveae*, first recorded in 1918) and cacao canker (*Phytophthora palmivora*, first recorded in 1884). Today, we know at least 230 genera to cause diseases in plants of Sri Lanka. These parasitic fungi are distributed in all the five subdivisions of Mycota (Fungi).

LIST OF THE GENERA

SIMPLIFIED KEY TO THE SUB - DIVISIONS OF THE FUNGI ON PLANTS

1.	Assimilative phase a plasmodium or pseudoplasmodium	MYXOMYCOTINA (P.7)
	Assimilative phase typically filamentous; plasmodium absent	2
2.	Motile cells (zoospores) present, perfect state with oospores	MASTIGOMYCOTINA (P.9)
	Motile cells absent; perfect state when present with no oospores	3
3	Perfect state present	4
	Perfect state absent	DEUTEROMYCOTINA (P.103)
4.	Perfect state with zygospores	ZYGOMYCOTINA (P.15)
	Perfect state with no zygospores	5
5.	Perfect state producing ascospores	ASCOMYCOTINA (P.17)
	Perfect state producing basidiospores	BASIDIOMYCOTINA (P.69)

SUB-DIVISION — MYXOMYCOTINA

Vegetative phase consists of a plasmodium (a multinucleate mass of protoplasm lacking a cell wall) or a pseudoplasmodium, (an aggregate of separate amoeboid cells).

Single class — **PLASMODIOPHOROMYCETES**

CLASS — PLASMODIOPHOROMYCETES

Obligate endoparasites of vascular plants, algae and fungi, causing economica lly important diseases such as club root of crucifers and powdery scab of potatoes. Somati c phase is a plasmodium; plasmodium of the early phase gives rise to zoosporangia containing biflagellate zoospores; plasmodium of the later phase gives rise to resting spores. The single order Plasmodiophorales have the same characteristics as the class.

Single genus — **(Plasmodiophora)**

1. *Plasmodiophora* Woron. (Fig 1. a-d)

Mycelium lacking, cells consisting of a naked plasmodium; number of thin walled zoosporangia formed from a plasmodium, packed together in the host cell. Plasmodium of the later phase, produce resting spores which are closely packed together inside the host cell and are released into the soil as the root tissue decays; parasitic in plant tissue causing hypertrophy of the host cells.

The genus includes *P. brassicae* (Woron.), a widespread species and 4 uncertain species. *P. brassicae* (Woron.) causes 'club root' of crucifers, resulting in large galls on the main root preventing the formation of a normal branched root system. If infection takes place at a later stage, galls may occur only on lateral roots giving the appearance from which the alternative name of 'finger and toe' disease is derived.

One species recorded in Sri Lanka

(1) *P. brassicae* Woron.
on *Brassica oleracea* P: 18

Plate I Figs. 1 —3

1. *Plasmodiophora brassicae*

   a — club root, habit x 1/3

   b — plasmodia in the cortex of the infected root x 400

   c — resting spores x 400

   d — zoospores, much enlarged

2. *Synchytrium endobioticum*

   a — resting sporangia, enlarged

   b — prosorus with a vesicle, enlarged

   c — zoosporangium, enlarged

   d — zoospore, enlarged

3. *Pythium* a — d. *P debaryanum*

   a — mycelium in the rotting tissues x 400

   b — sporangium with vesicle containing zoospores x 400

   c — oogonium and antheredium x 400

   d — zoospores, enlarged

   e-f — *P. aphanidermatum*

   e — lobed sporangium, enlarged

   f — germinating sporangium, enlarged
   (Figs. 1 — 3 after Webster)

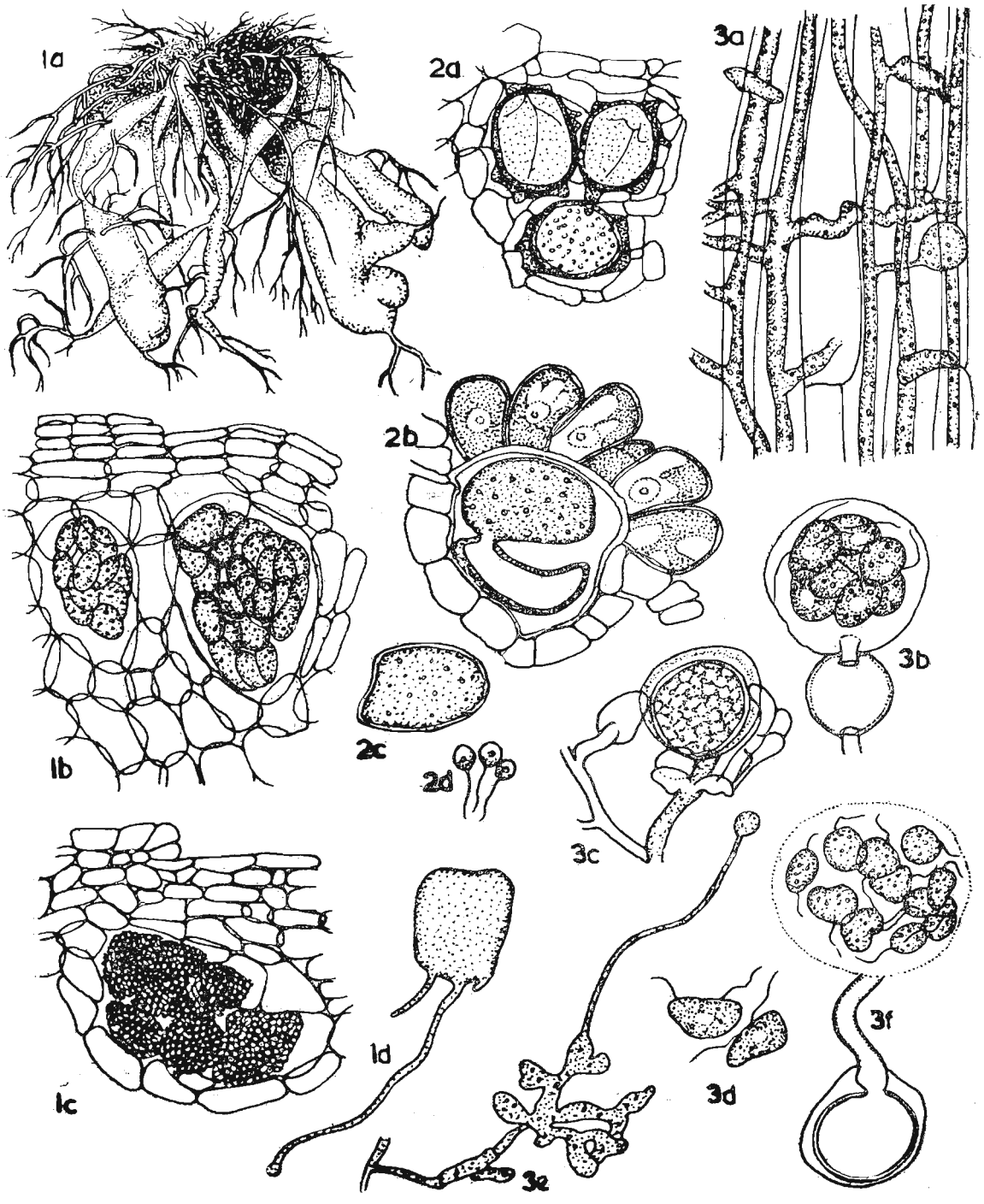

Plate I Figs. 1 — 3

SUB-DIVISION — MASTIGOMYCOTINA

Zoosporic fungi with a motile phase. Mycelium when present is aseptate in youth.

KEY TO THE CLASSES OF THE SUB-DIVISION MASTIGOMYCOTINA

Zoospores uniflagellate	CHYTRIDIOMYCETES
Zoospores biflagellate	OOMYCETES

CLASS — CHYTRIDIOMYCETES

Typically found in aquatic habitats. Many of them inhabit soil, some parasitic on living plants. Thallus a unicellular body converting as a whole into reproductive structures; or rhizomycelium with reproductive structures or a well developed coenocytic mycelium with reproductive structures. Asexual reproductive structure is a sporangium giving rise to uniflagellate zoospores. Sexual reproduction is by conjugation of planogametes, aplanogametes, or gametangia.

The single order Chytridiales has the same characteristics as the class.

A single genus *Synchytrium* de Bary & Woron.

2. *Synchytrium* de Bary and Woron. (Fig 2. a-d.)
= *Woroninella* Racib. (Ainsworth, 1963)

Zoospores penetrate the tissue of the host and form a plasmodium which becomes surrounded by a thick membrane and forms a resting spore, which on germination liberates its contents as zoospores, or as a single mass which divides directly into zoospores, or into a group of thin walled sporangia containing zoospores. No mycelium present at any stage. Parasitic in the tissue of plants, more especially in the epidermal cells. 50 species. Widespread. *S. endobioticum* is the best known species, the cause of the serious black wart disease of potato. Other species parasitise plants of no economic importance.

2 species recorded in Sri Lanka.

(1) *S. fuscum* Petch
On *Emilia sonchifolia* — P : 18

(2) *S. atylosiae* (Petch) Gäum.
(as *Woroninella umbilicata* (B. & Br.) Petch)
On *Phaseolus grahamianus*
& *Atylosia rugosa* — P : 18

CLASS — OOMYCETES

Most oomycetes are aquatic, although some grow in soils, and others parasitise vascular plants. Vegetative body is typically mycelial, coenocytic and very extensive. Mycelium when young is aseptate, irregular septa appearing with age, with delimitation of reproductive structures and under unfavourable conditions. Cell walls are unusual for fungi in that chitin is absent, principal component being glucans. Asexual spores are biflagellate zoospores, one flagellum of the whiplash type and the other tinsel type. In some advanced members sporangium assumes the function of a spore, gets detached from the sporangiophore and germinates directly. Sexual reproduction oogamous resulting in the formation of an oospore. In all cases the sexual spores are the direct result of cell and nuclear fusion.

There is a single order — Peronosporales.

ORDER PERONOSPORALES ('Downy mildews')

This is a group of plant parasites, many of which cause serious damage to important crop plants. Some members are intracellular in the host (ie the hyphae penetrate the host cells), and haustoria are rare, whilst in others hyphae are entirely intercellular with haustoria entering the host cells. Sporangia globose, under most circumstances with a tendency to germinate by germ tubes, instead of by the producton of zoospores, thus functioning as a conidium.

KEY TO THE GENERA OF THE ORDER PERONOSPORALES

[The numbers after the names refer to the serial number of the genera]

1.	Sporangia catenulate (produced in chains); Sporangiophores forming a sorus	*Albugo* **(5)**
	Sporangia not catenulate; sporangiophores not forming a sorus.	2
2.	Zoospores form within the sporangium	3
	Zoospores form not within the sporangium but inside a vesicle.	*Pythium* **(3)**
3.	Sporangiophore of determinate growth	4
	Sporangiophore of indeterminate growth	*Phytophthora* **(4)**
4.	Sporangiophore branching irregularly spaced	*Plasmopara* **(6)**
	Sporangiophore branching dichotomous	5
5.	Branching at right angles	*Pseudoperonospora* **(8)**
	Branching at acute angles	*Peronospora* **(7)**

3. *Pythium* (Pringsh.) (Fig. 3 a-f)

Mycelium branched, septa rare; zoosporangia usually terminal or interstitial; oogonium containing one spore; wall of oospore colourless. Parasitic or saprophytic on plants and animals, mostly in water or very damp places. On plants some species cause 'root rots', 'foot rot' and 'damping off' of seedlings, later resulting in the sudden collapse of seedling plants, especially where seedlings are too densely crowded, or where the seed-beds are located in damp stuffy localities. All forms of reproduction in this genus are produced on the surface, never in the substance of the host. 65 species. Cosmopolitan.

6 species recorded in Sri Lanka.

(1) *P. aphanidermatum* (Edson) Fitzp. — P : 18
On *Curcuma longa*

(2) *P. butleri* — Unpublished data CARI Gannoruwa
On pine apple

(3) *P. debaryanum* Hesse. On Seedlings — P : 18

(4) *P. graminicola* Subram. recorded with doubt — P : 18
On *Curcuma longa* and *Zingiber officinalis*

(5) *P. myriotylum* Dreschl. On *Zingiber officinalis* — P : 18

(6) *P. vexans* de Bary On *Zingiber officinalis* — P : 18

4. *Phytophthora* de Bary. (Fig. 4 a-d.)

Conidiophores emerging through the stomata of the host-plant, sparingly branched; conidia ovate, papillate, produced apically producing zoospores. Oospores globose, epispore rather thin, smooth, brown. The conidia or zoosporangia are in reality always acrogenous or apical, but when a conidium is formed at the apex, the conidiophore continues to increase in length, and bears another conidium at its apex, and this continues repeatedly; consequently many of the conidia appear to be developed laterally on the conidiophore.

20 species, cosmopolitan. This genus includes important pathogens of Cacao (*P. palmivora* (Butl.) Butl.) causing pod rot and canker; lima bean (*P. phaseoli* (Thaxt.)), causing a downy mildew disease; potato and tomato (*P. infestans*) causing the 'late blight' disease; tobacco (*P. parasitica*) (Dastur) causing foot rot; of coconut (*P. palmivora*) (Butl.) (Butl.) causing 'bud rot' disease; of rubber (*P. palmivora*) (Butl.) Butl. causing the 'leaf fall'.

7 species are recorded in Sri Lanka.

(1) *P. arecae* (Colem.) Pethybr.
On *Areca catechu* — P : 18

(2) *P. cinnamomi*
On *Passiflora edulis* — P : 18

(3) *P. colocasiae* Racib.
On *Colocasia esculenta* — P : 18

(4) *P. infestans* (Mont.) de Bary
On *Lycopersicon esculentum*, *Solanum tuberosum* — P : 18

(5) *P. palmivora* (Butl.) Butl.
On *Hevea*, *Theobroma*, *Carica papaya*, *Cocos nucifera*, *Piper nigrum*, Orchids

(6) *P. parasitica* Dastur var. *nicotianae* (van Breda) Tucker. — P : 18
On *Nicotiana tabaccum*
P. parasitica Dastur.
On *Lycopersicon esculentum*, *Citrus* spp. — A : 145; 195
Passiflora edulis. *Piper betel*

(7) *P. phaseoli* Thaxt.
On *Phaseolus lunatus* — P : 18

5. *Albugo* Pers. ex S.F. Gray (Fig. 5 a-e.)

Seri or groups of condiophores produced under the epidermis of host, bursting through when the conidia are mature. Conidiophores in dense clusters, short, each bearing a chain of superposed conidia. Conidia all alike, colourless, and producing zoospores, or the terminal conidium larger than the rest, and either sterile or producing a germ tube on germination. Oospores globose, coloured, producing zoospores on germination.

As both conidia and oospores produce zoospores on germination, these fungi can only infect plants during the presence of a certain amount of moisture. All are parasites of plants. 30 species. Cosmopolitan. They cause 'white blisters' or white rusts of plants.

Plate II Figs. 4 — 5

4. *Phytophthora infestans*

a — sporangiophores penetrating a stoma, much enlarged

b — sporangium with an apical papilla, much enlarged

c — zoospores, much enlarged

d — oogonium and antheredium, much enlarged

5. *Albugo blitii*

a — habit x 1, white rust spots on leaves of *Amaranthus*

b — portion of an acervulus, much enlarged

c — germinating oospore, much enlarged

d — zoospores, much enlarged

e — haustoria, much enlarged
(Figs. 4 — 5 partly after Webster)

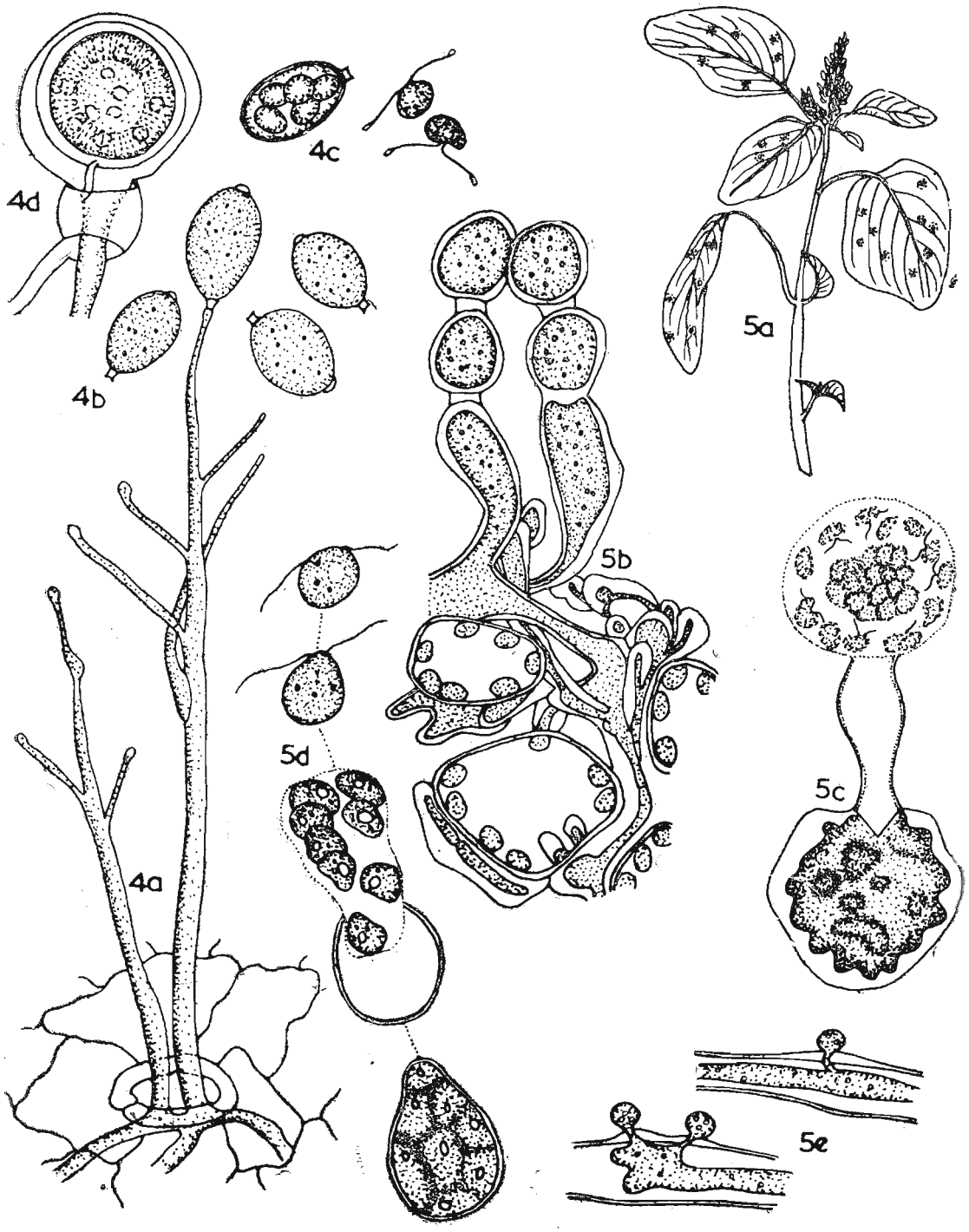

Plate II Figs. 4 — 5

5 species recorded in Sri Lanka.

(1) *A. bliti* (Biv. Bern. ex Lév.) Lév.
On *Achyranthes aspera* P : 17

(2) *A. candidus* (Pers. ex Chev.) Lév.
On *Brassica juncea* P : 17

(3) *A. ipomoeae-panduratae* (Schw.) Sier. and Swingle.
On *Argyreia populifolia* P : 17

(4) *A. platensis Speg.*
On *Boerhaavia diffusa* P : 17

(5) *A. portulacae* (DC. ex Lév.) Lév.
On *Portulaca quadrifida*, P : 17

6. *Plasmopara* Schroet. (Fig. 6 a)

Haustoria ovate; unbranched, Sporangiophores erect, comparatively sparingly branched, determinate, branched at right angles, irregularly spaced; conidia elliptical, generally papillate at the apex. Oospores globose, wall coloured.

All species are parasitic on plants. 20 species. Widespread. *P. viticola* (de Bary) Berl. & de Toni causes a serious disease called the 'downy mildew' of the grape-vine. Damage to the leaves reduces the photosynthesis, that the grapes shrivel through lack of sugar.

One species recorded in Sri Lanka.

(1) *P. viticola* (de Bary) Berl. & de Toni
On *Vitis vinifera* P : 18

7. *Peronospora* Corda (Fig. 7 a)

Haustoria filiform, branched, sporangiophore emerging through the stomata of the host; branching is dichotomous at acute angle; conidia elliptical, apex rounded, germination by the lateral protrusion of a germ tube. Oospores produced in the substance of the matrix.

All the species are parasitic on plants, mostly on leaves. Distinguished from allies by the filiform, branched haustoria, and absence of a papilla at the apex of the conidium.

75 species. Widespread, causing downy mildews of a number of crop plants.
2 species, are recorded in Sri Lanka.

(1) *P. parasitica* (Fr.) Tul.
On *Brassica juncea*
Brassica oleracea P : 18

(2) *P. pisi*
On *Pisum sativum* A : 115

8. *Pseudoperonospora* Rostovtsev (Fig 8a)

Differs from *Peronospora* Corda in that the sporangiophores are branched at right angles.
5 species, widespread, causing downy mildew of a number of economically important crops.

Plate III Figs. 6— 8

6. *Plasmopara viticola*

a — sporangiophores and sporangia emerging out of grape leaves, intecellular mycelium, with haustoria x 400

b — oospore, enlarged

c — germination of oospore, enlarged

7. *Peronospora destructor*

a — sporangiophore with sporangia, much enlarged

8. *Pseudoperonospora*

a — sporangiophore with sporangia, much enlarged
(Fig. 7 — 8 After Punithalingam)

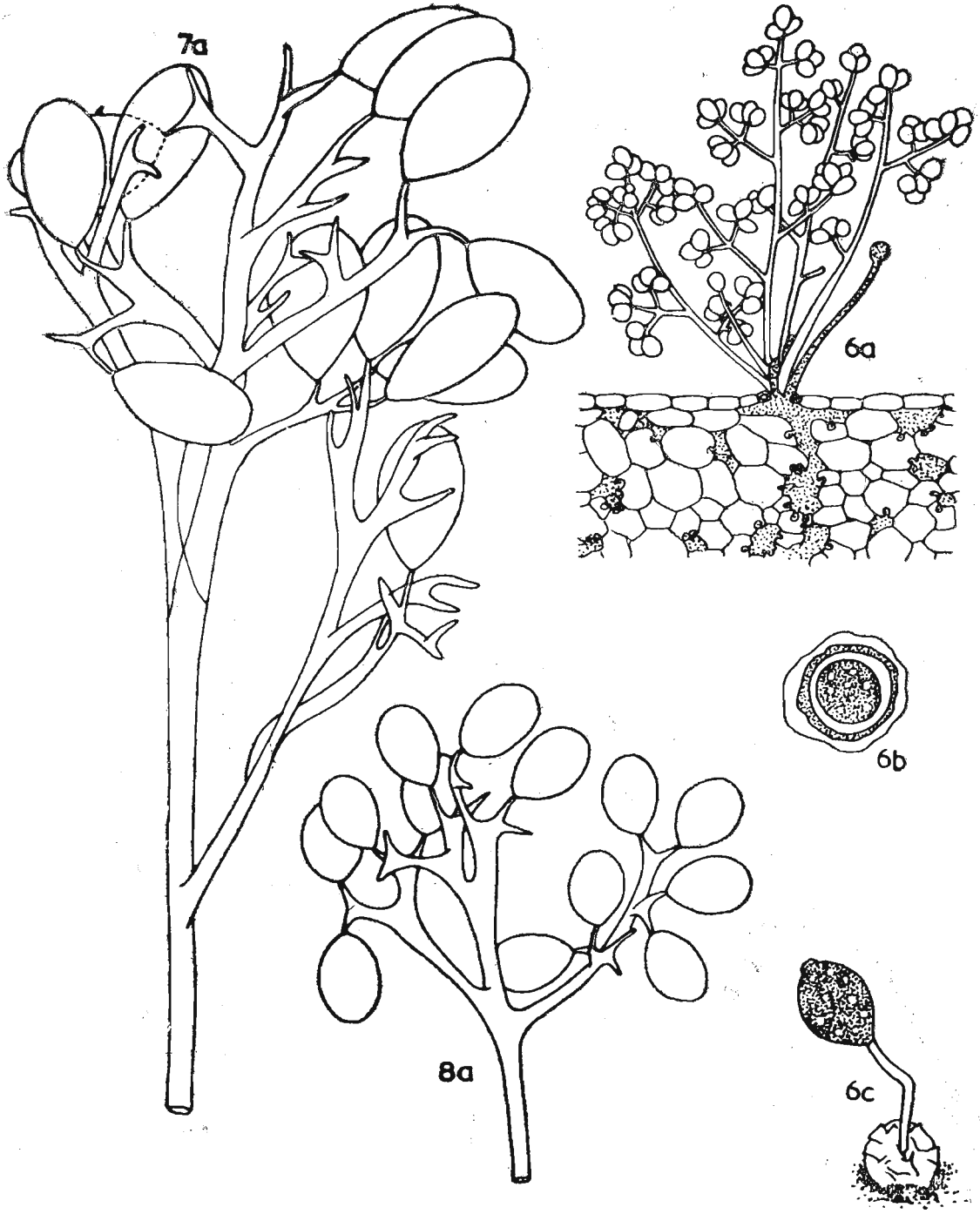

Plate III Figs. 6 — 8

One species recorded in Sri Lanka.

(1) *P. cubensis* (Berk. & Curt.) Rostov.
On *Cucumis sativus*
Curcubita pepo
Trichosanthes anguina P : 18

ZYGOMYCOTINA

This sub-division is an assemblage of fungi which reproduce asexually by non-motile aplanospores. The spores are contained in sporangia. Sexual reproduction is by gametangial copulation which is typically isogamous and results in the formation of zygospores. Mycelial organisation is coenocytic in youth. Septation occurring with laying down of reproductive organs, with age, or under unfavourable conditions.

ZYGOMYCETES

Some members are ubiquitous in soil and dung as saprophytes, few are parasitic on plants, other fungi, insects and animals. When parasitic on plants, they are weak parasites of fruits, and storage organs. Asexual reproduction by spores contained in globose sporangia surrounding a central core or columella. Some also possess few-spored sporangia, termed sporangioles, dispersed as a unit. In the conidial types, unicellular propagules are dispersed. Sexual reproduction results in the formation of warty zygospores.

There is a single order Mucorales, having the same characteristics of the class.

KEY TO THE GENERA OF THE ORDER MUCORALES

Sporangia all columellate and alike ..... *Rhizopus* **(9)**
Columellate sporangia accompanied by sporangioles *Choanephora* **(10)**

9. *Rhizopus* Ehrenberg ex Corda (Fig. 9a-d)

Occurs not only in soil but on fruits, other foods, all kinds of decaying materials and as a laboratory contaminant. Characteristic features are the presence of rhizoids at the base of sporangiophores, and the stoloniferous habit. An aerial hypha or stolon grows out and where it touches the substratum it bears rhizoids and sporangiophores. Growth in this manner is repeatted. Sporangiophores may be single but usually occur in groups of two, three or more. Sporangia columellate, white at first becoming bluish black at maturity. Columellae broadly subjacent, hemispherical, forming after dehiscence, by collapse, an organ of the shape of the pileus of a mushroom. Spores round or oval, angular, coloured bluish or brown with a cuticularised wall. Zygospores naked, formed in the substratum and on the stolons. *R. stolonifer* (syn. *R. nigricans*) is a common saprophyte and a facultative parasite of mature fruits and vegetables.

A single species recorded in Sri Lanka.

(1) *R. artocarpi* Racib.
Syn. *Mucor artocarpi* B. and Br. P : 18

Common on fruits and flowers of *Artocarpus integer* and fruits of *Musa*.

Plate IV Figs 9 — 12

9. *Rhizopus stolonifer*

a — habit x 40
b — sporangiophores and rhizoids x 400
c — columella and attached spores, much enlarged
d — zygospore, much enlarged

10. *Choanephora cucurbitarum*

a — sporangiophore with a sporangium, enlarged
b — conidiophore with conidia, enlarged
c — conidiophore, much enlarged
d — conidium, much enlarged
e — sporangiospore, much enlarged

11. *Taphrina* a — c *T. maculans*

a — part of turmeric leaf with spots x 1
b — mycelium x 400
c — asci and ascospores, much enlarged
11d—f. *T. deformans*
d — leaf curl of peach x 1
e — asci and ascospores, much enlarged
f — germinating ascospores, much enlarged

12. *Penicilliopsis clavariiformis*

a — ascocarps x 1/2
b — section through an ascocarp, enlarged
c — ascus with mature ascospores, much enlarged
d — *Penicillium* — like imperfect state x 265
(Figs. 9 — 10 After Webster)

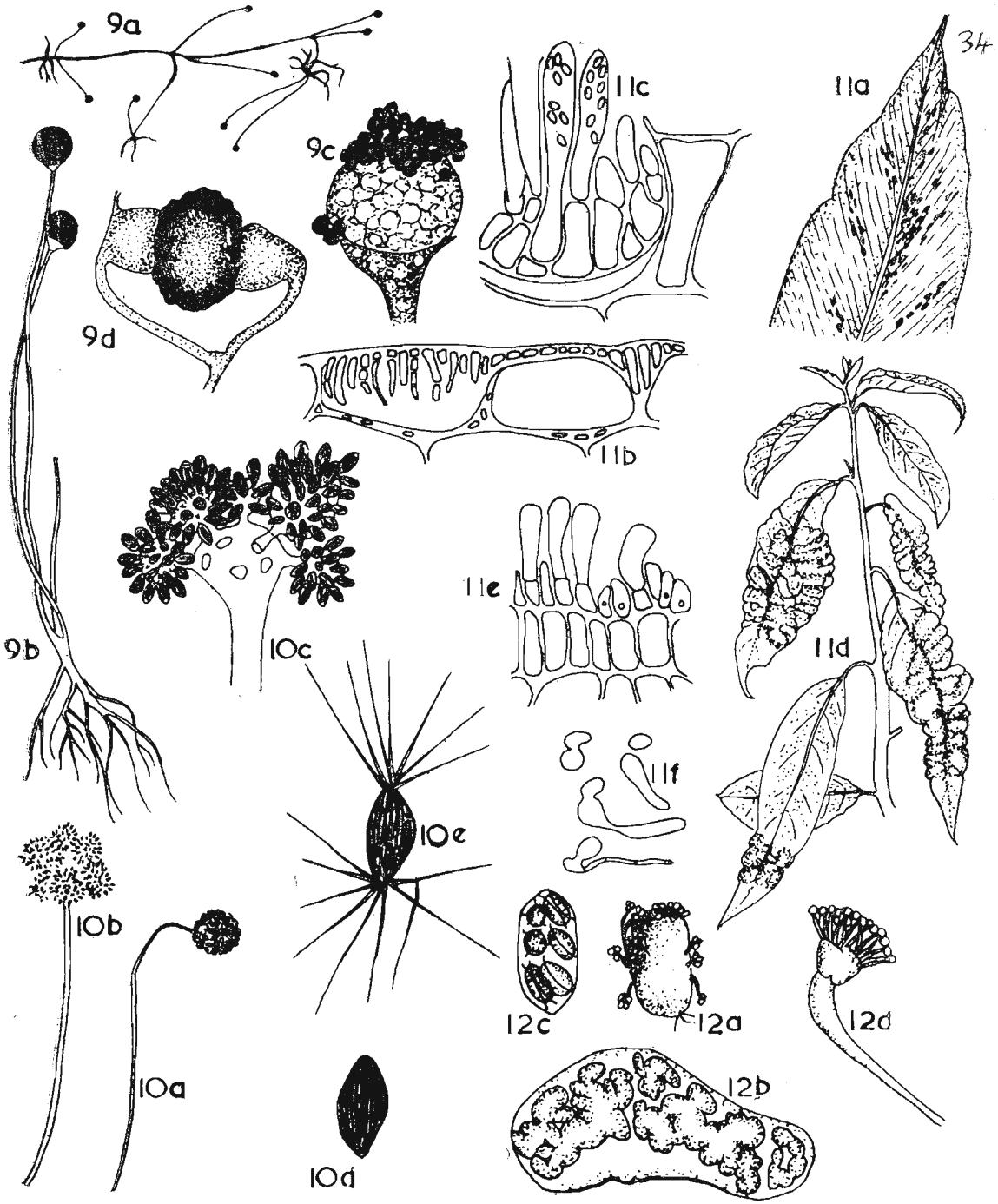

Plate IV Figs. 9 — 12

10. *Choanephora* Currey (Fig 10a-e)

Species are found in warmer soils. Some species cause a rot of fruits and is also commonly isolated from decaying flowers of various kinds. Asexual reproductive structures are of two kinds: columellate or non columellate sporangia with brown spores; non-columellate sporangioles borne in large numbers on globose vesicles; sporangioles containing from 1-5 dark, brown spores with bristle like appendages.

2 species especially tropical. *C. cucubitarum* (Berk. & Rav.) Thaxt. causes blossom blight and fruit rots of cucurbits and other plants.

2 species recorded in Sri Lanka.

(1) *C. infundibulifera*
On *Zinnia elegans* A : 21

(2) *C. simsoni Cunn.*
On *Zinnia elegans* P : 17

SUB-DIVISION — ASCOMYCOTINA (Ascomycetes)

Largest class of fungi containing some 15,000 species. Mycelium well developed (except in some Hemiascomycetes), usually richly branched and septate. The sexually produced spores (sometimes called the 'perfect' spores) are borne in a sac or ascus, typically containing 8 spores. Asci may be formed on the vegetative mycelium, but typically formed from ascogenous hyphae surrounded by sterile hyphae to form an ascocarp. The form of the ascocarp is very varied. When globose evanescent asci are borne at all levels from ascogenous hyphae ramifying irregularly throughout the central tissue of a closed ascocarp, they are termed *cleistothecia*. Flask shaped or globose, closed or ostiolate fruit bodies with asci arranged in a basal or peripheral layer, are termed *perithecia*. When asci are arranged in a layer on open saucer shaped ascocarps, they are termed *apothecia*. When the asci are individually and irregularly distributed in the stromatal tissue or grouped in locules, ascocarps are termed *ascostroma*. In many, ascocarps are seated on, or in a mass of tissue termed a *stroma*. Wall of a mature ascus is either single layered (unitunicate) or two-layered (bitunicate). Whilst some members of Ascomycotina reproduce by means of ascospores only, many have one or more conidial states. The conidial state, is also referred to as the 'imperfect' state. Different authorities hold widely different views about the classification of Ascomycetes. For the purpose of this key, the system proposed by Ainsworth (1973) will be followed.

KEY TO THE CLASSES OF THE SUBDIVISION ASCOMYCOTINA

1. Ascocarps and ascogenous hyphae present ; thallus mycelial 2
   Ascocarps and ascogenous hyphae lacking ; thallus mycelial or yeast like ..... HEMIASCOMYCETES (P. 18)

2. Asci unitunicate (if bitunicate borne in an apothecium); ascocarps of various types; 3
   Asci bitunicate ascocarp an ascostroma ..... LOCULOASCOMYCETES (P. 45)

3. Asci evanescent; scattered within a closed ascocarp ..... PLECTOMYCETES (P. 19)
   Asci persistent; regularly arranged within an ascocarp as a basal or peripheral layer 4

4. Ascocarp typically a perithecium ..... PYRENOMYCETES (P. 19)
   Ascocarp typically an apothecium ..... DISCOMYCETES (P. 65)

CLASS — HEMIASCOMYCETES

Feature which distinguishes this class from other classes is the absence of an ascocarp ie an investment of sterile cells surrounding the ascus. Asci are formed singly and are not borne on ascogenous hyphae.

Two orders are included here, the Endomycetales (the ascosporogenous yeasts, and related filamentous fungi) and the Taphrinales (a group of specialised plant parasites). Most yeasts are saprophytic. A few species are parasitic on human, animals or plants.

KEY TO THE ORDERS OF THE CLASS HEMIASCOMYCETES

Zygotes directly transformed into asci; ascospores spindle shaped ..... *ENDOMYCETALES*

Asci formed from a specialised ascogenous cell; ascospores spherical or ovoid ..... *TAPHRINALES*

ORDER — ENDOMYCETALES (Yeasts)

These are fungi which, in a stage of their life cycle, occur as single cells, reproducing by budding or fission. Zygotes or single cells transform into asci.

Most of the yeasts and related organisms are saprobes; their habitats are plants and animals. A few species are parasites and are known as human, animal, or plant pathogens.

There is a single genus *Nematospora*.

11. *Nematospora* Peglion

Mycelium is present with budding yeast cells. Ascospores are spindle shaped. Single species is recorded. Especially Tropical, inoculated by insects. One species recorded in Sri Lanka.

(1) *N. Coryli* Peglion
in pods of *Phaseolus lunatus* P : 20

ORDER — TAPHRINALES

Mycelium intercellular, or sub-cuticular or else develop within the outer epidermal wall. Hyphae hyaline and branched. Asci arise from ascogenous cells as thin walled sacs burst out, primarily clavate — cylindrical in shape. Asci occur in a subcuticular palisade layer or terminal cells of septate intercellular hyphae. Ascospores bud before or after ejection from the asci to form numerous blastospores.

Ascospores and blastospores forcibly discharged by rupture of the ascus wall at the apex, of ascus. Blastospores continue to bud after ejection.

Parasitic fungi which attack higher plants and ferns causing galls on leaves, stems and fruits as well as hypertrophied and deformed leaves and fruits and leaf spots. There is a single genus with characteristics as described for the order.

12. *Taphrina* Fr. (Fig 11a—f)

Exoascus Fuckel

The pathological effects produced by these fungi are of various kinds. The leaves curl with hypertrophy, and hyperplasia in the affected parts, causing 'witches brooms'. Sometimes there may be only spotting, the spots resembling the pustules caused by rusts. *T. maculans* causes a leaf spot on turmeric, resulting in considerable damage. *T. deformans* causes a leaf curl of peach. 100 species, widespread.

species recorded in Sri Lanka.

(1) T. *cornu-cervi* Giesenh.
on *Aspidium aristatum* — P : 21

(2) T. *deformans* (Berk.) Tul.
on *Prunus persica* — P : 21

(3) T. *laurencia* Giesenh.
on *Pteris quadriaurita* — P : 21

(4) *T. maculans* Butler
on *Curcuma longa* — A : 163

PLECTOMYCETES

In this group are included ascomycetes with ascocarps which are rudimentary, or consisting of a loose investment of hyphae or globose cleistothecia. Paraphyses are absent and asci are irregularly distributed, produced from fertile hyphae ramifying throughout the centrum. The asci are globose or broadly club-shaped and typically 8 spored, and thin walled. They are evanescent ie. release the ascospores by deliquescing and setting them free in the ascocarp. Ascospores are unicellular without germ pores or germ slits. Many Plectomycetes have conspicuous and characteristic imperfect states, which are encountered in nature, more frequently than the perfect states. There is a single order Eurotiales, with the characteristics described for the class. There is a single genus *Penicilliopsis.*

13. *Penicilliopsis* Ghosh, Orr & Kuehn (Fig. 12 a—d)

Cleistothecia stipitate, red-brown, in racemose clusters on stalks 2—3 cm tall;fertile areas separated into locules by sterile interthecial hyphae; ascospores with wing like appendages, some with equatorial crests; Imperfect state *Penicillium*-like, with catenulate phialospores.

5 species. Tropical.

One species recorded in Sri Lanka.

P. clavariiformis Solms — Laub.
On fruits of *Diospyros* sp. — P : 34

CLASS PYRENOMYCETES

The pyrenomycetes are defined here as ascomycetes with the ascocarp entirely surrounded by perithecial wall,containing unitunicate asci which primarily are arranged in a hymenial layer. In many, the perithecia are provided either apically or rarely laterally with an opening (ostiole) which is covered inside by hyphae-like paraphyses. Exceptionally it may be completely closed (astomatous) but ascus wall is persistent. Asci spherical, club shaped or cylindrical. Spores of various shapes, one-celled to many-celled, hyaline brightly coloured or black, at times with gelatinous sheath or appendages. Paraphyses may or may not be present.

Plate V Figs. 13 — 15

13. *Amazonia* sp.

a — section of a perithecium, enlarged

14. *Meliola* sp.

a — mycelium with capitate and mucronate hyphopodia x 500

b — mycelial setae x 500

c — ascospore x 500

15. *Erysiphe polygoni*

a — entire perithecium x 400

b — section through a perithecium much enlarged

c — ascus with ascospores much enlarged
(Fig. 15 after Webster)

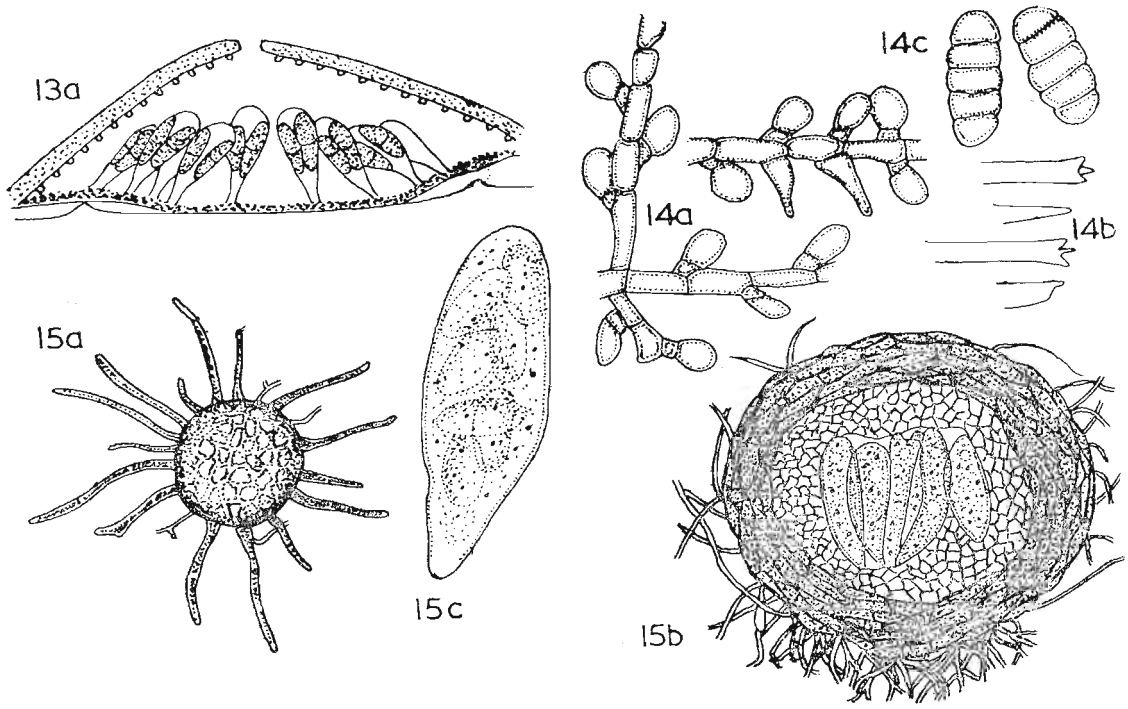

Plate V Figs. 13 — 15

Many are saprobic on stumps, dead twigs and branches, leaves and stems of herbaceous plants. Few are coprophilous. A large number cause serious diseases of plants.

Pyrenomycetes include a number of different evolutionary lines which are presently placed in several orders. The present classification of pyrenomycetes is based on Ainsworth et al. (1973).

KEY TO THE ORDERS OF THE CLASS PYRENOMYCETES

1. Perithecia ostiolate, if astomatous, not developing upon an external mycelium ..... *SPHAERIALES* (P. 24)

   Perithecia astomatous or rarely possessing rudimentary ostiole; developing upon an external mycelium 2

2. External mycelium dark, hyphopodia present ..... *MELIOLALES* (P. 21)

   External mycelium hyaline, hyphopodia absent ..... *ERYSIPHALES* (P. 23)

ORDER MELIOLALES ('Black or dark mildews')

Dark mycelium commonly with, two celled branches with a swollen terminal cell (capitate hyphopodia)or 1-celled flask shaped branches (mucronate hyphopodia),arising from the main hyphae. In some genera long erect hyphae are found over the surface of the colony and/or only around the base of the perithecia (mycelial setae). Perithecia dark, flattened or spherical, superficial on the mycelium, either astomatous or often with a rudimentary ostiolar neck. Asci evanescent 2—4 or rarely 8-spored. Ascospores 2—5 celled, dark brown, thick-walled.

For many years it was believed that various Meliolales had imperfect states in such genera as *Helminthosporium, Calonectria,* and *Arthrobotryum.* Hansford (1946) and others now believe that these imperfect fungi are parasitic on Meliolales.

These occur in warm humid forested tropical areas, usually on adult leaves, and are popularly referred to as 'black mildews' or 'dark mildews'.

KEY TO THE GENERA OF THE ORDER MELIOLALES

1. Perithecia globose; mycelial setae present ..... *Meliola* **(16)**

   Perithecia flattened; mycelial setae absent 2

2. Free mycelium present ..... *Amazonia* **(15)**
   Free mycelium absent ..... *Actinodothis* **(14)**

14. *Actinodothis* Syd.

No free mycelium. Perithecia superficial, flattened, with innate hypostroma, attached at several points; hymenia several with separate or divided scutellum, rounded or discoid; asci many in each hymenium, aparaphysate, 2-spored; ascospores dark, 4—5 celled.

One species recorded in Sri Lanka.

(1) *A. piperis* Syd.
On leaves of *Piper* ..... P : 21

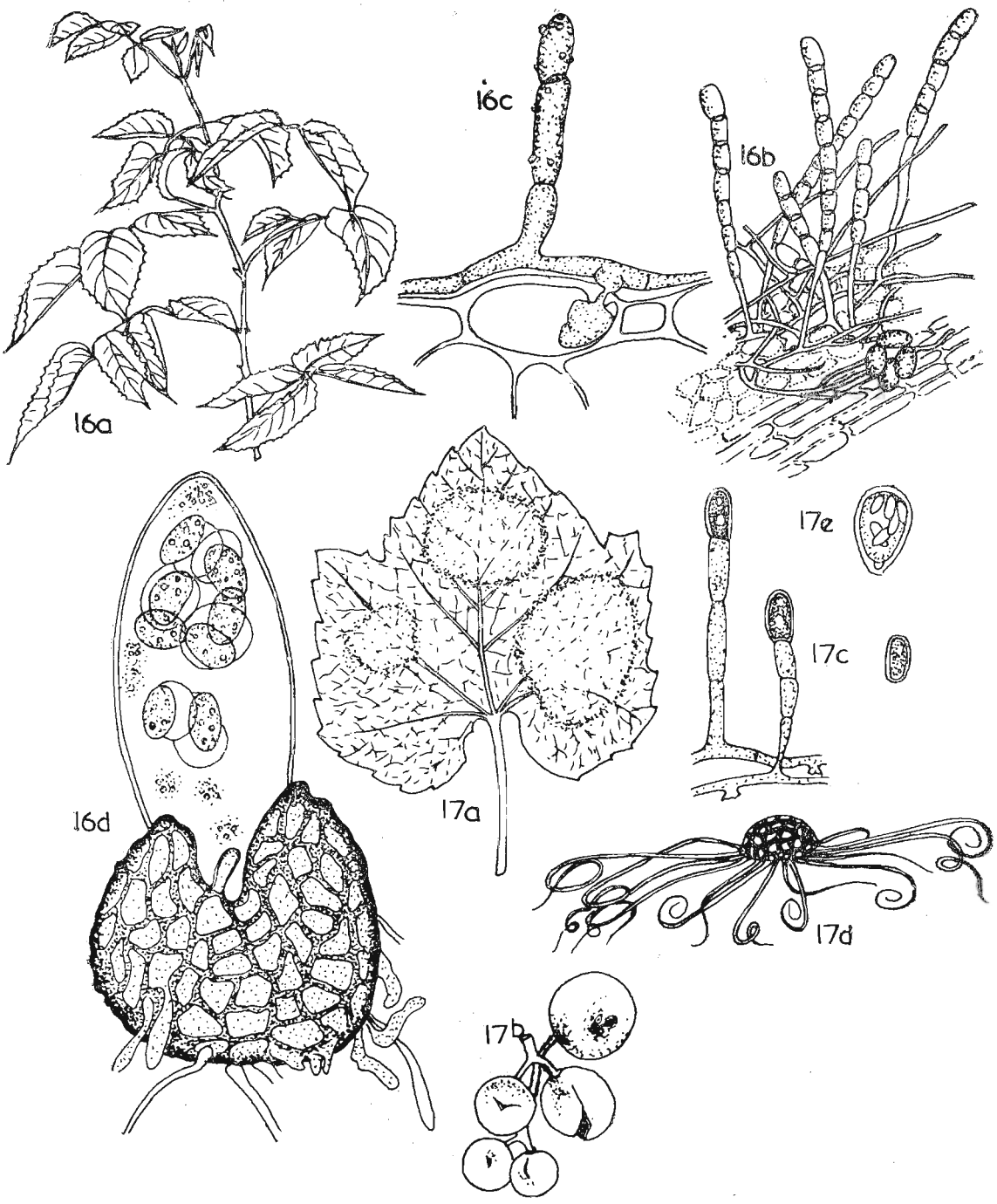

Plate VI Figs. 16 — 17

Plate VI Figs. 16 — 17

16, *Sphaerotheca pannosa*

a — habit showing curled up leaves x 1/2

b — mycelium and conidiopores on the epidermis of the leaf x 400

c — T.S. rose leaf with superficial mycelium, haustorium and conidial chain, much enlarged

d — perithecium with a single ascus containing ascospores, much enlarged

17. *Uncinula necator*

a — affected vine leaf x 1

b — affected grapes x 1

c — conidiophores and conidia x 400

d — perithecium with curled appendages x 400

e — ascus with ascospores, enlarged

15. *Amazonia* Theiss. (Fig 13a)

Mycelium dark forming a superficial net of thick walled regularly branched septate hyphae with hyphopodia. Perithecia flattened, radiate, superficial on the mycelium with dark peridium; ascospores 4—5, equal celled.

10 species. Amer., Asia, Afr. One species recorded in Sri Lanka.

(1) *A. peregrina* Syd.
On *Maesa indica* ..... P : 31

16. *Meliola* Fries (Fig 14a-c)

Dark superficial mycelium; lateral branches with club shaped or lobed hyphopodia; stiff erect bristles (setae), around black subglobose perithecia, and on the mycelium; ascospores 4—5 equal celled, sometimes muriform, hyaline or coloured.

More than 1000 sp. especially on tropical plants. 9 species recorded in Sri Lanka.

(1) *M. amphitricha* (Fr.) Fr.
On *Terminalia belerica, Dysoxylon, Hippocratea indica* P : 33

(2) *M. calastroma* (Desm.) Hohnel
On *Rubus moluccanus* and *R. ellipticus* P : 33

(3) *M. furcata* Lev.
On *Atalantia* P : 33

(4) *M. ganglifera* Kalchbr.
On *Hippocratea indica* P : 33

(5) *M. hyalospora* Lev.
On *Acrotrema* P : 33

(6) *M. moerenhoutiana* Mont.
On *Symblocos* P : 33

(7) *M. mollis* B. & Br.
On *Eugenia jambolana* P : 33

(8) *M. pleurostyliae* (B. & Br.) Hohnel
On *Pleurostylia* P : 33

(9) *M. tetradeniae* (Berk.) Theiss. & Syd.
On *Tetradenia* P : 33

ORDER-ERYSIPHALES ('Powdery mildews')

Mycelium entirely superficial with septate uninucleate hyphae, growing over the surface of the host plant (leaves, buds, flowers and fruits) and putting haustoria into the epidermal cells or in a few species into the sub-epidermal cells. Conidia produced in upright chains and often in such numbers that the host appears to be coated with white dust, hence the popular name 'powdery' mildews. Some species are known only in the asexual form (the form genera *Oidium*, *Oidiopsis* and *Ovulariopsis*); others produce perithecia only occasionally, and during unusually hot weather; perethecia dark, spherical, superficial on the mycelium, astomatous.

KEY TO THE GENERA OF THE ORDER ERISIPHALES

1. Perithecia with 1 ascus ..... *Sphaerotheca* **(18)**
   Perithecia with many asci 2
2. Appendages of perithecia simple ..... *Erysiphe* **(17)**
   Appendages of perithecia coiled at the ends ..... *Uncinula* **(19)**

17. *Erysiphe* Hedw. f. ex Fr. (Fig. 15a-c)

Perithecia contain several asci; ascus 8—spored; perithecial appendages simple, mycelioid. Conidial state — *Oidium*. 10 species, cosmopolitan. 2 species recorded in Sri Lanka.

(1) *E. cichoracearum*
On *Hibiscus esculentus*
Nicotiana tabacum
& *Chrysanthemum* A : 159, 218, 219, 243.

(2) *E. polygoni*
On *Vigna sinensis*
Pisum sativum A : 113. 116

18. *Sphaerotheca* Lev. (Fig 16a-d)

Perithecia having the vague, floccose appendages, springing from its base and interwoven with the mycelium; ascus solitary, 8 spored. Conidial state in the form genus *Oidium*.

6 species, cosmopolitan.

One species recorded in Sri Lanka.

(1) *S. pannosa* Wallr.
On *Rosa* sp. ..... A : 240

19. *Uncinula* Lev. (Fig. 17 a-e)

Perithecia with simple, rarely forked appendages, curled at the tip. Asci several, 2—8 spored.

20 species, cosmopolitan.

One species recorded in Sri Lanka.

(1) *U. necator*
On *Vitis vinifera* ..... A : 210

ORDER — SPHAERIALES

Ascocarps spherical, hemispherical, or flask shaped (botuliform) mostly ostiolate, and rarely astomatous (no opening), having a bright fleshy or dark membranous or carbonaceous wall. Ostiole provided with ostiolar hairs (periphyses). Ascocarps solitary or aggregated and connected by stromatic structures, or found on a subiculum (compact cottony mycelium). Asci spherical clavate, fusiform or cylindrical. Ascospores 1-celled or septate, hyaline or coloured.

Sphaeriales are considered here in a very broad sense to include Diaporthales, Xylariales, Claviceptales and Hypocreales (Ainsworth et-al. 1973).

KEY TO THE GENERA OF THE ORDER SPHAERIALES

1.	Perithecia, membranous to carbonaceous	.....	2	
	Perithecia fleshy	.....	25	
2.	Ascospores acicular to filiform	.....	*Ophiodothella*	**(46)**
	Ascospores not acicular to filiform	.....	3	
3.	Ascospores 1 — celled	.....	4	
	Ascospores many celled	.....	20	
4.	Ascospores hyaline or subhyaline	.....	5	
	Ascospores coloured	.....	13	
5.	Ascospores botuliform	.....	6	
	Ascospores not botuliform	.....	7	
6.	Stroma valsoid, ie perithecia in a circle or row	.....	*Valsa*	**(43)**
	Stroma not as above	.....	*Diatrype*	**(39)**
7.	Perithecia with a subicle or stroma	.....	8	
	Perithecia without a subicle or stroma	.....	9	
8.	Stroma with a black outer crust	.....	*Phyllachora*	**(47)**
	Stroma without a black outer crust	.....	*Glomerella*	**(45)**
9.	Perithecia innate	.....	10	
	Perithecia superficial	.....	11	
10.	Ascospores with a mucous sheath	.....	*Myelosperma*	**(36)**
	Ascospores without a mucous sheath	.....	*Physalospora*	**(38)**
11.	Ascus wall persistent	.....	*Wallrothiella*	**(50)**
	Ascus wall not persistent	.....	12	
12.	Perithecia spherical; asci spherical	.....	*Ceratocystis*	**(52)**
	Perithecia botuliform; asci clavate	.....	*Caliciopsis*	**(44)**
13.	Ascospores with mucilaginous appendage	.....	*Pemphidium*	**(37)**
	Ascospores without mucilaginous appendage	.....	14	
14.	Perithecia with a subicle or stroma	.....	15	
	Perithecia without a subicle or stroma	.....	19	
15.	Perithecia with a subicle	.....	*Rosellinia*	**(55)**
	Perithecia with a stroma	.....	16	
16.	Stroma covered by a clypeus	.....	*Sphaeorodothis*	**(49)**
	Clypeus lacking	.....	17	
17.	Stroma stalked	.....	*Xylaria*	**(57)**
	Stroma not stalked	.....	18	
18.	Stroma solid	.....	*Hypoxylon*	**(54)**
	Stroma more or less hollow	.....	*Ustulina*	**(56)**

19.	Perithecia immersed in the host tissue	.....	*Anthostomella*(53)
	Perithecia superficial	.....	*Rosellinia* (55)
20.	Ascospores 1 — septate	.....	21
	Ascospores many — septate	.....	23
21.	Cells of ascospores of equal size	.....	22
	Cells of ascospores of unequal size	.....	*Rehmiodothis* (48)
22.	Perithecia with a subicle or stroma; ascospores hyaline-subhyaline	.....	*Diaporthe* (40)
	Perithecia without a subicle or stroma; ascospores coloured	.....	*Plagiostoma* (42)
23.	Ascospores hyaline	.....	*Rhopographella*(58)
	Ascospores coloured	.....	24
24.	Perithecia with a subicle	.....	*Chaetosphaeria*(51)
	Perithecia in a stroma	.....	*Melogramma* (41)
25.	Ascospores acicular to filiform	.....	26
	Ascospores not acicular to filiform	.....	30
26.	Perithecia with a stroma	.....	27
	Perithecia without a stroma	.....	29
27.	Stroma bright	.....	28
	Stroma dark	.....	*Ustilaginoidea*(22)
28.	Stroma stalked and arising from a sclerotium	.....	*Claviceps* (20)
	Stroma not stalked and not arising from a sclerotium	.....	*Epichloe* (21)
29.	Perithecia innate	.....	*Micronectria* (26)
	Perithecia superficial	.....	*Ophionectria* (29)
30.	Ascospores 1 — celled	.....	31
	Ascospores many celled	.....	34
31.	Ascospores hyaline — subhyaline	.....	32
	Ascospores dark	.....	33
32.	Ascospores elliptical	.....	*Pseudonectria* (30)
	Ascospores not elliptical	.....	*Hyponectria* (35)
33.	Perithecia beaked	.....	*Melanospora* (32)
	Perithecia not beaked	.....	*Neocosmospora*(28)
34.	Ascospores 1 — septate	.....	35
	Ascospores many — septate	.....	38
35.	Perithecia with a subicle or stroma	.....	36
	Perithecia without a subicle or stroma	.....	37
36.	Perithecia in a subicle	.....	*Hypomyces* (31)
	Perithecia in a stroma	.....	*Hypocrea* (25)
37.	Perithecia with a stilboid base	.....	*Sphaerostilbe* (33)
	Perithecia without a stilboid base	.....	*Nectria* (27)

38. Perithecia with a subicle or stroma ..... *Stereocrea* **(34)**
Perithecia without a subicle or stroma 39

39. Perithecia red, yellow or white ..... *Calonectria* **(23)**
Perithecia blue, greenish, or violet ..... *Gibberella* **(24)**

20. *Claviceps* Tulsane (Fig 18 a-e)
= *Balansiella* P. Henn. Ainsworth (1963)

Stroma stipitate borne on an elongated black sclerotium, club shaped with globose heads, perithecia immersed in the stroma; asci narrow, cylindrical 8-spored; ascospores thread like; septate.

10 sp. Cosmopolitan. Parasitic on graminae and other hosts. Best known and economically more important species is *C. purpurea*, cause of ergot of rye and other grasses.

One species recorded in Sri Lanka under the name *Balansiella* P. Henn.

(1) *B. pulvinula* (B. & Br.) Petch
On *Panicum* P : 28

21. *Epichloe* (Fr.) Tul. (Fig 19 a-c)

Stroma sessile, effused, girdling the leaf sheath of grasses, bright coloured, at first bearing conidia; perithecia immersed; asci very long, cylindrical, wall persistent, 8-spored; spores septate, needle-shaped.

8 species, widespread. Parasitic on a number of graminaceous hosts. One species recorded in Sri Lanka.

(1) *E. cinerea* B. & Br.
On *Eragrostis nutans* P : 28

22. *Ustilaginoidea* Bref. (Fig 20a-b)

Stroma dark, irregulary spherical, effuse; perithecia immersed in the stroma; asci long and narrow, 8-spored; ascospores filiform, septate; dark conidial fructifications present in young stroma; conidia dark and smutlike; one celled.

5 species in ovaries of Graminae, in the warmer regions. *U. virens* infects the grains and causes the disease called the 'false smut of Rice'. On diseased grain the fungus develops into a large velvety swollen mass, often bigger than the normal grain. This mass emerges through the glumes.

One species recorded in Sri Lanka.

(1) *U. virens* (Cooke) Tak.
On *Oryza sativa* P : 79

23. *Calonectria* de Not. (Fig 21a-b)

Perithecia superficial, scattered, brightly coloured, yellow or red and occur isolated or several together; ascospores hyaline, elliptical or fusiform, with more than one septum.

50 sp. widespread. A few species grow on the bark of different trees. A number of others develop as hyperparasites of *Meliola* and other fungi (Hansford 1946). *Cylindrocladium floridanum* Sobers & Seymour is the imperfect state of *Calonectria kyotensis*, and is found to cause die-back in clove seedlings. (See *Cylindrocladium*)

Plate VII Figs. 18 — 22

18. *Claviceps purpurea*

a — sclerotium on a grass x 1
b — sclerotium with a perithecial stroma, enlarged
c — L.S. perithecial stroma x 40
d — T.S. young sclerotium with conidia, enlarged
e — ascus and ascospores, much enlarged

19. *Epichloe typhina*

a — perithecial stroma x 1
b — T.S. stem and leaf sheath of a grass surrounded by perithecial stroma x 40
c — ascus and ascospores, much enlarged

20. *Ustilaginoidea virens*

a — habit showing smutted and healthy paddy grains x 1
b — conidia and mycelium x 400

21. *Calonectria* sp.

a — perithecium, enlarged
b — ascospore, much enlarged

22. *Gibberella fujikuroi*

a — habit x 100
b — macroconidia and microconidia x 400
c — section of a perithecium, much enlarged
d — ascus, much enlarged
e — ascospore, much enlarged
(Figs. 18 — 19 After Webster)

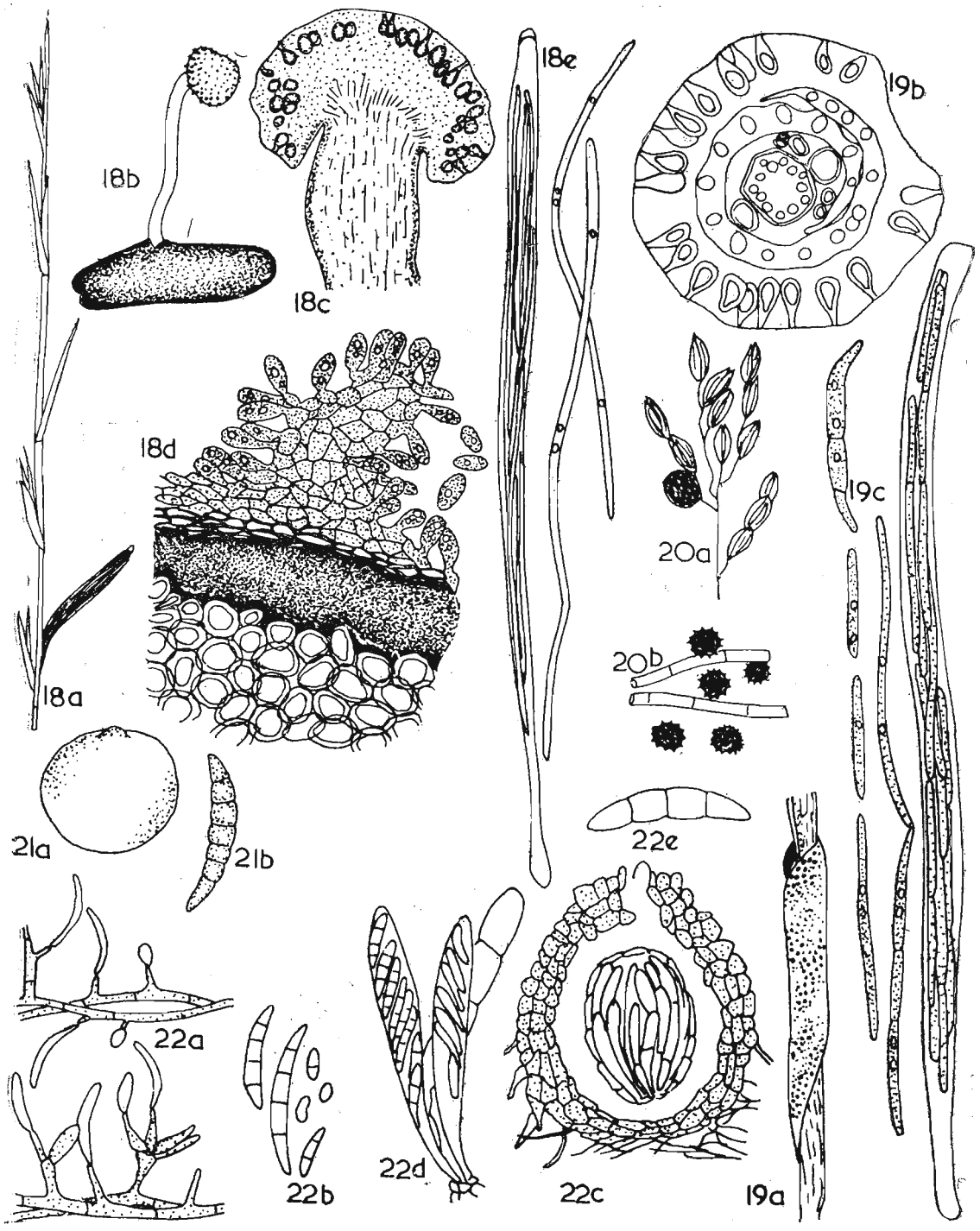

Plate VII Figs. 18 — 22

One species recorded in Sri Lanka.

(1) *C. volutella* (B. & Br.) Sacc.
On *Meliola* P : 28

24. *Gibberella* Sacc. (Fig 22 a—e)

Perithecia have a transparent blue or violet colour and form tufts on the stromata, superficial; asci 8-spored; ascospores light coloured, spindle-shaped or oblong, more than 2-celled often separating within the ascus; conidial states in the form—genus *Fusarium*. 10 species widespread.

G. fujikuroi (Saw.) Wollenw. (= G. *moniliforme* (Sheld) Wineland) causes on seedlings and mature rice plants, a disease referred to as 'foot rot' and 'Bakanae disease'. Diseased seedlings become pale and thin and finally killed. In the field with mature plants, the most conspicuous symptom is the appearance of tall and lanky tillers, which come into 'shot blade earlier than the rest of the crop bearing pale green flags. Conidial state of this fungus is *Fusarium moniliforme*. *G. fujikuroi* (Saw.) Wollenw. is used for the production of gibberellin and gibberellic acid.

One species recorded in Sri Lanka.

(1) *G. fujikuroi* (Saw.) Wollenw.
On *Oryza sativa* A : 94

25. *Hypocrea* Fries (Fig 23a—c)
= *Creopus* Link
= *Mycocitrus* Moller (Muller, E. and Von Arx. J. A. 1973)

Stroma sessile flat or cushion shaped, dotted with the ostioles of the completely immersed perithecia; asci ultimately 16-spored, part spores globose, hyaline or yellowish. Conidial states belong to the form-genera *Trichoderma* and *Gliocladium*.

One species recorded in Sri Lanka.

(1) *H. jecorina* B. & Br.
On old Pyrenomycetes or polypores ..... P : 29

One more species recorded in Sri Lanka under the name *Mycocitrus* Moller as:

(2) *M. hypocrellicola* (P. Henn.) Hohnel
On *Arundinaria debilis* ..... P : 30

26. *Microrectria* Speg.

Perithecia separate, with a single ostiole, innate or finally erumpent; asci 8-spored aparaphysate; ascospores acicular-filiform, many-celled hyaline.

3 species. S. Amer., Asia, Eur.

1 species recorded in Sri Lanka.

(1) *M. eugeniae* Petch
On leaves of *Eugenia* P : 30

27. *Nectria* Fries (Fig 24a—c)
= *Lasionectria* (Sacc.) Cooke fide Dingley (Ainsworth 1963)

Plate VIII Figs. 23 — 30.

23. *Hypocrea* sp.

a — ascus x 500
b — section of perithecia x 400
c — ascospores x 1000

24. *Nectria* sp.

a — v.s. perithecial stroma, enlarged
b — asci much enlarged
c — ascospore, much enlarged

25. *Ophionectria* sp.

a — perithecium x 5
b — ascus x 500
c — ascospore x 1000

26. *Pseudonectria* sp.

a — perithecium x 100
b — ascospore x 500

27. *Hypomyces* sp.

a — section of perithecium x 30
b — ascus x 500
c — ascospore x 1000

28. *Melanospora* sp.

a — perithecium x 50
b — ascus with ascospores, much enlarged

29. *Sphaerostilbe repens*

a — *Hevea* root with bark removed to show the mycelial strands x 1/10
b — cross section of the cortex of a rhizomorph x 400
c — groups of perithecia on a horizontal rhizomorph x 2
d — perithecium x 50
e — ascus, enlarged
f — ascospore, much enlarged
g — group of conidiophores x 4
h — conidiophore and conidia, enlarged

30. *Physalospora tucumanensis*

a — portion of a sugarcane leaf showing lesions on the midrib x 1/5
b — acervulus x 100
c — conidia and young conidiophores x 400
d — mature conidia x 400
e — section of a perithecium, enlarged
f — ascospore x 1000

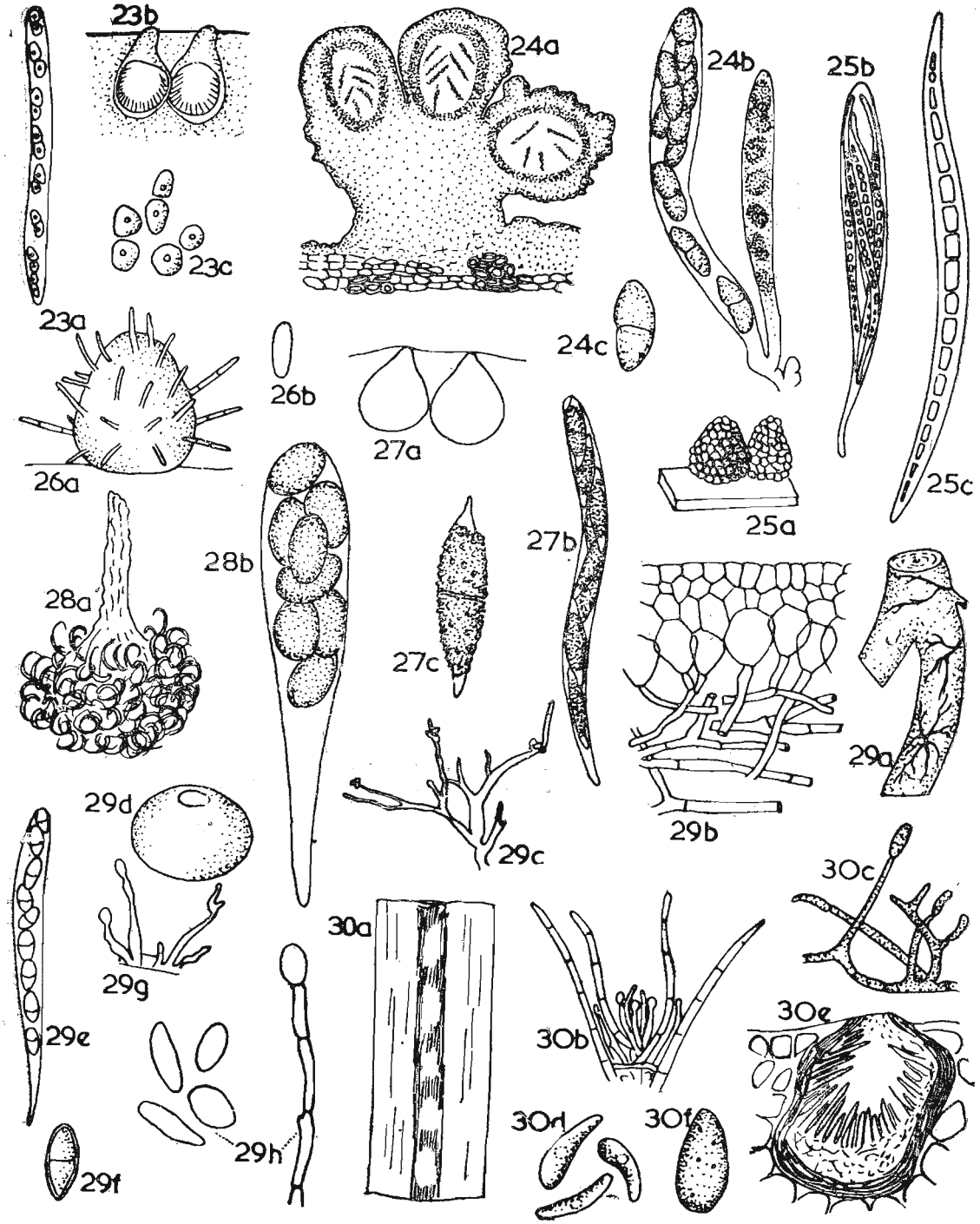

Plate VIII Figs. 23 — 30

Perithecia distinct, clustered, or scattered, sometimes produced on a fleshy stroma that has previously borne conidia, clear coloured, usually red or orange; asci cylindric or clavate, 8-spored; ascospores hyaline, elongated 1-septate.

50 species, cosmopolitan. Many species partly parasitic on higher plants.

4 species recorded in Sri Lanka.

(1) *N. dorcas* (B. & Br.) Sacc.
On a monocotyledon — P : 30

(2) *N. lucida* Hohnel
On *Acacia* — P : 30

(3) *N. pulcherrima* B. & Br.
On *Acacia* and other leguminous trees — P : 30

(4) *N. striatospora* Zimm.
On *Theobroma, Albizzia etc.* — P : 30

One more species recorded in Sri Lanka and described under the name *Lasionectria* (Sacc.) Cooke

(5) *L. dothideicola* Petch
On *Phylachora hibisci* — P : 29

28. *Neocosmospora* E. F. Smith

Perithecia as in *Nectria;* asci cylindrical, 8-spored, uniseriate; spores globose or subglobose, brown. Conidial forms, macroconidia of the *Fusarium* stage and microconidia. 2-species widespread, *N. vasinfecta* E. F. Smith and *N. africana*, common on plant debris in warmer areas occasionally infect roots of different crops causing wilt diseases.

One species recorded in Sri Lanka.

(1) *N. vasinfecta* E. F. Smith
On *Indigofera* — P : 30

29. *Ophionectria* Sacc. (Fig. 25a—b)

Perithecia resemble those of *Nectria* but containing long cylindrical multiseptate ascospores, sometimes replaced by rod-like secondary spores.

20 species, widespread.

Two species recorded in Sri Lanka.

(1) *O. muscivora* Petch
On moss on tree trunks — P : 31

(2) *O. uredinicola* Petch
On *Uredo* on *Arundinaria debilis* — P : 31

30. *Pseudonectria* Seaver (Fig 26a—b)

Perithecia scattered, superficial without a common hyphal mat, bright coloured, small; asci 8-spored; ascospores hyaline, non-septate, elliptical.

5 species. Eur., Amer., Asia

T wo species recorded in Sri Lanka.

(1) *P. gigaspora* (Cooke & Massee) Petch
On *Botryosphaeria inflata* P : 31

(2) *P. tabacina* (Ces.) Petch
On an unknown fruit P : 31

31. *Hypomyces* (Fr.) Tul. (Fig 27a—c)
= *Bresadolella* Hohnel fide Clements and Shear (Ainsworth 1963)

Perithecia gregarious on a common hyphal web; asci bright,coloured 8-spored; ascospores 1 septate, elongated, pointed at each end. Conidial states in *Cladobotryum* and *Sepedonium* form — genera. 30 species, widespread.

One species recorded in Sri Lanka under the name *Bresadolella* Hohnel

(1) *B. nigra* Petch
On *Hypocrea* P : 28

32. *Melanospora* Corda (Fig. 28a—b)

Perithecia scattered, superficial, subglobose with a long slender beak terminated by an ostiole which is surrounded by a ring of short hyaline bristles. Occasionally the beak may be greatly reduced and the genus is then to be separated from *Sphaeroderma* by the presence of the ostiolar bristles. Asci usually 8-spored, soon disappearing; ascospores non-septate, dark brown or black.

46 species. Widespread.

Two species recorded in Sri Lanka.

(1) *M. parasitica* Tul.
On *Cephalosporium longisporum* P : 30

(2) *M. zamiae*
On fruits of *Musa* and *Hevea* P : 30

33. *Sphaerostilbe* Tulasne (Fig. 29a—h)

Perithecia occurring in clusters around a club-shaped structure which carries conidia,small, sub-globose to pear shaped, often collapsing when dry and then appearing cup shaped; smooth or finely warted, brightly coloured usually with orange or reddish tints; asci cylindrical 8-spored, at least at first; ascospores uniseriate, elliptical, 1-septate, hyaline or rarely becoming light brown. Conidial stage in the form-genus *Stilbum*.

10 spp. widespread. *S. repens* Brok & Br. causes root disease in several cultivated plants, more especially on tea and rubber. Roots have a waterlogged appearance, and a peculiar 'vinegar' smell. Bark is of a violet colour, and under the bark, thick strands of mycelium radiate in star fashion over the wood.

One species recorded in Sri Lanka.

(1) *S. repens* B. & Br.
On *Camellia sinensis, Hevea* and other plants P : 31

34. *Stereocrea* Syd.

Stromata erumpent — superficial, composite, clustered like grapes; perithecia immersed in stroma; asci 8-spored, aparaphysate, ascospores elongated, clavate, many-celled, hyaline.

2 species, Philippine islands, Sri Lanka.

One species recorded in Sri Lanka.

(1) *S. schizostachyi* Syd.
On *Arundinaria debilis* P : 31

35. *Hyponectria* Sacc.

Perithecia embedded in leaf tissue, scattered, somewhat flattened, wall composed for the greater part of slender almost colourless hyphae, with a ring of dark brown angular cells around the ostiole; asci 8-spored; ascospores hyaline, non-septate.

10 species. Widespread, on leaves.

Three species recorded in Sri Lanka.

(1) *H. embeliae* Petch
On leaves of *Embelia viridiflora* P : 29

(2) *H. eugeniae* Petch
On leaves of *Eugenia mabaeoides* P : 29

(3) *H. memecyli* Petch nom. nov.
On *Memecylon umbellatum* P : 29

36. *Myelosperma* Syd.

Perithecium immersed in the host tissue, around a collective ostiolum; asci mostly large with a chitinoid pulvillus, thin membrane often with apical structures or thickenings; ascospores transluscent, one-celled, ellipsoid, ovoid or fusiform.

1 species, in Sri Lanka

(1) *M. tumidum* Syd.
On midrib of *Cocos nucifera* P : 25

37. *Pemphidium* Mont
= *Seynesia* Sacc. (Ainsworth 1963)

Perithecium ostiolate; asci mostly large, amyloid portion a simple ring or a system of rings and in addition, often with a chitinous pulvillus, thin membrane; ascospores brown, 1-celled, fusiform, with mucilaginous appendages at both ends, germ pores not equatorial, ejected when mature.

One species recorded in Sri Lanka, under the name *Seynesia* as

(1) *S. ipomoeae* Syd.
On *Ipomoea obscura* P : 35

38. *Physalospora* Niessl (Fig. 30a—f)
= *Acanthorhynchus;* = *Benedekiella;* = *Pseudoguignardia;*
= *Pseudophysalospora;* = *Trichophysalospora* (Muller, E. & Von Arx J. A.1973)

Plate IX Figs. 31 — 35

31. *Diatrype* sp.

a — perithecium x 10
b — section of perithecia x 40
c — ascus and paraphyses x 500
d — ascospores x 1000

32. *Diaporthe* a — d *D. vexans*

a — pycnidia, enlarged
b — conidiophores, enlarged; c-beta conidia, enlarged
d — alfa conidia, enlarged
e—h *D. batatis*
e — beta conida, enlarged
f — alfa conidia, enlarged
g — asci, enlarged
h — ascospore, enlarged

33. *Melogramma* sp.

a — habit x 5
b — section of a stroma x 20
c — ascus and paraphyses x 500
d — ascospore x 1000

34. *Plagiostoma* sp.

a — habit, enlarged
b — perithecium enlarged
c — ascospore, enlarged

35. *Valsa* sp.

a — perithecial stroma breaking through a stem x 1/10
b — section through a stroma of *a*, enlarged
c — asci and ascospores, enlarged
d — section through pycnidial stroma, enlarged
e — condiophores with young conidia, enlarged
f — mature conidia, enlarged

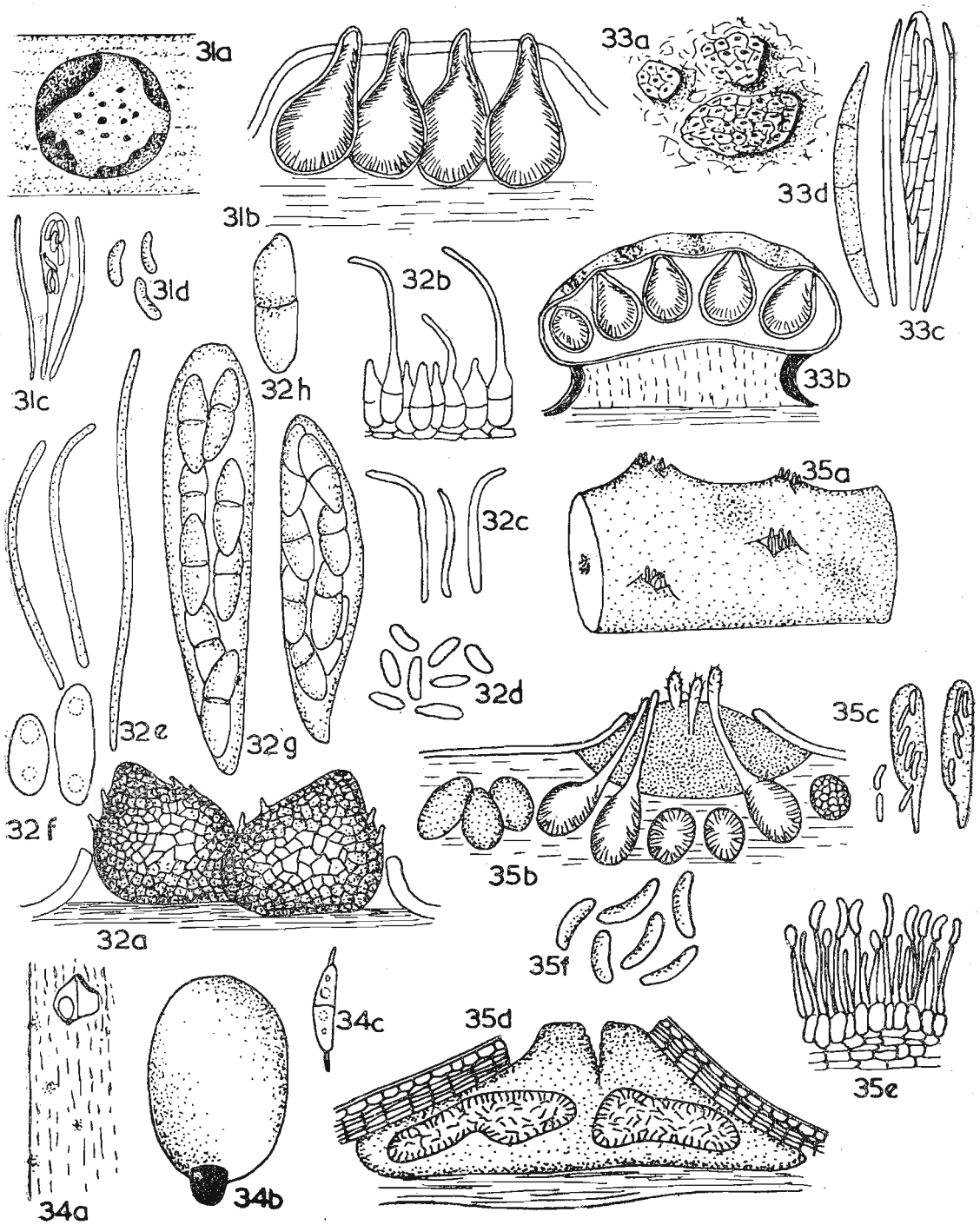

Plate IX Figs. 31 — 35

Perithecia glabrous or setose with a fleshy wall formed under the epidermis, but are otherwise devoid of covering; asci mostly large with a chitinoid pulvillus, thin membrane often with apical structure or thickenings, presistent membrane; ascospores one-celled ovoid or elliptical, hyaline or bright, ejected when mature.

30 species. Widespread. *P. tucumanensis* Syn. *Glomerella tucumanensis* (Speg.) Arx & Muller (conidial state *Colletotrichum falcatum*), causes a highly destructive disease of sugar cane — the Red Rot. It rots the seed pieces, and underground parts of ratoon crops. It produces long red linear lesions on the midribs of leaves. Diseased plants are recognised in the field by the yellowing, shrivelling and dying of the upper leaves.

30 species; Widespread.

3 species recorded in Sri Lanka.

(1) *P. adianthi* Höhnel
On *Adianthum* P : 25

(2) *P. cyperi* Petch
On leaves of *Cypreus arenarius* P : 25

(3) *P. tucumanensis* Speg.
= *Glomerella tucumanensis*
On *Saccharum officinarum* A : 230

39. *Diatrype* Fr. (Fig. 31a—b)

Stroma cushion shaped, discoid or forming a widespread crust, erumpent; every perithecium has a separate neck to the surface; asci rather small, clavate, stalked, with a well developed apical ring in some species, 8-spored; ascospores sausage shaped, usually light brown.

50 species. Widespread.

One species recorded in Sri Lanka.

(1) *D. conferta* Petch
On branches of *Camellia sinensis* P : 22

40. *Diaporthe* Nitschke (Fig. 32a—h)

Perithecia clustered or scattered, but enclosed within widespreading blackened zones of the substrate, both above the level of the perithecial bodies and beneath them. These stromatic crusts appear as fine black lines when the substrate is cut at right angles to the surface. Perithecia small, black, commonly in small groups with their ostiolar beaks erumpent together; asci clavate to cylindric — clavate, with a distinct apical ring—like thickening, freed from the perithecial wall and lying loosely in the cavity at maturity. Ascospores cylindric-fusoid, with one approximately median septum, often slightly eccentric or curved, hyaline, without appendages.

Diaporthe is a large cosmopolitan genus and some species occur on a wide range of host plants. Most have conidial states belonging to the form-genus *Phomopsis*, characterised by chambered pycnidia, embedded in host tissue and yielding innumerable fusiform hyaline conidia. Many also have a second conidial state the so called B-spore, thread like and often hooked like a walking stick.

75 species especially N. Temp.

Two species recorded in Sri Lanka.

(1) *D. citri* Wolf
On grapefruit P : 22

(2) *D. heveae* Petch
On branches of *Hevea brasiliensis* P : 22

41. *Melogramma* Tul. (Fig. 33a—d)

Perithecia inserted in a small but well developed stroma; asci clavate, short stalked; ascospores elongated, multiseptate, brownish but with the terminal cells colourless.

15 species. Widespread.

One species recorded in Sri Lanka.

(1) *M. lobeliae* Petch
On *Lobelia nicotianifolia* P : 24

42. *Plagiostoma* Fuckel (Fig. 34a—c)

Perithecia immersed in tissue of leaves of herbaceous stems, long beaked, neck situated at one end; asci small, clavate, becoming loose; ascospores, septate and hyaline.

4 species. Europe

Syns. *Chalcosphaeria, Gnomonina, Laestadia* Auersw. (non Kunth) (Muller, E. & Von Arx 1973)

Three species recorded in Sri Lanka under the name *Laestadia* Auersw.

(1) *L. jasmini* Petch
On leaves of *Jasminum flexile* P : 24

(2) *L. pertusa* (B. & Br.) Sacc.
On leaves of *Dioscorea tomentosa* P : 24

(3) *L. traversi* Cav.
On *Vanilla* P : 24

43. *Valsa* Fries (Fig 35a—f)

Stroma rudimentary, a mere web of hyphae between the perithecial necks; perithecia clustered in small groups, flask shaped, their long necks converging and erumpent together, usually in a small grey pad of stromatic tissue; asci club-shaped with 8-spores or less; ascospores sausage shaped, colourless. The perithecia are usually preceeded by a conidial stage belonging to the form genus *Cytospora*, characterised by chambered pycnidia immersed in the bark and containing innumerable, minute hyaline, sausage shaped conidia which emerge in glutinous coils in damp weather.

100 species. Cosmopolitan.

One species recorded in Sri Lanka.

(1) *V. tenebricosa* Cooke
On a spathe of a palm P : 27

44. *Caliciopsis* Peck (Fig 36a—b)

Perithecium mostly not immersed, botuliform, parasitic on Coniferae; asci evanescent often spherical, clavate, mostly with stalk, ripening in succession; ascospores becoming free in the cavity and often discharged in a slimy mass, small to medium size, one celled, ellipsoid; coloured.

10 species. Widespread.

One species recorded in Sri Lanka.

(1) *C. symploci* Fitzp.
On *Symplocus obiusa* P : 32

45. *Glomerella* Spauld. & Schrenk. (Fig. 37a—f)

Perithecia cespitose or more or less compound and immersed in a stroma, with which they often form an evident hard cushion; asci oblong to clavate, 8-spored, paraphyses absent; spores oblong, usually slightly curved, one-celled, hyaline.

5 species. Widespread.

G. cingulata is the ascigerous state of *Colletotrichum gloeosporoides, Colletotrichum coffeanum, Gleosporium musarum* and that of *Gloeosporium graminicola.* These and other species are parasitic on a large number of hosts. *G. cingulata* is responsible for the appreciable wastage of the harvested banana and chilli fruits. It causes unsightly blemishes and a soft rot of the ripening fruit, the disease often described as 'anthracnose'. *G. cingulata* causes 'leaf spots' on leaves of many plants. *G. gossypii* (conidial state *Colletotrichum gosspyii*)

5 species recorded in Sri Lanka.

(1) *G. cingulata* (Stonem.) Spauld. & Schrenk, = *Gnomoniopsis cingulate* Ston.
Conidial state *Colletotrichum gloeosporoides* = *Vermicularia gloeosporoides*
On fruits of banana
leaves of *Ficus religiosa*
leaves and flowers of *Anthurium*

(2) *G. gossypii* Edgerton.
On *Gossypium* P : 23

(3) *G. musarum* Petch
On leaves of Banana P : 23

(4) *G. piperata* (Stonem.) Spauld. & Schrenk.
On *Capsicum annuum* P : 23

(5) *G. vanillae* (Zimm.) Petch & Ragun.
On *Vanilla* P : 23

(6) *G. tucumanensis* (Speg.) V. Arx and Muller
(conidial state *Colletotrichum falcatum*)
On *Saccharum officianarum* A : 230

46. *Ophiodothella* (P. Henn.) Hohnel

Stromata dark, at least covered with a dark stromatic clypeus, develop within the host tissue; asci 8-spored; ascospores hyaline or when brown uniformly coloured, filiform.

Plate X Figs. 36 — 39.

36. *Caliciopsis* sp.

a — habit, enlarged

b — ascus with ascospores and paraphyses, much enlarged

37. *Glomerella cingulata*

a — fruit rot on banana, much reduced

b — acervulus on apple fruit x 400

c — conidium x 400

d — conidium showing septum during germination, enlarged

e — perithecium, enlarged

f — ascus with ascospores enlarged,

38. *Phyllachora graminis*

a — habit x 10;

b — section perithecium, enlarged;

c — ascus x 500

d — ascospores x 1000

39. *Chaetosphaeria* sp.

a — perithecium, enlarged

b — paraphyses, ascus with ascospores x 500

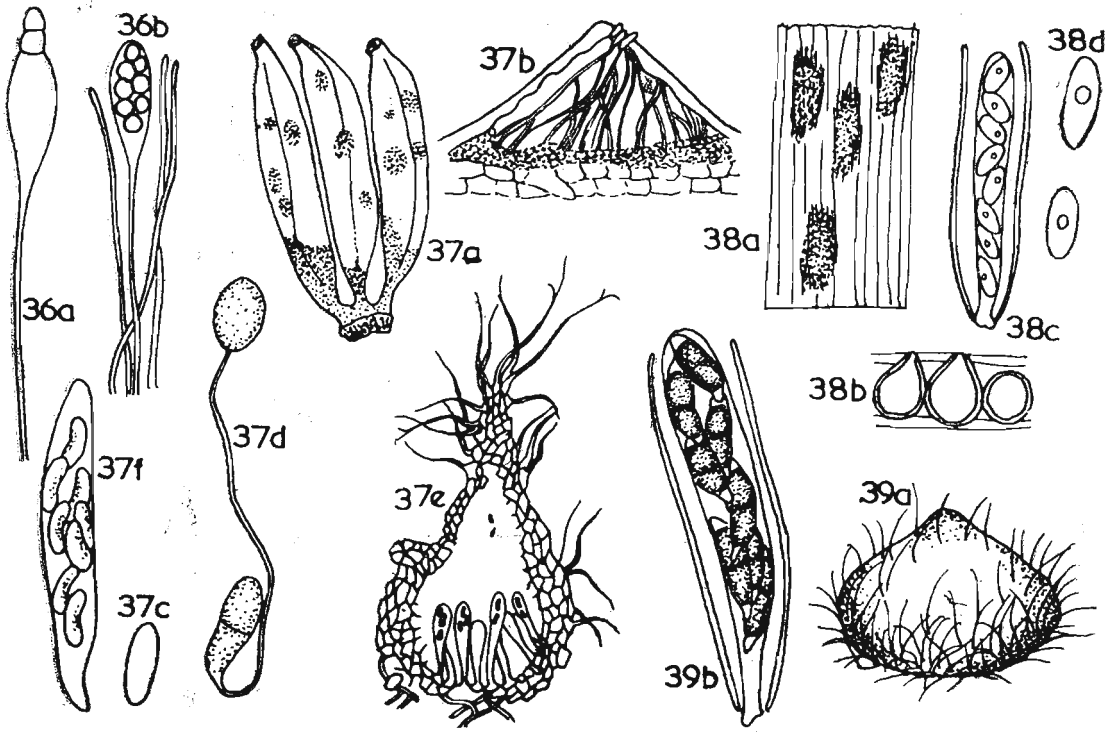

Plate X Figs. 36 — 39

(14) *P. thwaitesii* (Berk.) Sacc.
On *Cyperaceous* plant — P : 34

(15) *P. tragiae* (Berk. & Curt.) Sacc.
On *Croton klotzschianus* — P : 34

(16) *P. vanderystii* Theiss. & Syd.
On *Panicum plicatum* — P : 34

(17) *P. winkleri* Syd.
On *Paspalum scrobiculatum*

5 more species recorded and described in Sri Lanka, under the name *Catacauma* Theiss. & Syd.

(18) *C. aspideum* (Berk.) Theiss. & Syd.
On *Ficus parasitica* — P : 32

(19) *C. gracillimum* (Speg.) Theiss. & Syd.
On *Fimbristylis monostachya*

(20) *C. infectorium* (Cooke) Theiss. & Syd.
On *Ficus infectoria* — P : 32

(21) *C. microcentum* (B. & Br.) Theiss. & Syd.
On *Ficus parasitica* — P : 32

(22) *C. repens* (Corda) Theiss. & Syd.
On *Ficus religiosa* & *Ficus tomentosa* — P : 32

48. *Rehmiodothis* Theiss. & Syd.
= *Munkiodothis*

Stroma subcuticular, hemispherical, dark at least covered with a dark stromatic clypeus; ascocarp immersed in the stroma, thin walled; asci with a thin persistent membrane; ascospores 2-celled, composed of a larger upper cell and a small basal cell; hyaline; paraphyses present.

R. osbeckiae is parasitic on Melastomaceae.

One species is recorded in Sri Lanka.

(1) *R. osbeckiae* (B. & Br.) Theiss. & Syd.
On *Osbeckia virgata* — P : 34

49. *Sphaerodothis* (Sacc. & Syd.) Shear
= *Phaeochora* Höhnel fide Arx & Muller (Ainsworth 1963)

Perithecium ostiolate, immersed in a dark carbonaceous stroma covered by a dark stromatic clypeus, stroma developing within the host tissue; ascospores uniformly brown, one-celled.

12 species, especially warmer parts.

One species recorded in Sri Lanka under the name *Phaeochora* Höhnel

(1) *P. calamigena* (B. & Br.) Theiss. & Syd.
On *Calamus zeylanicus* — P : 34

50. *Wallrothiella* Sacc.

Perithecia separate, glabrous, not beaked; paraphyses absent; ascospores 1 celled, hyaline — sub hyaline.

15 species. Widespread.

1 species recorded in Sri Lanka.

(1) *E. episphaerica* Petch
On *Aglaospora aculeata* on *Camellia sinensis* — P : 27

51. *Chaetosphaeria* Tul. (Fig. 39a—b)

Perithecia often gregarious but without a stroma, more or less globose or pear shaped but not long beaked, superficial, smooth or hairy; asci cylindric-clavate; ascospores hyaline, usually 1-septate. Conidial states in the form genera *Catenularia*, *Chloridium* and *Stachybotrys*.

20 species. Widespread.

1 species recorded in Sri Lanka.

(1) *C. xanthotricha* (B. & Br.) Sacc.
On the cuticle of some monocots — P : 22

52. *Ceratocystis* Ellis & Halst. (Fig 40 a—f)
= *Endoconidiophora;* = *Grosmannia;* = *Linostoma;* = *Ophiostoma* = *Rostrella* (Muller, E. and Von Arx 1973)

Perithecia minute, bearing a very long slender beak, dark coloured; asci spherical, 8-spored, subglobose, becoming loose in a mucilaginous matrix within the perithecium, ascus wall not persistent, soon disappearing, liberating the ascospores which ooze out of the ostiole in a drop of mucilage; ascospores small, hyaline, 1-celled.

55 species, temperate. Many species are responsible for wood blueing, often associated with bark beetles.

C. paradoxa cause 'stem bleeding disease' in arecanut, coconut and palmyrah, easily recognised by the presence of a reddish-brown liquid which oozes through cracks in the stem. The same fungus on pineapple, causes the 'base rot or heart rot' of the suckers, white spots of leaves, and fruit rot, the base rot being the most destructive phase. On sugar cane *C. paradoxa* causes 'Pineapple disease', where the central core of the stalk becomes black, breaking down, giving off an odour, resembling that of fresh pineapples.

One species recorded in Sri Lanka.

(1) *C. paradoxa*
On *Cocos nucifera* — A : 64
Ananas comosus — A : 192
Saccharum officinarum — A : 192
Areca catechu
Borassus flabellifer

53. *Anthostomella* Sacc. (Fig 41a—c)
= *Paranthostomolla;* = *Myconeesia* Kirs., = *Phaeaspis* Kirs., (Muller, E. and Von Arx J. A. 1973)

40. *Ceratocystis*

a and b *C. paradoxa*
a — conidiophore and conidia, enlarged
b — branches with chains of chlamydospores, enlarged
c—f *C. piceae*
c — perithecium, enlarged
d — details of ostiole showing ring of setae, enlarged
e — conidial fructification bearing sticky mass of spores, enlarged
f — asci with ascospores, enlarged

41. *Anthostomella* sp.

a — perithecium x 100
b — asci and paraphyses x 500
c — ascospores x 1000

42. *Hypoxylon* sp.

a — perithecial stroma habit x 1/4
b — section of perithecium, enlarged
c — ascus and paraphyses, enlarged
d — ascospores, enlarged

43. *Rosellinia*

a — injury of a main stem of a tea bush, much reduced
b—d *R. arcuata*
b — conidiophores x 4
c — group of perithecia x 10
d — ascospores x 500
e — *R. bunodes* ascosporex x 200

44. *Ustulina zonata*

a — fructification x 1
b — cross section of fructification showing perithecial cavities x 6
c — ascus and paraphyses, enlarged
d — ascospores, much enlarged

45. *Xylaria thwaitessii*

a — fructification x 1
b — section showing perithecial cavities x 5
c — section perithecium x 400
d — paraphyses and ascus x 400
e — ascospores x 400

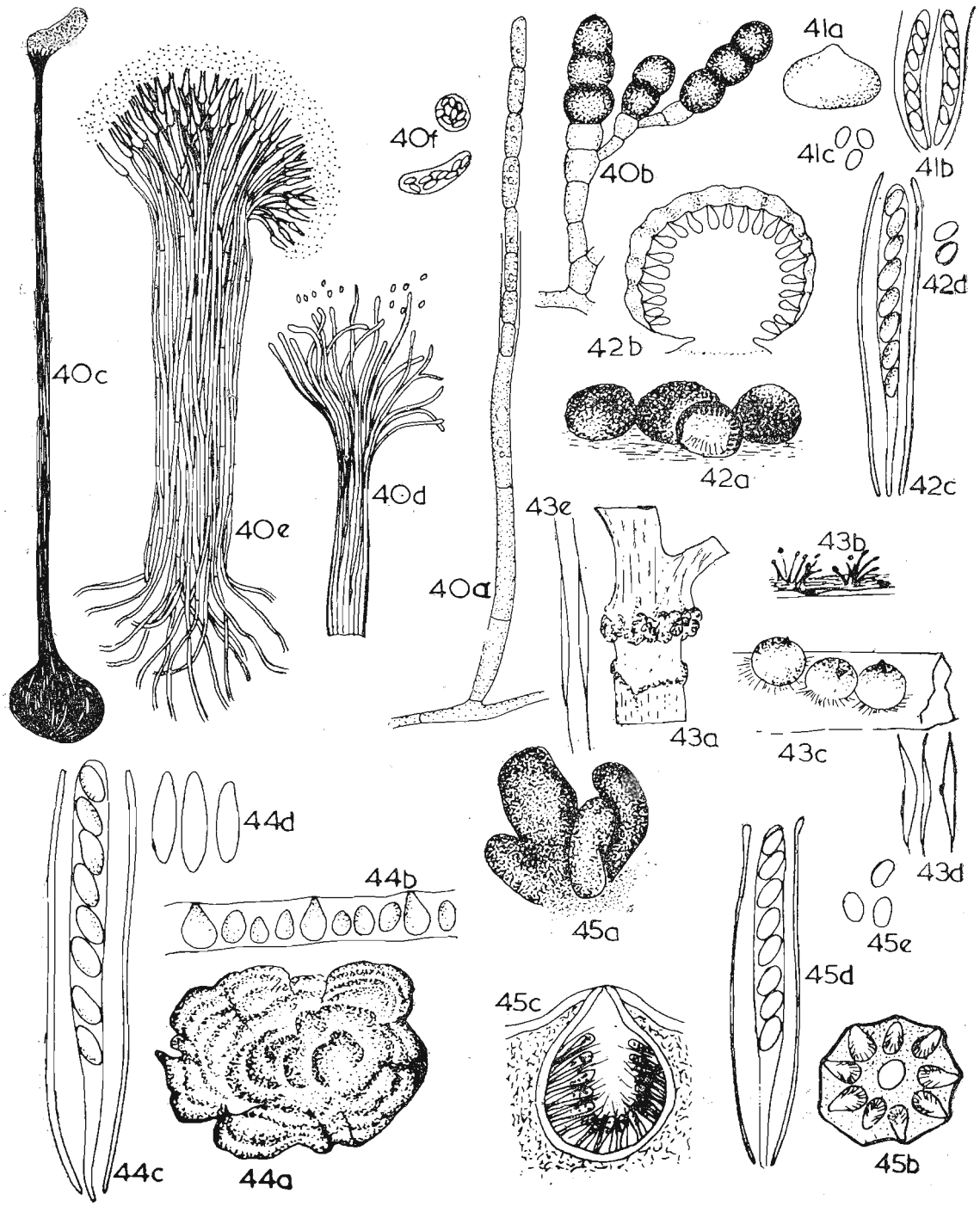

Plate XI Figs. 40 — 45

Ascocarp small, embedded single or in small groups in the tissues of herbaceous stems and leaves, usually surrounded by a small patch of dark mycelium, forming a thin stroma or 'clypeus' on the surface of the substrate; asci usually with an apical ring — like thickening; ascospores dark coloured, non-septate, sometimes with a minute hyaline appendage or a gelatinous coat

50 species. Widespread on dead leaves of many hosts.

2 species recorded in Sri Lanka.

A. confluens Petch
On petioles of a palm — P : 22

4. *dilatata* (B. & Br.) Petch
On petioles of a palm — P : 22

54. *Hypoxylon* Bull. ex Fries (Fig. 42 a—d)

Perithecia globose to slightly flask shaped, clustered in a common stroma which may have a black, brown, reddish, or even white surface and may vary in shape from a hemispherical cushion to a thin spreading crust; ascospores elliptic-fusiform to bean shaped, dark brown, non septate with a distinct colourless furrow on one side. The ostioles may open flush with the surface of the stroma, appearing only as minute pores, or may protrude above it, as small papillae.

Conidial states in *Nodulisporium* and *Geniculisporium*

100 species. Widespread.

Two species recorded in Sri Lanka.

(1) *H. olivaceum* Petch
On a stem of *Mangifera indica* — P : 23

(2) *H. vestitum* Petch
On a stem of *Camellia sinensis* — P : 24

55. *Rosellinia* de Not. (Fig 43 a—e)
= *Pleosporosis*; = *Sphaeropysxis* (Muller, E. and Von Arx J. A. 1973)

Perithecia almost superficial, subglobose, papillate, sub-carbonaceous, black, glabrous or hairy, or seated on a velvety subiculum; asci 8-spored, spores 1 celled broadly ovate or elongated and cymbiform, brown with or without hyaline appendages; paraphyses present.

100 species, widespread. Some species are destructive root parasites. *R. arcuata* and *R. bunodes* causes root rot called the 'Black root disease' of Tea and other tropical crops. The disease can be recognised by black strands of mycelium more or less wooly in appearance on the surface of the root, turning black through grey and the star like patterns of interwoven hyphae between the bark and the wood.

2 species recorded in Sri Lanka.

(1) *R. arcuata* Petch
On roots of *Camellia sinensis*, *Cinnamomum camphora*, *Erythrina*, *Grevillea robusta*, *Panax fruticosum*, *Symplocos obtusa* etc. — P : 25

Erythrina lithosperma, *Tephrosia vogelu* — T. R. I. Pamp 2/66

(2) *R. bunodes* (B. & Br)
On *Camellia sinensis, Hevea, Artocarpus integer* P : 26

56. *Ustulina* Tul. (Fig. 44 a—d)

Stroma effuse, hollow; perithecia large, globose to slightly flask shaped, ostiolate, clustered in a common stroma which may have a black brown, reddish or even white surface and may vary in shape from a hemispherical cushion to a thin spreading crust on bark; asci cylindric to clavate; spores large, elliptic, fusiform to bean-shaped, dark brown, 1-celled with a distinct colourless furrow down one side.

5 or 6 species, widespread. *U. deusta* causes a root disease in Tea and Rubber, which is sometimes called 'charcoal rot'. The disease can be readily recognised by the large white or brownish white, fan shaped patches of mycelium on the wood surface and the presence of black double lines which run parallel to each other and traversing the wood. The name 'charcoal rot' is derived from the charcoal like nature of the fructifications which are often found at the collars or main stem of diseased bush.

One species recorded in Sri Lanka.

(1) *U. deusta* (Fr.) Petrak
(Syn. *U. zonata*)

On roots of *Camellia sinensis*
Citrus, *Hevea* and many other woody plants P : 27

57. *Xylaria* Hill ex Grev. (Fig. 45 a—e)

Stroma more or less stalked, cylindrical to fusiform, sometimes forked, black or nearly so but sometimes partly covered with light coloured conidia, when immature, perithecia in a single layer usually inserted beneath a black crust, in a few species superficial, flesh of stroma usually white; asci, large, cylindrical to fusoid; ascospores elliptic-fusiform-pear shaped, dark brown 1-celled.

100 species, cosmopolitan. Commonly saprophytic, *X. thwaitesii* causes 'black root disease' in rubber. The diseased roots are first noticed by the presence of stag-horn like fructifications, ash coloured at the start, turning black later on.

One species recorded in Sri Lanka.

(1) *X. thwaitesii* Berk. & Cooke apud Cooke
On *Hevea brasiliensis* P : 27

58. *Rhopographella* (P. Henn.) Sacc.

Stromata yellow, erumpent; perithecia 1 mm diameter, 2-3 in a stroma, ostioles not very prominent; asci broadly clavate to oval, 4-spored; ascospores hyaline 3—celled.

One species recorded in Sri Lanka.

(1) *R. ochlandrae* Petch
On *Ochlandra stridula* P : 35

CLASS LOCULOASCOMYCETES

The asci are bitunicate. Ascocarp is an ascostroma with the asci individually and irregularly distributed in the stromal tissue or grouped in locules; the ascostroma then becomes a perethecioid or less commonly an apothecioid, pseudothecium. The pseudothecia are separate, grouped on a common basal stroma in which they are more or less immersed, or else they are completely immersed and appear as unwalled locules in a multilocular stroma. Ascocarps may be entirely superficial, erumpent or immersed in the substratum. The centrum is composed of asci interspersed with persistent pseudoparaphyses or of fasicles of aparaphysate asci in disintegrating centrum tissue. Perethecioid forms have ostioles. Apothecioid forms open by splitting. Usually the ascospores are septate. Loculoascomycetes appear as superficial epiphytes, parasites, or hyperparasites of superficial fungi and insects, as internal parasites fruiting on green leaves and stems, as parasites fruiting on dead leaves and stems and as saprophytes.

KEY TO THE ORDERS OF THE CLASS LOCULOASCOMYCETES

1. Ascocarp dimidiate—scutate; with inverse basipetal development — HEMISPHAERIALES
   Ascocarp not dimidiate — scutate; with acropetal or centrifugal development 2 (P.58)

2. Asci singly and irregularly distributed in the tissue of ascostroma — MYRIANGIALES (P.45)
   Asci grouped in locules in a pseudothecium; pseudothecium separate or grouped in a stroma 3

3. Asci interspersed with pseudoparaphyses 4
   Asci not interspersed with pseudoparaphyses — DOTHIDEALES (P.46)

4. Pseudothecia perithecioid — PLEOSPORALES (P.42)
   Pseudothecia apothecioid — HYSTERIALES (P.58)

ORDER MYRIANGIALES

Ascocarps intra- or sub-epidermal and are only partially erumpent. They occur in the form of extensive crusts on large to small, pulvinate, sub-globose or discoid ascostromata. Asci are globose, individually distributed in the parenchymatous tissue of the ascostroma. Ascospores phragmosporous (spores with transverse septa). They are epiphytes, parasites or hyperparasites on superficial fungi or scale insects on living leaves. These fungi are mostly tropical or sub-tropical.

KEY TO THE GENERA OF THE ORDER MYRIANGIALES

1. Thallus a globose or lobed body of toruloid hyphae in a gelatinous matrix — *Atichia* (59)
   Thallus a mycelium 2

2. Ascocarp superficial — *Zukaliopsis* (61)
   Ascocarp permanently innate — *Elsinoé* (60)

59. *Atichia* Flotow (Fig. 46 a—c)

Thallus usually lobed; asexual propagules triangular, branched structures resembling staurospores, formed in the cavities in the thallus. Asci broad, clavate, embedded individually in a single layer in the periphery of the thallus; ascospores 1-septate, hyaline-pale brown; saprotrophic in insect secretions on leaves and stems. 5 species, especially warmer parts.

1 species recorded in Sri Lanka.

(1) *A. millardeti* Racib.
On *Cinnamomum loureiri*,
Eurya japonica and *Scolopia crassipes* P : 32

60. *Elsinoë* Racib. (Fig. 47 a—f)

Ascocarp innate, intra-or sub-epidermal, partially erumpent at maturity, containing locules at various levels each with a single ascus; ascospores 3-septate with longitudinal septa in some cells, hyaline to yellowish, covered with a gelatinous substance. When covered with a drop of water ascospores produce short sterigmata on which conidia are borne.

Mycelium resulting from this forms a subcuticular stroma on which acervuli produce conidia, embedded in gelatinous matrix. Conidial state is in the form-genus *Sphaceloma*- conidia hyaline, 1-celled, ovoid- oblong.

40 species, especially warmer parts. *Elsinoe fawcettié* Bitanc and Jenkins, causes serious damage to Rough lemon, a variety of citrus popularly used as a root stock in Ceylon. The disease is described under the name of 'citrus scab' resulting in scab lesions on leaves, twigs, and fruits.

3 species are recorded in Sri Lanka.

(1) *E. canavaliae* Racib.
On *Canavalia ensiformis* P : 32

(2) *E. fawcettiè* Bitanc and Jenkins
On *Citrus* P : 32

(3) *E. theae* Bitanc and Jenkins
On leaves of *Camellia sinensis* P : 32

61. *Zukaliopsis* P. Henn.

Ascocarp superficial, submembranous, dark; mycelium effuse; asci sub-ovoid, 8-spored; ascospores cylindrical — oblong, many septate, muriform, hyaline.

1 or 2 species, S. America.

One species recorded in Sri Lanka.

(1) *Z. heveae* Petch
On *Hevea brasiliensis* P : 35

ORDER — DOTHIDEALES

Loculoascomycetes producing fascicles of aparaphysate, obclavate to short cylindrical asci in very small, ostiolate, spherical locules in multiloculate, pulvinate to crustose ascostromata or in small perithecioid pseudothecia. These fungi are common and widely distributed on dead leaves and stems. Many that mature on dead leaves cause leaf — spot diseases with which their various conidial states are associated. A few produce mature pseudothecia on green leaves or stems or in necrotic lesions on living leaves.

KEY TO THE GENERA OF THE ORDER DOTHIDEALES

1. Asci arising individually; paraphyses present 2
Asci arising in fascicles; paraphyses absent 3

2.	Ascospores 1 — septate	*Trichothyrium*	(62)
	Ascospores many — septate	*Chaetothyrium*	(63)
3.	Pseudothecia perithecioid; asci grouped in fascicles	4	
	Pseudothecia apothecioid; asci in a continuous flat disc	*Dothiora*	(70)
4.	Pseudothecia on a superficial mycelium or subiculum	*Dimerosporina*	(71)
	Pseudothecia not as above	5	
5.	Ascospores 1 — celled	*Guignardia*	(65)
	Ascospores many — celled	6	
6.	Ascospores 1 — septate	7	
	Ascospores many — septate	*Sphaerulina*	(69)
7.	Pseudothecia on or in a stroma	8	
	Pseudothecia not on or in a stroma	*Mycosphaerella*	(67)
8.	Stroma immersed in the substratum	9	
	Stroma not immersed in the substratum	*Microcyclus*	(66)
9.	Paraphyses present	*Placostroma*	(68)
	Paraphyses absent	*Euryachora*	(64)

62. *Trichothyrium* Speg. (Fig. 48 a—d)

Mycelium forming membranous bands of parallel hyphae; ascocarp lenticular, composed of upper and lower, radiately structured plates fused at the periphery, arising from the surface of the superficial mycelium or at the tip of a single stalk hypha; asci semiprostrate with their tips directed toward a pore in the centre of the upper plate; ascospores usually 1-septate, hyaline.

12 species, warmer areas.

1 species recorded in Sri Lanka.

(1) *T. asterophorum* (B. & Br.) Hohnel
On *Panicum* P : 35

63. *Chaetothyrium* Speg. (Fig. 49 a—b)
= *Zukalia* Sacc. fide Theiss. & Syd. (Ainsworth 1963)

Mycelium usually scanty, bearing erect dark bristles; ascocarp globose, dark, covered by the mycelial membrane; asci 8-spored; ascospores hyaline, many septate, ellipsoid-cylindrical. Ectocommensals on the cuticle of vascular plants.

12 species, warmer parts of the world.

1 species recorded in Sri Lanka and described under the name *Zukalia* Sacc.

(1) *Z. rubi* Petch
On *Rubus moluccanus* P : 35

64. *Euryachora* Fuckel (Fig. 50 a—c)
= *Oligostroma Syd.* (Ainsworth et. al. 1973)

Stromata sub-cuticular or sub-epidermal, cushion shaped, black, containing small locules with few asci thick-walled; ascospores hyaline, 1-septate.

Plate XII Figs. 46 — 51

46. *Atichia*

a — thallus, enlarged
b — section of the thallus through ascigerous cushion, much enlarged
c — propagules, enlarged

47. *Elsinoe* sp.

a — habit on twig, x 1
b — portion of acervulus on twig, enlarged
c — conidia, much enlarged
d — ascocarp, enlarged
e — asci, enlarged
f — ascospores, much enlarged

48. *Trichothyrium*

a — habit x 1
b — a portion of *a* enlarged
c — mycelium showing ascostroma, enlarged
d — section of the ascostroma, enlarged

49. *Chaetothyrium* sp.

a — habit x 5
b — ascus with ascospores, enlarged

50. *Euryachora* sp.

a — habit x 1
b — perithecia x 10
c — ascus with ascospores, much enlarged

51. *Guignardia bidwellii*

a — pycnidium enlarged
b — conidia, enlarged
c — ascocarp, enlarged
d — ascus, enlarged
e — ascospores, enlarged

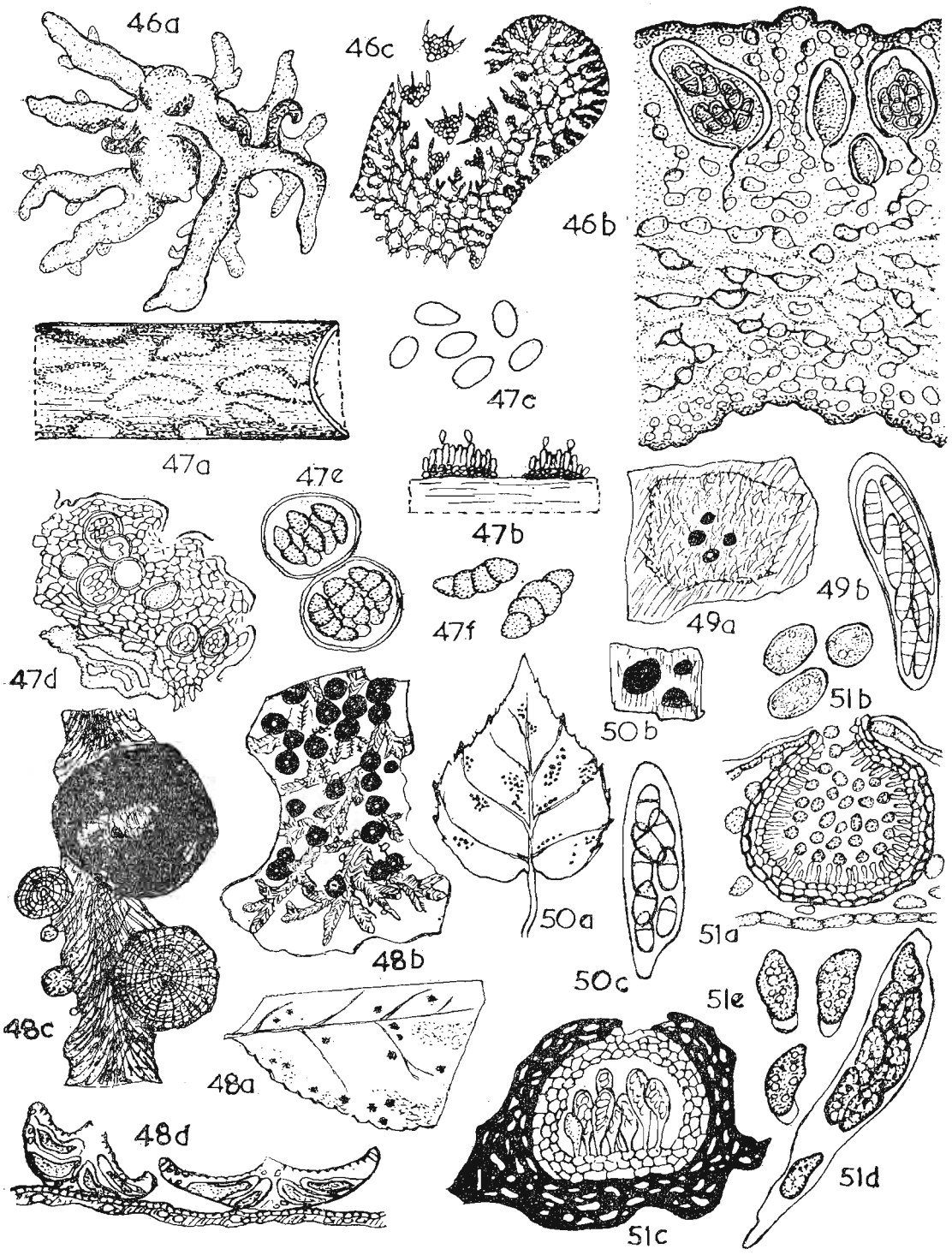

Plate XII Figs. 46 — 51

10 species, temperate.

1 species recorded in Sri Lanka and described under the name *Oligostroma* Syd.

(1) *O. strychni* Petch
On *Strychnos benthami* P : 33

65. *Guignardia* Viala & Ravaz (Fig. 51 a—e)

Ascocarp innate, separate, lenticular, ostiolate, usually with a projecting mouth, membranous; asci arising from the base of the locule; 8-spored, short stalked, clavate; ascospores elongated, 1-celled, hyaline; paraphyses absent.

100 species, widespread. *G. camelliae* (Cooke) Butler ex Petch, causes minute crater-like spots on living leaves of *Camellia sinensis*.

3 species recorded in Sri Lanka.

(1) *G. camelliae* (Cooke) Butler ex Petch
On *Camellia sinensis* P : 23

(2) *G. heveae* Syd.
On *Hevea brasiliensis* P : 23

(3) *G. opuntiae* Petch
On *Opuntia dillenii* P : 23

66. *Microcyclus* Sacc. (Fig. 52a)

Stroma erumpent from deeper in the substrate, pulvinate with immersed locules; ascocarp perethecioid, opening by an apical ostiole which is frequently lined with paraphyses; asci grouped in fascicles; ascospores 1-septate, hyaline.

4 species. Tropical.

1 species recorded in Sri Lanka.

(1) *M. walsurae* Syd.
On *Walsura piscidia* P : 33

67. *Mycosphaerella* Johanson (Fig. 53 a—i)
= *Sphaerella* (Fr.) Rabenh, (Ainsworth 1973)

Ascocarp perithecioid, membranous, sub-globose or depressed, immersed in the host tissue or bursting through, usually black; asci often ventricose, 8—16 spores; ascospores elongated, 1-septate, hyaline; paraphyses absent. Conidial states may be *Ramularia, Ovularia, Cercospora, Phyllosticta, Ascochyta, Septoria* or *Phleospora*.

500 species or more, cosmopolitan causing 'leaf spots' on a number of plants both cultivated and wild. *M. camelliae* Petch on tea; *M. fragariae* on strawberry; *M. gossypina* on *Gossypium*, in Sri Lanka, this disease is associated with the conidial stage of the fungs — *Cercospora gossypina; M. musicola* on Banana, in Sri Lanka, this is associated with the conidial stage of the fungus-*Cercospora musae*.

Plate XIII Figs. 52 — 58

52. *Microcyclus* sp.

a — V.S. ascocarp, enlarged

53. *Mycosphaerella* a & b *M. musicola*

a — cluster of conidiophores (*Cercospora musae*), enlarged
b — conidia, enlarged
c — i, *M. fragariae*
c — leaf spots on infected leaf x 1
d — cluster of conidiophores (*Ramularia tulsanei*), enlarged
e — conidia, enlarged
f — ascocarp, enlarged
g — section through ascocarp, enlarged
h — ascus, enlarged
i — ascospores, enlarged

54. *Placostroma* sp.

a — V.S. stroma, enlarged

55. *Sphaerulina taxi*

a — section perithecium, enlarged
b — ascus with ascospores, much enlarged
c — ascospore, much enlarged

56. *Dothiora* sp.

a — habit, enlarged
b — ascus with ascospores, much enlarged

57. *Lizonia* sp.

a — habit x 1
b — ascus tip with ascospores, much enlarged

58. *Parodiella* sp.

a — section ascocarp, much enlarged
b — ascospore, much enlarged

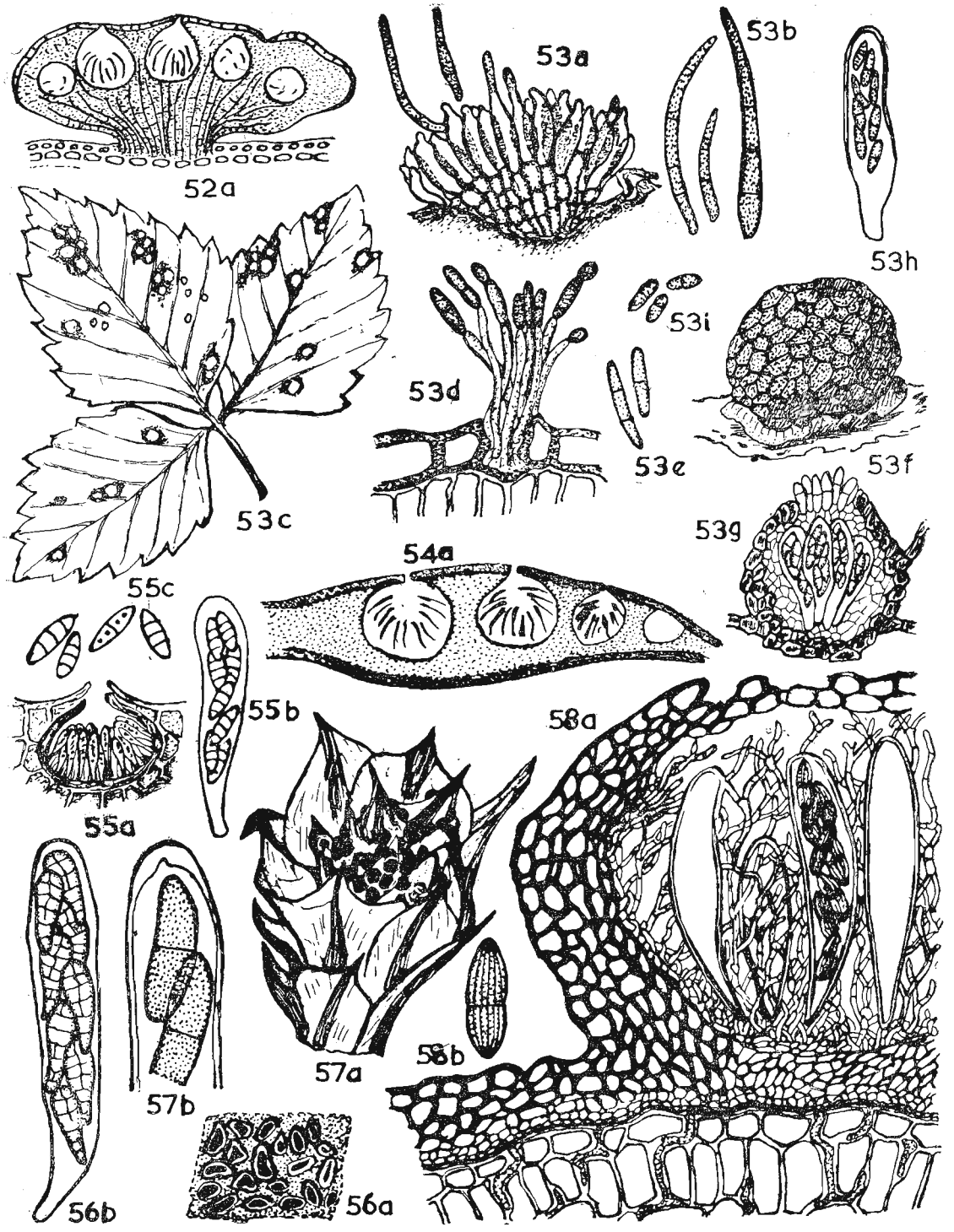

Plate XIII Figs. 52 — 58

NA - 77-2

4 species have been recorded in Sri Lanka.

(1) *M. camelliae* Petch
On *Camellia sinensis* **P : 25**

(2) *M. caricae* Syd.
On *Carica papaya* **P : 25**

(3) *M. citrullina* (C. O. Sm.) Grossenb.
On *Luffa acutangula* **P : 25**

(4) *M. erythrinae* Koord.
On *Erythrina lithosperma* **P : 25**

In addition 12 more species have been recorded in Sri Lanka and described under the name *Sphaerella* as:

(5) *S. citricola* McAlp.
On *Citrus limomum* **P : 26**

(6) *S. cleidii* (B. & Br.) Sacc.
On Cleidion **P : 26**

(7) *S. crotalariae* Petch
On *Crotalaria striata* **P : 26**

(8) *S. depazeiformis* (Auersw.) Ces. & de Not.
On *Oxalis corniculata* **P : 26**

(9) *S. fragariae* (Tul.) Sacc.
On *Fragaria vesca* **P : 26**

(10) *S. gastonis* Sacc.
On *Cocos nucifera* **P : 26**

(11) *S. heveae* Petch
On *Hevea brasiliensis* **P : 26**

(12) *S. lobeliae* Petch
On *Lobelia nicotianifolia* **P : 26**

(13) *S. rosigena* Ell. & EV.
On *Rosa* (cult) **P : 26**

(14) *S. senecionis* Petch
On *Senecio scandens* **P : 26**

(15) *S. spinicola* Ell. & EV.
On spines of *Rosa* (cult) **P : 26**

(16) *S. vernoniae* Petch
On *Vernonia hookeriana* **P : 26**

68. *Placostroma* Theiss. & Syd. (Fig. 54a)

Stroma dark, persistently innate forming a clypeus with the epidermis; ascocarp sunken in the stroma and reduced to polyascus locules with ostioles; ascus cylindrical, 8-spored, with paraphyses; ascospores hyaline, 2-celled.

1 species recorded in Sri Lanka.

(1) *P. elettariae* (B. & Br.) Theiss. & Syd.
On *Amomum floribundum* P : 34

69. *Sphaerulina* Sacc. (Fig. 55 a—c)

Perithecia minute, usually black, more or less globose; asci relatively large, often ventricose, without pseudoparaphyses; ascospores many-septate, hyaline or nearly so.

40 species, widespread.

1 species recorded in Sri Lanka.

(1) *S. mappiae* (Petch) Bond.
On *Mappia ovata.* P : 34

70. *Dothiora* Fr. (Fig. 56 a—b)

Perithecioid ascostroma embedded in the substratum, which they rupture into lobes, while they themselves dehisce by irregular fissures. Asci club shaped, 8-spores; ascospores hyaline or yellow, multiseptate, club-shaped or spindle shaped; paraphyses never present.

10 species, especially temperate.

1 species, recorded in Sri Lanka.

(1) *D. symploci* Petch
On *Symplocus specata* P : 32

71. *Dimerosporina* Höhnel

Mycelium in a single layer, consisting of brown exhyphopodiate hyphae, frequently agglutinate into a membrane. Erect setae and short stipitate pycnidia present. Perithecioid ascocarp fleshy, membranous, ovate with papilla and pore, glabrous, seated on a short erect stalk on the mycelium. Paraphyses indistinct. Asci ovate, up to 8-spored, spores hyaline to yellowish 1 septate. Perithecial wall of several layers of parenchyma.

3 species in Sri Lanka, Philip.

1 species recorded in Sri Lanka.

(1) *D. amomi* (B. & Br.) Hohnel
On leaves of *Amomum* P : 32

ORDER PLEOSPORALES

Pseudothecia middle—sized to large, perethecioid, containing cylindrical asci among persistent pseudoparaphyses. Pseudothecia are solitary but may be gregarious or seated on a basal stroma in which they are partially immersed. Ascospores are commonly phragmosporous (spores with transverse septa) or dictyosporous (spores with transverse and longitudinal septa). Some genera cause 'leaf spot' and 'blight' diseases with which their conidial states are associated.

KEY TO THE GENERA OF THE ORDER PLEOSPORALES

1. Pseudothecia small; superficial on green leaves or stems 2
Pseudothecia middle-sized to large; on dead stems 6

2.	Pseudothecia supericial, arising on a superficial mycelium	*Lizonia*	(72)
	Pseudothecia erumpent or immersed, or if superficial not on a superficial mycelium	. .3	
3.	Pseudothecia immersed in the substrate	. .4	
	Pseudothecia not immersed in the substrate	. .5	
4.	Ascospores 2 — celled	*Venturia*	(76)
	Ascospores 3 — celled	*Dermatodothis*	(73)
5.	Pseudothecia superficial on a superficial mycelium or stroma	*Parodiella*	(74)
	Pseudothecia erumpent from beneath the cuticle or epidermis	*Rosenscheldiella*	(75)
6.	Ascospores 1 — celled	*Botryosphaeria*	(77)
	Ascospores many — celled	. .7	
7.	Parasitic on lichens	*Didymosphaeria*	(79)
	Parasitic on vascular plants	. .8	
8.	Ascospores 1 — septate	*Didymosphaeria*	(79)
	Ascospores many-septate	. .9	
9.	Ascospores acicular or thread shaped	. .10	
	Ascospores not acicular or thread shaped	. .11	
10.	Ascospores with a deep constriction in the middle, with a swollen cell above and below	*Ophiobolus*	(82)
	Ascospores of uniform diameter, lacking deep constriction and swollen cells	*Cochliobolus*	(78)
11.	Ascospores large with conspicuous gelatinous sheath	*Massaria*	(80)
	Ascospores small, lacking a gelatinous sheath	*Nodulosphaeria*	(81)

72. *Lizonia* Ces. & de Not. (Fig. 57 a—b)

Perithecia gregarious, free on a dark coloured mycelium, smooth; asci large, cylindric — clavate, 8-spored; ascospores 1-septate, yellowish brown; parasitic on mosses.

1 species, Europe.

1 species recorded in Sri Lanka.

(1) *L. orbis* (Berk.) Petch.

On leaves of *Litsea zeylanica* P : 24

73. *Dermatodothis* Racib.

Ascocarp multiloculate with immersed locules, maturing on living leaves, intercuticular or epidermal; shield radiate at least at margins; asci paraphysate, 8-spored; ascospores brown, 3 celled.

2 species, Java, Sri Lanka.

1 species recorded in Sri Lanka.

(1) *D. zeylanica* Syd.
On leaves of *Symplocus obtusa* P : 32
S. elegans and *S. latiflora.*

74. *Parodiella* (Speg.) Theiss. & Syd. (Fig. 58 a—b)

Ascocarp dark, large, thick walled, borne single on a broad stromatic base arising froma hypostroma; ascospores 1 septate, large brown faintly, striate.

1 species on leguminosae. Widespread.

1 species recorded in Sri Lanka.

(1) *P. perisporioides* (Berk. & Curt) Speg.
On *Crotalaria, Desmodium* and *Indigofera.* P : 33

75. *Rosencheldiella* Theiss. & Syd.

Perithecia superficial without true ostiole; free on a basal innate-erumpent stroma; asci basal, fasciculate, 8-spored, aparaphysate; ascospores 1-septate, hyaline; conidia unknown.

4 species. Tropical.

1 species recorded in Sri Lanka.

(1) *R. eugeniae* Petch
On *Eugenia subavenis* P : 35

76. *Venturia* Sacc. (Fig. 59 a—h)
= *Phaeosphaerella* Karst. Ainsworth 1963)

Ascostroma innate in the host tissue, sub-epidermal or subcuticular, ostioles papillate with dark hairs or setae especially around the ostioles. Asci usually rather small but without a massive apical thickening and are interspersed with pseudoparaphyses at least in the ripe ascocarp. Ascospores at first colourless or pale green, they change to olive brown or greyish-green rarely dark brown at maturity, 2 celled, septum little displaced from the middle so that one cell is longer than the other. Conidiophore often develop from a sub epidermal or sub cuticular stroma, push through the surface where they produce conidia. Conidial stages in the form genus *Spilocaea* and *Fusicladium.* Conidiophores 1 celled, short. Conidia dark, 2 celled (1 celled may be present) broadly ovoid to pyriform or angled and pointed with a truncate base. 60 species, widespread. The most injurious fungus attacking the apple tree in *V. inaequalis* causing 'apple scab', in many instances rendering unsaleble from half to the entire crop, in addition to the injury caused to the tree. The conidial state of the fungus is called. *Spilocaea pomi* Fr. (= *S. dendriicu m;* = *Fusicladium pomi;* = *Helminthosporium pyrorum*)

1 species recorded in Sri Lanka.

(1) *V. inaequalis* (Cooke) Winter
On Apple. A : 213

In addition one more species has been recorded in Sri Lanka and described under the name *Phaeosphaerella* Karst.

(2) *P. theae* Petch
On leaves of *Camellia sinensis* P : 25

The fungus results in the formation of numerous irregular holes, usually small, in the leaf.

77. *Botryosphaeria* Ces. & de Not. (Fig. 60 a—b)
= *Desmotascus* Stev. fide Arx & Muller (Ainsworth 1963)

Perithecia globose, scattered or aggregated in large or small cushion like stromata, ostioles papillate; asci clavate, with numerous paraphyses; ascospores hyaline or nearly so, non-septate, usually averaging over 18/u long.

20 species, widespread.

6 species recorded in Sri Lanka.

(1) *B. agaves* (P. Henn.) Syd.
On *Yucca gloriosa* P : 22

(2) *B. erythrinae* Petch
On stems of *Erythrina lithosperma* P : 22

(3) *B. inflata* Cooke & Massee
On *Cedrella toona* P : 22

(4) *B. microspora* Petch
On old stems of *Camellia sinensis* P : 22

(5) *B. theicola* Petch
On branches of *Camellia sinensis* P : 22

(6) *B. vanillae* (Stonem.) Petch & Rangun.
On *Vanilla* P : 22

In addition to this 3 more species have been recorded and described in Sri Lanka under the name *Desmotascus* Ster.

(7) *D. cinnamomi* Petch
On stems of *Cinnamomum zeylanicum* P : 22

(8) *D. cocoes* Petch
On leaves of *Cocos nucifera* P : 22

(9) *D. neglectus* (Petch) Petch
On living branches of *Camellia* P : 22

78. *Cochliobolus* Drechsler (Fig. 61 a—f)

Ascostroma usually solitary but may also be in groups, seated on a basal stroma; ascocarp perithecium-like, erect with apical round ostiole, black, beak not compressed, setae absent; asci cylindrical among persistent pseudoparaphyses which arise near the upper end of the cavity and grow downwards; ascospores hyaline, filiform with numerous but often inconspicuous septa, without germ slits or pore, no deep constriction and swollen cells, of uniform diameter more or less spirally coiled within the ascus. Conidial stages as in the form-genus *Helminthosporium*. Conidiophores short, septate, simple or sparingly branched bearing conidia successively on new growing tips; geniculate at points below the conidia; conidia dark, typically containing more than three cells, cylindrical or ellipsoid, sometimes slightly curved or bent, ends rounded. Parasitic on grasses and cereals. 7 species, especially warmer areas. Disease called 'Brown spot of rice' resulting in a seedling blight, brown-red spotting of the leaves, black spotting of the glumes' and severe damage to the kernels is caused by *C. miyabeanus*, the conidial stage, being *Helminthosporium oryzae*.

Plate XIV Fig . 59 — 62

5 9. a—g *Venturia inaegualis*

a — spots on apple leaf x 1
b — conidial form of fungus on apple fruit x 1
c — section of tissue showing cluster of conidiophore, enlarged
d — conidiophores x 400
e — mature conidia x 400
f — section of ascocarp x 400
g — ascus with ascospores, much enlarged
h — *Phaeosphaerella* injury on tea leaf, habit

60. *Botryosphaeria* sp.

a — habit x 1
b — ascus with ascospores, much enlarged

61. *Cochliobolus miyabeanus*

a — spotted paddy grains x 1
b — spotted paddy leaf x 1
c — conidiophores, much enlarged (*Helminthosporium oryzae*)
d — conidia, much enlarged
e — ascocarp embedded in the leaf, enlarged
f — ascus with ascospores, much enlarged

62. *Didymosphaeria* sp.

a — habit x 1
b — asci with ascospores, much enlarged

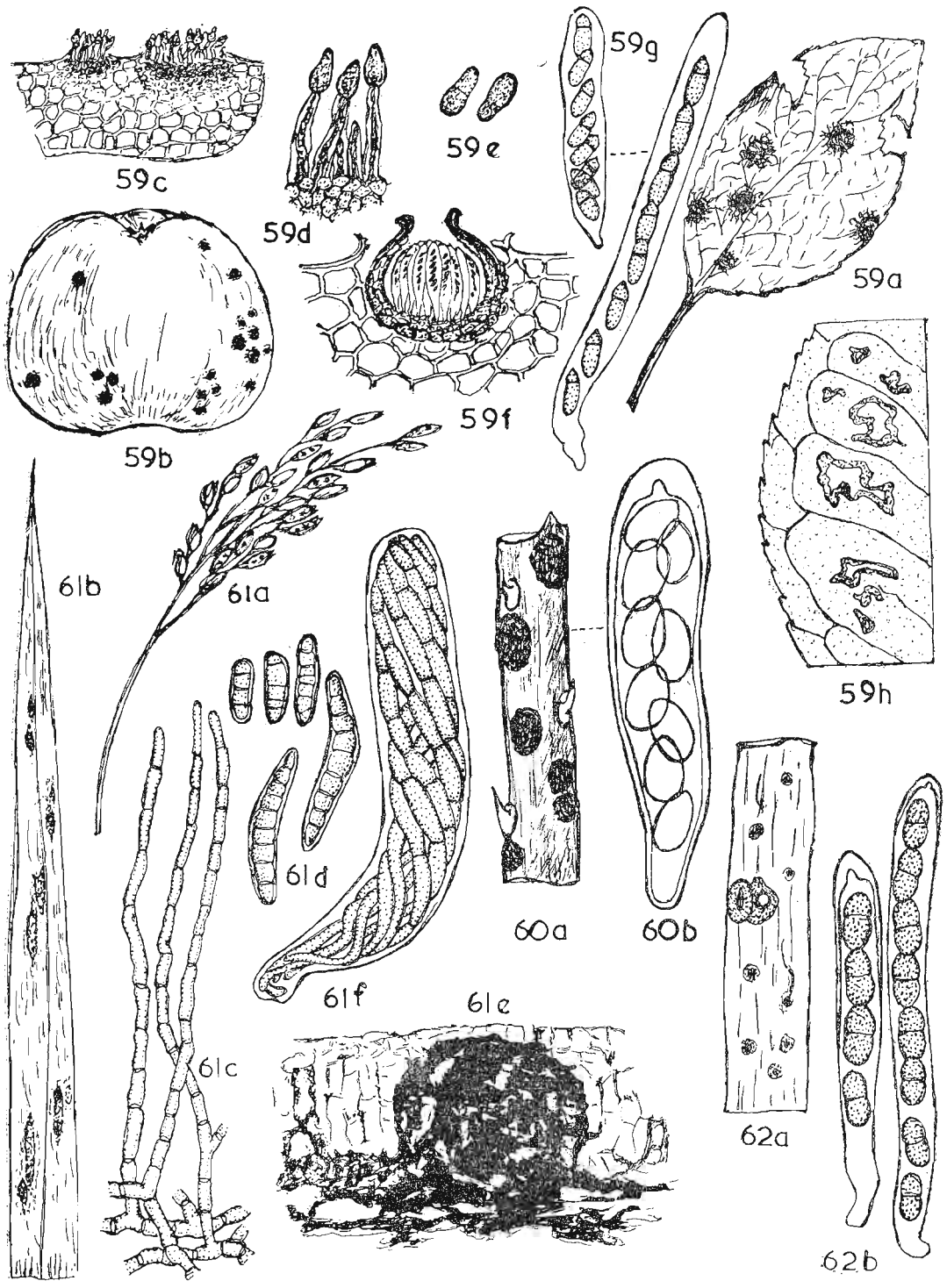

Plate XIV Figs 59 — 62

1 species recorded in Sri Lanka.

(1) *C. miyabeanus*
On *Oryza sativa* A : 90

79. *Didymosphaeria* Fuckel (Fig. 62 a—b)
= *Phaeodothis* Syd. fido Scheipflug (Ainsworth 1963)

Perithecia scattered, immersed, subglobose, dark coloured, sometimes associated with slight development of a clypeus around the ostiole; asci 8-spored; ascospores uniseriate, 1-septate, brown.

100 species, widespread

1 species recorded in Sri Lanka.

(1) *D. theae* Petch
On branches of *Camellia sinensis* P : 22

In addition two more species have been recorded in Sri Lanka and described under the name *Phaeodothis* Syd.

(2) *P. isachnes* Petch
On *Isachne kunthiane* P : 34

(3) *P. sparsa* Petch
On *Acacia caesia* P : 34

80. *Massaria* de Not. (Fig. 63 a—d)
= *Aglaospora* de Not.

Ascostroma perithecium-like, immersed in bark, sometimes clustered and surrounded by a rudimentary stroma, pseudoparaphyses absent; asci large, thick walled; ascospores very large, brown, many celled with a thick hyaline gelatinous coat or sheath. A weak parasite.

30 species, widespread

M. aculeata de Not. causes the disease described as 'thorny stem blight' in tea, readily recognised by the black thorns which are produced on the dead branches. These thorns are the tops of the fruiting bodies of the fungus. *M. thiecola* Petch causes gradual death of upper parts of the tea bush, branch by branch, often accompanied by the production of new shoots at the collar.

2 species have been described in Sri Lanka.

(1) *M. aculeate* de Not.
On *Camellia sinensis* A : 40

(2) *M. thiecola* Petch
On *Camellia sinensis* P : 24

81. *Nodulosphaeria* Rabenh.

Ascostroma scattered, immersed or becoming superficial by shedding of the host tissue, globose to conical with well developed ostioles and beak; asci thick walled, 8 spored; ascospores usually somewhat fusiform with 2 to many cross septa, usually yellowish to yellowish brown, 1 cell in the upper half of the ascospore distinctly broader than the others.

This genus comprises most of the species traditionally placed in *Ophiobolus* (Ainsworth et al 1973)

82. *Ophiobolus* Riess (Fig. 64 a—c)

Perithecia immersed mainly in dead tissues of herbaceous plants or becoming superficial by shedding of the host epidermis, subglobose, usually with a long apical papilla or short beak; asci cylindrical, thick walled at the tip; ascospores long and thread like, multiseptate, yellowish to brownish.

100 species, widespread, especially on old herbaceous stems. According to Ainsworth et al (1973) the species of *Ophiobolus* have now been distributed into the Genera; *Ophiobolus*, *Gauemannomyces* and *Nodulosphaeria*.

O. oryzinus attacks the rice leaf sheaths producing a brown discolouration in the region of the water level, finally resulting in the death of the leaves. The disease is described as "Brown sheath rot of Rice."

1 species recorded in Sri Lanka.

(1) *O. oryzinus*
On *Oryza sativa* A : 97

ORDER HYSTERIALES

These are easily recognised by their distinctive boat-shaped to linear, carbonaceous pseudo thecia opening by a longitudinal slit and becoming apothecioid when moistened. They superficially resemble the ascocarps of the Phacidiales. In cross section, the pseudothecia look much the same as the perethecioid pseudothecia of the Pleosporales, with long cylindrical asci and persistent pseudoparaphyses.

A single genus *Gloniella* is recorded.

83. *Gloniella* Sacc. (Fig. 65 a—c)

Ascocarp oblong to cylindrical with thick walls and thick lips; ascus 8-spored; ascospores more than 1-septate, hyaline.

20 species, temperate.

1 species recorded in Sri Lanka.

(1) *G. drynariae* (B. & Br.) Massee
On fronds of *Drynaria quercifolia* P : 32

ORDER HEMISPHAERIALES

A large group with superficial or rarely subcuticular, dimidiate, scutate ascocarps. Mycelium may be entirely superficial and form dark net works of anastomosing hyphae or bands or plates of parallel or radiating hyphae, less commonly the myceluim is hyaline and inconspicuous. Parasites may have a partly internal mycelium. The internal mycelium may form a hypostroma. Ascocarp may contain several immersed locules, more commonly they are orbicular to elongated pseudothecia, which may fuse laterally into extensive crusts. Asci are globose to cylindrical. Ascospores 1-septate.

They are mostly tropical and sub-tropical, but few are in the temperate regions. They occur primarily on living leaves, young stems and occasionally fruits, as hyperparasites on superficial fungi, as ectocommensals apparently growing on exudates from the stomata and cuticle and as parasites. Some of the parasites cause necrosis and produce mature ascocarps on dead tissue.

KEY TO THE GENERA OF THE ORDER HEMISPHAERIALES

1.	Pseudothecia hemiperithecioid, opening by a small round ostiole in the centre of the shield	..2	
	Pseudothecia apothecioid, opening by crumbling or splitting of the shield to form a broad pore, a longitudinal slit or irregular clefts.	..12	
2.	Pseudothecia sub-cuticular	..3	
	Pseudothecia superficial	..5	
3.	Ascospores brown with light coloured bands around the middle	*Vizella*	**(94)**
	Ascospores uniformly coloured, hyaline — pale brown	..4	
4.	Pseudothecia multiloculate with immersed locules	*Trabutia*	**(93)**
	Pseudothecia unilocular, single or sometimes fused lateral	*Microdothella*	**(92)**
5.	Scutellum radiate throughout	..6	
	Scutellum radiate only at margins	..10	
6.	Ascocarp or hypostroma innate or erumpent	..7	
	Ascocarp superficial, no hypostroma	..8	
7.	Hymenium linear	*Monorhiza*	**(89)**
	Hymenium rounded or discoid	*Marchalia*	**(87)**
8.	Superficial mycelium present	..9	
	Superficial mycelium lacking	*Dothidella*	**(86)**
9.	Free mycelium membranous	*Trichopeltis*	**(91)**
	Free mycelium not membranous	*Calothyrium*	**(84)**
10.	Scutellum wavy plectenchymatous; mycelium present	..11	
	Scutellum open reticulate; without evident mycelium	*Micropeltella*	**(88)**
11.	Ascocarp setose	*Chaetopeltopsis*	**(85)**
	Ascocarp not setose	*Stomiopeltella*	**(90)**
12.	Superficial mycelium present; Pseudothecium small, unilocular	..13	
	Superficial mycelium lacking; Pseudothecium large, multilocular	..14	
13.	Pseudothecia orbicular, opening by a broad pore or by irregularly stellate fissures	*Asterina*	**(95)**
	Pseudothecia elongate, opening by longitudinal slit	*Lembosia*	**(96)**
14.	Hypostroma subcuticular	*Dothidasteroma*	**(98)**
	Hypostroma intra-epidermal or deeper	..15	
15.	Locules in more or less complete rings surrounding a sterile centre	*Cocconia*	**(97)**
	Locules not in rings	..16	
16.	Locules linear, extending radially from sterile centre or running parallel	*Parmulina*	**(100)**
	Locules rounded, oblong or linear inordinately arranged and often anastomosing	*Hysterostomella*	**(99)**

84. *Calothyrium* Theiss. (Fig. 66 a—c)

Ascocarp superficial, more or less circular with a central pore, minute, appearing like fly specks on leaves, grass culms and the like. There is a copious brown superficial mycelium around the pseudothecia, ascospores hyaline, 2-celled.

25 species, widespread.

1 species recorded in Sri Lanka.

(1) *C. reticulatum* Petch
On *Aporosa lanceolata* P : 32

85. *Chaetopeltopsis* Theiss.

Characters similar to *Stomiopeltella* except for a setose ascocarp.

1 species. Tropical

1 species recorded in Sri Lanka

(1) *C. tenuissima* (Petch) Theiss.
On green stems and fruits of *Hevea brasiliensis* P : 32

86. *Dothidella* Speg. (Fig. 67 a)

Ascocarp small, black, embedded in a black stroma buried in the tissue; asci 8-spored; spores 2-celled, pale coloured. *Dothidella* Speg. is a nomen ambiguum fide Ainsworth (1963)

1 species recorded in Sri Lanka

(1) *D. calophylli* (B. & Br.) Petch
On leaves of *Calophyllum walkeri* P : 32

87. *Marchalia* Sacc.

Ascocarp superficial with innate hypostroma, dimidiate with radiate scutellum, round to more or less elongate; hymenium round or linear, around sterile centre, paraphyses present, many asci in each hymenium; asci elongate-clavate, 8-spored; spores ovate — oblong, 1-septate, hyaline.

Marchalia Sacc. a nomen confuscum fide Ainsworth (1963)

1 species recorded in Sri Lanka

(1) *M. spurcaria* (B. & Br.) Sacc.
On leaves of *Artocarpus integer* P : 33

88. *Micropeltella* Syd.

Ascocarp superficial with hypostroma, dimidiate — scutate; scutellum open reticulate radiate at margins, typically without an evident mycelium; hymenium single; asci clavate; spores fusiform, many-celled, hyaline; paraphyses lacking.

30 species. Tropical.

2 species recorded in Sri Lanka.

(1) *M. confluens* Petch
On leaves of *Pavetta natalensis* P : 33

(2) *M. thwaitesii* Petch
On *Agyneia multilocularis* and *Aporosa lanceolata* P : 33

89. *Monorhiza* Theiss. & Syd.

Ascocarp spherical, superficial with innate hypostroma, dimidiate with radiate scutellum; hymenium linear, several, arranged irregularly; asci 8-spored, numerous in each hymenium, basal, parallel, clavate, paraphyses present; spores 2-celled, brown.

2 species, Java, Sri Lanka

1 species recorded in Sri Lanka.

(1) *M. nervisequia* (Berk.) Theiss. & Syd.
On fern fronds P : 33

90. *Stomiopeltella* Theiss.

Ascocarp glabrous, scutellum wavy, plectenchymatous, with ostiole; mycelium reticulate without hyphopodia; hymenium single; asci subglobose; spores hyaline 2-celled.

9 species, tropical.

1 species recorded in Sri Lanka.

(1) *S. nubecula* (B. & Br.) Theiss.
On leaves of *Antidesma* P : 35

91. *Trichopeltis* Speg.
= *Trichopeltula* Theiss. fide Clem. & Shear. (Ainsworth 1963)

Free mycelium thalloid, radiately prosenchymatic, membranous; ascocarp superficial without hypostroma, dimidiate with radiate scutellum, round or linear; asci typically many, basal, parallel or convergent, saccate-clavate; spores 3-celled, hyaline.

2 species, South American and New Zealand.

1 species recorded in Sri Lanka under the name *Trichopeltula* Theiss. as:

(1) *T. hedycaryae* Theiss.
On *Scolopia crassipes* and *Cinnamomum ovalifolium* P : 35

92. *Microdothella* Syd.

Ascocarp subcuticular, shield of ascocarp radiate at least at margins, unilocular, single or sometimes fused laterally; spores hyaline, 1-celled.

1 species recorded in Sri Lanka

(1) *M. theae* Petch
On twigs of *Camellia sinensis* P : 33

93. *Trabutia* Sacc. & Roum.

Ascocarp sub-cuticular, multiloculate with immersed locules maturing on living leaves; shield of ascocarp radiate at least at margins; ascospores 1-celled, hyaline or becoming brown.

Plate XV Figs. 63 — 71

63. *Massaria theicola*

a — L.S. infected stem of tea, much reduced
b — section ascocarp, enlarged
c — ascus with paraphyses, much enlarged
d — ascospores, much enlarged

64. *Ophiobolus graminis*

a — ascocarp, enlarged
b — asci and paraphyses, enlarged
c — ascospore, enlarged

65. *Gloniella* sp.

a — habit x 1
b — ascus and paraphyses, enlarged
c — ascospore, much enlarged

66. *Calothyrium* sp.

a — thallus x 500
b — ascus, enlarged
c — ascospore, enlarged

67. *Dothidella* sp.

a — V.S. stroma, enlarged

68. *Vizella* sp.

a — ascocarp V.S., enlarged
b — ascus, enlarged
c — ascospores, enlarged

69. *Asterina* sp.

a — habit, reduced
b — thallus x 500
c — ascospore, much enlarged
d — *A. sphaerotheca* mycelium and ascostroma, enlarged

70. *Lembosia* sp.

a — habit x 10
b — ascocarp, enlarged
c — ascus, enlarged
d — ascospore, enlarged

71. *Cocconia* sp.

a — section of ascocarp arising from immersed hypostroma, enlarged
b — ascospores, enlarged

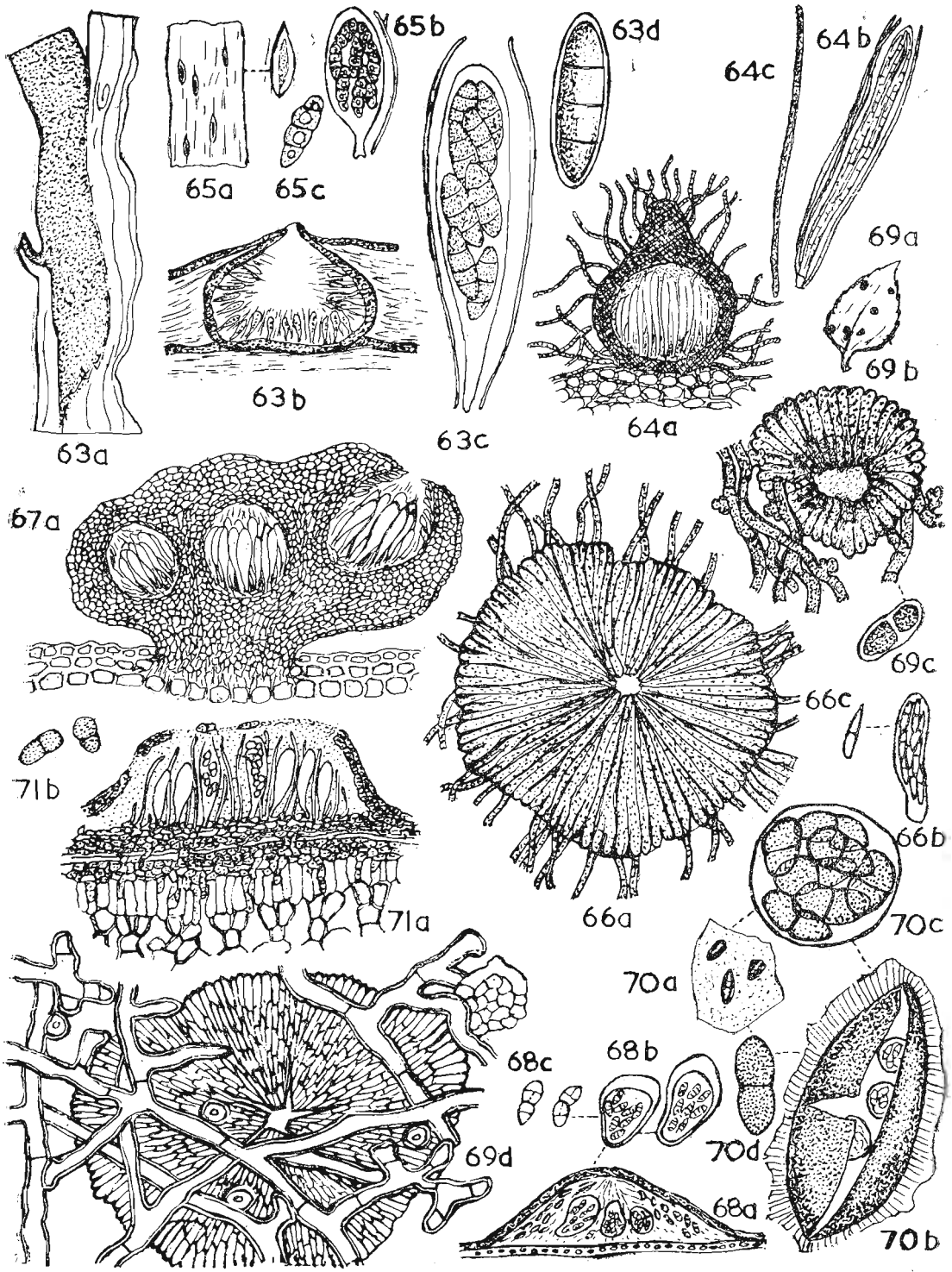

Plate XV Figs. 63—71

5 species, temperate.

1 species recorded in Sri Lanka.

(1) *T. granulata* (B. & Br.) Petch
On *Caesalpinia sepiaria* P : 35

94. *Vizella* Sacc. (Fig. 66 a—c)
= *Phaeaspis* Clem. & Shear. fide Hughes (Ainsworth 1963)

Ascocarp sub-cuticular, shield of ascocarp several cells thick, black, carboneous; ascus 8-spored; spore brown with light coloured band around the middle, 1-celled.

5 species. Tropical

1 species recorded in Sri Lanka under the name *Phaeaspis* Clem. & Shear.

(1) *P. gomphispora* (B. & Br.) Petch ex Clem. & Shear.
On *Pavetta* P : 34

95. *Asterina* Le'v. (Fig. 69 a—c)

Mycelium dark brown, superficial forming a net work visible to the eye as small irregular black patches on living leaves, septate, bearing numerous hyphopodia, ascocarp circular with a central pore; asci sub-globose, 8-spored, spores clavate, 1-septate, often slightly constricted dark brown.

250 species, especially warmer parts. Parasites on the surface of leaves.

4 species recorded in Sri Lanka.

(1) *A. crustosa* Berk. & Cooke
On *Eugenia* and *Ficus* P : 31

(2) *A. echinospora* Höhnel
On *Cansjera rheedii* P : 31

(3) *A. micropeltis* B. & Br.
On leaves of *Eugenia hemisphaerica* P : 31

(4) *A. sphaerotheca* Karst. & Roum.
On *Cipadessa fruticosa* P : 31

96. *Lembosia* Le'v. (Fig. 70 a—c)

Superficial mycelium formed of brown hyphae; ascocarp elongated black, opening by a longitudinal slit, sometimes lobed or triangular, surrounded by a narrow belt of superficial radiating brown hyphae; asci globose, 8-spored; spores clavate, irregularly arranged, 1-septate, constricted at the septum, ultimately pale brown.

50 species, especially warmer parts.

2 species, recorded in Sri Lanka.

(1) *L. intricata* (B. & Br.) Petch
On *Pandanus* P : 33

(2) *L. pavettae* Theiss.
On leaves of *Pavetta indica* P : 33

97. *Cocconia* Sacc. (Fig. 71 a—b)

Ascocarp large, brown, connected with hypostroma at many points by single hyphae penetrating cuticle; internal mycelium a membranous or crust like hypostroma which may be intra-epidermal or deeper; locules in single usually incomplete rings; ascus 8-spored; spores 1-septate, near the middle.

5 species, Tropical.

1 species recorded in Sri Lanka.

(1) *C. placenta* (B. & Br.) Sacc.
On leaves of *Symplocos spicata* P : 32

98. *Dothidasteroma* Höhnel

Hypostroma membranous or band shaped, subcuticular; ascocarps usually single, rounded to oblong; ascus 8-spored, cylindric to clavate; ascospores 1-septate becoming brown.

1 species recorded in Sri Lanka

(1) *D. maculosum* (B. & Br.) Höhnel
On leaves of *Sterculia thwaitesii* P : 32

99. *Hysterostomella* Speg.
= *Monorhizina* Theiss. & Syd. fide Eileen Fischer (Ainsworth 1963)

Ascocarp apothecioid, multilocular, locules round, oblong or linear, locules inordinately arranged and often anastomosing at most radially arranged at margins; hypostroma intra epidermal or deeper, shield radiate opening by splitting; ascus clavate — cylindric, 8-spored, spores 1-septate, brown.

10 species, Tropical

1 species recorded in Sri Lanka under the name *Monorhizina* Theiss. & Syd.

(1) *M. filicina* (B. & Br.) Theiss. & Syd.
On fronds of *Alsophila glabra* P : 33

100. *Parmulina* Theiss. & Syd.

Internal mycelium a membranous or crust like hypostroma which is intra-epidermal or deeper; ascocarps multiloculate, locules radiating in all directions from a sterile centre or radiating locules, flattened, conical; ascus 8-spored; spores septate at or above the middle, long, remaining hyaline finally brownish, at most 5/^{u}m wide.

5 species, Asia, America.

1 species recorded in Sri Lanka.

(1) *P. exsculpta* (Berk.) Theiss. & Syd.
On *Aporosa lindleyana*, *A. acuminata*, and *Agyneia multilocularis* P : 33

CLASS — DISCOMYCETES

Ascocarp is a typical apothecium taking the shape of a saucer, a cup, or nearly a closed sphere, but varies in complexity from group to group. It is generally characterised by an open hymenium consisting of both paraphyses and asci. Ascocarp may be free or sometimes seated on a subiculum or spring from a sclerotium. Asci clavate to cylindrical, two — many spored, operculate or inoperculate; spores globose, ellipsoid, fusiform or filiform, one — many celled, hyaline or variously coloured.

Most are saprophytic whilst a few are important plant parasites including a number of leaf pathogens.

KEY TO THE ORDERS OF THE CLASS DISCOMYCETES

1.	Apothecia developing within a stroma	..... *PHACIDIALES* (*P*.65)
	Apothecia not developing within a stroma	 2
2.	Asci cylindrical, very long and narrow	..... *OSTROPALES* (*P*.65)
	Asci more or less clavate	..... *HELOTIALES* (*P*.66)

ORDER — PHACIDIALES

Ascocarp begins as a stroma. Usually externally black, spherical to discoid or frequently hysteriform, and is immersed wholly or partly in host tissues or more rarely is on the surface of the substrate. Ascocarp differentiates to form 1 or several hymenial areas consisting of asci and paraphyses. Asci are thickened apically, violently discharge ascospores into the air and are 4—8 spored. Ascospores are ovoid to filiform, sometimes constricted in the middle, non-septate to transversely multiseptate, hyaline or rarely brown. Sometimes they have a gelatinous sheath, and are bipolar symmetrical or asymmetrical or radially symmetrical.

There is a single genus *Hypodermella*.

101. *Hypodermella* Von Tubeuf (Fig. 72 a—b)

Apothecia elliptical or elongated, developed either within or beneath the epidermis of flowering plants which they commonly lift to form small black blisters, with a black covering tissue which splits longitudinally to expose the disc; asci cylindric-clavate, 8-spored or 4-spored; ascospores clavate, longer in proportion to the length of the ascus.

20 Species. N. Temperate.

One species recorded in Sri Lanka

(1) *H. symploci* Petch
On leaves of *Symplocos* P : 20

ORDER — OSTROPALES

Ascocarps in this order are lignicolous or folicolous. If superficial they are pileate — stipitate, clavate and laterally compressed, turbinate, or lenticular. If they are partially to wholly immersed in the substrate, they are discoid to perithecioid; asci are cylindrical and very long, with a thickened apex; 8-spored; ascospores are smooth, hyaline, long, filiform, and multiseptate.

There is a single genus *Stictis*.

102. *Stictis* Pers. ex Fr. Gray (Fig. 73 a—d)

Apothecia immersed in plant tissue, then erumpent and opening to expose a circular disc surrounded by a broad white sterile margin which may be split into lobes; asci elongated; ascospores long and slender, but, less thread like, multiseptate, paraphyses slender, simple and slightly forked at the tip only; when dry the hymenium separates from the margin.

40 species, widespread.

One species recorded in Sri Lanka.

(1) *S. emarginata* Cooke & Massee
On leaves of *Eucalyptus robusta* P : 21

ORDER — HELOTIALES

Ascocarps are minute to moderate in size, of varying morphology and are superficial or immersed in host tissues; asci are clavate to cylindrical, with an apical pore, 2—8 spored with the ascospores rarely budding in the ascus to produce conidia; ascospores smooth or very rarely marked with cyanophilic ornaments, hyaline to brown and of various shapes; radially symmetrical, although frequently they will have bipolar symmetry; non-septate or with one to many septate. Plant parasites or saprobes, rarely found on soil or dung.

KEY TO THE PARASITIC GENERA OF THE ORDER HELOTIALES

1.	Apothecia sunken then erumpent usually opening by lobes	... 2	
	Apothecia typically superficial opening circularly	... 3	
2.	Apothecia opening by a narrow cleft	... *Lophodermium*	**(108)**
	Apothecia opening by lobes or a wide cleft	... *Henriquesia*	**(107)**
3.	Apothecia gelatinous	... *Bulgaria*	**(103)**
	Apothecia not gelatinous	... 4	
4.	Apothecia typically waxy	... 5	
	Apothecia typically fleshy	... *Phaeoglossum*	**(110)**
5.	Outer wall of apothecium dark	... *Niptera*	**(109)**
	Outer wall of apothecium rarely dark	... 6	
6.	Spores unicellular	... 7	
	Spores septate	... *Diplocarpon*	**(104)**
7.	Spores oblong	... *Helotiopsis*	**(106)**
	Spores acicular to filiform	... *Gorgoniceps*	**(105)**

103. *Bulgaria* Fries (Fig. 74 a—c)
= *Sarcosoma* fide Seaver (Ainsworth 1963)

Apothecia large, turbinate, gregarious, gelatinous; ascospores black or dark brown.

One species recorded in Sri Lanka, under the name *Sarcosoma* Casp.

(1) *S. thwaitesii* (B. & Br.) Petch
On *Juniperus bermudiana* P : 21

104. *Diplocarpon* Wolf (Fig. 75 a—d)

Apothecia dark coloured, very soft fleshed, erumpent, not associated with a stroma within the leaf tissue; asci 8-spored; ascospores hyaline, 2-celled. Conidial state in *Marssonina*

& *Entomosporium*. 3 species, widespread. *D. rosae* causes 'black spot' of rose, resulting in unsightly brownish-black spots on the upper surface of the leaves.

One species recorded in Sri Lanka.

(1) *D. rosae*
On *Rosa* A : 240

105. *Gorgoniceps* Karst. (Fig. 76 a—b)

Apothecia sessile or nearly so, obconical, smooth, external tissue composed of parallel brown hyphae; asci cylindric-clavate, the pore blued by iodine, 8-spored; ascospores long slender, multiseptate; paraphyses slender.

4 species, widespread.

One species recorded in Sri Lanka.

(1) *G. marginata* Petch
On living leaves of *Hedyotis lessertiana* P : 19

106. *Helotiopsis* Höhnel

Apothecium superficial, stalked, bright coloured, waxy, hypothecium well developed, excipulum rarely so; asci mostly cylindric, 8-spored; paraphyses filiform; ascospores globose, 1-celled, hyaline.

1 or 2 species Sri Lanka, Philippine islands.

1 species recorded in Sri Lanka.

(1) *H. apicalis* (B. & Br.) Höhnel
On *Macromitrium sulcatum* P : 19

107. *Henriquesia* Pass. & Thum.

Apothecium stromate, hymenium exposed at maturity, hypothecium well developed; asci mostly cylindrical, 8-spored; paraphyses numerous, much branched and swollen at the tips.

2 or 3 species. Eur., N. America, Sri Lanka.

1 species recorded in Sri Lanka.

(1) *H. ochlandrae* Petch
On living leaves of *Ochlandra stridula* P : 20

108. *Lophodermium* Chevalier (Fig. 77 a—b)

Apothecia superficially resemble *Hypodermella* but containing filiform ascospores.

50 species. Temperate.

1 species recorded in Sri Lanka.

(1) *L. fourcroyae* (B. & Br.) Massee
On leaves of *Fourcroya* P : 20

Plate XVI Figs. 72 — 78

72. *Hypodermella*

a — habit x 1
b — clavate ascospore, much enlarged

73. *Stictis radiata*

a — habit x 1
b — section apothecium x 5
c — ascus and paraphyses x 500
d — ascospores x 1000

74. *Bulgaria*

a — habit x 1
b — section of apothecia, young and mature x 5
c — ascospore x 1000

75. *Diplocarpon rosae*

a — spots on rose leaf x 1
b — section apothecium on plant tissue, enlarged
c — ascus and paraphyses, much enlarged
d — ascospores, much enlarged

76. *Gorgoniceps* sp.

a — apothecium x 5
b — ascus with ascospores and paraphyses, much enlarged

77. *Lophodermium*

a — habit x 1
b — ascus with ascospores and paraphyses, much enlarged

78. *Niptera*

a — habit x 1
b — ascus and paraphyses, enlarged
c — ascospores, much enlarged

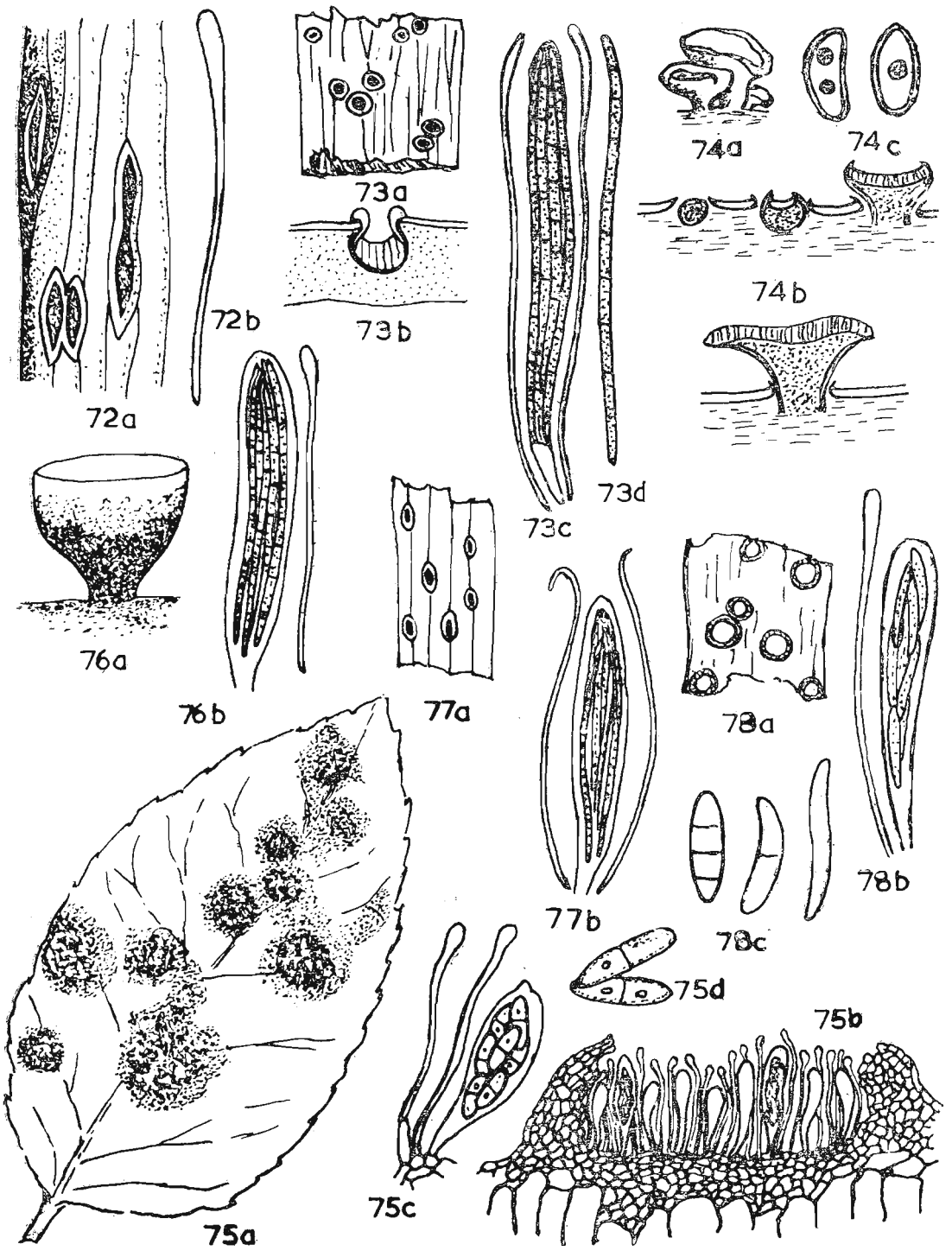

Plate XVI Figs. 72 — 78

109. *Niptera* Fr. (Fig. 78 a—c)

Apothecia brown, sessile, on opening generally exhibit a flat saucer shaped transparent stratum of asci; ascopores unicellular or 2-celled when mature, hyaline, spindle-shaped or club-like; paraphyses hyaline or coloured, sometimes forked.

24 species. Widespread.

1 species recorded in Sri Lanka.

(1) *N. epiphytica* Petch
On living leaves of *Psychotria*. P : 20

110. *Phaeoglossum* Petch

Apothecia typically superficial, bright coloured, fleshy, stalked, capitate, hypothecium and excipulum not indicated, hymenium on the out side of the fruit body; asci cylindric, 8-spored opening by an operculum; ascospores 1-celled; paraphyses filiform.

1 species recorded in Sri Lanka.

(1) *P. zeylanicum* Petch
On fruits of *Loranthus* P : 21

SUB-DIVISION — BASIDIOMYCOTINA

Mycelium well developed, usually richly branched and septate. Many members show the presence of clamp connections. Characteristic spore bearing structure is the *basidium* bearing spores exogenously, usually on projections termed sterigmata. Number of spores per basidium is typically four, but two spored basidia are quite common. Some members produce their spores in sori but many others have complex fruit bodies or basidioscarps in which the spores are formed. Basidia may be simple, septate or deeply divided. Basidiospore is typically unicellular, uninucleate, hyaline or pigmented, and of various shapes.

Mycelium is frequently perennial in leaf mould or wood, sometimes forming fairy rings, sclerotia or rhizomorphs. When enough material has been stored in it and other conditions are right the fruit bodies are formed; these which are macroscopic are, common in the woods and fields. This includes 550 genera (175 monotypic) + 1200 syn.

KEY TO THE CLASSES OF BASIDIOMYCOTINA

Basidiocarp usually well developed; basidia typically organised as a hymenium; ... *HYMENOMYCETES* (*P.*93)

Basidiocarp lacking and replaced by teleutospores grouped in sori or scattered within the host tissue; basidia not in a hymenium ... *TELIOMYCETES* (*P.*69)

CLASS — TELIOMYCETES

Basidia do not arise on basidiocarps. Basidiocarps are replaced by sori of spores called teleutospores or teliospores, rarely scattered or grouped within host tissues. Basidia arise on germination of a teleutospore. The teleutospores serve as resting spores. These are always parasitic on vascular plants.

KEY TO THE ORDERS OF THE CLASS TELIOMYCETES

Basidiospores produced on sterigmata; basidiospores forcibly discharged : *UREDINALES* (*P.*74)

Basidiospores sessile; basidiospores not forcibly discharged : *USTILAGINALES* (*P.*70)

ORDER — USTILAGINALES (Smut fungi or Smuts)

They are called smut fungi because they form black dusty spore masses in the plant tissue, resembling soot or smut. The dark spores are the teleutospores, also referred to as the smut spores.

They are parasitic on vascular plants especially on Graminae and Cyperaceae. The signs of attack are usually limited to the ovary, anthers, inflorescence, leaves and stems of the host. The mycelium may be throughout the plant or as in most cases only at the points of infection. In most genera there are only the teleutospores (smut spores, chlamydospores, brand spores, resting spores) and basidio spores. The teleutospores on germination produce a basidium (promycelium) capable of giving rise to an indefinite number of basidiospores (sporidia, sporidiole, 'conidia'). The teleutospores are in sori and when mature are generally uncovered as a dark powder, less frequently they are covered spores in ones, twos, or in balls.

There are 42 Genera (15 monotypic) + 33 syn., 700 species.

KEY TO THE GENERA OF THE ORDER USTILAGINALES

1.	Teleutospores give rise to basidium (promycelium)	... 2	
	Teleutospores give rise directly to basidiospores (sporidia)	... *Graphiola*	**(117)**
2.	Basidium transversely septate	... 3	
	Basidium not septate	... *Entyloma*	**(116)**
3.	Teleutospores united in large numbers in balls	... *Sorosporium*	**(113)**
	Teleutospores not united	... 4	
4.	Sori traversed by many bundles of sterile hyphae	... *Farysia*	**(112)**
	Sori not traversed by bundles	... 5	
5.	Teleutospores powdery	... 6	
	Teleutospores agglutinated into a carbonaceous mass	... *Cintractia*	**(111)**
6.	Sori with a more or less permanent peridium	... *Sphacelotheca*	**(114)**
	Sori without a peridium	.. *Ustilago*	**(115)**

111. *Cintractia* Cornu (Fig. 79 a—c)

Vegetative hyphae spreading in the tissues of the host, soon disappearing; fertile hyphae branched, the spores formed in the interior of gelatinised, clustered terminal branches; spores one celled, in masses, not powdery; sorus with a columella.

40 species on Cyperaceae and Juncaceae, cosmopolitan.

3 species recorded in Sri Lanka.

(1) *C. axicola* (Berk.) Cornu
On *Fimbristylis diphylla* — P : 36

(2) *C. leucoderma* (Berk.) P. Henn.
On *Rhynchospora aurea* — P : 36

(3) *C. peribebuyensis* Speg.
On *Cyperus distans* — P : 36

112. *Farysia* Racib.

Sori enclosed at the start and finally erumpent, with richly branched loose penicillate branches, traversed by many sterile bundles of hyphae; spores globose, solitary, in superficial septate hyphae; sporidioles elongate.

8 species on Cyperaceae, widespread.

2 species recorded in Sri Lanka.

(1) *F. emodensis* (Berk.) Syd.
On *Polygonum chinense* P : 36

(2) *F. olivacea* (DC.) Syd.
On *Carex indica* and *C. baccans* P : 36

113. *Sorosporium* Rud. (Fig. 80 a—b)

Spore formation takes place in a mass of twisted gelatinous hyphae. Spores at first embedded in a gelatinous investment and united into packets, but later becoming separate. Promycelium filiform and separate.

30 species. Cosmopolitan.

2 species recorded in Sri Lanka.

(1) *S. andropogonis — aciculati* (Petch) Petch
On *Andropogon aciculatus* P : 36

(2) *S. paspali* McAlp.
On *Paspalum scrobiculatum* P : 36

114. *Sphacelotheca* de Bary (Fig. 81 a—e)

The sporocarp is sharply defined, and consists of a columella round which the loose mass of spores is disposed, the whole being enclosed in a covering formed by non-sporogenous hyphae. Spores typically arising from the complete division of the mycelium to form powdery masses; promycelium septate transversely, sporidioles arising at the septa and usually at the apex also, often increasing further by proliferation.

7 species recorded in Sri Lanka.

30 species on Graminae and Polygonaceae. Cosmopolitan. 'Grain smut' of sorghum is caused by *Sphacelotheca sorghi*. Fungus attacks only the grain and transforms the grain into a spore sac or smut balls, brown-grey in colour, filled with the smut spores.

(1) *S. hydropiperis* (Schum.) de Bary
On *Polygonum minus* P : 36

(2) *S. monilifera* (Ell. & Everh.) Clinton
On *Andropogon contortus* P : 36

(3) *S. nardi* (Syd.) Zundel
On *Cymbopogon confertiflorus* P : 36

(4) *S. spermoidea* (B. & Br.) Mundkur
On *Cymbopogon nardus* P : 36

Plate XVII Figs. 79 — 82

79. *Cintractia leucoderma*

a — smutted ear x 1
b — germinating teleutospore, much enlarged
c — section through smutted region, much enlarged

80. *Sorosporium saponariae*

a—b stages in the formation of smut balls, much enlarged

81. *Sphacelotheca* a, b — *S. hydropiperis*

a — mass of spores emerging from fruit body, enlarged
b — section of mature fruit body enlarged
c — e, *S. sorghi*
c — sorus, enlarged
d — columella after the spores have fallen, enlarged
e — promycelium, sporidia, budding of sporidia, much enlarged

82. *Ustilago scitaminae*

a — smutted sugar cane, apical region showing whip, much reduced
b — smut spores x 400
c — germinating smut spores x 400

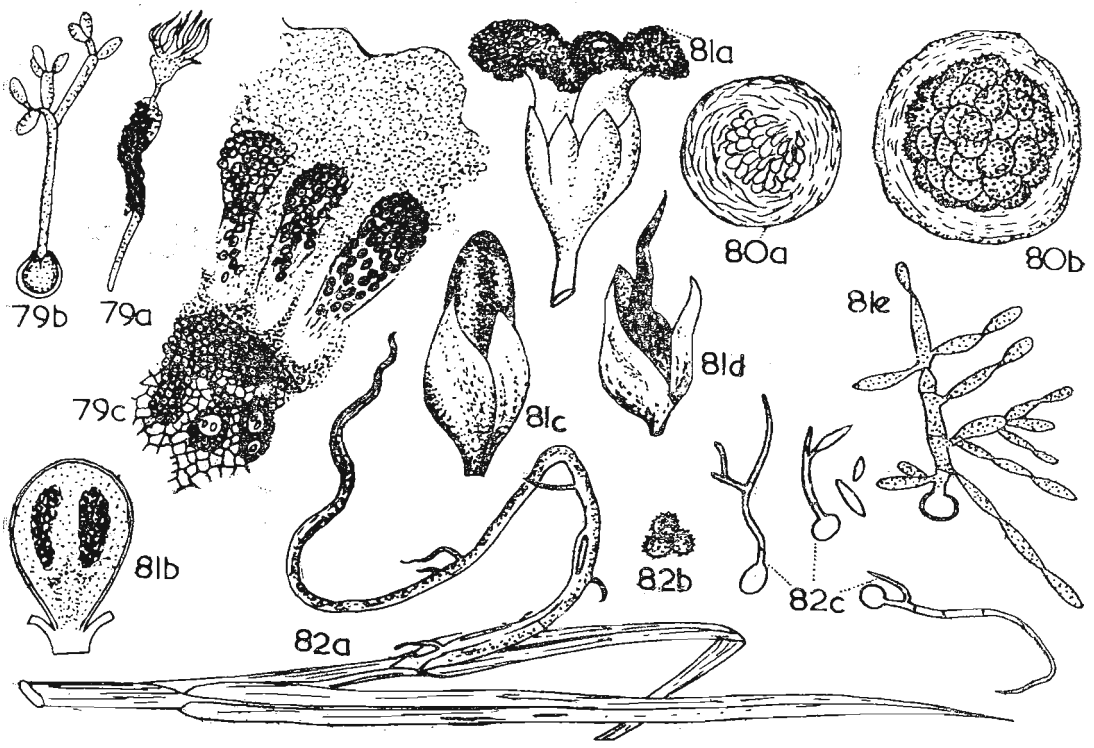

Plate XVII Figs. 79 — 82

(5) *S. sorghi* (Link) Clint
On *Sorghum vulgare* P : 36

115. *Ustilago* (Pers.) Roussel (Fig. 82 a—c)

Vegetative hyphae spreading in the tissues of the host, soon disappearing; fertile hyphae branched, the spores are formed, in the interior of gelatinised, clustered, terminal branches; spores one-celled, powdery, on germination producing a short, septate promycelium, which bears minute, lateral, secondary spores.

300 species, especially on Graminae. Cosmopolitan. An important pathogen is *U. scitaminae* causing smut of sugar cane, characterised by the production of a long (often 2—3 feet in length) whip like structure from the terminal bud of the stalk. At first this is white but later becomes black and dusty.

7 species recorded in Sri Lanka.

(1) *U. anthistriae* Petch
On *Anthisitria tremula* P : 36

(2) *U. coicis* Bref.
On *Coix lachryma — jobi* P : 36

(3) *U. digitariae* (Kunze) Wint.
On *Panicum repens* P : 36

(4) *U. linearis* (B. & Br.) Petch
On *Vetiveria zizanioides* P : 36

(5) *U. scleriae* (DC.) Tul. P : 36

(6) *U. tonglinensis* Tracy & Earle. P : 36
On *Ischaemum ciliare*

(7) *U. scitaminae*
On *Saccharum officinarum* A : 225

116. *Entyloma* de Bary

Mycelium intercellular. The spores are of intercalary origin, and arise here and there on any part of the mycelium. The spore clusters appear externally as spots, and the spores never leave the host; epispore thick, generally multistratose, hyaline or brownish, smooth or ornamented; promycelium filiform, sporidiola many, acrogenous, elongated, for the most part conjugating in pairs. Conidia present in some species, forming white tufts on living leaves.

100 species. Cosmopolitan. Sori generally on leaves causing leaf spots.

2 species recorded in Sri Lanka.

(1) *E. dahiliae* Syd.
On *Dahlia* P : 36

(2) *E. fuscum* Schroet.
On *Papaver* sp. cult. P : 36

117. *Graphiola* Poit.

Erumpent; peridium minute, black, forming a wall out of which arises a tuft of yellow hyphae which carry the spores up with them.

4 species on Palmaceae. Tropical.

1 species recorded in Sri Lanka.

(1) *G. phoenicis* Poit.
On *Phoenix pusilla* P : 36

ORDER — UREDINALES (Rust fungi or rusts)

These fungi are called 'rust fungi' because of the rusty coloured spores they form. The mycelium is generally limited to parts of the leaves or other aerial organ of the host (local infection). If systemic it may overwinter in roots and in other parts. A species may possess several forms of spores (as many as five), one of which is the teleutospore which is rarely absent from the life cycle of a species. The teleutospore is borne in a sorus called the teleutosorus (telia), is one to many-celled, dark and on germination gives rise to a 4-celled basidum (promycelium) each cell of which in turn produce on a sterigma a single basidiospore (sporidium). The other spore forms and their sori are: Pycnia (spermogonia) which are subcuticular or subcortical on leaves and branches with pycniospores; aecia (aecidia, cluster-cups) generally with a peridium and containing aeciospores (aecidiospores); uredia (uredosori) with uredospores (summer spores, red rust spores) which generally become free through the broken epidermis of the host.

If there is no knowledge of the teleutospore stage, the form genus (as for eg. *Aecidium, Uredo*) is however put in the Uredinales and not in Fungi Imperfecti.

Many rusts complete their life cycle on 2 different host plants which are usually quite unrelated to each other — Heteroecious. Others complete their life cycle in a single host — Autoecious.

They are obligate parasites of Angiosperms, Gymnosperms and Pteriodophytes, causing great economic losses. The order includes 114 genera (46 monotypic)+ 137 syn., 4600 species.

KEY TO THE GENERA OF THE ORDER UREDINALES

1.	Teleutosorus present	... 2	
	Teleutosorus absent	... 22	
2.	Teleutospores laterally united into layers or crusts or columns	... 3	
	Teleutospores free	... 8	
3.	Teleutospores 1-celled	... 4	
	Teleutospores many — celled	... *Pucciniastrum*	**(123)**
4.	Aecium with a peridium	... 5	
	Aecium without a peridium	... 7	
5.	Uredospores in chains	... 6	
	Uredospores not in chains	... *Crossopsora*	**(120)**
6.	Teleutosorus pulvinate; teleutospores separate	... *Chrysomyxa*	**(118)**
	Teleutosorus flat; teleutospores laterally united	... *Coleosporium*	**(119)**

7.	Teleutospores in one layer	...	*Melampsora* (121)
	Teleutospores in several distinct layers	...	*Phakopsora* (122)
8.	Teleutospores 1-celled	...	9
	Teleutospores many-celled	...	15
9.	Sp ores or sporogenous hyphae exserted through the stomata	...	10
	Sp ores or sporogenous hyphae not exserted through the stomata	...	12
10.	Sp orogenous hyphae as loose twisted threads	...	*Skierka* (140)
	Sp orogenous hyphae not twisted	...	11
11.	Basidium (promycelium) filiform, many-septate, sterigmate	...	*Hemileia* (131)
	Basidium not filiform, 1-septate, not sterigmate	...	*Cystopsora* (127)
12.	Teleutospore stalked	...	13
	Teleutospore sessile	...	*Cerotelium* (126)
13.	Pycnia typically sub-cuticular	...	*Kuehneola* (132)
	Pycnia typically sub-epidermal	...	14
14.	Teleutospore yellow to dark; accia with a persistent peridium	...	*Uromyces* (142)
	Teleutospore hyaline; aecia when present without a persistent peridium	...	*Blastopsora* (125)
15.	Teleutospores 1-septate	...	16
	Teleutospores many-septate	...	18
16.	Teleutospores divided lengthwise	...	*Diorchidium* (128)
	Teleutospores divided crosswise	...	17
17.	Uredia present	...	*Puccinia* (137)
	Uredia absent	...	*Gymnoconia* (129)
18.	Teleutospores transversely septate	...	19
	Teleutospores radially septate	...	20
19.	Teleutospores dark coloured	...	*Phragmidium* (136)
	Teleutospores pale coloured	...	*Phragmidiella* (135)
20.	Cells of teleutospore 3, forming a triangle	...	21
	Cells of teleutospore more than 3, forming a head with cysts	...	*Ravenelia* (138)
21.	Teleutospore wall spiny	...	*Nyssopsora* (133)
	Teleutospore wall smooth	...	*Hapalophragmium* (130)
22.	Spores in uredia	...	*Uredo* (141)
	Spores in aecia	...	23
23.	Peridium cup-shaped	...	*Aecidium* (124)
	Peridium perfectly closed, finally splitting in various ways	...	*Pericladium* (134)

118. *Chrysomyxa* Unger (Fig. 83 a—d)

The teleutospores are formed closely together in yellow sori, arranged in a single series like palisade tissue, sometimes branched, lower cells sterile, coalescing in a waxy convex mass; each spore consists of an acropetal series of cells, the distal end of which, without leaving the

sorus germinates to produce a promycelium of several cells. Uredospores are not always present, when present sori yellowish —rufous, soon pale; spores in short chains which soon break up, elliptic or sub-cylindrical, orange, warted. Aecidia as in *Puccinia*. Heteroecious.

20 species. N. Hemisphere.

One species recorded in Sri Lanka.

(1) *C. bombacis* Petch
On *Bombax malabaricum* P : 37

119. *Coleosporium* Lev. (Fig. 84 a—c)

Teleutospores in flat, waxy, indehiscent sori, with a colourless gelatinuous membrane which is thin and wavy at the sides, but strongly thickened above, at first filled with a rich orange-red oily mass; at length each spore divides into four superimposed cells, which germinate in situ producing four celled promycelia. Uredospores not enclosed in a peridium, abstricted in short chains, resembling the aecidiospores. Aecidia with a more or less cylindrical inflated peridium, which opens by a cleft and becomes irregularly torn; aecidiospores with colourless membrane, without germ pores superficially tuberculate, the tubercles somewhat deciduous. Heteroecious.

8 species. Cosmopolitan.

2 species recorded in Sri Lanka.

(1) *C. balsaminae* (Cooke) Syd.
On *Impatiens oppositifolia* P : 37

(2) *C. erythrinae* Petch
On *Erythrina lithosperma* P : 37

120. *Crossopsora* Syd.

Uredosorus subepidermal, erumpent with a peridium, paraphyses present; uredospore single, 1-celled, globose to ellipsoid, echinulate; aecia with a peridium; telia lentiform to columnar; teleutospores seriate, 1-celled, in exserted columns.

2 species, tropical.

(1) *C. premnae* (Petch) Syd.
On *Premna corymbosa* P : 37

(2) *C. zizyphi* (Syd. & Butl.) Syd.
On *Zizyphus oenophila* P : 37

121. *Melampsora* Cast. (Fig. 85 a—c)

Teleutospores dark, unicellular wedge shaped, compacted laterally into a flat irregular dark crust-like cushion, wall coloured, smooth. The yellow uredospores have a coat beset with fine spines, and are given off from sori which may or may not be enclosed in a peridium. The sori of the aecidium stage have no peridium and are known under the generic name *Caeoma;* they frequently occur on other hosts than those of the teleutospores. Spermogonia or pycnidia are produced in minute orbicular yellow patches. Heteroecious or autoecious.

80 species, mostly N. temperate.

4 species recorded in Sri Lanka.

(1) *M. acalyphae* Petch
On *Acalypha fruticosa* **P** : 38

(2) *M. epitea* (Kunze & Schm.) Thüm.
On *Salix tetrasperma* **P** : 38

(3) *M. helioscopiae* (Pers.) Wint.
On Euphorbia rothiana **P** : 38

(4) *M. ricini* (Biv. — Bernh.) Pass.
On *Ricinus communis* **P** : 38

122. *Phakopsora* Diet. (Fig. 86 a—c)

Resembles *Melampsora* but teleutospores in several distinct layers in a lenticular sorus.

50 species, widespread. Tropical. Causes rusts of cotton and vine. *P. vitis* forms small yellowish powdery pustules on cultivated vine leaves.

(1) *P. desmium* (B. & Br.) Cummins
On *Gossypium* **P** : 38

(2) *P. vitis* Syd.
On *Vitis vinifera* **P** : 38

123. *Pucciniastrum* Otth. (Fig. 87 a—c)
= *Thekopsora* Magn. (Ainsworth 1963)

Heteroecious or aecidia unknown; teleutospores extracellular, in a single layer, subepidermal, with a brownish membrane, divided by vertical septa into 2—4 cells; uredosori surrounded by a delicate hemispherical peridium, opening at the summit with a pore; uredospores yellow in mass, with indistinct or no germ pores; aecidia with thin cylindrical peridium; aecidiospores verrucose except on one side which is thinner and smooth, and provided with germ pores.

37 species, mostly north Temperate, on dicots and orchids.

13 species having teleutospores within the epidermal cells, were earlier segregated as *Thekopsora* Magn.

2 species recorded in Sri Lanka.

(1) *P. agrimoniae* (Schw.) Tranz.
On *Agrimonia zeylanica* **P** : 39

(2) *P. boehmeriae* (Diet.) Syd.
On *Boehmeria platyphylla* **P** : 39

One more species recorded in Sri Lanka and described under the name *Thekopsora*

(3) *T. rubiae* Kom.
On *Rubia cordifolia* **P** : 39

Plate XVIII Figs. 83 — 87

83. *Chrysomyxa* a, b — *C. rhododendri*

a — section through teleutosorus, much enlarged
b — germinating teleutospore, much enlarged
c—d *C. pyrolae*
c — chains of young uredospores, much enlarged
d — mature uredospore, much enlarged

84. *Coleosporium*

a — *C. euphorbiae* section through teleutosorus, much enlarged
b—c *C. sonchi*
b — chains of uredospores, much enlarged
c — mature uredospore, much enlarged

85. *Melampsora*

a — young aecium, much enlarged
b — part of uredosorus with uredospores, much enlarged
c — part of teleutosorus with teleutospores, much enlarged

86. *Phakopsora vitis*

a — teleutosori on grape leaf, habit x 1
b — section through teleutosorus, much enlarged
c — uredospores, enlarged

87. *Pucciniastrum*

a — habit x 1
b — uredospore x 600
c — teleutospores beneath the epidermis, much enlarged

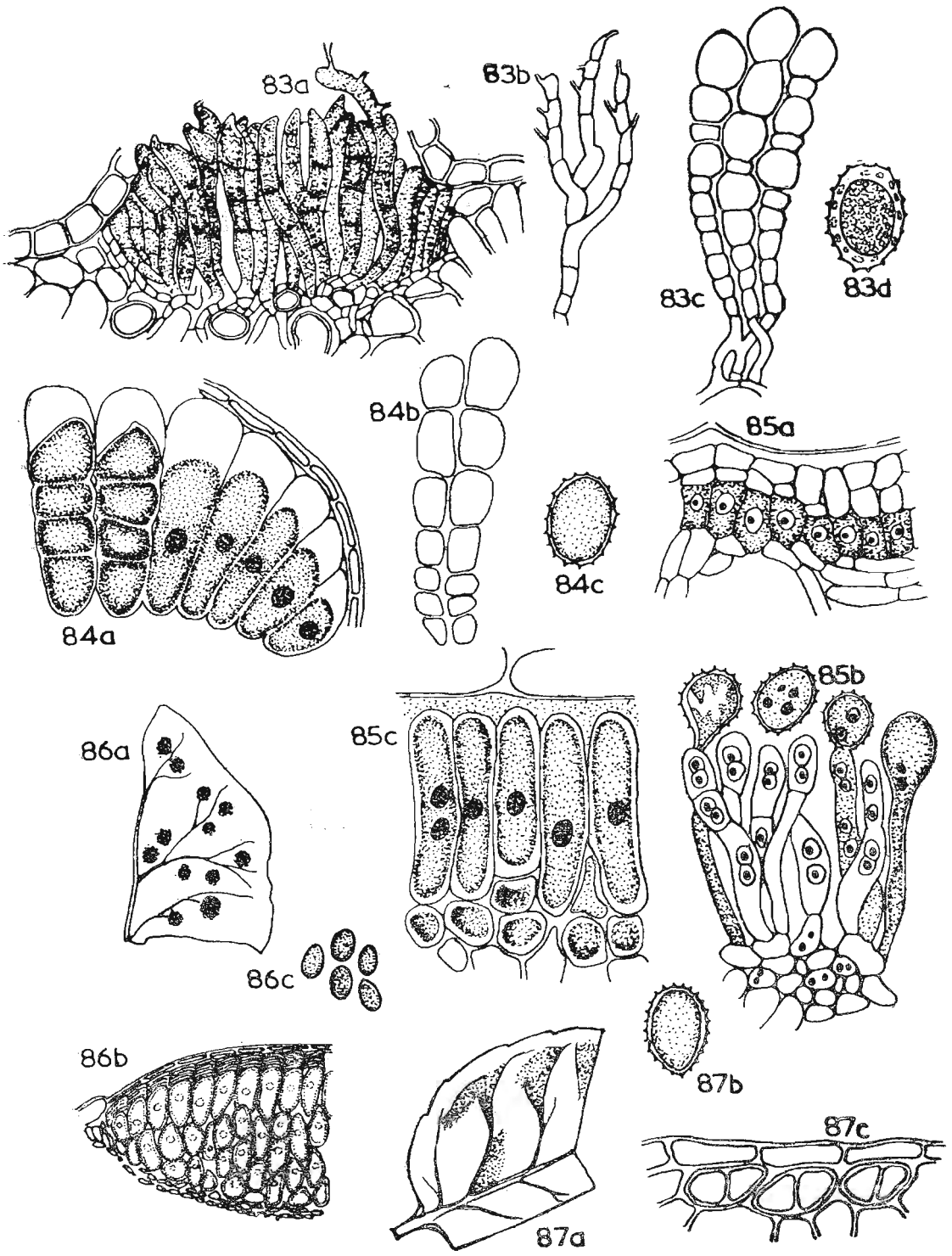

Plate XVIII Figs. 83 — 87

124. *Aecidium* Pers. (Fig. 88 a—b)

Peridium cup shaped, rarely cylindrical, margin often revolute, and torn, aecidiospores produced in chains, subglobose, to globose.

A form-genus. 600 sp., on Angiosperms especially in areas where there is little knowledge of the life histories of rusts. As with other Fungi Imperfecti (F.I.) an *Aecidium* name is sometimes used even when there is a named perfect (telial) state.

20 species recorded in Sri Lanka.

(1) *A. acanthacearum* Cooke
On *Justicia procumbens* P : 36

(2) *A. argyreiae* B. & Br.
On *Argyreia elliptica*, *A. pomacea* and *A. populifolia* P : 36

(3) *A. breyniae* Syd.
On *Breynia patens* P : 36

(4) *A. cassiae* Bres.
On *Cassia tora* P : 36

(5) *A. elaeagni — latifoliae* Petch
On *Elaeagnus latifolia* P : 36

(6) *A. erythrobasis* B. &. Br.
On *Hibiscus collinus*

(7) *A. flavidum* B. &. Br.
On *Pavetta indica* & *P. hispidular* P : 36

(8) *A. formosanum* Syd. (Syn. *A. gynurae* Petch; *A. emiliae* Petch)
On *Emilia sonchifolia* P : 37

(9) *A. kaerabachii* P. Henn.
On *Ipomoea cymosa* P : 37

(10) *A. luculentum* Syd.
On *Loranthus* sp. P : 37

(11) *A. micranthum* Syd.
On *Psychotria* elongata P : 37

(12) *A. nummulare* Berk. apud B. & Br.
On *Ceropegia* sp. P : 37

(13) *A. parsonsiae* Petch
On *Parsonsia spiralis* P : 37

(14) *A. petchii* Sacc. & Trott.
On *Paramignya monophylla* P : 37

(15) *A. polyalthiae* Petch
On *Polyalthia longifolia* P : 37

(16) *A. rhytismoideum* Berk.
On *Diospyros ovalifolia* & *D. embryopteris* P : 37

88. *Aecidium*

a — section through an immature aecium, enlarged
b — part of aecium showing peridium and chains of aeciospores, much enlarged

89. *Blastospora*

a — teleutospore, enlarged

90. *Cerotelium fici*

a — uredosori on *Ficus* leaf, reduced

91. *Cystopsora oleae*

a — cluster of teleutospores, enlarged
b — germinating teleutospore, enlarged
c — aeciospore, enlarged

92. *Diorchidium woodii*

a — teleutospore x 500

93. *Gymnoconia*

a — aecia on *Rubus* leaf x 1
b — teleutospore x 400

94. *Hapalophragmium derridis*

a — teleutospores, enlarged

95. *Hemileia vastatrix*

a — coffee leaf with rust spots, reduced
b — section through infected leaf showing mycelium, haustoria, and a cluster of uredospores x 400
c — uredospore x 400
d — teleutospore x 400
e — germinating teleutospore x 400

96. *Kuehneola*

a — *K. tormentillae* teleutospores, enlarged

b—c *K. aebida*
b — uredospore, enlarged
c — teleutospores, enlarged

97. *Nyssopsora*

a — teleutospore x 500

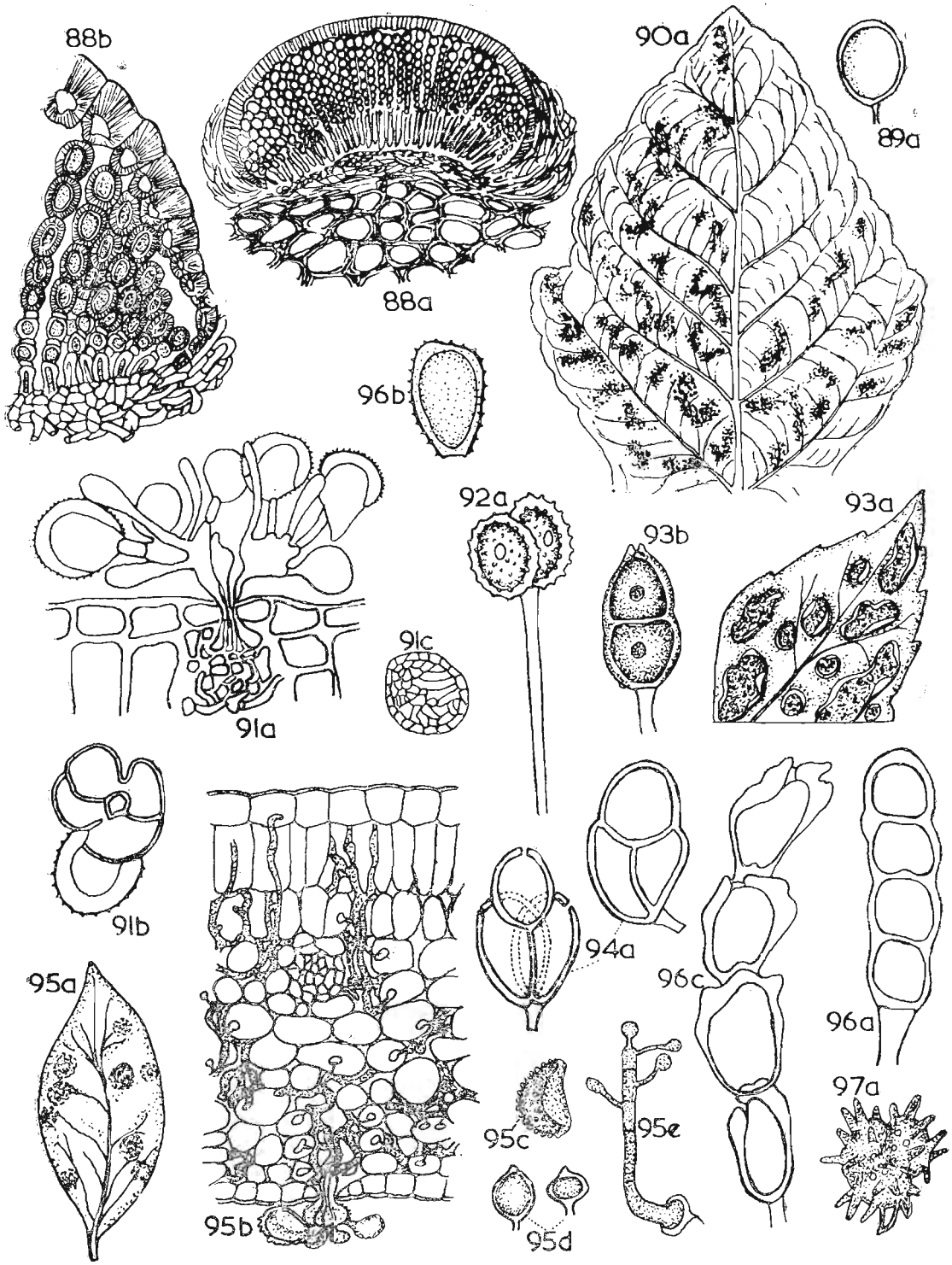

Plate XIX Figs. 88 — 97

(17) *A. serpiculae* Petch
On *Serpicula hirsuta* P : 37

(18) *A. vernoniae — cinereae* Petch
On *Vernonia cinera* P : 37

(19) *A. vernoniae — hookerianae* Petch
On *Vernonia hookeriana* P : 37

(20) *A. Vignae* Cooke
On *Vigna* sp. P : 37

125. *Blastospora* Diet. (Fig. 89 a)

Uredospore solitary, not catenulate; teleutospores solitary, free, 1-celled, hyaline, stipitate; promycelium formed by proliferation of stem apex. 3 species. Japan and Sri Lanka.

One species recorded in Sri Lanka.

(1) *B. hedyotidis* Petch
On *Hedyotis lessertina* P : 37

126. *Cerotelium* Arth. (Fig. 90 a)
= *Catenulospora* Mundkur fide Cummins (Ainsworth 1963)

Pycnidium subcuticular; aecidia with peridium; uredospores single, pedicelled, sub-hyaline, echinulate, germ pores indistinct; teleutosori containing spores in globular masses; teleutospores 1-celled, catenulate, sub-hyaline.

20 species, in warmer areas.

1 species recorded in Sri Lanka.

(1) *C. fici* (Cast.) Arth.
On *Ficus carica, F. parasitica* and *Morus indica* P : 37

One more species recorded in Sri Lanka and described under the genus *Catenulopsora* Mundkur

(2) *C. flacourtiae* Mundkur & Thirum.
On *Flacourtia ramontchi* P : 37

127. *Cystopsora* Butler (Fig. 91 a—c)

Teleutospores 1-celled, stalked; promycelium 2-celled, half exserted at sporebase; sporidioles sessile; sporogenous hyphae exserted through the stomata; aecia with a peridium.

1 species in India and Sri Lanka.

(1) *C. oleae* Butl.
On *Olea polygama* & *O.* sp. P : 37

128. *Diorchidium* Kalchbr. (Fig. 92 a)

Similar to *Puccinia* but differs in having a 2-celled teleutospore divided lengthwise.

12 species, widespread. 3 species recorded in Sri Lanka.

(1) *D. laevigatum* Syd. & Butl.
On *Oplismensus compositus* P : 37

(2) *D. orientale* Syd. & Butl.
On *Panicum trigonum* & *P.* sp. P : 37

(3) *D. polyalthiae* Syd.
On *Polyalthia longiflora* P : 37

129. *Gymnoconia* Lagerh. (Fig. 93 a—b)

Aecia present without peridium; no uredia; telia without definite peridium; teleutospores 2-celled, divided cross-wise with germ pore in each cell.

2 species, widespread.

1 species recorded in Sri Lanka.

(1) *G. patouillardi* Trotter.
On *Alchemilla indica* P : 37

130. *Hapalophragmium* Syd. (Fig. 94 a)

Pycnidium and aecium not known; uredospores solitary, with several germ pores teleutospores septate, radially 3-celled with 2 basal and 1 apical cells each with one germ pore.

8 species, tropical.

One species recorded in Sri Lanka.

(1) *H. derridis* Syd.
On *Derris uliginosa* P : 37

131. *Hemileia* Berk. and Br. (Fig. 5 a—d)

Uredo stage forming powdery orange patches; uredospores in small heads or clusters borne on hyphae emerging through stomata, reniform or subglobose, the whole or only a portion of the surface warted, germ pores 3—5. Telia present; teleutospores 1-celled, coloured or hyaline, typically single, stalked, broadly ovate or umbonate, germ pore apical, springing from center of cluster of uredospores, after the latter are fully developed. Aecidium stage unknown.

35 species, especially tropical.

Hemileia vastatrix causes coffee rust. Leaves are the most frequently attacked, although young shoots and berries do not escape. On the leaves the earliest indication of the disease is the presence of more or less circular, discoloured spots. These increase in size for sometime and become pale yellow, and studded with bright yellow clusters of spores, which soon assume on both surfaces of leaves, but the spore clusters are confined to the under-surface. Wild plants producing the fungus in Ceylon are *Plectronia campanulata* and *Coffea travancorensis.*

4 species recorded in Sri Lanka.

(1) *H. canthii* B. & Br.
On *Canthium* (*Plectronia*) *campanulatum* and *C. rheedii* P : 37

(2) *H. phaji* Syd.
On *Phajus grandiflorus* & *P. sanderina* P : 37

(3) *H. vastatrix* B. & Br. apud Berk.
On *Coffea arabica, C. liberica, C. bengalensis*
Plectronia campanulatum Massee P : 37

(4) *H. wrightiae* (Racib.)
On *Wrightia zeylanica* P : 37

132. *Kuehneola* Magnus (Fig. 96 a—c)

Teleutospores of several cells as in *Phragmidium*, but the wall is faintly coloured or colourless and smooth; pores one in each cell, apical, spermogonia sub-cuticular, somewhat flattened without ostiolar filaments. Uredo-sori of two kinds; primary i.e. the equivalent of the caeomata often surrounding the spermogonia without paraphyses; secondary, similar but scattered, sometimes with paraphyses; uredospores borne singly on pedicels, with few and inconspicuous equatorial pores. Autoecious.

5 species. Temperate.

1 species recorded in Sri Lanka.

(1) *K. aliena* (Syd. & Butl.) Syd. & Butl.
On *Spondias mangifera* P : 38

133. *Nyssopsora* Arth. (Fig. 97 a)

Teleutosorus naked, dark. Teleutospores opaque, blackish brown, bordered with well developed, brown, either simple or stellate spines; spores more or less radially septate, three-celled forming a triangle, each cell with 2 to many germ pores. Uredospores unicelled without germ pores. Pycnidium and aecidium not detected.

10 species, widespread. Species with aecial stage segregated as *Triphragmiopsis*.

1 species recorded in Sri Lanka.

(1) *N. thwaitesii* (B. & Br.) Syd.
On *Heptapleurum stellatum* P : 38

134. *Pericladium* Pass.

Pseudoperidium coriaceous — corky, irregularly sub-globose, perfectly closed, finally splitting in various ways; spores subglobose to irregular, free.

2 species, on woody plants; Africa, Sri Lanka and India.

1 species recorded in Sri Lanka.

(1) *P. grewiae* Pass.
On *Grewia columnaris* P : 36

135. *Phragmidiella* P. Henn.
= *Mehtamyces* Mundkur & Thirum. fide M & T (Ainsworth 1963)

Uredosorus without peridium; uredospore dark coloured, rough walled; teleutospores 3 — 4 septate, pale coloured.

Plate XX Figs. 98 — 101

98. *Phragmidium subcorticium*

a — rust infected rose leaf x 1
b — section aecium showing paraphyses and aeciospores, enlarged
c — uredospores, enlarged
d — teleutospore, enlarged

99. *Puccinia* a — c *P. sorghi*

a — section, leaf of maize showing part of uredosorus on the left and teleutosorus on the right x 400
b — teleutospores, much enlarged
c — uredospores, much enlarged
d — *P. graminis*, section of barberry leaf showing aecia and pycnia x 100

100. *Ravenalia*

a — teleutospore clusters on a leaf, habit x 1
b — teleutospore x 200

101. *Uromyces appendiculatus*

a — bean leaf with rust spots, habit x 1
b — uredospores on stalks x 400
c — teleutospores on stalks x 400

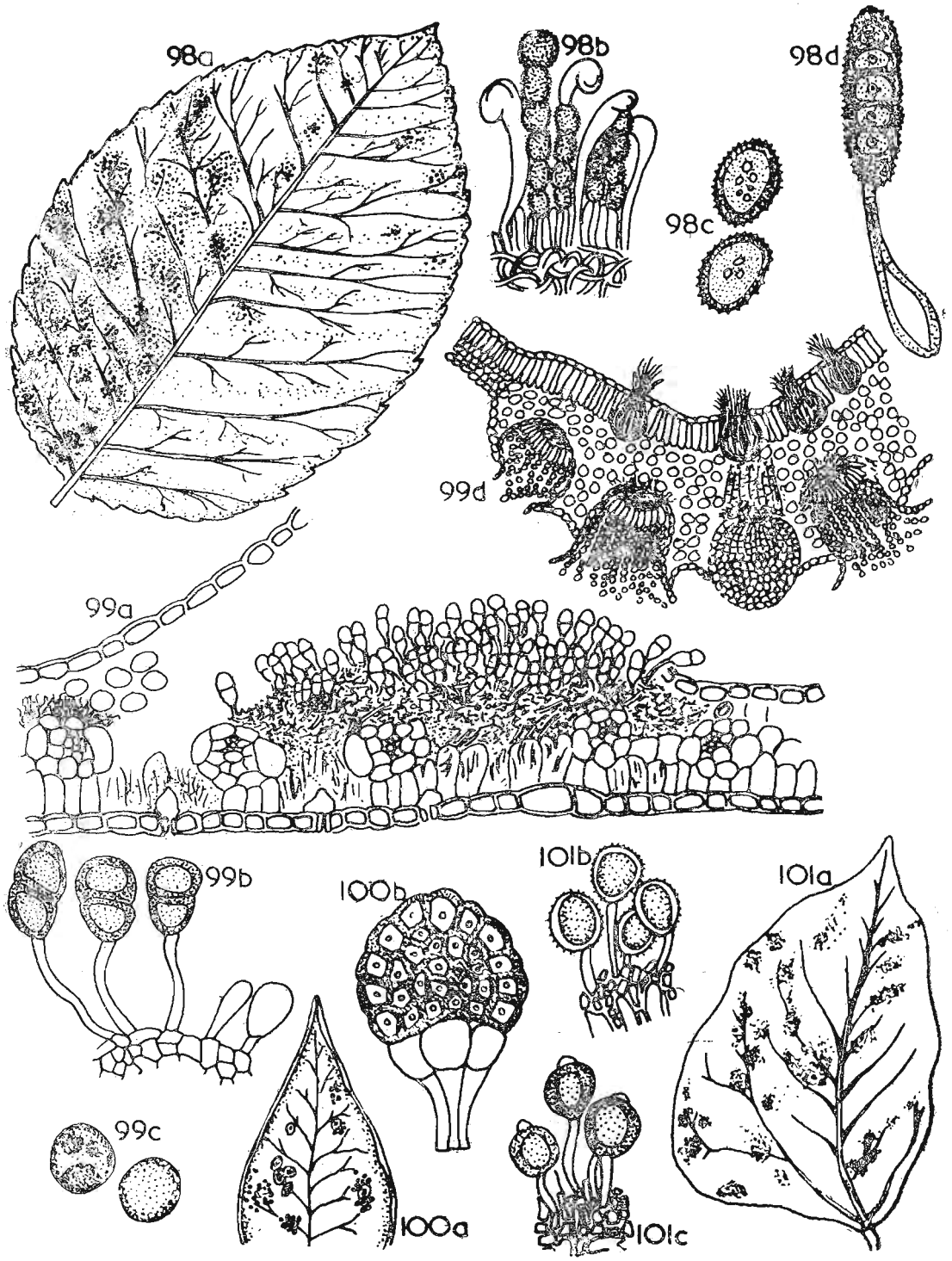

Plate XX Figs. 98 — 101

4 or 5 species on Bignoniaceae, in Africa and India.

1 species recorded in Sri Lanka and described under the genus *Mehtamyces*.

(1) *M. sterospermi* (Mundk.) Mundk. & Thirum.
On *Stereospermum chelonioides* P : 38

136. *Phragmidium* Link (Fig. 98 a—d)

Spermogonia flattened, orbicular, sub-cuticular with flexuous hyphae; aecidia caeomoid in roundish clusters, confluent and broadly effused; aeciospores in chains; uredospores formed singly at the tips of hyphae; teleutospores typically free, transversely 3-many septate, upper cell with 1 germ pore remainder with 4 germ pores, wall thick, laminate, usually coarsely verrucose, the middle layer dark and rigid; basidiospores globose. Autoecious. 60 species, especially temperate on Rosaceae.

The fungus causes rusts on *Rubus*, Raspberry and *Rosa*. P. *subcorticitum* is a troublesome pest to roses, often causing distortion of the parts affected. *P. mucronatum* also produces rust disease on roses.

60 species, especially Temperate.

4 species recorded in Sri Lanka.

(1) *P. mucronatum* (Pers.) Schlecht.
On *Rosa* sp. P : 38

(2) *P. orientale* Syd.
On *Rubus ellipticus* and *R. moluccanus* P : 38

(3) *P. subcorticium* Wint.
On *Rosa* sp. P : 38

(4) *P. zeylanicum* Petch
: On *Rubus lasiocarpus* P : 38

137. *Puccinia* Pers. (Fig. 99 a—d)
= *Xenostele* Sgd. fide Cummins (Ainsworth 1963)

Sori of teleutospores more or less powdery, sub-epidermal, without a distinct periderm; teleutospores transversely 1-septate, each cell having one germ pore; basidia external, typically 4-celled; basidiospores flattened on one side or kidney shaped; spermogonia deeply embedded in the tissues of the host, flask shaped; aecidia with a peridium which is occasionally evanescent; uredospores single celled. 3000 — 4000 species, cosmopolitian. Important pathogen of cereals and grasses, and great number of other crops.

P. sorghi Schwein (syn. *P. maydis*) causes rust of sorghum (*Andropogon sorghum*) and maize (*Zea mays*). Small round, red-brown pustules or rust spots occur relatively uniformly distributed over the leaf surface. Often the leaf tissue around these groups of pustules die, giving rise to scattered leaf spotting. In addition midrib, leaf sheath, ear husk, and tussels may be affected.

37 species recorded in Sri Lanka.

(1) *P. abutili* B. & Br.
On *Abutilon graveolens* P : 38

(2) *P. anaphalidis* (Miyabe.) Sacc. & Trott.
On *Anaphalis zeylanica* P : 38

(3) *P. arenariae* (Schum.) Wint.
On *Cerastium indicum* — P : 38

(4) *P. congesta* B. & Br.
On *Polygonum chinense* — P : 38

(5) *P. crepidis — japonicae* (Lindr.) Diet.
On *Crepis japonica* — P : 38

(6) *P. cynodontis* Desm.
On *Cynodon dactylon* — P : 38

(7) *P. chrysanthemi*
On *Chrysanthemum* sp. — A : 243

(8) *P. droogensis* Butl.
On *Berberis aristata* — P : 38

(9) *P. duthiae* Ell. & Tracy
On *Andropogon pertusus* — P : 38

(10) *P. eragrostidis* Petch
On *Eragrostis nigra* — P : 38

(11) *P. exhauriens* Thum.
On *Jasminum flexile* — P : 38

(12) *P. ferruginea* Lév.
On *Smilax aspera*
On *S. zeylanica* & *S.* sp. — P : 38

(13) *P. flaccida* B. & Br.
On *Panicum* sp. — P : 38

(14) *P. heterospora* Berk. & Curt.
On *Sida humilis* & *S. cordifolia* — P : 38

(15) *P. isachnes* (Petch) Petch
On *Isachne kunthiana* & *I. gardneri* — P : 38

(16) *P. kuehnii* (Krug.) Butl.
On *Saccharum spontaneum* — P : 38

(17) *P. kusanoi* Diet.
On *Arundinaria japonica* — P : 38

(18) *P. longicornis* Pat. & Har.
On *Bambusa vulgaris* & *B. arundinacea* — P : 38

(19) *P. mysorensis* Syd. & Butl.
On *Kyllinga brevifolia* & *K. monocephala* — P : 38

(20) *P. nakanishikii* Diet.
On *Cymbopogon confertiflorus*, *C. martini* & *Andropogon intermedius* — P : 38

(21) *P. phyllocladiae* Cooke
On *Asparagus falcatus* — P : 39

(22) *P. pogonatheri* Petch
On *Pogonatherum crinitum* P : 39

(23) *P. polygonii — amphibii* Pers.
On *Polygonum punctatum* P : 39

(24) *P. pruni — spinosae* Pers.
On *Prunus persica* P : 39

(25) *P. purpurea* Cooke
On *Sorghum halepense* & *S. vulgare* P : 39

(26) *P. romagnoliana* Maire & Sacc.
On *Cyperus rotundus* P : 39

(27) *P. ruelliae* (B. & Br.) Lagerh.
On *Ruellia ringens* P : 39

(28) *P. rufipes* Diet.
On *Imperata arundinacea* P : 39

(29) *P. shiraiana* Syd.
On *Justicia procumbens* P : 39

(30) *P. sonchi* Rob.
On *Sonchus* sp. P : 38

(31) *P. sorghi* Schw.
On *Zea mays* P : 39

(32) *P. spongiosa* B. & Br.
On *Webera corymbosa* P : 39

(33) *P. substriata* Ell. & Barth.
On *Panicum sanguinale* P : 39

(34) *P. substriata* var. *penicillariae*
On *Pennisetum spicatum* P : 39

(35) *P. tabernaemontana dichotoma* B. & Br.
On *Justicia gendarussa* P : 39

(36) *P. thwaitesii* Berk. apud B. & Br.
On *Justicia gendarussa* P : 39

(37) *P. uralensis* Tranz.
On *Senecio scandens* P : 39

(38) *P. vernoniae — scariosae* Petch
On *Vernonia* scariosa P : 39

2 more species recorded in Sri Lanka and described under the genus *Xenostele*

(39) *X. echinacea* (B. & Br.) Syd.
On *Actinadaphne molochina* and *A. speciosa* P : 41

(40) *X. litseae* (Pat.) Syd.
On *Litsea fuscata*. This may be a synonym of *X. echinacea* P : 41

138. *Ravenelia* Berk. (Fig. 100 a--b)

Heads many-celled with a compound stalk; teliospore muriform. 120 species, warmer parts. Autoecious. Mostly on Leguminosae.

8 species recorded in Sri Lanka.

(1) *R. aculeifera* Berk. apud B. & Br.
On *Mezoneurum enneaphyllum* P : 39

(2) *R. berkeleyi* Mundk. & Thirum.
On *Cassia absus* P : 39

(3) *R. breyniae-patentis* Mundk. & Thirum.
On *Breynia patens* P : 39

(4) *R. emblicae* Syd.
On *Phyllanthus polyphyllus* P : 39

(5) *R. hobsoni* Cocke
On *Pongamia glabra* P : 39

(6) *R. ornata* Syd.
On *Abrus precatorius* P : 39

(7) *R. sessilis* Berk. apud B. & Br.
On *Albizzia lebbek* P : 39

(8) *R. stictica* B. & Br.
On *Pongamia glabra* and
Mundulea (Tephrosia) suberosa P : 39

139. *Scopella* Mains

13 species, tropical.

1 species recorded in Sri Lanka.

(1) *S. echinulata* (Niessl) Mains
On *Madhuca (Bassia) longifolia* P : 39

140. *Skierka* Racib.
= *Ctenoderma* Syd. fide Mains (Ainsworth 1963)

Uredospores obovate, echinulate; teleutospores exserted in loose twisted threads, 1-celled.

10 species. Tropical.

1 species recorded in Sri Lanka.

(1) *S. petchii* (Syd.) Mains
On *Sapindus bifoliatus* P : 39

One more species recorded in Sri Lanka and described under the genus. *Ctenoderma* Syd.

(2) *C. toddaliae* (Petch) Syd.
On *Toddalia aculeata* P : 37

141. *Uredo* Pers.

Sori generally orange yellow, somewhat powdery, pseudoperidium absent; uredospores produced single at the tips of fertile hyphae. The species are probably only forms not yet connected with higher stages.

A form-genus, 500 species; especially in Tropics.

56 species recorded in Sri Lanka.

(1) *U. amoni* Petch
On *Amomum involucratum* P : 39

(2) *U. andropogonis — zeylanici* Petch
On *Andropogon zeylanicus* P : 39

(3) *U. anthistiriae* Petch
On *Anthistiria imberbis, A. gigantea,* and *Pseudanthistiria umbellata* P : 39

(4) *U. anthistiriae — tremulae* Petch
On *Anthistiria tremula* P : 39

(5) *U. argyreiae* Petch
On *Argyreia tiliifolia* P : 40

(6) *U. artocarpi* B. & Br.
On *Artocarpus lakoocha* P : 40

(7) *U. callicarpae* Petch
On *Callicarpa lanata* P : 40

(8) *U. caricicola* Petch
On *Carex walkeri* & *C. baccans* P : 40

(9) *U. cassiae — bicapsularis* Petch
On *Cassia bicapsularis* P : 40

(10) *U. cassiae — glaucae* Syd.
On *Cassia glauca* P : 40

(11) *U. chasaliae* Petch
On Chasalia curviflora P : 40

(12) *U. clerodendricola* P. Henn.
On *Clerodendron inerme* P : 40

(13) *U. commelinae* Speg. (Syns. *U. davaoensis* Syd. *U., ochracea* Diet.)
On *Cyanotis zeylanica* and *Commelina nudiflora* P : 40

(14) *U. cudraniae* Petch
On *Cudrania javanensis* P : 40

(15) *U. cymbopogonis — polyneuri* Petch
On *Cymbopogon polyneuros* P : 40

(16) *U. dendrocalami* Petch
On *Dendrocalamus strictus* P : 40

(17) *U. desmodii — parvifolii* Petch
On *Desmodium parvifolium* P : 40

(18) *U. desmodii — pulchelli* Syd.
(Syns. *U. desmodii-heterocarpi* Petch and *U. desmodii-triqueriti* Petch)
On *Desmodium heterocarpum* and *D. triquetrum* P : 40

(19) *U. dianellae* Diet.
On *Dianella ensifolia* P : 40

(20) *U. dioscoreae — alatae* Racib.
(Syn. *Aecidium dioscoreae* B. & Br.)
On *Dioscorea alata* & *D.* sp. cult P : 40

(21) *U. dioscoreae — sativae* Syd.
(Syn. *U. dioscoreae pentaphyllae* Petch)
On *Dioscorea pentaphylla* P : 40

(22) *U. dregiae* Petch
On *Dregia volubilis* P : 40

(23) *U. elephantopodis* Petch
On *Elephantopus scaber* P : 40

(24) *U. emiliae — zeylanicae* Petch
On Emilia zeylanica P : 40

(25) *U. erythrinae* P. Henn.
(Syn. *U. erythrinea-ovalifoliae* Petch)
On *Erythrina ovalifolia* & *E. velutina* P : 40

(26) *U. gynurae* Petch
On *Gynura lycopersicifolia* P : 40

(27) *U. hemidesmi* Syd. (Syn. *U. hemidesmi* Petch)
On *Hemidesmus indicus* P : 40

(28) *U. hyperici — japonici* Petch
On *Hypericum japonicum* P : 40

(29) *U. hyperici mysorensis* Petch
On *Hypericum mysorense* P : 40

(30) *U. ignobilis* Syd.
On *Sporobolus diander* & *S. indicus* P : 40

(31) *U. ischaemi — ciliaris* Petch
(Syn. *U. ischaemi-commutati* Petch)
On *Ischaemum ciliare* & *I. commutatum* P : 40

(32) *U. lipocarphae* Syd.
On *Lipocarpha argentea* P : 40

(33) *U. lophantheri* Petch
On *Lophantherum gracile* P : 40

(34) *U. marisci* Petch
On *Mariscus sieberianus* P : 40

(35) *U. meliosmae* Petch
On *Meliosma wrightii* P : 40

(36) *U. microglossae* Petch
On *Microglossa zeylanica* P : 40

(37) *U. momordicae* Petch
On *Momordica charantia* P : 40

(38) *U. ochlandrae* Petch
On *Ochlanara stridula* P : 40

(39) *U. operta* Syd. & Butl.
On *Coix lachryma — jobi* P : 40

(40) *U. ophiopogonis* Syd.
On *Ophiopogon intermedius* P : 40

(41) *U. ophiorrhizae* Petch
On *Ophiorrhiza mungos* P : 40

(42) *U. Panici — montani* Petch
On *Panicum montanum* P : 40

(43) *U. panici — villosi* Petch
On *Panicum villosum* P : 40

(44) *U. paspali-longiflori* Petch
On *Paspalum longiflorum* P : 40

(45) *U. paspali — perrottetii* Petch
On *Paspalum perrottetii* P : 40

(46) *U. paspali — scrobiculati* Syd.
On *Paspalum scrobulatum* P : 40

(47) *U. phyllanthi — longifolii* Petch
On *Phyllanthus longifolius* P : 40

(48) *U. phyllanthi — reticulati* Petch
On *Phyllanthus reticulatus* P : 40

(49) *U. pouzolziae* Syd.
On *Pouzolzia bennettiana* P : 40

(50) *U. sissoo* Syd. & Butl.
On *Dalbergia sissoo* P : 40

(51) *U. socotrae* Syd.
On *Cassia corymbosa* P : 40

(52) *U. sopubiae* Petch
On *Sopubia trifida* P : 40

(53) *U. tectonae* Racib.
On *Tectona grandis* P : 40

(54) *U. tephrosiae* Rabenh. ex Syd.
On *Tephrosia purpurea* P : 40

(55) *U. trichosanthes* Petch
On *Trichosanthes palmata* P : 41

(56) *U. vernoniicola* Petch (Syn. *U. vernoniae-hookerianae* Petch)
On *Vernonia cinerea*, *V. hookeriana*,
V. setigera & *V. wrightiana* P : 41

142. *Uromyces* Link (Fig. 101 a—c)

Teleutospores unicellular,yellow to dark on distinct pedicel, almost always with an apical pore, produced in flattened sori. Uredospores, aecidia and pycnidia are not present in every species. When present spermogonia or pycnidia deeply embedded in the tissues of the host, flask shaped with conical mouth and ostiolar filaments and flexuous hyphae. Aecidia usually with an evident, generally cup shaped peridium. Uredospores formed singly on their pedicels with several, usually rather distinct pores, rarely accompanied by paraphyses. Basidiospores flattened on one side or kidney shaped. Autoecious or heteroecious.

600 species. Cosmopolitian.

The species are arranged according to the families to which the hosts belong. *U. appendiculatus* (Syn *U. phaseoli*) attacks french bean (*Phaseolus vulgaris*) and cowpea (*Vigna sinensis*) and causes heavy losses to both dry and pole snap beans. Fungus attacks stem, pods and more commonly leaves and causes red brown spots. *U. vicia fabae* is the broad been rust, parasitising the leaves and stems resulting in minute brown pustules scattered thickly over the under surface (uredo stage) or whitish spots(aecidia stage)or round elongated dark coloured spots (telial stage).

17 species recorded in Sri Lanka.

(1) *U. anotidis* Petch
On *Anotis richardiana* P : 41

(2) *U. apludae* Syd. & Butl.
On *Apluda varia* P : 41

(3) *U. appendiculatus* (Pers.) Link
On *Phaseolus vulgaris*, *P. lunatus*,
Psophocarpus tetragonolobus & *Vigna sinensis* P : 41

(4) *U. bidentis* Lagerh.
On *Bidens pilosa* P : 41

(5) *U. blainvilleae* Berk. apud B. & Br.
On *Blainvillea latifolia* P : 41

(6) *U. decoratus* Syd.
On *Crotalaria* sp. P : 41

(7) *U. dianthi* (Pers.) Niessl
On *Dianthus caryophyllus* P : 41

(8) *U. linearis* B. & Br.
On *Panicum repens* P : 41

(9) *U. mucunae* Rabenh.
On *Mucuna pruriens* P : 41

(10) *U. pseudarthriae* Cooke
On *Pseudarthria viscida* P : 41

(11) *U. rumicis* (Schum.) Wint.
On *Rumex obtusifolius* P : 41

(12) *U. scleriae* P. Henn.
On *Scleria zeylanica* P : 41

(13) *U. setariae — italicae* (Diet.) Yoshino
On *Setaria italica*, *S. glauca* and *S. intermedia* P : 41

(14) *U. sojae* (P. Henn.) Syd.
On *Glycine max* P : 41

(15) *U. vestergreni* Syd. (Syn. *U. verruculosus* B. & Br.)
On *Bauhinia tomentosa* P : 41

(16) *U. vicia fabae* (= *U. fabae*)
On *Vicia fabae* P : 41

(17) *U. vignae* Barcl.
On *Vigna catjang* and *V. sinensis* P : 41

HYMENOMYCETES

This is the largest group of basidiomycotina and include many of the well known mushrooms and toadstools (agarics), bracket fungi, and coral fungi (polypores), the jelly fungi and the like. All produce basidia in a palisade like hymenial layer, which is fully exposed at maturity. The shape and size of the basidiocarp vary as does the manner in which the hymenium is borne. They bear the spores perched obliquely on sterigmata and discharge them violently by the water drop mechanism. The jelly fungi and most of the agarics are saprophytic and play an important role in the decay of woodland and grassland litter, dung and composts. Many form mycorrhizae with forest trees. Few are parasitic. The bracket fungi or polypores are important economically because they include a number of serious pathogens of forest trees and plantation crops.

KEY TO THE ORDERS OF THE CLASS HYMENOMYCETES

1. Basidia septate ... TREMELLALES
Basidia not septate ... 2 (P.94)

2. Basidiocarp present; hymenium in basidiocarp ... 3
Basidiocarp absent; hymenium covering the surface of parasitised tissues ... EXOBASIDIALES (P.95)

3. Hymenium borne in various ways, but if basidia lines pores or gills, texture of basidiocarp not soft and putrescent ... APHYLLLOPHORALES (P.97)
Hymenium borne on lamellae or lining the interior of tubes in the latter case soft and putrescent ... AGARICALES (P.101)

ORDER TREMELLALES

Basidiocarp is generally gelatinous (trembling fungi) when wet, and horn like when dry, sometimes waxy like and membranous. Hymenium is smooth or convolute and infrequently covered. Basidia subglobose, longitudinally or vertically cruciately divided into 2-4 parts. Mostly saprobic on dead wood; some species parasitic on plants and scale insects. 65 Genera (25 monotypic) + 60 syn., 500 sp., especially tropical.

KEY TO THE GENERA OF THE ORDER TREMELLALES

1. Probasidium becoming longitudinally or obliquely septate into 2—4 cells ... 2
   Probasidium becoming transversely septate into 4 cells ... *Helicobasidium* **(143)**

2. Sterigmata lateral ... *Septobasidium* **(144)**
   Sterigmata terminal ... *Tremella* **(145)**

143. *Helicobasidium* Pat. (Fig. 102 a)

Receptacle membranous soft, floccose, effused, incrusting. Hymenium smooth. Basidia cylindrical, more or less incurved, transversely 2—4 septate, with subulate, unilateral sterigmata. Spores white, oval, or pear shaped, smooth, producing on germination either sporidiola or a mycelium.

10 species, widespread. One species recorded in Sri Lanka.

(1) *H. compactum* Boedijn.
On *Clerodendron fragrans* and *Hevea* root — P : 43

144. *Septobasidium* Pat. (Fig. 103 a—c)

Pileus effuse, resupinate coriaceous, not gelatinous; wall of probasidium thick and whole structure resembles a spore; the promycelium (basidium) is 4 celled, transversely septate, each cell sterigmate giving a single basidiospore. Basidiospore 1-celled, oblong, hyaline.

170 species, especially warmer areas.

8 species recorded in Sri Lanka.

(1) *S. aligerum* Petch
On *citrus* — P : 45

(2) *S. boedijnii* Couch
On *Hedyotis* — P : 45

(3) *S. bogoriense* Pat.
On *Citrus* and
On *Erythrina lithosperma* — P : 45

(4) *S. petchii* Couch
On *Litsea, Murraya exotica* and *Psychotria elongata* — P : 46

(5) *S. rimulosum* Petch & Couch apud Couch
On *Camellia sinensis* — P : 46

(6) *S. scabiosum* Couch & Petch apud Couch
On leaves of *Codiaeum variegatum* — P : 46

(7) *S. theae* Boed. & Steinm.
On *Camellia sinensis* P : 45

(8) *S. thwaitesii* (B. & Br.) Pat. apud Petch
On *Piper* and *Pouzolzia* P : 45

145. *Tremella* Dill. ex Fr. (Fig. 104 a—c)

Receptacle gelatinous or waxy, soft, foliaceous, brain like, or tubercular. Hymenium spread over the whole surface, very rarely papillate. Basidia amphigenous, superficial or immersed. Conidia on the same receptacle preceeding or accompanying the spores. Spores white, rarely yellowish, globose, oval, elliptical or pyriform; smooth or punctate; producing sporidioles on germination, or tufts of condia that bud in a yeast-like manner.

40 species. Cosmopolitan.

1 species recorded in Sri Lanka.

(1) *T. versicolor* (B. & Br.)
On *Corticium* P : 47

ORDER EXOBASIDIALES

Mycelium is immersed in the substrate. Basidiocarp lacking. Hymenium effused, rarely consisting of basidia only, bursting through the surface of the parasitised tissues. Parasites of flowering plants mostly belonging to the family Ericaceae but also in some species of the Theaceae and Lauraceae.

4 Genera, (2 monotypic) + 2 Syn., 15 species (10 in Exobasidium).

KEY TO THE GENERA OF THE ORDER EXOBASIDIALES

1. Spores 1-celled, oblong to fusoid; basidia 2-sterigmate ... *Kordyana* **(147)**
Spores finally 2-celled, mostly curved; basidia 4-sterigmate ... *Exobasidium* **(146)**

146. *Exobasidium* Woron. (Fig. 105 a—h)

Mycelium immersed in the interior of the host. Basidia are formed on the extremities of branches of mycelium, which break out through the cuticle of attacked organs. Basidia emerge on the surface of the host and from each of the four sterigmata, a single spore is given off. Basidiospores white, elongate, fusiform or oblong, smooth, simple at first, finally septate.

10 species, especially north temperate.

All species parasitic on living plants more especially on the leaves, forming galls or blisters that usually become red. *Exobasidium vexans* Massee causes 'blister blight' of tea. On leaves, fungus produces blisters of finite dimensions, upper surface of the blister becoming indented, corresponding with a protrusion of the lower surface. *Exobasidium vaccinii* Woron, cause of very common and conspicuous deformtion which affects the leaves, flowers and shoots of *Rhododendron* sp. *Exobasidium cinnamomi* causes stem disease of cinnamon.

5 species recorded in Sri Lanka.

(1) *E. cinnamomi* Petch
On *Cinnamomum zeylanicum* and *Cinnamomum cassia* P : 43

Plate XXI Figs. 102 — 106

102. *Helicobasidium*

a — section of a basidiocarp showing basidia and basidiospores, enlarged

103. *Septobasidium*

a — section of basidiocarp x 100
b — section of basidiocarp showing hypobasidium, epibasidium and spores x 400
c — basidiospores x 400

104. *Tremella*

a — basidiocarp x 1
b — section through hymenium x 400
c — sporidia much enlarged

105. *Exobasidium* a — d *E. vexans* ; e—h. *E. vaccini*

a — Tea leaf showing blisters x 1
b — T.S. Leaf showing hymenium x 400
c — basidium with basidiospores x 400
d — mature basidiospores x 500
e — habit x 1
f — section of leaf showing hymenium x 500
g — basidiospores, much enlarged
h — germinating basidiospores, much enlarged

106. *Kordyana*

a — section host tissue showing hymenium x 500
b — basidiospore, much enlarged

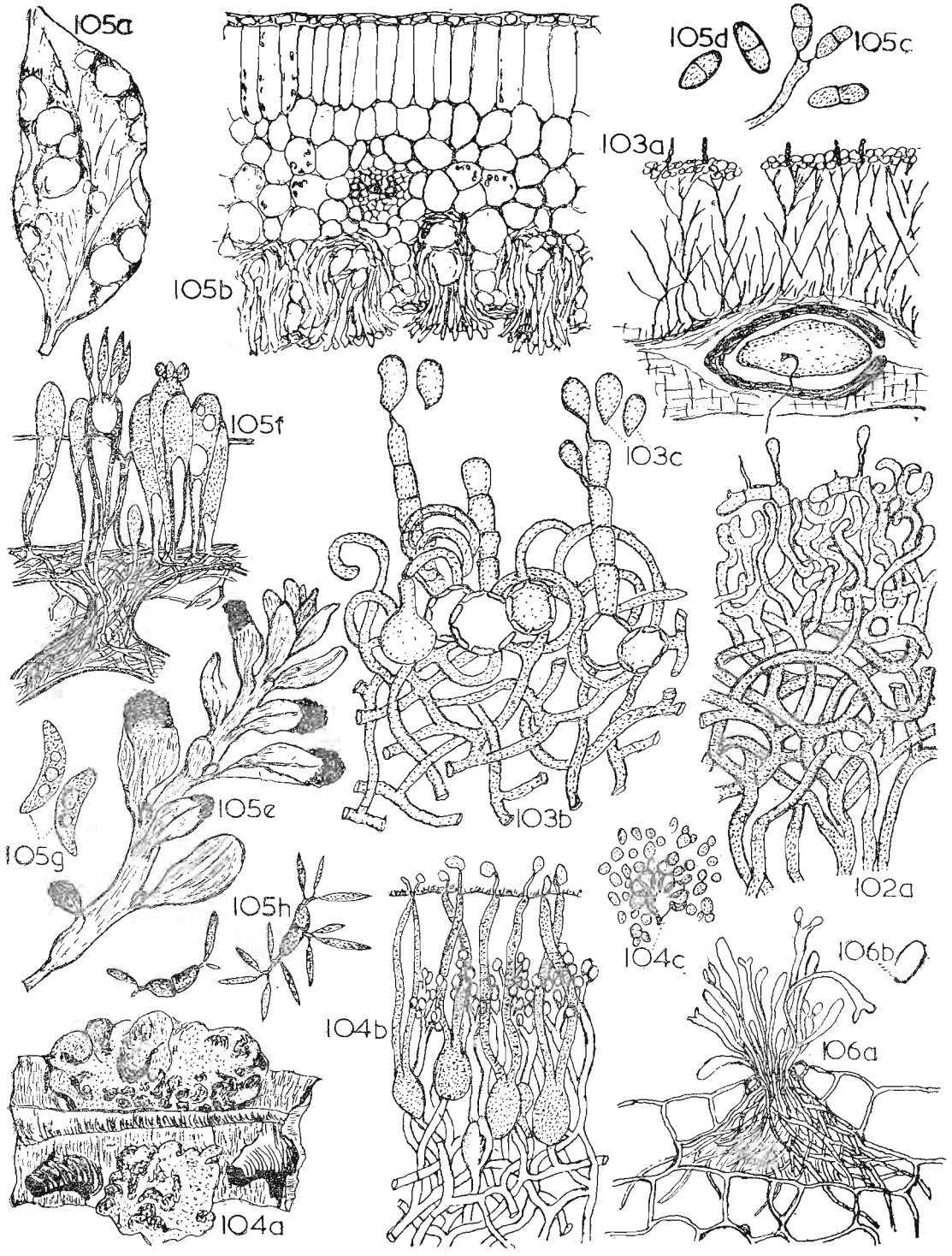

Plate XXI Figs. 102 — 106

(2) *E. indicum* Syd. & Butl.
On *Symplocos* sp. P : 43

(3) *E. vaccinii* Woron. (syn. *E. rhododendri* Cramer)
On *Rhododendron arboreum* P : 43

(4) *E. vexans* Massee
On *Camellia sinensis* P : 43

(5) *E. zeylanicum* Petch
On *Rhododendron arboreum* P : 43

147. *Kordyana* Pat. (Fig. 106 a—b)

Fungus effuse, growing on plants; hymenium minute, semiglobose; basidia simple, 2-spored; spores oblong-elliptic, hyaline, 1-celled.

5 species. Tropical, parasitising especially Commelinaceae.

1 species recorded in Sri Lanka.

(1) *K. commelinae* Petch
On *Commelina nudiflora* P : 44

ORDER APHYLLOPHORALES

This is an artificial order of holobasidiate fungi, forming distinct fruit bodies. Hymenium is indefinite, increasing by centrifugal growth fully exposed from the first, lining the interior of pores, covering the surface of teeth, tubercles or anastomosing imperfect lamella or forming a smooth surface. Hymenium may be formed on one side of the basidiocarp (unilateral) or it may be formed on two sides or all round (amphigenous). If tubes or gills are present, the texture of the basidiocarp may be papery, leathery or woody but not soft and putrescent.

The order includes 123 Genera + 385 Syn., 2900 species.

Some species do damage to trees, sometimes as parasites but generally by attacking the dead heart wood.

KEY TO THE GENERA OF THE ORDER APHYLLOPHORALES

1. Hymenium borne on tubes ... 2
   Hymenium not borne on tubes ... 3

2. Basidiocarp resupinate ... *Poria* **(152)**
   Basidiocarp not resupinate ... *Fomes* **(151)**

3. Hymenium of teeth ... *Irpex* **(150)**
   Hymenium not as above ... 4

4. Basidiocarp resupinate, effuse ... *Corticium* **(148)**
   Basidiocarp typically erect, funnel form ... *Cyphella* **(149)**

148. *Corticium* Fr. (Fig. 107 a-f)

Basidiocarp entirely adnate to the matrix, often broadly effused, hymenium smooth, polished, composed of basidia and paraphysis only. Spores colourless.

Plate XXII Figs. 107 — 110

107. *Coticium* a — d *C. solani*

a — mycelium with chlamydospores x 400
b — mycelium showing characteristic branching x 400
c — mycelium and sclerotium in tube culture x 1
d — section of sclerotium, much enlarged
e — *C.* sp. blighted cocoa twig, reduced
f — *C. theae* section tea leaf showing basidia and basidiospores, much enlarged

108. *Cyphella*

a — habit x 1
b — basidiocarp x 10

109. *Irpex*

a — basidiocarp on wood x 1

110. *Fomes* a — f *F. noxius*

a — affected rubber root showing typical encrustation of sand and stones, reduced
b — basidiocarp on a rubber stump, reduced
c — V.S. basidiocarp showing layers of tubes, enlarged
d — surface and side view of tubes, enlarged
e — surface section of basidiocarp, showing a pore x 400
f — basidia and basidiospores, much enlarged
g — *F. lignosus* anastomosing rhizomorphs on rubber root, reduced

150 species, cosmopolitan *C. solani* (= *Pellicularia filamentosa* (Pat.) Rogers) causes the black scurf disease or stem canker of potato. Disease results in girdling of the stem and death of affected underground shoots. Aerial symptoms simulate those of leaf roll due to a virus infection. Infected tubers show cavities with brown mycelium and sclerotia on the surface. Imperfect stage of *C. solani* is *Rhizoctonia solani* which is widespread in Sri Lanka, attacking more than 200 species of plants.

C. sasaki (Syn. *Pellicularia sasaki*) causes 'sheath blight' of rice and other plants. Fungus attacks seedlings, killing them. On older plants the most conspicuous symptom is greenish-grey lesions at the base of the stem and leaf sheaths, killing leaves and lodging the plants. The imperfect stage is *Rhizoctonia Solani*. *C. salmonicolor* B. & Br. (Syn. *Pellicularia Salmonicolor*) is widespread attacking Tea, Rubber, Orange, Cocoa, Cinnamon, Mango etc. Fungus causes a disease bark disease characterised by the production of pink-pustules of fungus tissue, and called 'pink disease.'

7 species recorded in Sri Lanka.

(1) *C. hypophyllum* Petch
On *Lasianthus* — P : 42

(2) *C. invisum* Petch
On *Camellia sinensis, Oxyanthus tubiflorus, Hemidesmus indicus, Calophyllum burmanni, Vernonia scariosa* — P : 42

(3) *C. pervagum* Petch
On *Erythroxylon coca* — P : 42

(4) *C. salmonicolor* B. & Br.
On many plants (Syn. *Corticium javanicum* Zimm. *Pellicularia salmonicolor*) — P : 42

(5) *C. sasaki*
On *Oryza sativa, Zea mays* — A : 96

(6) *C. solani* Prill. & Delacr., Bourd. & Galz.
On *Solanum tuberosum* — P : 42

(7) *C. rolfsii* (Curzi) imperfect state *Sclerotium rolfsii* Sacc.
On *Mucuna* sp.; *Arachis hypogea* — P : 77

149. *Cyphella* Fr. (Fig. 108 a—b)

Receptacle waxy, membranous or sub-gelatinous cup shaped, stipitate sessile or pendulous. Hymenium smooth, regulose or veined. Spores white, elliptical obvate, globose pyriform, sub-pyriform, ovate, clavate, or pipe-shaped, smooth. Basidia clavate with 2—4 sterigmata. Cystidia rarely present.

100 species. Cosmopolitan. Generally saprophytes on wood but some on mosses are possibly parasites.

2 species recorded in Sri Lanka.

(1) *C. grisea* Petch
On bark of living trees — P : 43

(2) *C. Parasitica* B. & Br.
On *Sphaeria* sp. — P : 43

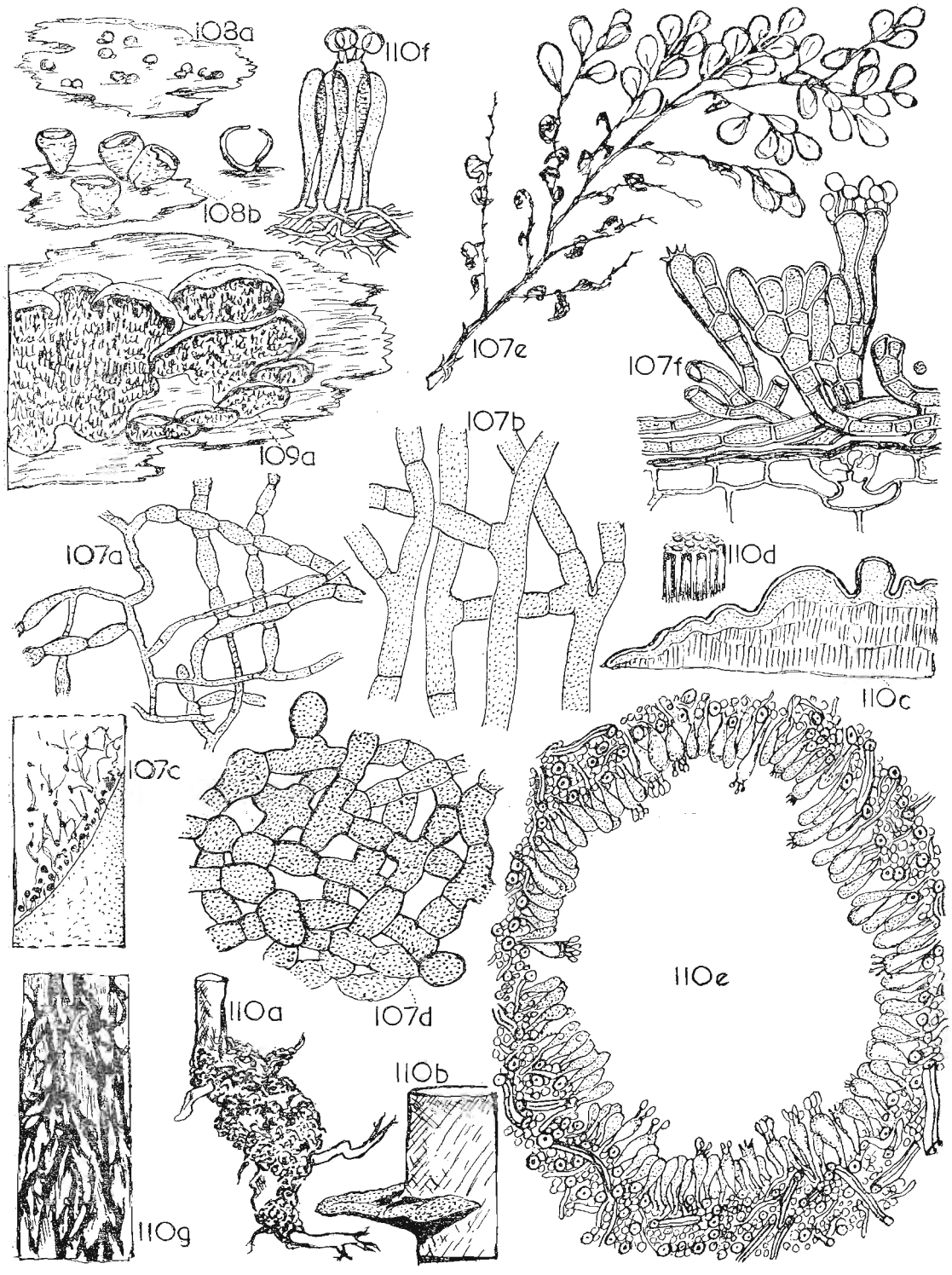

Plate XXII Figs. 107 — 110

150. *Irpex* Fr. (Fig. 109 a)

Cap corky, coriaceous, or membranous, dimidiate or resupinate sessile. Tubes homogenous alveolar at first then becoming torn into teeth or plates. Flesh white or coloured; spores white, elliptical, oval, globose, cylindrical or elliptic, long, smooth or punctate.

50 sp., widespread. *I. subvinosus* attack,tea. Diseased roots are covered with a net work of white strands. Wood becomes white and friable.

2 species recorded in Sri Lanka.

(1) *I. destruens* Petch
On *Camellia sinensis* — P : 44

(2) *I. subvinosus* (B. & Br.) Petch
On *Acacia decurrens,Camellia sinensis, Tephrosia candida* — P : 44

151. *Fomes* (Fr.) Kickx (Fig. 110 a—g)

Basidiocarp perennial,cinnamon brown. Pileus thick, bracket or hoof shaped, hard and woody, often with concentric ridges, not colour zoned; hymenium of tubes, tubes stratified in layers, the external stratum of tube alone producing spores. Spores are hyaline or brown, ellipsoid up to 25 Mm long. Conidial forms are known in some species.

100 sp. Perennial on wood. Causes 'root rot' of Tea, Rubber and other tropical plants.

F. lignosus Klotzsch causes, commercially important 'white root disease' of Rubber, Tea, Cocoa, Coconut, Coffee, Jak as well as a large number of forest trees and green manure plants. Most important diagnostic feature is the presence of stout rather flat cords of mycelium which run more or less longitudinally and unite with one another to form a net work. *Fomes noxius* causes another common root disease of rubber and other plants. — 'brown root disease'. Most typical feature is the presence of a thick brownish — black encrustation of soil, sand and small stones of infected roots, which has 3 — 4 mm of earth & sand fastened firmly to the surface and cannot be washed off.

5 species recorded in Sri Lanka.

(1) *F. caryophylli* (Racib.) Bres.
On Clove — P : 48

(2) *F. floccosus* Bres.
On *Poinciana regia and Bombax malabaricum* — P : 48

(3) *F. lamaoensis* (Murr.) Sacc. & Trott.
On *Hevea, Camellia* etc. — P : 48

(4) *F. lignosus* (Klotz.) Bres.
On *Hevea brasiliensis, Camellia, Artocarpus* — P : 48

(5) *F. noxius*
On *Hevea, Camellia* and other forest trees — TRI Pamphlet 2/66 A : 238

152. *Poria* Pers. ex S.F. Gray (Fig. 111 a—b)

Basidiocarp entirely resupinate forming more or less extended patches covered with the pores or hymenium, flesh thin, often almost absent, spores white or coloured, elliptical, globose, sub-globose, obovate or cylindrical; smooth or punctate.

200 sp., cosmopolitan, causes rot of root and wood of many plants, the disease described as 'red root disease'. Fungus can be recognised as red sheets, smooth, thin, flat, dark or cords attached to the surface of the tap root.

P. hypolateritia, causing 'red root of tea', kills the plants suddenly. The fungus completely disintegrates the root tissues, leaving a formless moist pulp.

4 species recorded in Sri Lanka.

(1) *P. albobrunnea* Petch
On *Acacia decurrens* P : 52

(2) *P. hypobrunnea* Petch
On *Hevea brasiliensis*, *Camellia sinensis*, *Tephrosia candida* P : 52

(3) *P. hypolateritia* (Berk.) Cooke
On *Camellia sinensis* P : 52

(4) *P. rubrochorda* Petch
On *Dendrocalamus giganteus* P : 52

ORDER AGARICALES

This includes the fungi whose fruit bodies are commonly called the mushrooms and toadstools. It also includes another group of fleshy large fungi called boletus. The characteristic macroscopic fruit body of the mushrooms and toadstools is made up of a fleshy or sometimes cartilage-like and generally stipitate pileus, having hymenium — covered gills on its under side (inferior).

This order includes 143 genera (½ + 390 syn.) 4200 species. Most are saprophytes but a small number are pathogenic on higher plants. Some have mycorrhizal associations especially with forest trees. A number are edible.

KEY TO THE GENERA OF THE ORDER AGARICALES

Fruit body more or less fleshy, soft, soon decaying ... *Armillariella* **(153)**

Fruit body coriaceous, persistent ... *Marasmius* **(154)**

153. *Armillariella* (Karst.) Karst. (Fig. 112 a—d)

Pileus very variable usually brownish with a tinge of honey colour, adorned with minuted tufts of brownish or blackish hairs, sometimes glabrous, even, or when old slightly striate on the margin; gills usually decurrent, sometimes adnate, white or whitish becoming sordid with age and sometimes variegated with reddish brown spots; stem ringed at length, brownish towards the base; spores white.

A. mellea (= *Armillaria mellea* (Fr.) Quel.) is the cause of serious root rots on trees and other plants. Roots are first attacked, mycelium gradually passing into the collar and lower portions of the trunk. Injury does not penetrate very deeply into the wood but as the cambium and outer layers of sap wood are gradually killed, the trees eventually die. The rhizomorphs emit phosphorescent light. Another indication of *A. mellea* is the great outflow of resin from the bark at the base of the stem and from roots, whereby hard clumps of earth are formed round the roots.

NA - 77 - 3

Plate XXIII Fig. 111 – 112

111. *Poria hypolateritia*

a – mycelial sheaths on tea root, reduced

b – basidiocarp on tea stump, reduced

112 a – d *Armillariella mellea*

a – rhizomorphs under the bark of an infected tree, reduced

b – cluster of basidiocarps x 1

c – basidiocarp x 1

d – section of a gill showing basidia and basidiospores x 400

e – i *Marasmius* e – h *M. Pulcher*

e – epiphytic thread blight on tea leaf x ½

f – epiphytic thread blight on tea stem, reduced

g – thread blight and 'Cyphella form' on portion of a leaf

h – Cyphella form

i – *M. equicrinis* – Horse hair blight on Nutmeg, reduced

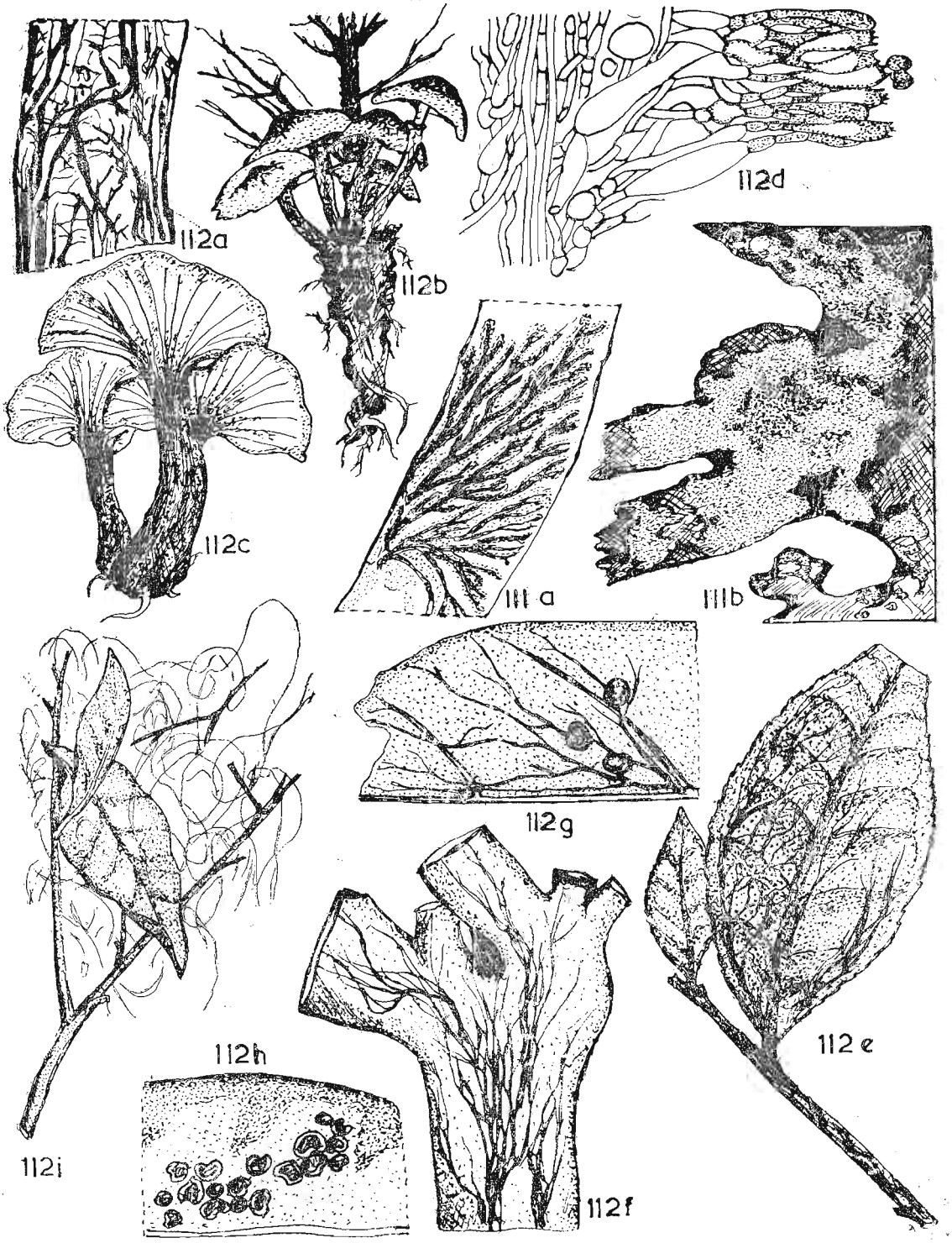

Plate XXIII Figs. 111 — 112

One species recorded in Sri Lanka.

(1) *A. mellea* = *Armillaria mellea* (Fr.) Quel.
On *Acacia decurrens* P : 53

154. *Marasmius* Fr. (Fig. 112 e—i)

Pileus thin, tough and pliant, coriaceous or membranous; stem cartilaginous or horny, continuous with the pileus but of a different texture; gills pliant, rather tough, somewhat distant with an acute entire edge; spores hyaline or whitish.

4 species recorded in Sri Lanka.

(1) *M. equicrinus* Muell.
— horse hair blight
On tea, nutmeg, rubber and on shrubs in jungles P : 60

(2) *M. pulcher* (B. & Br.) Petch — thread blight
On tea, nutmeg, cocoa and *Beloperone oblongata* P : 60

(3) *M. rigidichorda* Petch — horse hair blight
On shrubs and trees in jungles P : 60

(4) *M. stenophyllus* Mont.
On *Musa paradisiaca* P : 60

SUB — DIVISION DEUTEROMYCOTINA

This is an assemblage of fungi reproducing by spores which are formed without nuclear fusion followed by meiosis. This artificial subdivision embraces the imperfect, asexual, or conidial states of Ascomycotina, Basidiomycotina, and of Zygomycotina. It also includes the conidial states of fungi, those with which no perfect states have yet been correlated, if indeed any are in existence. The conidial states are grouped into form-genera and form-species, implication being that names are proposed without a knowledge of the sexual states of the taxa they represent. In practice however the prefix "form" is understood but usually omitted. The species included in a form-genus are related to each other by the form of their conidia and conidiogenous apparatus, but not necessarily by phylogeny.

KEY TO THE CLASSES OF DEUTEROMYCOTINA

1. Reproductive structures present ... 2
Reproductive structures absent ... *AGONOMYCETES* (P.159)

2. Reproductive structures borne in pycnidia or acervuli ... *COELOMYCETES* (P.133)
Reproductive structures borne otherwise ... *HYPHOMYCETES* (P.103)

CLASS — HYPHOMYCETES

This constitute the largest form-class of the Deuteromycotina, including over 10,000 form-species. This class includes the fungal pathogens of man, a number of serious plant pathogens, pathogens of insects and other arthropods, many of the industrially important fungi, common contaminants of microbiological laboratories, and many soil fungi which are saprobic playing a significant part in the soil economy. The conidia may be borne on conidiophores or on ordinary hyphae. The conidiophores may be separate from one another, or the conidiophores may arise from a small cushion or stroma of hyphae (resulting complex being know as a *sporodochium*) or conidiophores develop into tufts or columns forming antler-like or cylindrical bodies known as *coremia* or *synnemata*. Conidia of various shapes, hyaline or coloured, 1 to many-celled. This class has a single order Moniliales with the characters described for the class.

KEY TO THE GENERA OF THE ORDER MONILIALES

1.	Hyphae in more or less loose cottony mass	... 2	
	Hyphae compacted to form a globose to cylindric spore-body which is often stalked	... 45	
2.	Hyphae and conidia hyaline or brightly coloured	... 3	
	Hyphae and conidia both typically dark, or one or the other dark	... 25	
3.	Conidia 1-celled	... 4	
	Conidia more than 1-celled	... 16	
4.	Conidiophores very short or obsolete or little different from the conidia	... 5	
	Conidiophores elongate and distinct from the conidia	... 8	
5.	Conidia globose	... *Oospora*	**(168)**
	Conidia not globose	... 6	
6.	Conidiophores simple, arising from superficial mycelium	... 7	
	Conidiophores sparingly branched, typically arising through stomata	... *Oidiopsis*	**(166)**
7.	Conidia ovoid to elliptic	... *Oidium*	**(167)**
	Conidia clavate	... *Ovulariopsis*	**(170)**
8.	Conidia capitate	... 9	
	Conidia not capitate	... 10	
9.	Conidia enclosed in mucus	... *Gliocladium*	**(162)**
	Conidia not in mucus	... *Penicillium*	**(171)**
10.	Conidia borne on tip (acrogenous) on verticillate branches	... 11	
	Conidia not as above	... 12	
11.	Conidia solitary or loosely grouped	... *Verticillium*	**(177)**
	Conidia in heads or spikes	... *Acrostalagmus*	**(156)**
12.	Conidia typically borne on the walls or sides (pleurogenous)	... *Acladium*	**(155)**
	Conidia not as above	... 13	
13.	Conidiophores simple or nearly so	... *Ovularia*	**(169)**
	Conidiophores branched	... 14	
14.	Conidiophores procumbent	... *Sporotrichum*	**(175)**
	Conidiophores erect or ascending	... 15	
15.	Conidia solitary	... *Monosporium*	**(165)**
	Conidia loosely grouped about the apex	... *Botrytis*	**(157)**
16.	Conidia 2-celled	... 17	
	Conidia more than 2-celled	... 19	
17.	Conidia produced in chains (catenate)	... *Hormiactis*	**(164)**
	Conidia not produced in chains	... 18	

18.	Conidiophores much branched	... *Cylindrocladium*	(160)
	Conidiophores simple	... *Trichothecium*	(176)
19.	Conidia broad filiform	... *Cercosporella*	(159)
	Conidia not as above	... 20	
20.	Conidia spirally curved	... *Helicomyces*	(163)
	Conidia not as above	... 21	
21.	Conidia pyriform	... *Piricularia*	(172)
	Conidia not pyriform	... 22	
22.	Typical large canoe shaped macroconidia and small microconidia present	... *Fusarium*	(161)
	Conidia not as above	... 23	
23.	Conidia capitate or fascicled	... *Candelospora*	(158)
	Conidia solitary	... 24	
24.	Conidia cylindric to clavate	... *Ramularia*	(174)
	Conidia doliform (jar shaped)	... *Pithomyces*	(173)
25.	Conidia stellate	... *Tripospórium*	(196)
	Conidia not stellate	... 26	
26.	Conidia long, filiform	... *Cercospora*	(181)
	Conidia not as above	... 27	
27.	Conidia 1-celled	... 28	
	Conidia more than 1-celled	... 33	
28.	Conidiophores very short or scarcely different from the conidia	... *Coniosporium*	(183)
	Conidiophores distinct from the conidia	... 29	
29.	Conidia dark	... 30	
	Conidia not dark	... *Zygosporium*	(197)
30.	Conidia endogenous	... *Thielaviopsis*	(195)
	Conidia exogenous	... 31	
31.	Cells of conidiophore short and somewhat inflated	... *Nigrospora*	(193)
	Cells of conidiophore long and not inflated	... 32	
32.	Conidia catenate (in chains)	... *Lacellina*	(190)
	Conidia not catenate	... *Monotospora*	(192)
33.	Conidia 2-celled	... 34	
	Conidia more than 2-celled	... 37	
34.	Conidia in heads	... *Cordana*	(185)
	Conidia not in heads	... 35	
35.	Conidia catenate, chains often short	... *Cladosporium*	(182)
	Conidia not catenate	... 36	

36.	Conidia acrogenous (borne at tip only)	...	*Fusicladium* **(197)**
	Conidia acropleurogenous (borne at tip and sides)	...	*Cladosporium* **(182)**
37.	Conidia transversely septate	...	38
	Conidia muriform (transversely and longitudinally septate)	...	43
38.	Conidiophores very short or little different from conidia	...	39
	Conidiophores long or distinctly different from conidia	...	40
39.	Conidia catenate	...	*Septonema* **(194)**
	Conidia not catenate	...	*Ceratophorum* **(180)**
40.	Conidia echinulate	...	*Heterosporium* **(189)**
	Conidia smooth	...	41
41.	Conidia typically curved with one of the central cells enlarged	...	*Curvularia* **(186)**
	Conidia not as above	...	42
42.	Conidia ovate	...	*Brachysporium* **(179)**
	Conidia elongate	...	*Helminthosporium* **(188)**
43.	Conidiophore very short or scarcely different from the conidia	...	*Coniothecium* **(184)**
	Conidiophore long or distinctly different from the conidia	...	44
44.	Conidia catenate	...	*Alternaria* **(178)**
	Conidia not catenate	...	*Macrosporium* **(191)**
45.	Spore body stalked, capitate (spores in heads) to cylindric ie. a synnema	...	46
	Spore body typically sessile, globose to pulvinate or applanate ie. a sporodochium (Sporodochia frequently are not produced in culture	...	51
46.	Hyphae and conidia pale or brightly coloured	...	47
	Hyphae and conidia or one or the other dark	...	49
47.	Conidia 1-celled	...	*Stilbum* **(203)**
	Conidia 2-celled	...	48
48.	Synnema capitate	...	*Didymostilbe* **(201)**
	Synnema cylindric	...	*Actinostilbe* **(198)**
49.	Conidia 2-celled	...	*Didymobotryum* **(200)**
	Conidia more than 2-celled	...	50
50.	Conidial part capitate or at least terminal	...	*Arthrobotryum* **(199)**
	Conidial part cylindric or long clavate	...	*Podosporium* **(202)**
51.	Hyphae and conidia hyaline or brightly coloured	...	52
	Hyphae olive to brown black, conidia of the same colour as hyphae, sometimes hyaline	...	55
52.	Conidia of two types, — large canoe shaped macroconidia and small microconidia	...	*Fusarium* **(161)**
	Conidia of one type only	...	53

53. Sporodochia globose ... *Aegerita* **(204)**
Sporodochia not globose ... 54

54. Conidiophores much branched ... *Tubercularia* **(210)**
Conidiophores simple or nearly so ... *Tubereulina* **(211)**

55. Conidia one-celled ... 56
Conidia many-celled ... 58

56. Sporodochia hairy or setulose ... 57
Sporodochia glabrous ... *Epicoccum* **(206)**

57. Sporodochia more or less uniformly setulose (with bristles) ... *Chaetostroma* **(205)**
Sporodochia ciliate at margin ... *Myrothecium* **(208)**

58. Conidia cruciately 4-celled ... *Spegazzinia* **(209)**
Conidia not as above ... *Exosporium* **(207)**

155. *Acladium* Link (Fig. 113 a)
= *Trichosporum* Fr. (Ainsworth 1963)

Mycelium hyaline, loose, and cottony, rarely fasciculate; conidiophores simple, long, distinct from the conidia; conidia 1-celled, hyaline or bright coloured, smooth, typically pleurigenous, globose to ellipsoid.

5 species, widespread.

1 species recorded in Sri Lanka and described under the Genus *Trichosporium* as

(1) *T. vesiculosum* Butl.
On *Casuarina equisetifolia* P : 79

156. *Acrostalagmus* Corda (Fig. 114 a—c)

Conidiophores slender with verticillate branches; conidia hyaline, one-celled, ovoid, held together in heads in slime drops. This genus is very close to *Verticillium* and is believed by some to be synonymous with it.

2 species recorded in Sri Lanka.

(1) *A. cinnabarinus* Corda
On *Scleroderma* P : 72

(2) *A. fulvus* B. & Br.
On leaves of a monocotyledon P : 72

157. *Botrytis* Pers. ex Fr. (Fig. 115 a—c)

Sterile hyphae creeping; conidiophores long, slender, erect, pigmented, vaguely branched upwards, branchlets slender, apical cells enlarged and rounded, bearing conidia grouped like grapes on short sterigmata; conidia hyaline or ash coloured, grey in mass, 1 celled, ovoid, elliptic or globose; mycelium grey, growing rapidly in culture, irregular sclerotia frequently produced. Parasitic, causing 'grey mold' of many plants or saprophytic.

50 species. Cosmopolitan.

One species recorded in Sri Lanka.

(1) *B.* sp.
On *Ricinus* Tropical Agriculture **XCIX**
P : 6

158. *Candelospora* Rea & Hawley (Fig. 116 a)

Conidiophores erect, hyaline, septate, branched; spore bearing branches penicillate; conidia hyaline, 4- celled, cylindrical, narrow; parasitic on higher plants. This genus differs from *Cylindrocladium* primarily in the number of cells in the conidium.

2 species, European, N. Amer.

1 species recorded in Sri Lanka; *C. theae* causing a leaf disease in tea. On leaves it produces numerous spots, black-brown or grey-white in colour, which later coalesce giving a black colour to the leaf. The fungus causes premature defoliation of both young and old leaves. The perfect stage of the fungus is *Calonectria theae*.

(1) *C. theae*
On *Camellia sinensis, Acacia decurrens, Acacia melanoxylon, Eucalyptus* sp. A : 33

159. *Cercosporella* Sacc. (Fig. 117 a—d)

Conidiophores hyaline, slender, bearing single conidia apically, or on short branches; conidia hyaline, several-celled, oblong, cylindrical to filiform, straight or curved; parasitic on higher plants; differs from *Cercospora* in that both conidia and conidiophores are hyaline.

80 species, widespread. Some species have characters in common with *Ramularia*. Causes leaf spots.

3 species recorded in Sri Lanka.

(1) *C. brassicae* (Fautr. & Roum.) Höhnel
On *Brassica campestris* P : 73

(2) *C. crataevae* (B. & Br.) Petch
On *Crataeva roxburghii* P : 73

(3) *C. theae* Petch
(Syn. *Candelospora theae*)
On *Camellia sinensis, Acacia dealbata Eucalyptus* sp. & *Tephrosia radicans* P : 73

160. *Cylindrocladium* Morgan (Fig. 118 a)

Conidiophores regularly and repeatedly dichotomously or trichotomously branched, each terminating in 2-3 phialides; conidia hyaline, 2-celled, cylindrical, borne singly; parasitic or saprophytic.

10 species, widespread. *C. floridanum* Sobers & Seymour cause dieback of clove seedlings. Perfect state is in *Calonectria kyotensis*.

2 species recorded in Sri Lanka.

(1) *C. floridanum* Sobers & Seymour
On seedlings of *Syzygium aromaticum* Sivakadadcham 1976

(2) *C. pithecolobii* Petch
On living leaves of *Pithecolobium saman* P : 74

161. *Fusarium* Link ex Fr. (Fig. 119 a—i)

Mycelium cottony in culture, often with some tinge of pink,purple or yellow in the mycelium or medium. Some produce conidia on sporodochia, others in smooth gelatinous layers and still others in scattered clusters, on all parts of the mycelium. Conidiophores variable, slender and simple, or more stout, branched irregularly or bearing a whorl of phialides. The one feature common to the different types of culture is the spore. Macroconidia are canoe shaped with pointed ends usually with several cross septa, colourless or pale coloured, never dark, and are quite unlike of any other fungi. In addition to this, many species produce microconidia, which are small, ovate, elongate, pyriform or comma shaped, usually non-septate more rarely 1-3 septate. A number of species form chlamydospores.

65 species + 78 varieties, cosmopolitan, saprophytes and parasites. A number of species have perfect states in the family Hypocreaceae of Sphaeriales (*Gibberella*, *Nectria* etc.) Important pathogens: *F. solani* var. *caeruleum* (dry rot of potato in storage where decay is slow and tissue becomes dry and powdery, leaving whitish to brownish areas which dessicate to form cavities) *F. oxysporum* Schl. ex Fr. var. *cubense* (E. F. Smith) Woll. (Wilt of banana called the 'Panama disease' where leaves turn yellow,collapse at the bases remaining hanging downward along the pseudostem; underground symptoms are diagnostic — yellow orange or red streaks at the regions of the vascular tissues) *F. oxysporum* Schl. ex Fr. var. *passiflorae* (vascular wilt of passion); *F. moniliforme* (the conidial state of *Gibberella fujikuroi* causing 'foot rot and bankanae disease' of rice, both in the nursery and in the field. Seedlings become pale thin and finally killed. In older plants infection results in tall and lanky tillers bearing pale green flags)

9 species recorded in Sri Lanka.

(1) *F. equiseti* On seeds of Cowpea, Mungbean and pumpkin	Unpublished data C.A.R.I. Gannoruwa
(2) *F. entomophilum* Petch On *Clitellaria heminopla*	P : 74
(3) *F. epithele* Mc. Alp. On *Citrus*	P : 74
(4) *F. heterosporium* Nees ex Fr. On *Sorghum vulgare*	P : 74
(5) *F. moniliforme* On *Oryza sativa*	A : 94
(6) *F. orchidis* Petch Orchid leaves	P : 74
(7) *F. oxysporum* Fr. var *cubense* on *Musa paradisiaca* var *passiflorae* on *Passiflora edulis*	A : 177, 209
(8) *F. solani* var. *caeruleum* = *Fusarium caeruleum* Lib. Sacc. On *Solanum tuberosum*	A : 130
(9) *F. uredinicola* Petch On *Uredo microglossae*	P : 74

Plate XXIV Figs. 113 — 123

113. *Acladium*

a — conidiophores with conidia much enlarged

114. *Acrostalagmus cinnabarinus*

a — conidiophore, a water mount x 400
b — conidiophore with conidia x 100
c — conidiophore showing spore heads on slime drops x 4 00

115. *Botrytis*

a — conidiophore and conidia x 40
b — conidiophore and conidia x 100
c — upper portion of conidiophore showing swollen tips and conidia x 500

116. *Candelospora citri*

a — conidiophore and conidia, much enlarged

117. *Cercosporella theae*

a — mature spots on tea leaf just fully expanded x 1
b — irregular patches on older leaves x 1
c — conidiophore x 300

118. *Cylindrocladium*

a — conidiophores and conidia, enlarged

119. *Fusarium*

a — *F. oxysporum*
a — onion bulb showing basal rot, reduced
b — e *F. solani* var *caeruleum*
b — conidiophore with microconidia, enlarged
c — macroconidia, enlarged
d — chlamydospores, enlarged
e — chlamydospores with conidia, enlarged
f — i *F. oxysporum* var *cubense*
f — Infected banana plant, reduced
g — Section of diseased rhizome showing vascular darkening, reduced
h — macroconidia and microconidia, enlarged
i — chlamydospores, enlarged

120. *Gliocladium*

a — conidiophore with conidia in slime drop, much enlarged

121. *Helicomyces*

a — conidiophore with conidia, much enlarged

122. *Hormiactis*

a — conidiophore with chains of conidia, enlarged
b — conidia enlarged

123. *Monosporium*

a — conidiophore with conidia, enlarged

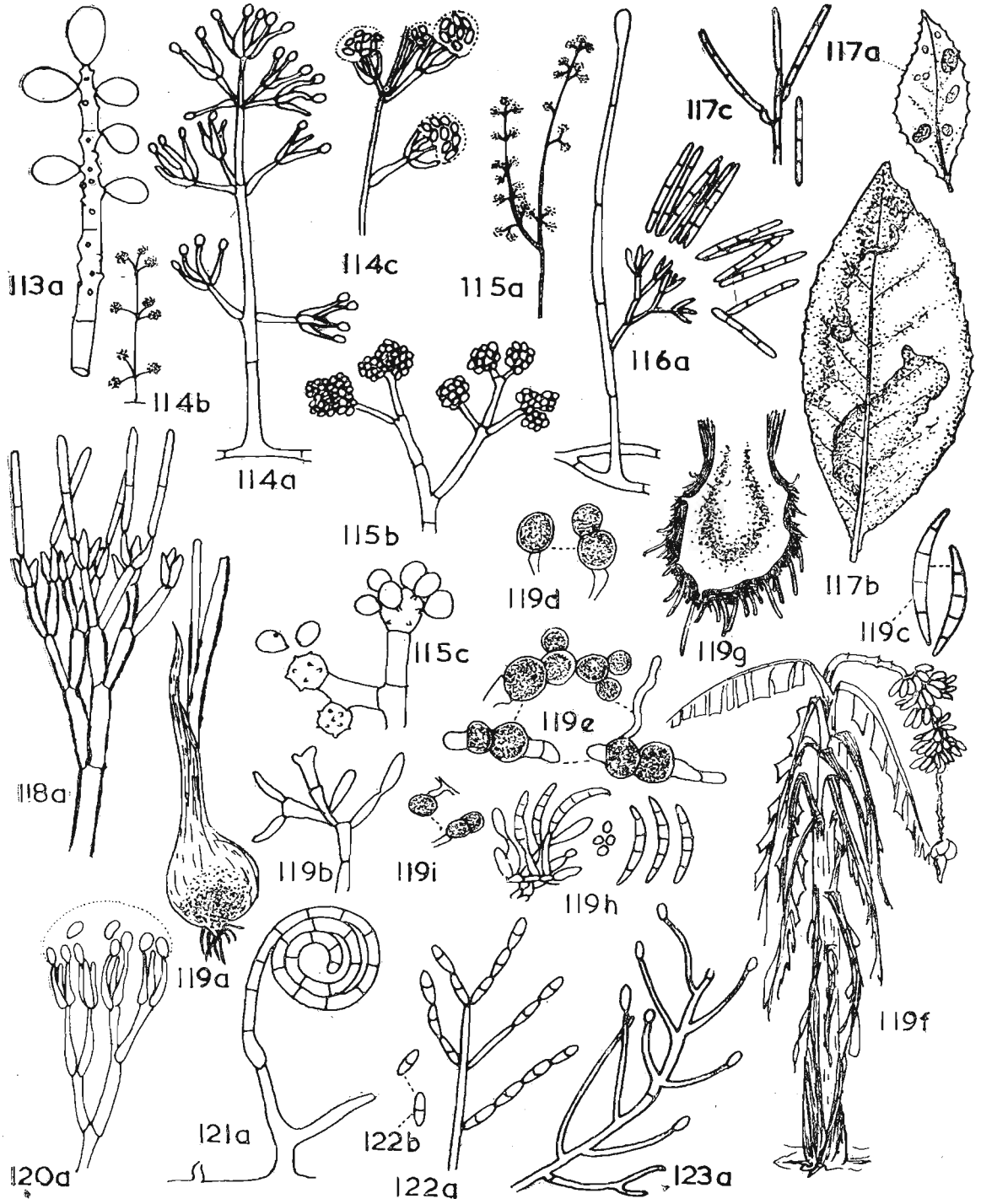

Plate XXIV Figs. 113 — 123

162. *Gliocladium* Corda (Fig. 120 a)

Conidiophores erect, septate, penicillate above, branches and branchlets septate; conidia hyaline or brightly coloured in mass, 1-celled, acrogenous (produced successively apically in heads) irregularly massed together, surrounded by a mucilaginous coat.

Differs from *Penicillium* in the conidia not being produced in chains and in being involved in a mass of mucous forming a head. Some of the species are considered as representing the conidial condition of the fungus *Hypomyces*, the species which are parasitic on fungi.

10 species, widespread.

1 species recorded in Sri Lanka.

(1) *G. penicillioides* Corda
On *Polystictus flabelliformis* P : 75

163. *Helicomyces* Link ex Waller (Fig. 121 a)
= *Helicostilbe* Höhnel Linder 'emended' the genus for *Helicostilbe simplex* Petch, Sri Lanka.

Conidiophores hyaline, short or elongate; conidia hyaline or sub-hyaline septate, conidial filaments thin, hygroscopic, tightly coiled; mostly saprophytic on decaying wood.

5 species, widespread.

1 sp ecies recorded in Sri Lanka and described under the name *Helicostilbe* as:

(1) *H. simplex*. Petch
On *Daphniphyllum glaucescens* P : 75

164. *Hormiactis* Preuss (Fig. 122 a—b)

Conidiophores simple, long; conidia hyaline or sub-hyaline, 2-celled, oblong to cylindric, borne at the tip and on the sides, catenate, chains binate or ternate.

5 species, Eur., Amer., Sri Lanka

1 species recorded in Sri Lanka.

(1) *H. rosea* Petch
On *Hibiscus* sp. P : 75

165. *Monosporium* Bon. (Fig. 123 a)

Conidiophores dendroid, repeatedly branched, erect, hyaline; conidia borne singly at the apex of branches, 1-celled, hyaline or lightly coloured, mostly saprophytic.

10 species. Temperate.

1 species recorded in Sri Lanka

(1) *M. squamicola* (B. & Br.) Petch.
On leaves of *Clerodendron* P : 76

166. *Oidiopsis* Scalia (Fig. 124 a)

Mycelium external on host, chiefly on the leaves, white; conidiophores erect, branched and typically arising from a stoma; conidia in chains; conidia rather large, elliptical, colourless or pale coloured.

1 species recorded in Sri Lanka, causing 'powdery mildews' on aerial parts of plants.

(1) *O. taurica* (Lèv.) Salm.
On *Cajanus cajan* and
On *Capsicum annuum* P : 76

167. *Oidium* Sacc. (Fig. 125 a—b)

Like *Oidiopsis* Scalia, but the conidiophores arise on a superficial mycelium, simple and consist of a short stipe of 1 or more cells, and a cell which gives rise to conidia in chains.

25 species especially Tropical. Many are imperfect states of family Erysiphaceae, and cause 'powdery mildews'. (see Erysiphales)

6 species recorded in Sri Lanka.

(1) *O. balsamii*
On *Impatiens* A : 109

(2) *O. heveae* Steinm.
On *Hevea brasiliensis* P : 76

(3) *O. quercinum* Thüm.
On *Quercus pedunculata* P : 76

(4) *O. mangiferae*
On *Mangifera indica* A : 185, 187

(5) *O. tingitaninum* Carter
On *Citrus* P : 76

(6) *O. tuckeri* Berk.
On *Vitis vinifera* P : 76

Several unidentified species of *Oidium* (conidial states of powdery mildews) are common on a number of hosts including *Stachytarpheta, Hibiscus esculentus, Bixa, Zinnia elegans, Gomphrena globosa, Dorstenia* sp; *Aegle marmelos* etc.

168. *Oospora* Wallr.

Tufts delicate, effused or pulvinate, lax or rather compact; fertile hyphae short, slender, simple or sparingly branched; conidia in chains, globose or elliptical, hyaline or clear coloured.

50 species, cosmopolitan. *O. lactis parasitica* is a wound pathogen causing a watery rot on tomato fruits, starting at the stem end or at growth cracks. *O. aurantii* cause a similar rot on orange fruits.

2 species recorded in Sri Lanka.

(1) *O. aurantii* Petch
On Orange fruits **P : 76**

(2) *O. lactis* (Fres.) Sacc. f. *parasitica*
Pritchard and Porte.
On *Lycopersicon esculentum* **P : 76**

169. *Ovularia* Sacc. (Fig. 126 a—c)

Conidiophores emerging in clusters, simple or branched; conidia hyaline, 1-celled, ovoid or globose, apical or lateral, single or less often catenulate; parasitic.

100 species, cosmopolitan.

2 species recorded in Sri Lanka.

(1) *O. bixae* Racib.
On *Bixa orellana* P : 77

(2) *O. aurantii* McAlp.
On Oranges P : 77

170. *Ovulariopsis* Pat. & Harr. (Fig. 127 a)

Similar to *Oidium* but with clavate conidia. 5 species. Widespread. *O. moricola* causes powdery mildew' disease on *Morus.*

1 species recorded in Sri Lanka.

(1) *O. moricola* Delacr.
On *Morus* P : 77

One more unidentified species causes powdery mildews on chilli (*Capsicum annuum*)

171. *Penicillium* Link ex Fr. (Fig. 128 a—b)
= *Coremium* Link in part fide Thom. (Ainsworth 1963)

Mycelium creeping, septate; conidiophores erect, either detached from one another or to some degree aggregated into fascicles or compacted into definite coremia, septate, smooth or rough, terminating in a broom like whorl of branches, the latter consisting of a single whorl of phialides or twice to several times verticillately branched, the final branches bearing the phialides; conidia in dry unbranched chains, globose, ovoid, elliptical or pyriform, smooth or rough hyaline or brightly coloured.

137 species, cosmopolitan. Some have perfect states in *Carpenteles, Talaromyces.* Common moulds, many named on cultural, biochemical, or pathogenic characters. *P. digitatum* Sacc. (blue mould of citrus fruits) is a wound parasite, resulting in a soft rot of oranges, which later gets coated with a blue mould.

2 species recorded in Sri Lanka.

(1) *P. digitatum* Sacc.
On *Citrus* fruits P : 77

(2) *P. incarnatum* B. & Br.
On Bamboo P : 77

3 more unidentified species recorded in Sri Lanka.

(3) *Penicillium* sp.
On fruits of *Carica papaya* A : 188

(4) *Penicillium* sp.
On seeds of *Arachis hypogea* A : 121

Plate XXV Figs. 124 – 132.

124. *Oidiopsis*

a — conidiophore with conidia emerging through a stoma x 400

125. *Oidium balsamii*

a — conidiophore with chains of conidia x 400
b — conidia x 40

126. *Ovularia*

a — cluster of conidiophores x 100
b — conidiophores x 400
c — conidia x 400

127. *Ovulariopsis*

a — conidiophore and conidia x 400

128. *Penicillium*

a — conidiophore x 400
b — phialides with chains of conidia, much enlarged

129. *Piricularia oryzae*

a — paddy leaf with spindle lesions with a dark margin, reduced
b — nodes of infected panicle showing broken-neck phase x 1
c — conidiophores with conidia emerging through a stoma x 500
d — conidia x 500

130. *Ramularia*

a — conidiophores with conidia, much enlarged

131. *Sporotrichum*

a — a complete branched conidiophore x 100
b — portion of a branch of conidiophore and conidia x 500

132. *Trichothecium*

a — conidiophore with conidia, much enlarged

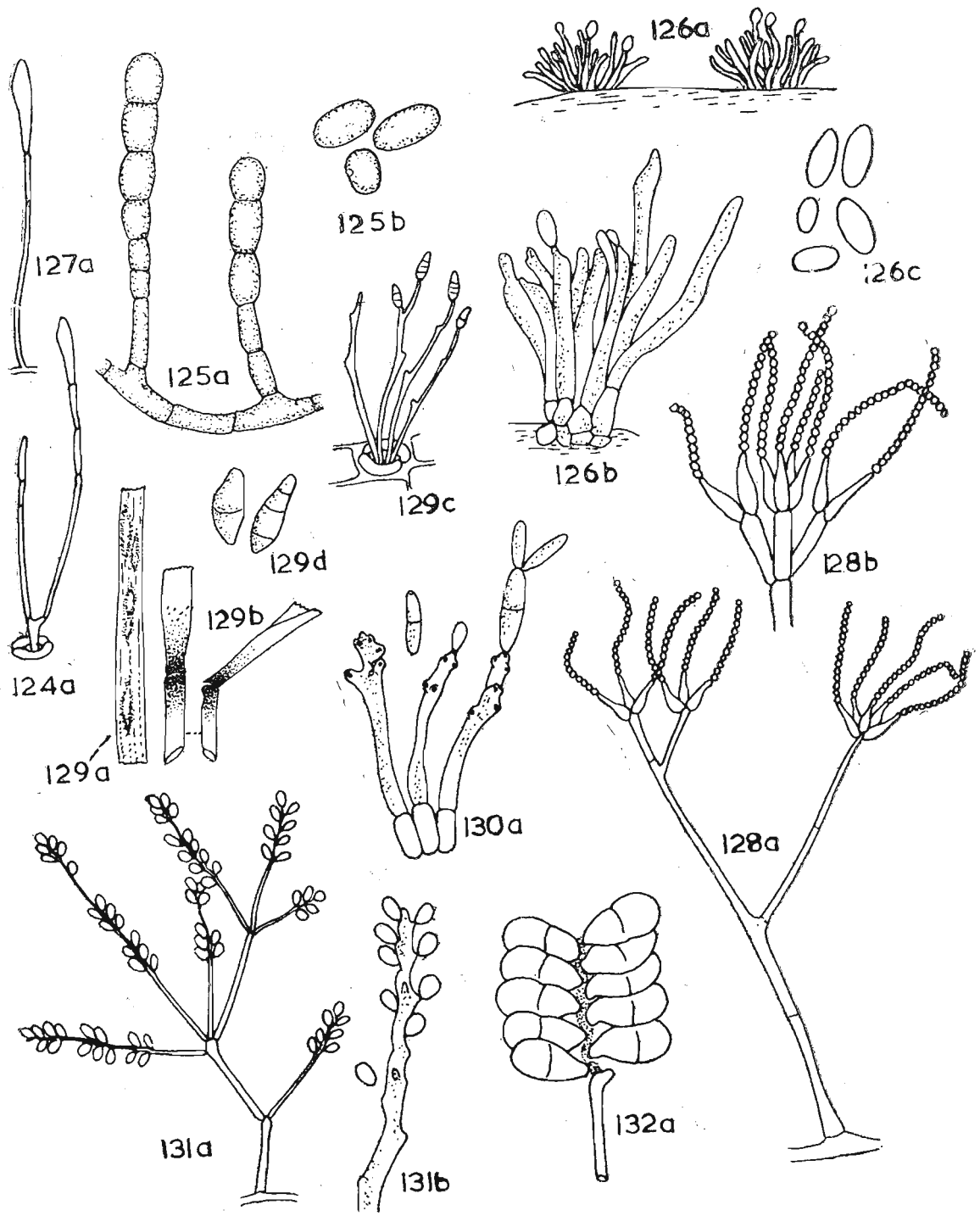

Plate XXV Figs. 124 — 132

(5) *Penicillium* sp.
On fruits of ***Ananas comosus*** **(Pineapple)**

2 more species recorded in Sri Lanka, and described under the name *Coremium* Link as

(6) *C. compressum* (B. & Br.) Petch
On fruit of *Citrus maxima* P : 74

(7) *C. pulcherrimum* Petch
On *Lecanium nigrum* P : 74

172. *Piricularia* Sacc. (Fig. 129 a—d)

Conidiophores long, slender, simple or rarely branched, septate, single or in tufts; conidia pyriform to nearly ellipsoid, borne singly and attached at the broader end, hyaline, 2 to 3-celled. Parasitic chiefly on grasses.

5 species, especially temperate. *P. oryzae* Cav. causes 'rice blast disease', affecting the leaves, culms, panicles and flowers of rice plants. A diseased rice crop shows plainly from a distance and as the name 'blast' implies the crop appears brown and scorched standing out in strong contrast to healthy green foliage.

2 species recorded in Sri Lanka.

(1) *P. grisea*
On ripe fruits of *Musa paradisiaca* (banana) A : 181

(2) *P. oryzae* Cav.
On Oryza sativa (rice);
Panicum repens; Eleusine coracana (Kurakkan) P : 77

173. *Pithomyces* Berk. & Br.

Conidiophores long and distinct from the conidia, granulate, simple or nearly so; conidia many-celled, solitary, jar shaped or cask shaped (doliform), hyaline or light coloured.

1 species, in Java and Sri Lanka

(1) *P. flavus* B. & Br.
On some Monocotlyedons P : 77

174. *Ramularia* Sacc. (Fig. 130 a)

Mycelium internal, intercellular; conidiophores, through stomata, clustered, short, with tips furnished with minute projecting points, hyaline or coloured, cylindrical, mostly 2-celled, sometimes produced in chains. Differs from *Ovularia* in the septate conidia.

300 species especially temperate, causing leaf spots.

1 species recorded in Sri Lanka.

(1) *R. areola* Atk.
On *Gossypium* P : 77

175. *Sporotrichum* Link ex Fr. (Fig. 131 a—b)

Conidiophores hyaline, sometimes simple, usually irregularly branched, with spore-bearing portion near the apex; conidia hyaline, 1-celled, globose or ovoid, attached apically or laterally; saprophytic in soil, parasitic on higher plants or pathogenic on animals (causing 'sporotrichosis').

3 species recorded in Sri Lanka.

(1) *S. album* Petch
On *Cordyceps dipterigena* P : 78

(2) *S. isarioides* Petch
On *Cordyceps dipterigena* P : 78

(3) *S. lichenicola* B. & Br.
On lichens P : 78

176. *Trichothecium* Link ex Fr. (Fig. 132 a)

Sterile hyphae creeping; conidiophores simple, erect, long, slender, septate; conidia terminal, solitary, 2-celled, hyaline or bright coloured, ovoid to ellipsoid; saprophytic or weakly parasitic, when parasitic a wound parasite.

5 species. Cosmopolitan.

2 species recorded in Sri Lanka.

(1) *T. luteum* Petch
On fruits of *Hevea brasiliensis* P : 79

(2) *T. parasiticum* Petch
On uredo of *Melampsora* sp. P : 79

177. *Verticillium* Nees ex Wallr. (Fig. 133 a—c)

Sterile hyphae septate, creeping, branched, hyaline or brightly coloured. Conidiophores hyaline, slender, erect, branched, at least some of the branches verticillate; terminal branchlets usually flask shaped and distinctly pointed at the apex. Conidia ovoid to ellipsoid not in chains, hyaline, or pale coloured, 1-celled, borne single or under moist conditions in slimy balls, Vascular parasites causing wilts of higher plants, parasitic on other fungi or growing saprophytically.

40 species. Cosmopolitan. *Acrostalagmus* Corda is a Syn. but is often used.

2 species recorded in Sri Lanka.

(1) V. *attenuatum* Petch
On *Lycoperdon* sp. P : 79

(2) V. *niveum* Petch
On leaves of *Adenostemma viscosum* P : 79

178. *Alternaria* Nees ex Wallr. (Fig. 134 a—c)

Sterile hyphae creeping; conidiophores single or in groups, mostly unbranched, short. Conidia inverted or club shaped, mostly elongate at tip, muriform in the lower portion, dark coloured, lighter at the joints, frequently borne in acropetal chains (catenulate) and connected by slender portions, soon separating.

Parasitic or saprophytic on plant material. 50 species, cosmopolitan. A number of species cause 'black leaf spots' on various cultivated and wild plants. *A. solani* (Ellis and Martin) Sorauer causes 'early blight' of potato and tomato. Mature leaf spots are irregularly circular and usually show a series of concentric ridges which produce a target - board effect. When spots increase in number, they coalesce and kill the leaf.

8 species recorded in Sri Lanka.

(1) *A. brassicae* (Berk.) Sacc.
On *Brassica oleraceae*, *B. oleraceae* var *botrytis*, *B. campestris*, *B. juncea*, *Raphanus sativus* — A : 154, 157

(2) *A. carotae* (Ell. & Langl.) Stev.
On *Daucus carota* — P : 72

(3) *A. dauci*
On *Daucus carota* — A : 136, 137

(4) *A. herculea* (Ell. & Martin.) Elliott.
On *Armoracia rusticana* — P : 72

(5) *A. longipies*
On *Nicotiana tabacum* — A : 215, 219

(6) *A. padiwickii*(= *Trichoconis padiwickii*)
On paddy grains — Administration report, Dept. of Agricul. 1968—69.

(7) *A. passiflorae*
On *Passiflora edulis* — A : 209

(8) *A. solani* (Ellis & Martin) Sorauer
On *Lycopersicon esculentum*, *Solanum tuberosum* — A : 122, 127, 140

179. *Brachysporium* Sacc. (Fig. 135 a—b)

Conidiophores brown, erect, usually solitary, simple, septate; conidia dark, ovoid to obovoid, unequally 2-or more septate, attached to the apical cell of the conidoiphore by a short, narrow cell; mostly saprophytic.

25 species. Widespread. *B. torulosum* is the cause of 'Black tip disease' of banana fruits and leaf spots.

1 species recorded in Sri Lanka.

(1) *B. torulosum* Syd.
On leaves of *Musa paradisiaca* — P : 72

180. *Ceratophorum* Sacc. (Fig. 136 a)

Conidiophores dark, short, simple, bearing a solitary, apical conidium; conidia 3-to several celled, fusoid to cylindrical, the apical cell drawn out to a slender hyaline, often curved or hooked appendage; mostly saprophytic.

2 species recorded in Sri Lanka.

(1) *C. albizziae* Petch
On leaves of seedling of *Albizzia falcata* — P : 72

(2) *C. setosum* Kirchn.
On *Crotalaria anagyroides* and *C. usaramoensis* — P : 72

Plate XXVI Figs. 133 — 138

133. *Verticillium*

a — conidiophore with clusters of conidia x 100
b — conidiophore x 400
c — portion of conidiophore in water mount x 500

134. *Alternaria solani*

a — affected tomato leaf showing lesions x 1
b — conidiophore x 400
c — conidia, much enlarged

135. *Brachysporium*

a — conidiophore, enlarged
b — conidia, enlarged

136. *Ceratophorum*

a — conidium, enlarged

137. *Cercospora* a — c, *C. personata*

a — spots on ground nut leaves x 1
b — cluster of conidiophores, enlarged
c — conidia, enlarged
d — e *C. musae*
d — leaf spots on banana leaf, reduced
e — cluster of conidiophores with conidia, enlarged
f — *C. hibisca* conidiophores and conidia, enlarged

138. *Cladosporium fulvum*

a — undersurface of a diseased leaf of tomato x 1
b — cluster of conidiophores bearing conidia, enlarged

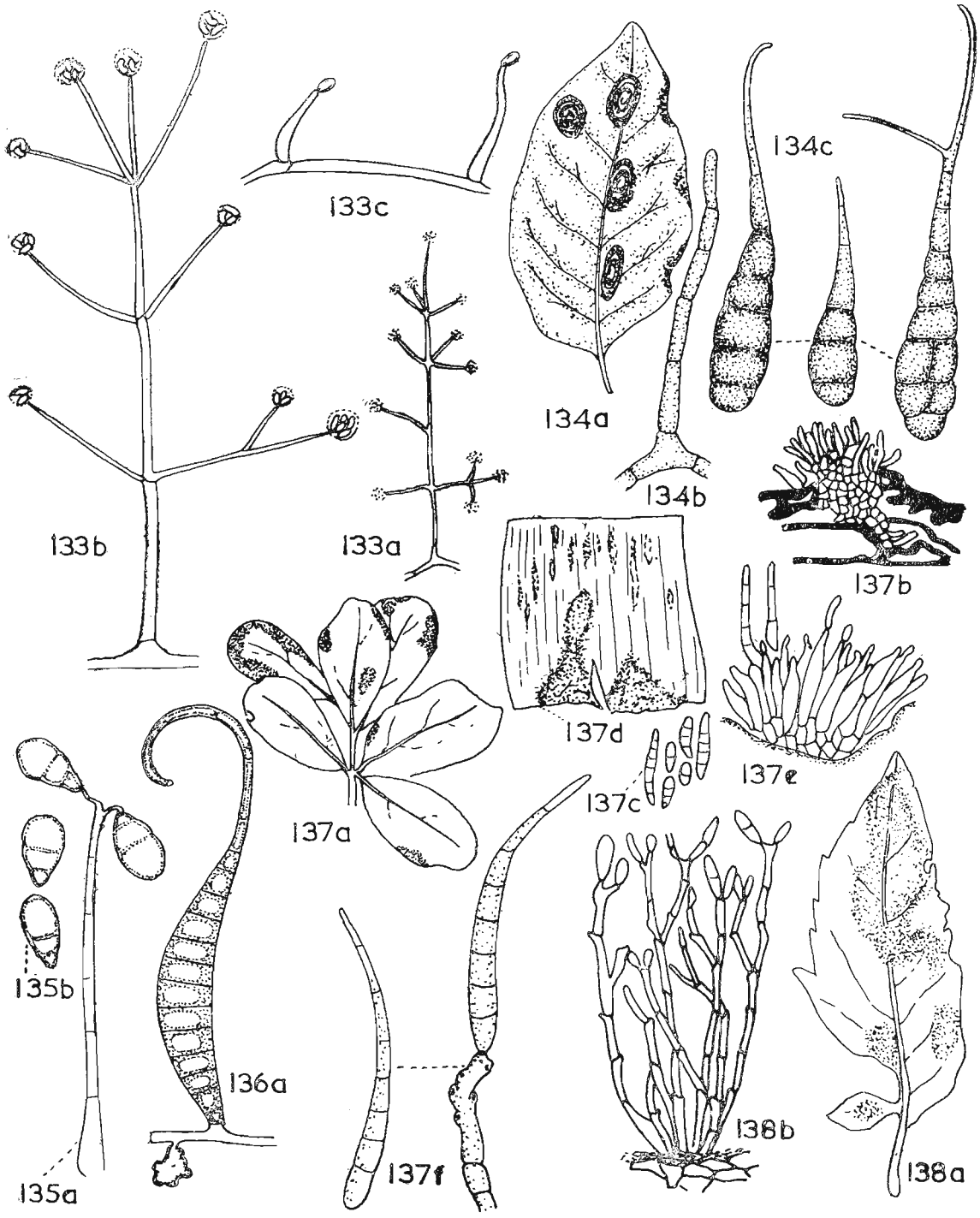

Plate XXVI Figs. 133 — 138

181. *Cercospora* Fres. (Fig. 137 a—f)

Hyphae not rigid, simple or branched, brown, often parasitic and forming spots on leaves; conidiophores dark, simple arising in clusters and bursting out of leaf tissue, bearing conidia successively on new growing tips; conidia elongated and slender, brown or olive, sometimes hyaline or sub-hyaline, septate, several celled, vermiform. 1270 (+ 560 Syn, fide chupp, Monograph of the fungus Genus *Cercospora*, 1954; arranged by host form, keys), cosmopolitan; parasites attacking the leaves producing leaf spots. *C. musae* Zimm. (perfect state belongs to *Mycosphaerella musicola* which causes, leaf spot of banana referred to as 'Sigatoka disease' where the symptoms are lenticular, grey spots surrounded by a brownish border which gradually diffuses into a bright yellow halo. These spots usually coalesce and result in large dead, dry patches. *C. personata* results in a serious leaf spotting and defoliation of ground nut, the disease being described as 'Tikka disease' of ground nut. The perfect state of this is *Mycosphaerella berkeleyii* Jenk.

40 species recorded in Sri Lanka.

(1) *C. averrhoae* Petch
On *Averrhoa carambola* — P : 72

(2) *C. apii*
On *Apium graveolens* — A : 161

(3) *C. beticola* Sacc.
On *Beta vulgaris* — P : 72

(4) *C. blumeae* Thum.
On *Blumea viscosula* — P : 72

(5) *C. bruceae* Petch
On *Brucea sumatrana* — P : 72

(6) *C. calpurniae* Petch
Calpurnia aurea — P : 72

(7) *C. capsici* Heald & Wolf.
On *Capsicum annuum* — P : 73

(8) *C. cardiospermi* Petch
On *Cardiospermum helicacabum* — P : 73

(9) *C. carotas*
On *Daucus carota* — A : 136, 137

(10) *C. cearae* Petch
On *Manihot glaziovii* — P : 73

(11) *C. cordobensis* Speg.
On *Argyreia populifolia* — P : 73

(12) *C. crotalariae* Sacc.
On *Crotalaria striata* — P : 73

(13) *C. cruenta* Sacc. (Perfect state in *Mycosphaerella cruenta*)
On *Phaseolus* — P : 73

(14) *C. dilleniae* Petch
On *Dillenia retusa* — P : 73

(15) *C. dioscoreae* Ell. and Martin
On *Dioscorea* — P : 73

(16) *C. gossypina* Cooke
On *Gossypium* — P : 73

(17) *C. henningsii* Allesch.
On *Manihot utilissima* — P : 73

(18) *C. hibisci* Tracy & Earle
On *Hibiscus esculentus* — P : 73

(19) *C. hiptages* Petch
On *Hiptage madablota* — P : 73

(20) *C. iteodaphnes* (Thüm.) Sacc.
On *Tetranthera iteodaphnes* — P : 73

(21) *C. koepkei*
On *Saccharum officinarum* — A : 224, 227

(22) *C. mangiferae*
On *Mangifera indica* — A : 185, 188

(23) *C. medicaginis* Syd.
On *Medicago-sativa* — P : 73

(24) *C. melongenae* Welles.
On *Solanum melongena* — P : 73

(25) *C. musae* Zimm.
On *Musa paradisiaca* — P : 73

(26) *C. nicotianae* Ell. & Everh.
On *Nicotiana tabacum* — P : 73

(27) *C. oryzae*
On *Oryza sativa* — A : 92

(28) *C. personata* (Berk. & Curt.) Ell. & Everh.
On *Arachis hypogea* — P : 73

(29) *C. pseudarthriae* Petch
On *Pseudarthria viscida* — P : 73

(30) *C. ricinella* Sacc. & Berl.
On *Ricinus communis* — P : 73

(31) *C. rosicola* Pass.
On *Rosa* — P : 73

(32) *C. sesami* Zimm.
On *Sesamum indicum* — P : 73

(33) *C. solani* Thum.
On *Solanum nigrum* P : 73

(34) *C. subsessilis* Syd.
On *Melia azedarach* P : 73

(35) *C. ternateae* Petch
On *Clitoria ternatea* P : 73

(36) *C. theae* Van Breda.
On *Camellia sinensis* P : 73

(37) *C. tiglii* P. Henn.
On *Croton tiglium* P : 73

(38) *C. viticota* (Ces.) Sacc.
On *Vitis vinifera* P : 73

(40) *C. zizyphi* Petch
On *Zizyphus oenoplia* P : 73

182. *Cladosporium* Link ex Fr. (Fig. 138 a—b)

Hyphae creeping. on the surface of the substrate; conidiophores dark, almost erect, branched variously, clustered or single, olive coloured. Conidia dark, at first one-celled then usually with a cross wall, shape variable, terminal and then pressed to a side.

Saprophytic on plant material or parasitic on higher plants and then forming velvety olive tufts, or cloud like patches on leaves.

50 species. Cosmopolitan. *C. fulvum* Co oke (perfect state in *Fulvia fulva*) causes 'leaf mould of tomato', where it attacks the leaves irrespective of their age, flowers and fruits. On leaves symptoms first appear in the form of spots, and later wilt, change to dark-brown colour and die young. Small fruits when attacked, drop prematurely, mature fruits rot at the stem-end.

9 species recorded in Sri Lanka.

(1) *C. apicale* B. & Br.
On leaves of *Cycas* sp. P : 73

(2) *C. calamigena* B. & Br. P : 73

(3) *C. compactiusculum* Sacc. & Syd.
On *Sterculia foetida* & *Terminalia* sp. P : 73

(4) *C. congestum* Berk.
On leaves of *Litsea* sp. P : 74

(5) *C. fuligineum* Bon.
On *Tricholoma erassum* P : 74

(6) *C. fulvum* Cooke
On *Lycopersicon esculentum* P : 74

(7) *C. herbarum* Fr. var *torulosum* B. & Br.
On leaves of *Anamirta*
fruits of *Sorghum vulgare*, *Hypericum* sp. *Citrus* sp. P : 74

(8) *C. myakei* Sacc. & Trott.
On *oryza sativa* P : 74

(9) *C. superficiale* Petch
leaves of *Cinnamomum ovalifolium* P : 74

183. *Coniosporium* Link ex Fr. (Fig. 139 a-b)

Conidiophores short, scarcely distinguishable from the hyphal cells; conidia dark, 1 celled, ovoid, mostly saprophytic.

2 or 3 species. Europe.

1 species recorded in Sri Lanka.

(1) *C. tetrantherae* (Thüm.) Sacc.
On *Litsea gardneri* P : 74

184. *Coniothecium* Corda (Fig. 140 a-c)

Conidiophores short or none; conidia dark, muriform, many-celled irregular, 30 species. Cosmopolitan.

1 species recorded in Sri Lanka.

(1) *C. chomatosporum* Corda
On apple P : 74

185. *Cordana* Preuss ex Sacc. (Fig. 141 a-c)

Mycelium dark; conidiophores dark, upright, slender, simple, bearing a head of conidia; conidia dark, 2-celled, oblong to broadly, ellipsoid; mostly saprophytic.

2 species. Europe and Tropics. *C. musae* (Zimm.) Höhnel causes 'leaf blotch of banana'. Symptoms are small, oval spots and later oval patches, and finally long strips of diseased dead tissue.

1 species recorded in Sri Lanka.

(1) *C. musae* (Zimm.) Höhnel.
On *Musa paradisiaca* P : 74

186. *Curvularia* Boedijn (Fig. 142 a-c)

Mycelium subhyaline or brown; conidiophores brown, erect, simple, septate; conidia spirally arranged or in clusters, ellipsoid or cylindrical, dark, 3-5 celled, typically bent or curved with 1 or 2 central cells broader and darker than the terminal cells. Parasitic or saprophytic.

15 species, widespread. *C. lunata* (Wakker) Boedijn is common on crop plants; especially Tropical. (The imperfect state of *Cochliobolus lunatus*).

3 species recorded in Sri Lanka.

(1) *C. fallax* Boedijn on paddy seeds — unpublished data, Div. of Pl. Path., C.A.R.I. Gannoruwa.

(2) *C. lunata* (Wakker) Boedijn
On *Sorghum vulgare* — P : 74

(3) *C. senegalensis* (Speg.) C. V. Subram.
On Pumpkin seeds — unpublished data, Div. of Pl. Path., C.A.R.I. Gannoruwa.

187. *Fusicladium* Bon. (Fig. 143 a)

Mycelium subcuticular on the host forming somewhat of a stroma which bears upright conidiophores, dark, 1-celled, short denticulate with conidial scars, young conidia produced successively as pushed out ends of new growing tips; conidia dark, ellipsoid to pyriform, typically 2-celled, although 1-celled conidia may predominate; parasitic on higher plants. Some species are conidial stages of *Venturia* (See *Venturia*).

40 species, widespread.

1 species recorded in Sri Lanka.

(1) *F. pongamiae* Syd.
On *Pongamia glabra* — P : 74

188. *Helminthosporium* Link ex Fr. (Fig. 144 a-d)

Many species are best known as parasites of cereals and grasses. A good number grow as saprophytes on plant debris. Mycelium light to dark in culture, extensive; conidiophores short or long, brown to black, septate, simple or sparingly branched, arising in groups, more or less irregular or bent, bearing conidia successively on new growing tips, geniculate at points below the conidia; conidia terminal or lateral on the geniculations, dark, typically containing more than 3 cells, with the end cells lighter coloured, cylindrical or ellipsoid, sometimes slightly curved or bent, ends rounded.

175 species. Cosmopolitan. Shoemaker restricts *Helminthosporium* to lignicolous species, and classifies certain grammicolous species in *Drechslera* and *Bipolaris*. Among the important pathogens are *H. oryzae* Van Breda causing rice brown spot (see *Cochliobolus miyabeanus*). *H. incurvatum* Bernard., causing brown spot disease of coconut resulting in yellowing and browning of coconut leaflets; *H. sacchari* causing 'eye spot of sugarcane' which is a highly destructive leaf disease, resulting in reddish-brown water-soaked spots or runners which coalesce to give a fired appearance; *H. sigmoideum* (sclerotial stage of which is *Sclerotium oryzae*) causing 'stem rot' of rice resulting in rotting and discolouration of the base of the stem, and production of a large number of tillers from the base of the stem and from nodes above the soil;- *H. torulosum* which in association with other weak parasites is responsible for rotting of harvested ripening banana fruits, and for the 'black spot disease' on banana leaf (Wardlaw 1935).

11 species recorded in Sri Lanka.

(1) *H. albizziae* Petch
On leaves of *Albizzia lebbek* — P : 75

(2) *H. garciniae* Petch
On leaves of *Garcinia mangostana* — P : 75

Plate XXVII Figs. 139 — 145

139. *Coniosporium*

a — top view of conidiophores and conidia, enlarged
b — side view of conidiophores and conidia, enlarged

140. *Coniothecium chromatosporum*

a — stem of apple showing canker, reduced
b — conidiophore, enlarged
c — conidia, enlarged

141. *Cordana musae*

a — conidiophore with conidia in heads, enlarged
b — tip of conidiophore, enlarged
c — conidia, enlarged

142. *Curvularia lunata*

a — conidiophore with a cluster of conidia, enlarged
b — tip of conidiophore x 400
c — conidia x 500

143. *Fusicladium*

a — conidiophores and conidia, enlarged

144. *Helminthosporium*

a — b *H. torulosum*
a — banana fruit affected by black tip disease, reduced
b — conidiophore and conidia, enlarged
c — d *H. oryzae*
c — conidiophore, enlarged
d — conidia, enlarged

145. *Heterosporium*

a — conidiophore, enlarged
b — conidia, enlarged

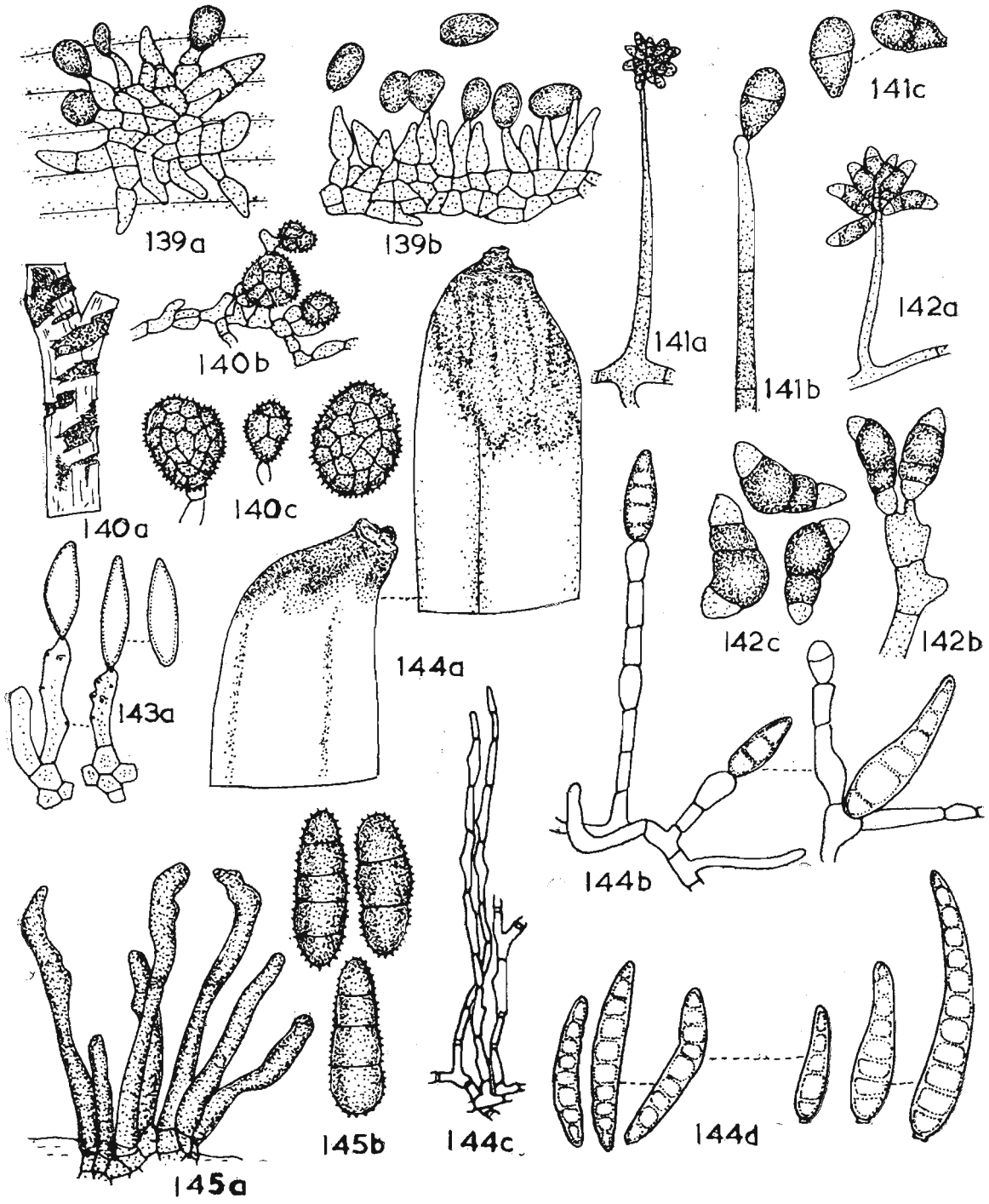

Plate XXVII Figs. 139 — 145

(3) *H. heveae* Petch
On leaves of *Hevea brasiliensis* — P : 75

(4) *H. incurvatum* Bernard.
On leaves of *Cocos nucifera* — P : 75

(5) *H. nodulosum* Sacc. (Perfect state in *Cochliobolus nodulosus*)
On *Eleusine coracana* and *E. indica* — P : 75

(6) *H. oryzae* Van Breda (perfect state in *Cochliobolus miyabeanus*)
On *Oryza sativa* — P : 75

(7) *H. ravenelii* Berk. & Curt.
On *Sporobolus indicus* — P : 75

(8) *H. sacchari*
On *Saccharum officinarum* — A : 228

(9) *H. sigmoideum* (perfect state in *Leptosphaeria salvinii*)
On *Oryza sativa* — A : 92

(10) *H. torulosum*
On fruits of *Musa paradisiaca* — A : 181
On leaves of banana — Wardlaw 1935;296

(11) *H. turcicum* Pass. (perfect state in *Trichometasphaeria turcica*)
On *Zea mays* — P : 75

189. *Heterosporium* Klotzsch ex Cooke (Fig. 145 a-b)

Conidiophores dark, simple, producing conidia as in *Helminthosporium;* conidia dark, typically 3 or more — celled, cylindrical, wall rough, echinulate to verrucose; parasitic, causing leaf spots, or saprophytic.

30 species. Cosmopolitan.

1 species recorded in Sri Lanka.

(1) *H. wickstroemiae* Petch
On leaves of *Wikstroemia viridiflora* — P : 75

190. *Lacellina* Sacc. (Fig. 146 a-d)

Setae erect, tall, brown, simple; conidiophores intermixed with setae, shorter, paler, simple; conidia 1-celled, globose or oval, mostly saprophytic.

3 species, tropical.

1 species recorded in Sri Lanka.

(1) *L. graminicola* (B. & Br.) Petch
On *Andropogon* — P : 76

191. *Macrosporium* Fr. (Fig. 147 a)

Usually forming blackish patches on living parts of plants; conidiophores clustered; conidia dark colour, muriform, many celled; often constricted at transverse septa.

Macrosporium Fr. is a nomen ambiguum (Ainsworth 1963)

1 species recorded in Sri Lanka.

(1) *M. macalpineanum* Sacc. & Syd.
On *Pelargonium* sp. cult — P : 76

192. *Monotospora* Sacc. (Fig. 148 a-b)

Mycelium dark; conidiophores dark, erect, slender, septate, simple bearing a conidium terminally, other conidia frequently attached laterally particularly in culture; conidia large black, 1-celled, ovoid to ellipsoid, mostly saprophytic.

5 species, temperate.

1 species recorded in Sri Lanka.

(1) *M. fusigera* B. & Br.
On a Palm — P : 76

193. *Nigrospora* Zimm. (Fig. 149 a-c)

Mycelium extensive and hyaline in culture; conidiophores short, cells somewhat inflated dark, simple or branched; conidia, black, 1-celled, globose to somewhat flattened, hyaline vesicle at the end of the conidio phore; parasitic on grasses or saprophytic.

N. oryzae (Berk. & Br.) Petch on maize and other hosts, widespread; perfect state of this is in *Khuskia oryzae* Hudson.

2 species recorded in Sri Lanka.

(1) *N. oryzae* (B. & Br.) Petch
= *Monotospora oryzae* B. & Br.
On *Oryza sativa* — P : 76

(2) *N. musae*
On banana leaf spots incited by *Cordana* — Wardlaw 1935

194. *Septonema* Corda (Fig. 150 a-b)

Conidiophores dark, simple or branched, tall or short, bearing conidia apically; conidia sub-hyaline to dark-brown, typically 3-to several — celled, cylindrical to fusoid, catenulate in simple or branched chains, produced acropetally; saprophytic or parasitic.

10 species, widespread.

1 species recorded in Sri Lanka.

(1) *S. olivaceonigrum* B. & Br.
On *Agave* — P : 78

195. *Thielaviopsis* Went (Fig. 151 a-b)

Mycelium white to grey in culture; conidiophores on short lateral branches of mycelium, sub-hyaline to dark, the terminal cell slightly broader at the base and tapering upward, producing spores endogenously; endoconidia hyaline, formed in chains or masses; chlamydospore formation frequent. Parasitic or saprophytic. Mostly imperfect stages of *Endoconidiophora*.

2 species, widespread. *T. paradoxa* (conidial or imperfect stage of *Ceratostomella paradoxa* Dade) causes 'stem bleeding disease' of arecanut, coconut and palmyrah, where the conspicuous symptom is the presence of reddish brown or rust coloured liquid which oozes through cracks in the stem, 'Base or Butt rot, of pineapple where the disease manifests itself as 'Base rot or Heart rot' of suckers, 'white spot' of leaves and fruit rot, and the 'pine apple disease' of sugar cane where the characteristic symptoms are a black central cylinder or 'pipe' which is readily seen when stalks are split, and an odour resembling that of fresh pineapples because of the presence of acetic ether.

1 species recorded in Sri Lanka.

(1) *T. paradoxa* (de Seynes) Höhnel
On *Cocos nucifera, Areca catehcu, Borassus flabbilifer, Ananas comosus* and *Saccharum officinarum* A : 64, 192

196. *Triposporium* Corda (Fig. 152 a-b)

Conidiophores dark, simple, septate, bearing a single conidium apically; conidia dark, with three septate arms radiating from a central cell; parasitic on leaves or saprophytic on plant material.

10 species, widespread.

1 species recorded in Sri Lanka.

(1) *T. gardneri* Berk. apud. B. & Br.
On living leaves of *Coffee arabica* P : 79

197. *Zygosporium* Mont. (Fig. 153 a-b)

Conidiophores erect, simple, brown at the base, apical cell hyaline or sub-hyaline; spore bearing structure single near base of conidiophore, consisting of stipe cell, a dark prophialide and sub-hyaline phialides; conidia 1-celled, hyaline, oval; mostly saprophytic.

8 species recorded in Sri Lanka.

(1) *Z. oscheoides* Mont.
On leaves of *Pandanus* and *Hevea* P : 79

198. *Actinostilbe* Petch

Fertile hyphae compacted into a cylindric synnema with a paraphysate disk at tip; conidia borne at the top, 2-celled, hyaline, oblong to fusoid.

1 species recorded in Sri Lanka.

(1) *A. vanillae* Petch
On stems of *Vanilla planifolia* P : 72

199. *Arthrobotryum* Ces. (Fig. 154 a-c)

Synnemata dark, cylindrical, with a globose sporulating head; conidia hyaline to dark, 3—4 celled, produced in slime; mostly saprophytic.

Plate XXVIII Figs. 146 — 157

146. *Lacellina graminicola*

a — habit, setae and conidiophores, enlarged
b — tip of setae, enlarged
c — tip of conidiophore, enlarged
d — conidia, enlarged

147. *Macrosporium*

a — conidiophores and conidia, enlarged

148. *Monotospora*

a — conidiophore and conidia x 400
b — tip of conidiophore, much enlarged

149. *Nigrospora*

a — *N. oryzae*, conidiophore and conidia x 400
b — c *N. musae* (on banana leaf)
b — conidiophore showing inflated tip and mature conidium x 400
c — young unpigmented conidia x 400

150. *Septonema*

a — tip of conidiophore with conidia x 400
b — conidia x 400

151. *Thielaviopsis paradoxa*

a — conidiophore with conidia x 400
b — chlamydospores x 500

152. *Triposporium*

a — conidiophores, enlarged
b — conidia, much enlarged

153. *Zygosporium oscheoides*

a — conidiophore with dark prophialide and sub-hyaline phialide, much enlarged
b — conidia, much enlarged

154. *Arthrobotryum*

a — synnema, enlarged
b — conidiophores, enlarged
c — conidia, enlarged

155. *Didymobotryum rigidum*

a — synnema, enlarged
b — conidiophore with conidia x 500

156. *Didymostilbe coffeae*

a — synnema x 50
b — head of synnema x 500
c — conidia x 600

157. *Podosporium*

a — synnema, enlarged
b — head showing conidiophores much enlarged
c — conidia, much enlarged

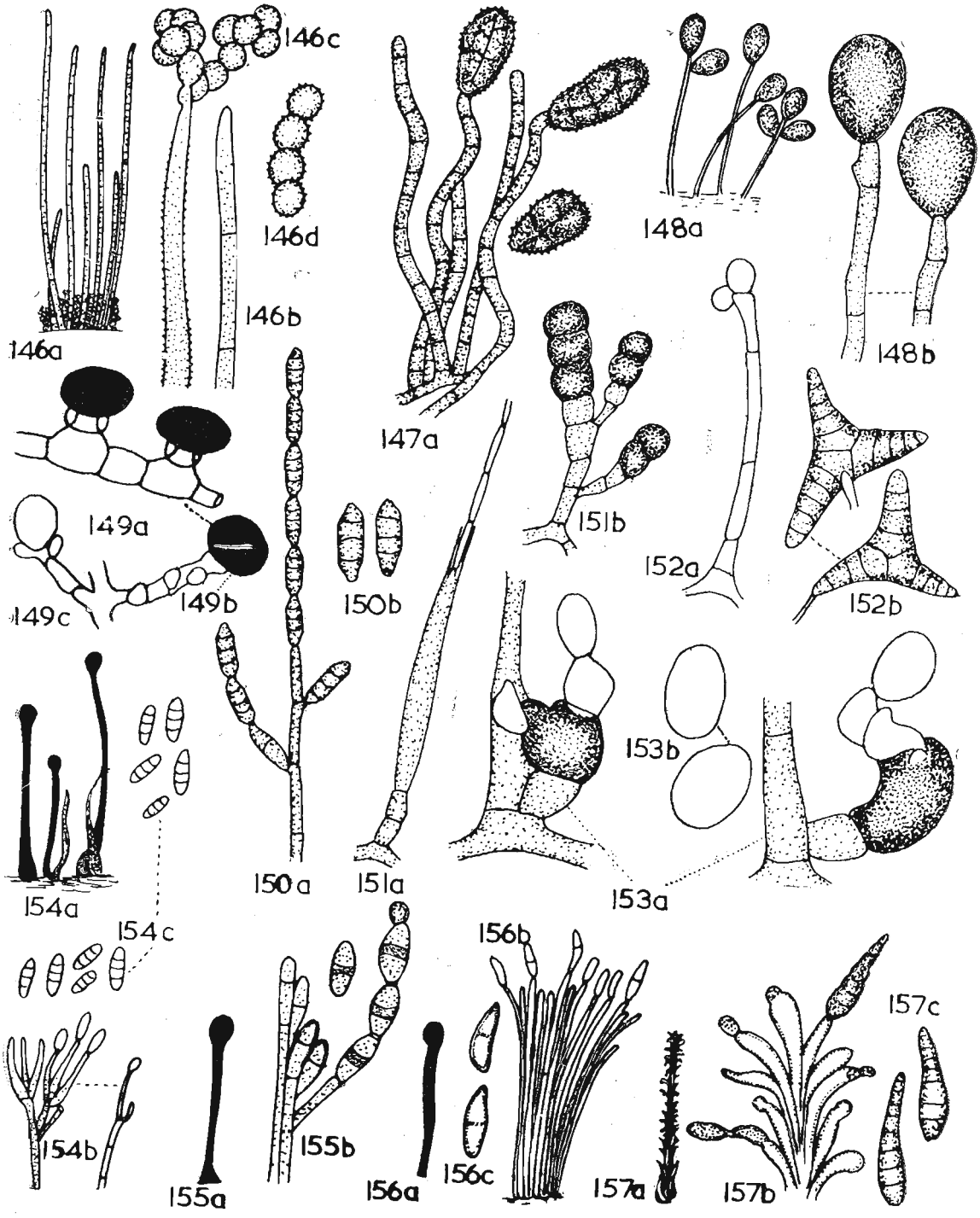

Plate XXVIII Figs. 146 — 157

3 species. Europe, Sri Lanka

2 species recorded in Sri Lanka.

(1) *A. glochidii* Petch
On leaves of *Glochidion coriaceum* P : 72

(2) *A. infundibuliforme* Petch
On leaves of *Cinnamomum ovalifolium* P : 72

200. *Didymobotryum* Sacc. (Fig. 155 a-b)

Synnemata dark, cylindrical; conidia 2-celled, dark, oblong to cylindric with a dark band across the middle.

5 spceies, N. Amer., Asia.

1 species recorded in Sri Lanka.

(1) *D. rigidum* (B. & Br.) Sacc.
On bamboo and *Oncosperma* P : 74

201. *Didymostilbe* P. Henn. (Fig. 156 a-c)

Synnemata light; stalk cylindrical, with an expanded ovoid or rounded spore bearing head; conidiophores hyaline, branched, short conidiophores produced abundantly in culture; conidia hyaline, 1-celled, usually becoming two-celled, contained in droplets of slime; ovoid to elongate mostly saprophytic.

3 species, widespread.

1 species recorded in Sri Lanka.

(1) *D. coffeae* P. Henn.
on twigs of *Camellia sinensis* P : 74

202. *Podosporium* Schw. (Fig. 157 a-c)

Synnemata stalked; stalk fibrous; conidia acropleurigenous, many celled, dark, oblong to cylindric.

10 species. Tropical.

1 species recorded in Sri Lanka.

(1) *P. sparsum* (B. & Br.) Petch
On *Pandanus odoratissimus* P : 77

203. *Stilbum* Tode ex Fr. (Fig. 158 a-b)

Synnemata cylindric, conidial part distinctly capitate; conidia covered with mucous, 1-celled hyaline to bright-coloured, globose to elliptic or oblong.

40 species, cosmopolitan.

3 species recorded in Sri Lanka.

(1) *S. candidulum* Penz. & Sacc.
On leaves of *Amomum* P : 78

(2) *S. durionis* Petch
On fruits of *Durio zibethinus* P : 78

(3) *S. nanum* Massee
On twigs of *Camellia sinensis* P : 78

204. *Aegerita* Pers. ex Fr. (Fig. 159 a—b)

Sporodochia somewhat spherical, somewhat coloured, superficial; conidia spherical, 1-celled.

10 species, widespread.

1 species recorded in Sri Lanka.

(1) *A. mellea* B. & Br.
On lichens P : 72

205. *Chaetostroma* Corda (Fig. 160 a—b)

Spore-bed black, bordered with black rigid hairs; conidia ovoid or sub-fusiform, rarely sub-globose. *Volutella* also has the spore bed surrounded by bristles but it is never black. *Vermicularia* has black bristles but a pycnidium is present.

10 species, widespread.

1 species recorded in Sri Lanka.

(1) *C. viride* Petch
On twigs of *Camellia sinensis* P : 73

206. *Epicoccum* Link ex Wallr. (Fig. 161 a—b)
= *Cerebella* Ces. (Ainsworth 1963)

Sporodochia dark, more or less cushion shaped, variable in size; conidiophores compact or loose, dark, rather short; conidia dark, 1-celled or several celled, globose; mostly saprophytic.

2 species, cosmopolitan. *E. andropogonis* (Ces.) Schol-Schwary (= *Cerebella andropogonis* Ces) frequently mistaken as Ustilaginales.

1 species recorded in Sri Lanka.

(1) *E. theobromae* Petch
On leaves of *Theobroma cacao* P : 74

6 more species recorded in Sri Lanka and described under the name *Cerebella* Ces as:

(2) *C. andropogonis* Ces.
On *Andropogon pertusus* P : 73

(3) *C. anthistiriae* Petch
On *Anthistiria imberbis* P : 73

(4) *C. cynodontis* Syd.
On *Cynodon dactylon* P : 73

(5) *C. inquinans* (B. & Br.) Petch
On *Paspalum scrobiculatum* P : 73

(6) *C. ischaemi* Petch
On *Ischaemum ciliare* P : 73

(7) *C. sorghi* Tracy & Earle
On *Sorghum vulgare* P : 73

207. *Exosporium* Link ex Wallr. (Fig. 162 a)

Stroma compact, convex or with the centre depressed; sporodochia erumpent, subglobose to convex; conidia acrogenous, dark, many celled, oblong to cylindric.

1 species recorded in Sri Lanka.

(1) *E. arecae* (B. & Br.) Petch
On leaves of *Areca catechu* P : 74

208. *Myrothecium* Tode ex Fr. (Fig. 163 a—c)

Sporodochia cushion like, light coloured to dark; conidiophores sub-hyaline to colored repeatedly branched, bearing conidia terminally; conidia sub-hyaline to dark, 1-celled ovoid to elongate, dry in mass; weakly parasitic or saprophytic.

6 species, cosmopolitan.

1 species recorded in Sri Lanka.

(1) *M. roridum* Fr.
On *Eleusine indica* P : 76

209. *Spegazzinia* Sacc. (Fig. 164 a — c)

Sporodochium small, dark; conidia of two kinds; (1) a 4-celled spiny spore, borne apically on a long slender conidiophore; (2) a 4-celled smooth spore borne on a short conidiophore; saprophytic on vegetable material; both conidiophore and conidia dark. The smooth spore and sporodochium may be absent in some species.

5 species, widespread.

2 species recorded in Sri Lanka.

(1) *S. meliolae* Zimm.
On *Meliola* & *Memecylon* P : 78

(2) *S. tessarthra* (Berk. & Curt.) Sacc.
On *Andropogon* P : 78

210. *Tubercularia* Tode ex Fr. (Fig. 165 a—c)

Sporodochia rather large, light to orange in colour, breaking out through the bark; conidiophores hyaline, elongate, repeatedly branched, (not verticillately) bearing conidia terminally; conidia hyaline, 1-celled, ovoid to elongate, in a dry mass on the surface of the sporodochium; mostly saprophytic.

Plate XXIX Figs. 158 — 166

158. *Stilbum nanum*

a — synnema x 50
b — conidiophore and conidia x 600

159. *Aegerita*

a — conidiophores, much enlarged
b — conidia, much enlarged

160. *Chaetostroma*

a — sporodochium, enlarged
b — conidiophores and conidia, enlarged

161. *Epicoccum*

a — sporodochium on wood x 1
b — conidiophores and conidia, much enlarged

162. *Exosporium*

a — conidiophores and conidia, much enlarged

163. *Myrothecium roridum*

a — sporodochium, enlarged
b — conidiophore and conidia, much enlarged
c — conidia, much enlarged

164. *Spegazzinia*

a — sporodochium, much enlarged
b — 4 celled spiny conidia, much enlarged
c — 4 celled smooth conidia, much enlarged

165. *Tubercularia vulgaris*

a — sporodochia on wood x 1
b — section through sporodochium, enlarged
c — conidiophore and conidia, much enlarged

166. *Tuberculina persicina*

a — section of a leaf showing two sporodochia and an aecium of rust, enlarged
b — conidiophore and conidia, enlarged
c — aeciospore of a rust, enlarged

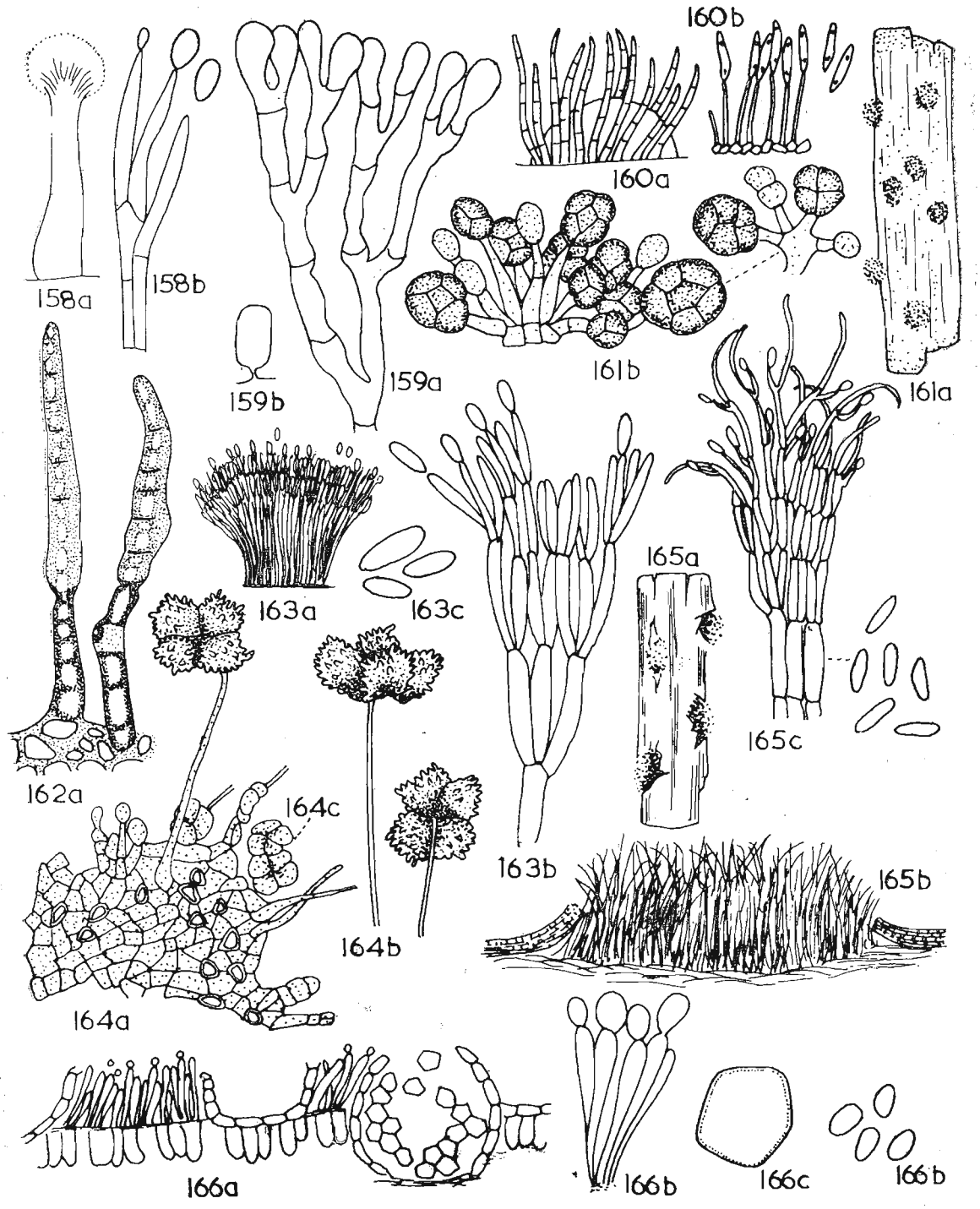

Plate XXIX Figs. 158 — 166

25 species, cosmopolitan.

5 species recorded in Sri Lanka.

(1) *T. cansjerae* Petch
On leaves of *Cansjera rheedii* P : 79

(2) *T. epimyces* Petch
On *Aegerita webberi* P : 79

(3) *T. hibisci* Petch
On leaves of *Hibiscus sabdariffa* P : 79

(4) *T. leguminicola* Petch
On pods of *Bauhinia* sp. P : 79

(5) *T. nigromaculans* Petch
On leaves of *Ficus—tsjakela* P : 79

211. *Tuberculina* Sacc. (Fig. 166 a—c)

Sporodochia small, breaking out in or near rust pustule; conidiophores hyaline, simple, non-septate, bearing single conidia terminally; conidia hyaline 1-celled, globose or ovoid to irregular; parasitic on rusts.

10 species, widespread.

2 species recorded in Sri Lanka.

(1) *T. persicina* (Ditm. ex Fr.) Sacc.
On (? a rust on) *Ipomoea biloba* P : 79

(2) *T. viridis* Petch
On *Puccinia* on *Ischaemum* P : 79

CLASS COELOMYCETES

Conidia are formed in various ways from conidiogenous cells lining a cavity which is initially enclosed by fungal tissue (pycnidia and eustromata) or a combination of fungal and host tissue (acervuli and pseudostromata). Fructifications when superficial or partly immersed may be subtended by vegetative hyphae, or by hyphae arranged in subicula, and anastomosing or radiating net works. Pycnidia are superficial or immersed, spherical, flattened or discoid, with a multicellular wall of isodiametric cells, pigmented, separate or aggregated, usually with an ostiole. Acervuli are immersed, separate or confluent, consisting of basal stroma; stromata may be uni— or multilocular, superficial or immersed and of various shapes.

More than 1100 generic names have been proposed in the Coelomycetes, of which approximately 400 — 500 are considered synonyms. Genera are world wide in distribution. Although they are most commonly reported from living or dead plant material and from soil, they are known from a wide variety of substrates. Many species are facultative parasites causing minor leaf, stem, and root lesions and cankers or galls, while others are saprophytic and weakly pathogenic, being associated with secondary damage such as is found in die backs and deteriorative conditions in shrubs and trees. A considerable number however are of economic importance as they cause serious agricultural and forestry diseases. Perfect states which have been correlated with coelomycetes belong to the sub-division Ascomycotina.

KEY TO THE ORDERS OF THE CLASS COELOMYCETES

Fructifications-acervuli	... MELANCONIALES	(P. 149)
Fructifications-pycnidia or stromata	... SPHAEROPSIDALES	(P. 134)

ORDER SPHAEROPSIDALES

This order consists of parasites or saprobes of plant material. Fructifications are superficial, semi-immersed or immersed, globose, discoid or hemispherical, eustromatic or pseudostromatic, unilocular, multilocular or convoluted, enclosing walls entirely formed of fungal pseudoparenchyma, forming conidia from the locular walls; dehiscing by a circular or longitudinal opening formed by disintegration of the upper walls.

KEY TO THE GENERA OF THE ORDER SPHAEROPSIDALES

1.	Pycnidia perithecium like, typically globose, ostiolate or astomous	... 2	
	Pycnidia not as above	... 25	
2.	Pycnidia brown to black, membranous to carbonaceous	... 3	
	Pycnidia bright coloured or hyaline, fleshy, sometimes gelatinous or waxy	... *Zythia*	**(234)**
3.	Conidia acicular to filiform	... *Septoria*	**(229)**
	Conidia not as above	... 4	
4.	Conidia 1 — celled	... 5	
	Conidia many — celled	... 18	
5.	Conidia hyaline	... 6	
	Conidia dark	... 17	
6.	Pycnidia with a subicle or stroma	... 7	
	Pycnidia without a subicle or stroma	... 10	
7.	Pycnidia with a subicle	... *Sirosphaera*	**(230)**
	Pycnidia with a stroma	... 8	
8.	Pycnidia single	... 9	
	Pycnidia confluent	... *Dothiorella*	**(219)**
9.	Conidia allantoid	... *Cytospora*	**(216)**
	Conidia globose or ovoid	... *Fusicoccum*	**(220)**
10.	Pycnidia rostrate or cylindric	... *Sphaeronaema*	
	Pycnidia glabrous	... 11	**(231)**
11.	Pycnidia hairy or setose	... *Pyrenochaete*	**(228)**
	Pycnidia glabrous	... 12	
12.	Pycnidia on fungi	... *Cicinnobolus*	**(215)**
	Pycnidia not on fungi	... 13	
13.	Parasitic principally on leaves	... *Phyllosticta*	**(227)**
	Parasitic principally on parts other than leaves	... 14	

14.	Conidia of two types, ovate and curved or bent	... *Phomopsis*	(226)
	Conidia of one type only	... 15	
15.	Conidia small	... *Phoma*	(225)
	Conidia large, over 15 microns long	... 16	
16.	Sclerotial stage frequent	... *Macrophomina*	(224)
	Sclerotial stage not associated	... *Macrophoma*	(223)
17.	Pycnidia with a subicle	... *Capnodiastrum*	(214)
	Pycnidia without a subicle	... *Sphaeropsis*	(232)
18.	Conidia 1-septate	... 19	
	Conidia more than 1-septate	... 23	
19.	Conidia hyaline	... 20	
	Conidia dark	... 22	
20.	Conidia filiform or curved	... *Hendersonina*	(222)
	Conidia not as above	... 21	
21.	Pycnidia maculicole	... *Ascochyta*	(212)
	Pycnidia not maculicole	... *Darluca*	(217)
22.	Pycnidia single, conidia ellipsoid to ovoid	... *Diplodia*	(218)
	Pycnidia stromatic, confluent; conidia ovoid to elongate	... *Botryodiplodia*	(213)
23.	Conidia hyaline	... 24	
	Conidia dark	... *Hendersonia*	(221)
24.	Conidia cylindrical to elliptical	... *Stagonospora*	(233)
	Conidia filiform to curved	... *Hendersonina*	(222)
25.	Pycnidia dimidiate and usually more or less distinctly radiate, rarely hysteroid	... 26	
	Pycnidia apothecium like or hysteroid, cupulate or discoid	... 30	
26.	Conidia acicular to filiform	... *Leptostromella*	(237)
	Conidia not acicular to filiform	... 26	
27.	Conidia 1-celled	... 27	
	Conidia many celled	... *Peltistromella*	(239)
28.	Pycnidia with a subicle	... *Asterostomella*	(236)
	Pycnidia without a subicle	... 28	
29.	Pycnidia innate	... *Leptothyrium*	(238)
	Pycnidia superficial	... *Actinothecium*	(235)
30.	Conidia filiform	... *Phlyctaena*	(241)
	Conidia globose — oblong	... *Phaeodiscula*	(240)

212. *Ascochyta* Lib. (Fig. 167 a—g)

Pycnidia separate, glabrous, dark, globose, immersed in the host tissue, finally erumpent, ostiolate; conidia hyaline, 2 — celled, ovoid to oblong. 400 species, cosmopolitan. Many species cause leaf spots. *A. caricae*, along with several other fungi incite anthracnose or fruit rot of papaw where the symptoms are dark sunken spots on the ripening fruit.

Plate XXX Figs. 167 — 169

167. *Ascochyta* a — e *A. pisi*

a — infected pod of pea, reduced
b — infected leaf-let of pea x 1
c — section, pod, showing pycnidium x 400
d — conidiophore and conidia x 1000
e — conidia x 1000
f — g *Ascochyta* sp.
f — section of banana leaf showing entire and section pycnidia x 400
g — conidia x 400

168. *Botryodiplodia*

a — *B. theobromae* section through diseased skin of banana, enlarged
b — d *B. acerina*
b — section pycnidia x 400
c — conidiophores x 500
d — mature and immature conidia x 500

169. *Cicinnobolus cessati*

a — hyphae and conidiophore of *Erysiphe* some bearing pycnidia of the parasite, enlarged
b — pycnidium, enlarged
c — conidia, enlarged

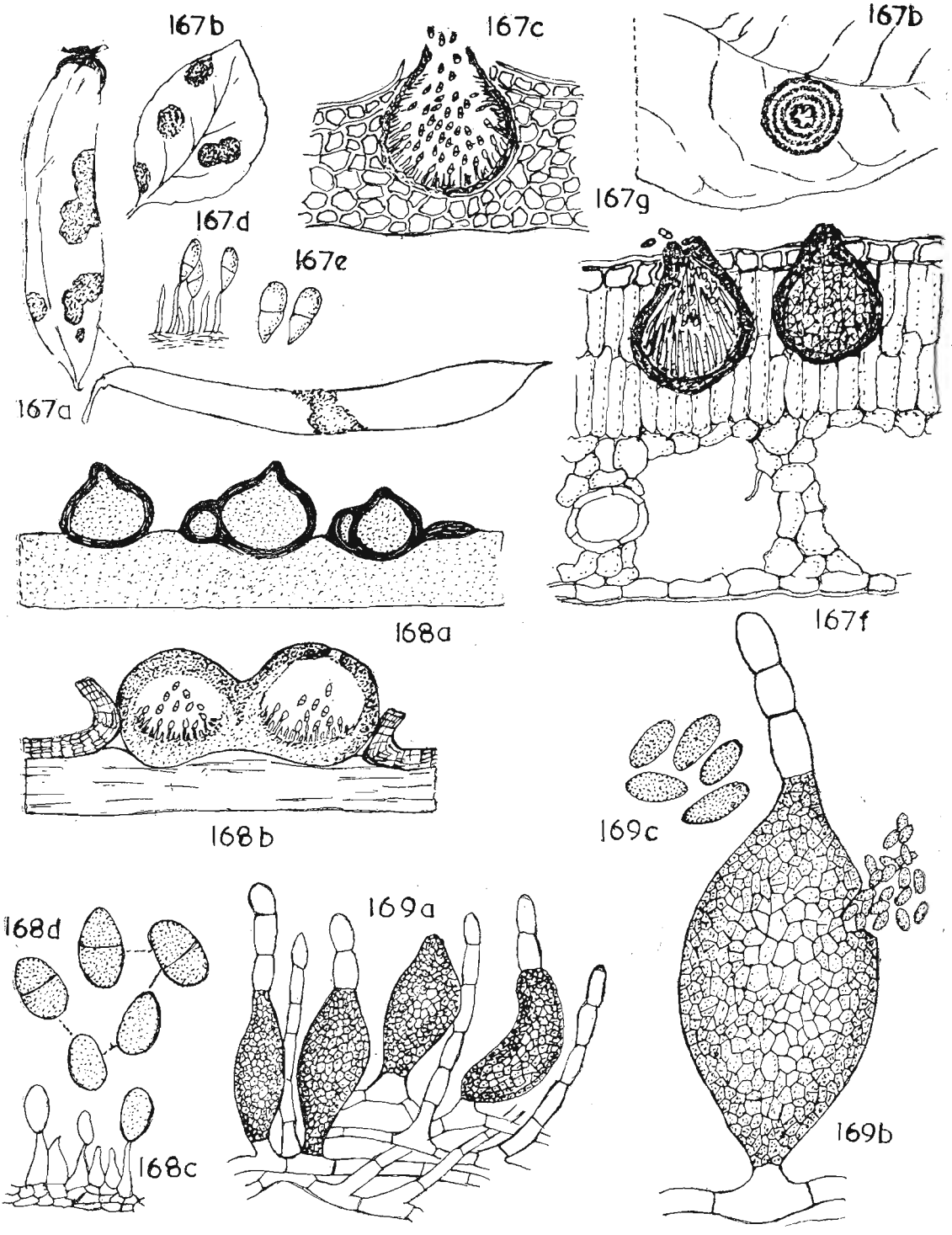

Plate XXX Figs. 167 — 169

8 Species recorded in Sri Lanka

(1) A. *cyphomandrae* Petch
On *Cyphomandra betacea* — P : 68

(2) *A. caricae*
On *Carica papaya* fruits — P : 190

(3) *A. heveae* Petch
On leaves of *Hevea brasiliensis* — P : 68

(4) *A. lobeliae* Petch
On leaves of *Lobelia nicotianifolia* — P : 68

(5) *A. Pisi* Lib.
On *Pisum sativum* — P : 68

(6) *A. rosicola* Sacc.
On *Rosa* sp. cult. — P : 68

(7) *A. theae* Hara.
On *Camellia sinensis* — P : 68

(8) Species found on leaves of *Musa paradisiaca*. This has not been identified as yet.

213. *Botryodiplodia* Sacc. (Fig. 168 a—d)

Pycnidia stromatic, black, ostiolate, erumpent, confluent; conidiophores simple, short; conidia dark, 2—celled at maturity, ovoid to elongate; parasitic or saprophytic on twigs.

This genus may be confused with *Macrophoma* or *Dothiorella*, if only immature conidia are present.

17 species, cosmopolitan. *B. theobromae* Pat. (Syn. *Diplodia natalensis* Pole. Evans) is a common pathogen on various cultivated plants. On tea (*Camellia sinensis*) it causes a root disease which only comes into prominence after pruning. Shoots die off, leaves become mottled with yellow and then turn black.

On rubber (*Hevea brasiliensis*) it causes 'die back' where young shoots and twigs are killed. On banana (*Musa paradisiaca*) it causes a rot of the main stalk of the bunch and rot the fruits. On fruits the disease is described as black finger tip disease resulting in a premature yellowing of fruit and soft watery rot with a peculiar odour. It also causes a rot of many harvested ripening fruits in storage.

3 species recorded in Sri Lanka.

(1) *B. diospyri* (B. & Br.) Petch
On fruits of *Diospyros embryopteris* — P : 68

(2) *B. sorghi* P. Henn.
On fruits of *Sorghum vulgare* — P : 68

(3) *B. theobromae* Pat.
On many fruits — P : 68
On *Camellia sinensis*, *Hevea brasiliensis* — Diseases of the Tea bush- Petch 1923. P : 149

214. *Capnodiastrum Speg.*

Pycnidia black on a dark subicle; conidiophores short; conidia dark 1-celled, ovate, globose or elliptic.

5 species especially South American.

1 species recorded in Sri Lanka.

(1) *C. congestum* Petch
On leaves of *Santalum album* P : 68

215. *Cicinnobolus* Ehrenb. (Fib. 169 a—c)

Pycnidia dark, rounded, clavate or fusoid, developing inside conidiophores of powdery mildew fungi (Erysiphales) without ostiole; conidia dark, 1-celled, ovoid — oblong; parasitic on Erysiphales.

5 species, widespread.

1 species recorded in Sri Lanka.

(1) *C. quercinus* Syd.
On *Oidium quercinum*
On *Quercus pedunculata* P : 68

216. *Cytospora* Ehrenb. ex Fr. (Fig. 170 a—c)

Pycnidia within, superficial or erumpent, tuberculate, globose stroma; cavities irregular, incompletely separate; conidiophores slender; conidia hyaline, 1-celled, elongate — curved (allantoid) discharged as cirrhi or beads. Parasitic or saprophytic on wood. Mostly imperfect stages of *Valsa*. 100 species, cosmopolitan. *C. sacchari* Butler is a weak parasite and is the cause of 'Sheath rot' of sugar cane which results in red to black discolouration of leaf sheaths at the soil level.

3 species recorded in Sri Lanka.

(1) *C. palmicola* Berk. & Curt.
On fruits of *Cocos nucifera* P : 69

(2) *C. theae* Petch
On stems of *Camellia sinensis* P : 69

(3) *C. sacchari* Butler
On leaf sheaths of *Saccharum officinarum* A : 225, 228

217. *Darluca* Cast. (Fig. 171 a—c)

Pycnidia black, spherical, ostiolate, superficial located in rust sori; conidia hyaline 2-celled, ellipsoid to fusoid to oblong, tipped with mucous or bristle — like appendages at both ends; parasitic on rust fungi, chiefly in uredia. *D. filum* (Biv. Bern. ex Fr.) Cast. (Perfect state *Eudarluca caricis*) cosmopolitan on rusts + 3 or 4 uncertain species.

1 species recorded in Sri Lanka.

(1) *D. filum* (Biv. Bern. ex Fr.) Cast.
On *uredo* on *Panicum repens* P : 69

218. *Diplodia* Fr. (Fig. 172 a—c)

Pycnidia black, single, globose, immersed, erumpent, ostiolate; conidiophores slender, simple; conidia dark, 2-celled, ellipsoid to ovoid; parasitic or saprophytic. 24 species, cosmopolitan; some, on a great number of hosts are imperfect states of *Physalospora*, some of *Tryblidiella*. A species of *Diplodia* gain entry through wounds on seed coats of ground nut and cause 'seed rot' of the nut.

3 species recorded in Sri Lanka.

(1) *D. arachidis* Petch
On stems of *Arachis hypogea* — P : 69

(2) *D. radula* B. & Br.
On Musaceae — P : 69

(3) *D.* species found on seeds of ground nut. This has not been identified as yet. — A : 121

219. *Dothiorella* Sacc. (Fig. 173 a—d)

Pycnidia dark, globose, grouped in a well developed stroma; stroma subcortical, breaking out; conidiophores simple, short; conidia hyaline.

1-celled, ovoid to broadly ellipsoid, parasitic or saprophytic.

20 species, widespread.

1 species recorded in Sri Lanka.

(1) *D. anonae* Petch
On twigs of *Anona cherimolia* — P : 69

220. *Fusicoccum* Corda (Fig. 174 a—c)

Pycnidia in spherical or flattened, sub-epidermal, erumpent, dark stroma, one to several per stroma, opening separately, or with a common pore; conidiophores simple, short; conidia hyaline, 1-celled, fusoid; parasitic or saprophytic.

50 species, widespread.

1 species recorded in Sri Lanka.

(1) *F. microspermum* Har. & Karst.
On *Terminalia* — P : 69

221. *Hendersonia* Sacc. (Fig. 175 a—c)

Pycnidia dark, separate, globose, ostiolate, immersed, usually erumpent; conidia dark, several celled, elongate to fusoid; parasitic or saprophytic. 250 species, cosmopolitan (*Sporocadus* Corda is an earlier name for *Hendersonia* Sacc.)

6 species recorded in Sri Lanka.

(1) *H. confluens* Petch
On stems of *Erythrina lithosperma* — P : 69

Plate XXXI Figs. 170 – 176

170. *Cytospora*

a – pycnidium immersed in the stroma, enlarged
b – conidiophore and conidia, enlarged
c – conidia, enlarged

171. *Darluca filum*

a – habit of pycnidium in uredia x 5
b – section through uredium of rust showing pycnidium x 400
c – conidia x 100

172. *Diplodia*

a – pycnidium immersed in the plant tissue x 400
b – conidiophore much enlarged
c – conidia, much enlarged

173. *Dothiorella*

a – habit of pycnidia and stroma x 1
b – section through stroma x 400
c – conidiophores x 1000;
d – conidia x 1000

174. *Fusicoccum*

a – section, stroma and pycnidium, enlarged
b – conidiophore and conidia, much enlarged
c – conidia, much enlarged

175. *Hendersonia*

a – pycnidium x 400
b – conidiophore and conidia x 1000
c – conidia enlarged

176. *Macrophoma*

a – c *M. musae*
a – banana fruit with black spot disease, reduced
b – section through pycnidium, enlarged
c – conidia, enlarged
d – e *M. theicola*
d – branch canker on red wood of tea, reduced
e – branch canker at the base of the stem of tea, reduced

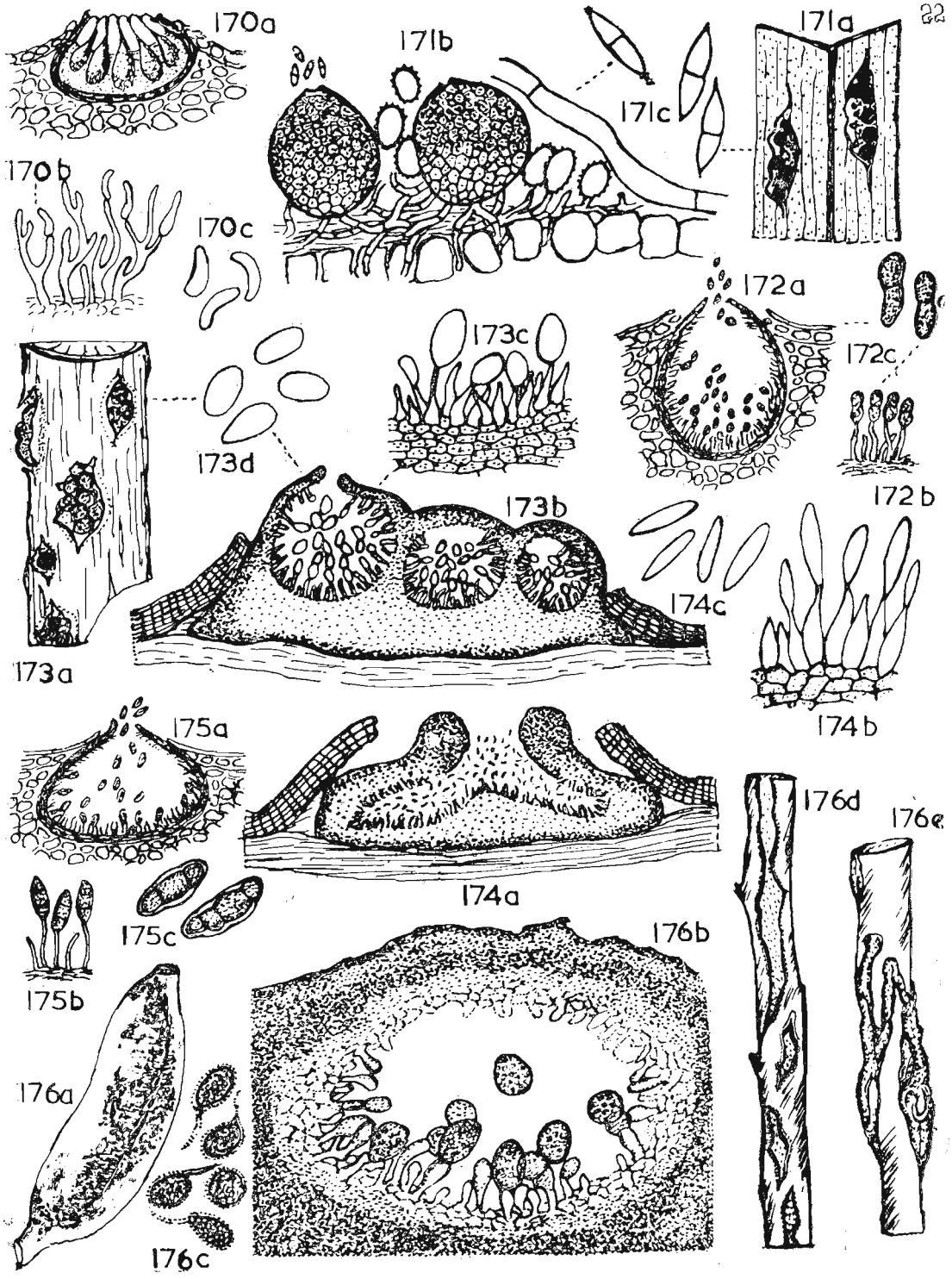

Plate XXXI Figs. 170 — 176

(2) *H. heveae* Petch
On *Hevea brasiliensis* P : 69

(3) *H. macrospora* Petch
On branches of *Camellia sinensis* P : 69

(4) *H. obesa* Petch
On leaves of *Erythrina velutina* P : 69

(5) *H. rosicola* Petch
On *Rosa* sp. cult. P : 69

(6) *H. symploci* B. & Br.
On *Symplocos obtusa* P : 69

222. *Hendersonina* Butler

Pycnidia immersed in a stroma; conidiophores short; conidia acrogenous elliptical to elongate, 1-celled or 2-celled, hyaline.

1 species recorded. India and Sri Lanka.

(1) *H. sacchari* Butler
On *Saccharum officianarum* P : 69

223. *Macrophoma* (Sacc.) Berl. & Vogl. (Fig. 176 a—e)

Pycnidia dark, ostiolate, globose to flask shaped, erumpent; conidiophores simple, short or elongate; conidia hyaline, 1-celled, over 15 microns long, ovate to broadly ellipsoid; parasitic.

In culture, species produce a fair amount of floccose aerial mycelium, white at first then darkening with pycnidia forming slowly, and beset in the light.

M. thiecola Petch (perfect state is *Physalospora neglecta*) causes the commonest stem disease of tea grown at low elevations where the symptoms are sunken dark patches on twigs and branches. It causes branch canker or kills the young shoots or may in acute cases kill the entire bush. *M. musae* Cooke (Berl. & Vogl.) causes the 'Freckle' or Black spot" disease of banana, where, on leaves and fruits numerous minute greyish or brown to dark brown raised spots with black dots in the centre appear. *M. theae* Speschnew occurs chiefly on the underside of the tea leaves where it causes greyish brown spots.

4 species recorded in Sri Lanka.

(1) *M. mantegazziana* (Penz.) Berl. & Vogl.
On leaves of *Citrus* P : 69

(2) *M. musae* (Cooke) Berl. & Vogl.
On fruits of *Musa paradisiacum* P : 70

(3) *M. theae* Speschnew
on leaves of *Camellia sinensis* P : 70

(4) *M. theicola* Petch
On stems of *Camellia sinensis* P : 70

224. *Macrophomina* Petrak (Fig. 177 a—e)

Pycnidia and sclerotia are commonly mixed, forming beneath the surface of the host; pycnidia are borne without a stroma; structure of pycnidia, conidiophore and conidia resemble those of Macrophoma. Fungus is a highly variable, and non pycnidial strains are common. Since the pathogen is commonly destructive without production of spores, it has been placed by some investigators in the class Agonomycetes. *M. phaseolina* (syn. *M. phaseoli* (Maub) Ashby, *Rhizoctonia bataticola*, *Sclerotium bataticola*) is an important root-parasite of *Phaseolus* in warmer regions. The disease is referred to as 'stem blight' where black sunken cankers may appear just below the cotyledonary node at the time of emergence. Such lesions extend up the stem and kill the growing point. If the disease advances slowly, leaf stunting and yellowing may follow. Black sclerotial masses may appear in the lesion.

1 species recorded in Sri Lanka.

(1) *M. phaseoli* (Maubl.)
On *Phaseolus* and on *Helianthus* P : 70
as *Rhizoctonia bataticola* Taubeuh & But.
on more than 50 hosts P : 77

225. *Phoma* Sacc. (Fig. 178 a—c)
= *Aposphaeria* Berk. (Ainsworth 1963)

Pycnidia more or less flask shaped, sometimes irregular with short necks, dark brown, fairly thin walled, and easily crushed, ostiolate, immersed in host tissue, erumpent with a short beak piercing the epidermis; conidiophores short or obsolete; conidia small, 1-celled hyaline, ovate to elongate; parasitic principally on plant parts other than leaves, typically on stems; usually not in necrotic spots. 200 species, cosmopolitan.

A number are without doubt plurivorous, and a number are states of other fungi. *P. betae* (Oudem.) Frank causes 'black leg of beet' which is a seedling disease, resulting in rot of root and damping off. *P. lingam* (Tode ex Fr.) Desm. causes dry rot of turnips and canker of crucifers. *P. theicola* Petch causes a leaf disease of tea differing in several respects from the common grey and brown blights. Spots appear between the lateral veins usually several on either side of the midrib, generally uniformly bright redbrown in colour.

12 species recorded in Sri Lanka.

(1) *P. aterrima* Petch
On fruits of *Hevea brasiliensis* P : 70

(2) *P. barringtoniae* (B. & Br.) Cooke and Massee
On *Barringtonia speciosa* P : 70

(3) *P. camelliae* Cooke
On leaves of *Camellia sinensis* P : 70

(4) *P. cocoicola* Petch
On leaves of *Cocos nucifera* P : 70

(5) *P. durionis* Petch
On fruits of *Durio zibethinus* P : 70,

(6) *P. glumarum* Ell. & Tracy.
On *Oryza sativa* P : 70

(7) *P. heveae* Petch
On branches of *Hevea brasiliensis* — P : 70

(8) *P. insidiosa* Tassi.
On fruits of *Sorghum vulgare* — P : 70

(9) *P. justiciae* Petch
On leaves of *Justicia betonica* — P : 70

(10) *P. murrayae* Petch
On leaves of *Murraya koenigii* — P : 70

(11) *P. orchidearum* Ces.
On leaves of orchid — P : 70

(12) *P. theicola* Petch
On leaves of *Camellia sinensis* — P : 70

One more species recorded in Sri Lanka and described under the genus *Aposphaeria* Berk. as:

(13) *A. heveae* Petch
On cortex of exposed lateral roots of *Hevea brasiliensis* — P : 67

226. *Phomopsis* Sacc. (Fig. 179 a -c)

Pycnidia separate without a stroma, dark, carbonaceous, membranous or nearly globose immersed, erumpent; conidiophores simple; conidia hyaline, 1-celled, of two types, ovoid to fusoid (alpha or A) conidia and filiform, curved or bent (beta or B) conidia; parasitic, causing spots on various plant parts. Imperfect states of *Diaporthe*.

100 species, cosmopolitan. *Phomopsis* species causes 'anthracnose' or 'Fruit rot' of many fruits including papaw and mango, where sunken brown spots appear on fruits approaching maturity, sometimes rotting the entire fruit and cause heavy wastage of ripening fruits. *P. vexans* causes 'Phomopsis blight', a common disease of brinjal affecting seedlings, leaves and fruits. On seedlings, fungus results in a collar rot or stem canker at the soil level, on leaves it produces grey spots, frequently causing death of the leaves, on fruits small sunken purple spots, which may merge until the entire fruit is rotten.

7 species recorded in Sri Lanka.

(1) *P. cocoes* Petch
On decaying fruits of *Cocos nucifera* — P : 71

(2) *P. lobeliae* Petch
On *Lobelia nicotianifolia* — P : 71

(3) *P. phaseoli* Petch
On *Glycine max* — P : 71

(4) *P. tersa* (Sacc.) Sutton
On leaves of *Passiflora* — unpublished data, Div. of Path' C.A.R.I. Gannoruwa

(5) *P. theae* Petch
On twigs of *Camellia sinensis* — P : 71

(6) *P. vexans*
On *Solanum melongena* — A : 149', 150

7th species found on ripe fruits of papaw and mango. This has not been identified as yet.

Plate XXXII Figs. 177 — 183

177. *Macrophomina phaseolina*

a — potato tuber and sprouts infected with black scurf, reduced
b — intracellular mycelium x 400
c — sclerotia x 50
d — pycnidia x 400
e — conidia x 400

178. *Phoma*

a — pycnidia from culture x 400
b — section host tissue showing pycnidia x 400
c — conidia x 800

179. *Phomopsis*

a — pycnidium immersed in the tissue x 400
b — beta conidia and conidiophore, enlarged
c — alpha conidia and conidiophore, enlarged

180. *Phyllosticta*

a — diseased leaf x 1
b — section leaf showing pycnidia x 400
c — conidiophore, much enlarged
d — conidia, much enlarged

181. *Pyrenochaeta*

a — group of pycnidia x 5
b — pycnidia x 600
c — conidiophores, enlarged
d — conidia, enlarged

182. *Septoria lycopersici*

a — diseased leaf x 1
b — leaf spot x 5
c — pycnidia in tissue x 400
d — conidia x 400

183. *Sphaeronema*

a — habit pycnidia x 5
b — section pycnidium, enlarged
c — conidiophores and sterile hyphae, much enlarged
d — conidia, much enlarged

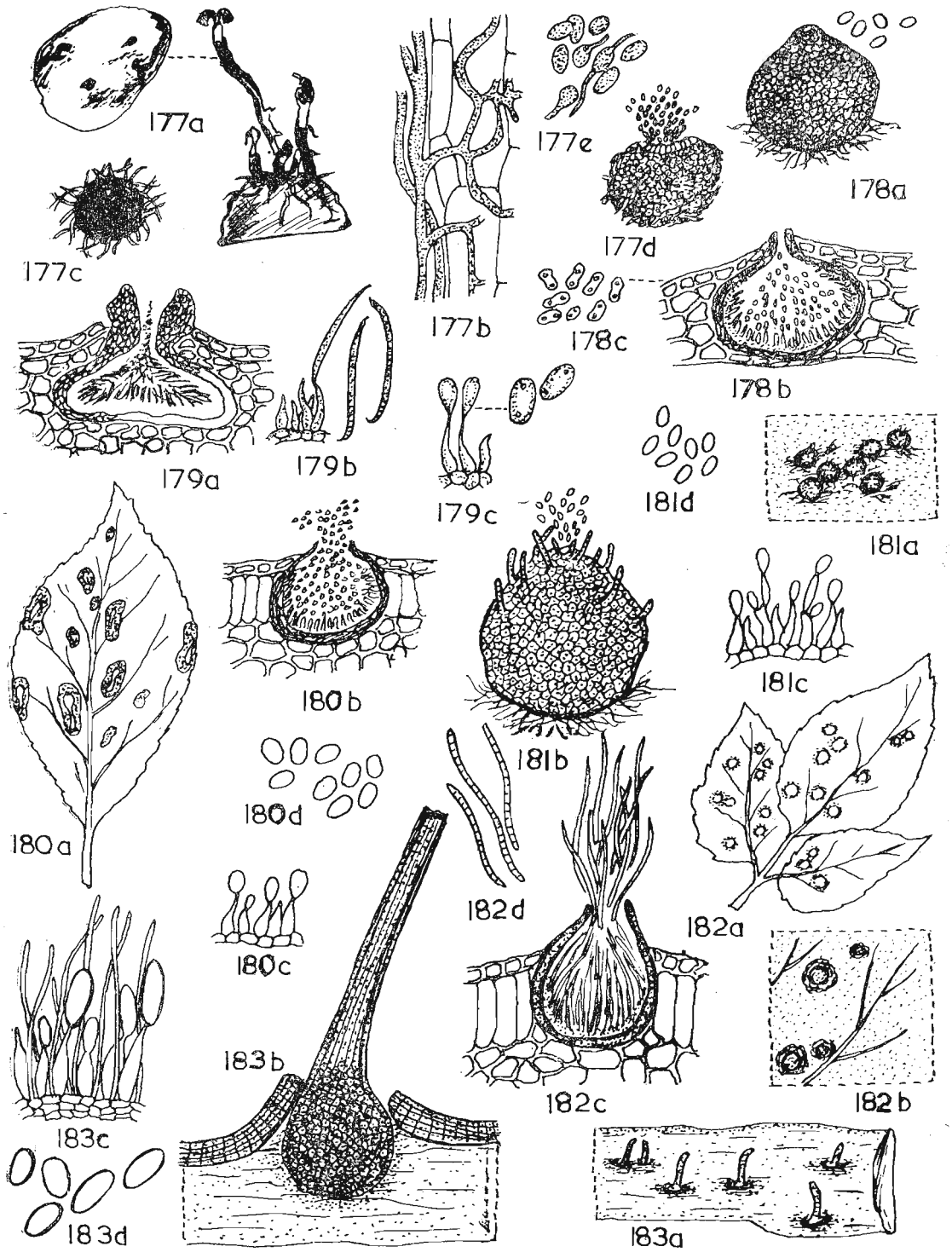

Plate XXXII Figs. 177 — 183

227. *Phyllosticta* Pers. ex Desm. (Fig. 180 a—d)

Pycnidia separate without a stroma, dark, ostiolate, lenticular to globose, immersed in the discoloured areas of the host tissue, erumpent or with a short beak piercing the epidermis; condiophores short or obsolete; conidia small, 1-celled, hyaline, ovate to elongate; parasitic producing spots principally on leaves, but as a rule the injury caused is too slight to be called a disease.

19 species recorded in Sri Lanka.

(1) *P. antirrhini* Syd.
On *Antirrhinum majus* P : 71

(2) *P. caricae-papayae* Allesch.
On *Carica papaya* P : 71

(3) *P. crotalariae* Sacc.
On *Crotalaria striata* P : 71

(4) *P. disciformis* Penz.
On leaves of *Citrus* P : 71

(5) *P. erythrinae* Petch
On young branches of *Erythrina lithosperma* P : 71

(6) *P. heveae* Zimm.
On *Hevea brasiliensis* P : 71

(7) *P. linocierae* Thüm.
On *Linociera purpurea* P : 71

(8) *P. mayilae* Petch
On *Bauhinia* sp P : 71

(9) *P. physaleos* Sacc.
On *Physalis peruviana* P : 71

(10) *P. piperis* Tassi.
On *Piper betel* P : 71

(11) *P. ramicola* Petch
On green twigs of *Hevea brasiliensis* P : 71

(12) *P. resedae Petch*
On *Reseda odorata* P : 71

(13) *P. rottlerae* (B. & Br.) Petch
On *Mallotus albus* P : 71

(14) *P. sapotae* Sacc.
On *Achras sapota* (Sapodilla) P : 71

(15) *P. solitaria*
On *Malus pumilla* A : 213

(16) *P. theae* Speschnew.
On *Camellia sinensis* P : 71

(17) *P. theobromae* d'Alm. & Cam.
On *Theobroma cacao* P : 71

(18) *P. usteri* Speg.
On *Coffea robusta*

(19) *P. violae* Desm.
On *Viola odorata* P : 71

228. *Pyrenochaeta* de Not. (Fig. 181 a—d)

Pycnidia dark, ostiolate, nearly globose, erumpent with few simple bristles, especially near the ostiole; conidiophores simple or branched; conidia small, 1-celled, hyaline, ovate to elongate; parasitic or saprophytic.

50 species widespread.

1 species recorded in Sri Lanka.

(1) *P. nipponica* Hara
On leaves of *Oryza sativa* P : 71

229. *Septoria* Sacc. (Fig. 182 a—b)

Pycnidia dark, glabrous, maculicole (dwelling in spots), separate, globose, ostiolate erumpent; conidiophores short; conidia hyaline to sub-hyaline, acicular to filiform, typically 10:1 or more or continous when shorter, several-septate; parasitic, typically causing leaf spot.

100 species, cosmopolitan.

11 species recorded in Sri Lanka.

(1) *S. apil* Chester.
On *Apium graveolens* P : 71

(2) *S. arisaemae* Petch
On *Arisaema leschenaultii* P : 71

(3) *S. chrysanthemella*
On *Chrysanthemum* sp. A : 243

(4) *S. cocoes* Petch
On leaves of *Cocos nucifera* P : 71

(5) *S. dianthi* Desm.
On *Dianthus crayophyllus* P : 71

(6) *S. drummondii* Ell. & Everh.
On *Phlox drummondii* P : 71

(7) *S. graminum* Desm.
On *Poa annua* P : 71

(8) *S. lactucae* Pass.
On *Lactuca sativa* P : 71

(9) *S. lycopersici* Speg.
On Lycopersicon esculentum P : 71

(10) *S. nesodes* Kalachbr.
On *Hydrocotyle asiatica* P : 71

(11) *S. obesa* Syd.
On *Chrysanthemum leucanthemum* P : 71

230. *Sirosphaera* Syd.

Pycnidia with a subicle, glabrous; conidiophores short; conidia hyaline, 1-celled, ovoid or ellipsoid, catenate.

3 species. Philippines and Sri Lanka.

2 species recorded in Sri Lanka.

(1) *S. botryosa* Syd.
On *Pseudomicrocera henningsii* on *Aonidia* on *Memecylon* P : 71

(2) *S. chlorostoma Petch*
On *Aegerita webberi* P : 71

231. *Sphaeronaema* Fr. (Fig. 183 a—b)

Pycnidia dark, superficial or erumpent, base spherical, with a long beak; conidiophores simple; conidia hyaline, 1-celled, ovoid to elongate; chiefly saprophytic.

50 species, cosmopolitan.

2 species recorded in Sri Lanka.

(1) *S. album* Petch
On decaying fruits of *Hevea brasiliensis* P : 71

(2) *S. nigrum* Petch
On roots of *Camellia sinensis* P : 71

232. *Sphaeropsis* Sacc. (Fig. 184 a—d)

Pycnidia black, separate or grouped, globose, erumpent, ostiolate; conidiophores short; conidia large, dark, 1-celled, ovate, elongate or somewhat irregular; parasitic.

30 species, cosmopolitan, frequently in association with canker and dieback of hard woods.

S. tumefaciens causes the 'sphaeropsis knot' of citrus where the prominent symptom is the appearence of knots on twigs and branches. In severe infections, the knots may cause girdling and eventual death of the branch.

1 species recorded in Sri Lanka.

(1) *S. tumefaciens*
On *Citrus* A : 198

233. *Stagonospora* Sacc. (Nom. Cons.) (Fig. 185 a—e)

Pycnidia dark, separate, superficial or erumpent, globose, ostiolate; conidiophores short; conidia hyaline, typically 3 — or more-celled, cylindrical to elliptical; parasitic or saprophytic on leaves and stems.

200 species, cosmopolitan.

1 species recorded in Sri Lanka.

(1) *S. theicola* Petch
On leaves of *Camellia sinensis* P : 71

234. *Zythia* Fr. (Fig. 186 a—b)

Pycnidia fleshy, bright coloured, globoid, ostiolate, innate more or less erumpent; conidiophores short; conidia 1-celled, hyaline, solitary, muticate, globoid, ovoid or oblong

25 species recorded in Sri Lanka.

(1) *Z. bicolor* (B. & Br.) Cooke & Massee
On the rind of Rambuttan P : 71

235. *Actinothecium* Ces.

Pycnidia dimidiate, hemispherical, typically with a more or less radiate scutellum, dark, separate, superficial; conidia 1-celled, hyaline, globose or oblong.

5 species, widespread.

1 species recorded in Sri Lanka.

(1) *A. pelliculosum* (B. & Br.) Petch
On lichens on bamboo P : 67

236. *Asterostomella* Speg. (Fig. 187 a—d)

Pycnidia dimidiate — scutate, conidia 1-celled, ovoid. States of Asterineae.

20 species, Tropical.

1 species recorded in Sri Lanka.

(1) *A. aberiae* Petch
On *Aberia gardneri* (Ket-ambilla) P : 68

237. *Leptostromella* Sacc.

Pycnidia black, elongate, longitudinally cleft, at first covered and at maturity appearing superficial, flattened to depressed; conidiophores simple, short; conidia hyaline, 1-or more-celled, elongate to filiform; mostly saprophytic.

20 species; Temperate.

1 species recorded in Sri Lanka.

(1) *L. swertiae* Petch
On leaves of *Swertia zeylanica* P : 69

238. *Leptothyrium* Kunze ex Wallr. (Fig. 188 a—c)

Pycnidia superficial or erumpent, dimidiate, shield-shaped, dark, with or without ostiole; conidiophores simple; conidia hyaline, 1-celled, ovoid, oblong or fusoid; parasitic on leaves fruits etc.

100 species, cosmopolitan.

1 species recorded in Sri Lanka.

(1) *L. theae* Petch
On stems of *Camellia sinensis* P : 69

239. *Peltistromella* Höhnel

Pycnidia dimidiate, typically with a more or less radiate scutellum, dark, with a stroma; stroma superficial; conidia 2-celled, dark, ovoid to oblong or globose.

2 species. Brazil, Sri Lanka.

One species recorded in Sri Lanka.

(1) *P. anomala* (B. & Br.) Petch
On leaves of *Artocarpus lakoocha* P : 70

240. *Phaeodiscula* Cub.

Pycnidia often globoid at first, then becoming scutellate or discoid, membranous, carbonaceous, superficial, glabrous; conidia 1-celled, dark, globose to oblong.

1 species. Europe.

1 species recorded in Sri Lanka.

(1) *P. cudraniae* Petch
On leaves of *Cudrania javanensis* P : 70

241. *Phlyctaena* Mont. and Desm. (Fig. 189 a—b)

Pycnidia dark, separate or sometimes confluent, developing in or under the epidermis or bark, closed or ostiolate, usually with one chamber or divided by irregular folds, 1-celled, cylindrical or long spindle shaped, mostly bent, sickle shaped; mostly saprophytic.

30 species, widespread.

1 species recorded in Sri Lanka.

(1) *P. heveae* Petch
On branches of *Hevea brasilliensis* P : 70

ORDER MELANCONIALES

Parasites or saprobes of plant material. Fructifications sub cuticular, sub-epidermal or sub-peridermal, with or without subicle and setae; stromatic tissue restricted to the base of the fructification, forming conidia on the upper surface; dehiscing by regular or irregular splitting of the overlying host tissues.

NA-77-34

KEY TO THE GENERA OF THE ORDER MELANCONIALES

1.	Conidia 1-celled	...	2
	Conidia more than 1-celled	...	5
2.	Conidia hyaline	...	3
	Conidia dark	...	*Melanconium* (245)
3.	Masses or acervuli setose	...	4
	Masses or acervuli not setose	...	*Gloeosporium* (244)
4.	Setae marginal	...	*Colletotrichum* (243)
	Seta scattered throughout	...	*Vermicularia* (249)
5.	Conidia 2-celled	...	6
	Conidia more than 2-celled	...	7
6.	Conidia hyaline	...	*Actinonema* (242)
	Conidia dark	...	*Neobarclaya* (246)
7.	Conidia hyaline or sub-hyaline	...	*Septogloeum* (248)
	Conidia dark at least in part	...	*Pestalotia* (247)

242. *Actinonema* Fries

Acervuli minute and situated on a gossamer net of mycelium; conidia hyaline, 2-celled, typically oblong. In many species fructifications are not produced. Hence some investigators place this genus under the class Agonomycetes (Ainsworth et al 1973).

10 species, widespread. *A. rosae* (Lib.) Fr. (Perfect state-*Diplocarpon rosae* Wolf) causes black radiating spots on roses (see *Diplocarpon rosae*). A premature defoliation takes place.

1 species recorded in Sri Lanka.

(1) *A. rosae* (Lib.) Fr.
On *Rosa* (cult) P : 67

243. *Colletotrichum* Corda (Fig. 190 a—e)

Aceruli sub-epidermal, disc shaped or cushion shaped, typically with dark spines or setae at the edge; conidiophores simple elongate; conidia hyaline or sub-hyaline, 1-celled, globose to fusoid; parasitic. Causal organism of fruit rots, leaf spots and anthracnose. Imperfect states of *Glomerella*. This genus differs from *Gleosporium* in having setae and from *Vermicularia* in having setae at the margins only.

Cosmopolitan. *C. gloesporioides* (Penzig) Saco. Penzig (600 syn. listed by Arx; perfect state is *Glomerella cingulata* (Stonem.) Spauld. and Schrenk) causes anthracnose or fruit rot of citrus, chilli, tomato, mango, banana and many other plants. *C. lindemuthianum* causes anthracnose of bean.

C. falcatum is the conidial state of *Glomerella tucumanensis* = *Physalospora tucumanensis* Speg. It causes the red rot of sugar cane. Fungus attacks all parts above ground but more specially stems and midribs of leaves.

The diagnostic symptoms can be seen when an infected stem is split open — longitudinal red streaks interrupted by patches extending crosswise on the stem.

26 species recorded in Sri Lanka.

(1) *C. brachytrichum* Delacr.
On leaves of *Theobroma cacao* — P : 68

(2) *C. camelliae* Massee
probably a state of *Guignardia camelliae*
On *Camellia sinensis* — P : 68

(3) *C. capsici* (Syd.) Butl. and Bisby
= *Vermicularia capsici*
On *Capsicum annuum, Lycopersicon esculentum & Curcuma longa* — P : 68

(4) *C. coffeanum* (perfect state in *Glomerella cingulata*)
On *Coffea* sp. — A : 83

(5) *C. crotalariae* Petch
On *Crotalaria striata* — P : 68

(6) *C. curcumae* (Syd.) Butler and Bisby
On *Curcuma longa* — P : 68

(7) *C. dracaenae* Petch
On *Dracaena sanderiana* — P : 68

(8) *C. erythrinae* Koord.
On *Erythrina lithosperma* — P : 68

(9) *C. falcatum* Koord. (perfect state in *Glomerella tucumanensis*)
On *Saccharum officinarum* — A : 224

(10) *C. ficus* Koord.
On *Ficus elastica* — P : 68

(11) *C. funtumiae* Petch
On *Funtumia elastica* — P : 68

(12) *C. gloesporioides* (Penzig) Sacc. (perfect state in *Glomerella cingulata*)
On *Citrus, Capsicum annuum & Mangifera indica* — P : 68

(13) *C. graminicola* (Ces.) G. W. Wils.
On *Sorghum vulgare* — P : 68

(14) *C. haveae* Petch
On Hevea brasiliensis — P : 68

(15) *C. incarnatum* Zimm.
On pods of *Theobroma* — P : 68

(16) *C. lindemuthianum* (Sacc. & Magn.) Bri. & Cav.
(= *G. lunaemuthianum*)
On *Phaseolus vulgaris* — P : 68

Plate XXXIII Figs. 184 – 190.

184. *Sphaeropsis malorum*

a — canker on apple showing pycnidia, reduced
b — pycnidia on leaf spot x 1
c — section pycnidium on fruit x 600
d — conidia from culture, much enlarged

185. *Stagonospora*

a — habit pycnidia x 1
b — pycnidia x 5
c — section pycnidium x 400
d — conidiophore, enlarged
e — conidia, enlarged

186. *Zythia resinae*

a — habit x 5
b — conidiophore and conidia x 1000

187. *Leptostromella filicina*

a — habit of pycnidia x 1
b — section pycnidium x 400
c — conidiophores, enlarged
d — conidia enlarged

188. *Leptothyrium*

a — habit on apple fruit x 5
b — section immature pycnidium x 400
c — top view pycnidium, enlarged

189. *Phlyctaena albacinata*

a — habit pycnidia x 1
b — section pycnidium x 400
c — conidiophores, enlarged
d — conidia, enlarged

190. *Colletotrichum*

a — *C. capsici* on chilli fruit x 1
b — e *C. lindemuthianum*
b — infected bean pod x 1
c — section of acervulus 600
d — conidiophores x 600
e — conidia x 600

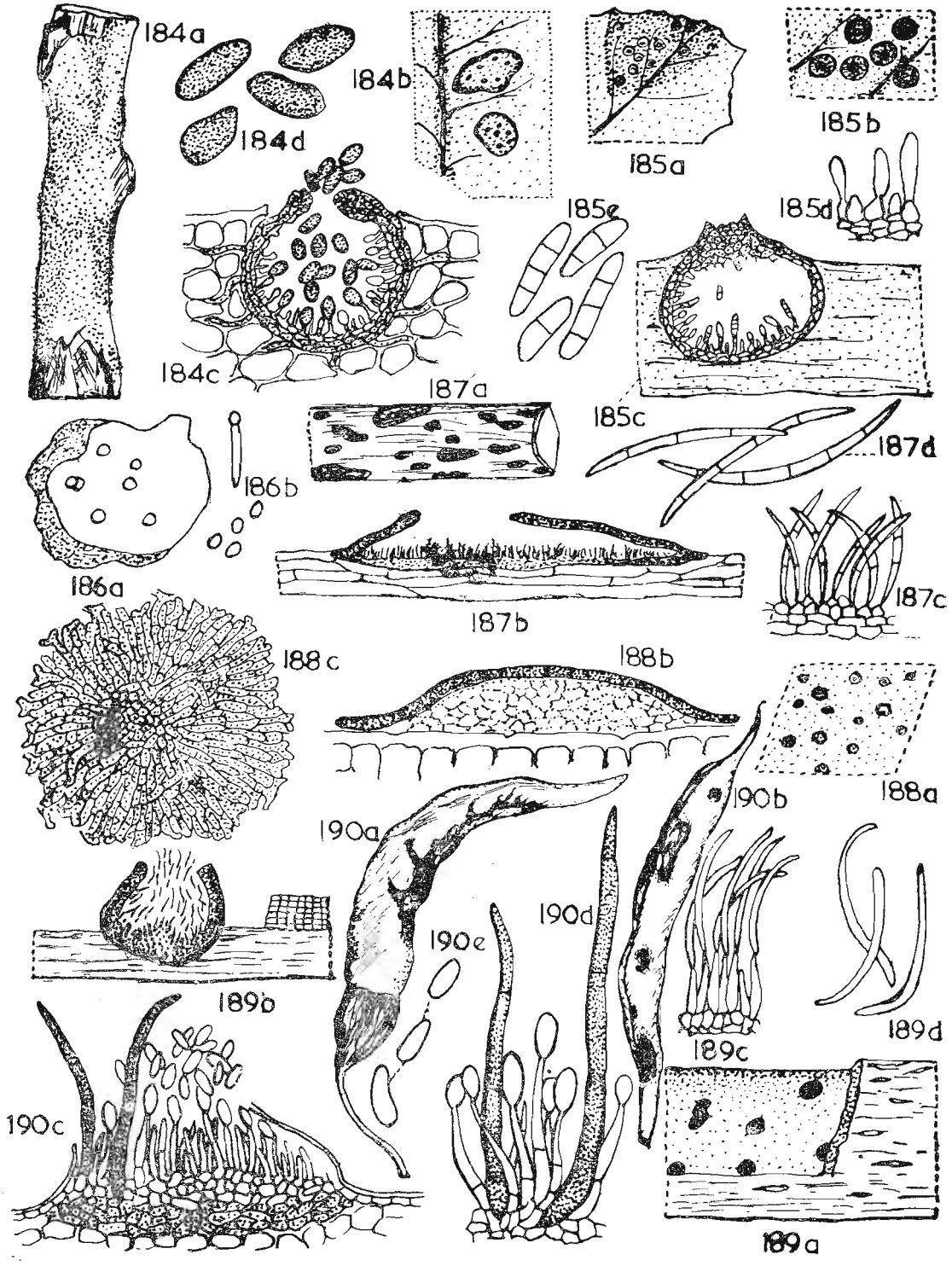

Plate XXXIII Figs. 184 — 190

(17) *C. nigrum* Ell. & Halst.
On *Capsicum annuum* P : 68

(18) *C. orchidearum* Allesch.
On orchids P : 68

(19) *C. paucisetum* Petch
On decaying fruits of *Cocos nucifera* P : 68

(20) *C. phomoides*
On fruits of *Lycopersicon esculentum* A : 145

(21) *C. piperis* Petch
On *Piper betel, Piper nigrum* P : 68

(22) *C. pisi*
On *Pisum sativum* A : 115

(23) *C. ricini* Petch
On *Ricinus communis* P : 68

(24) *C. seminicola* (B. & Br.) Petch
On seeds of *Artocarpus integer* P : 69

(25) *C. urenae* Petch
On leaves of *Urena lobata* P : 69

(26) *C. zingiberis* (Sundarar.) Butler & Bisby
On *Zingiber officinale* P : 69

244. *Gloeosporium* Desm. & Mont.; nom. rej. against *Marssonina* Magn. (Fig. 191 a—e)

Acervuli subepidermal, erumpent, disc shaped or cushion shaped, waxy; conidiophores simple variable in length; conidial masses discoid to pulvinate; conidia hyaline, 1-celled, ovate to oblong, sometimes curved; parasitic chiefly on leaves and fruits causing fruit rots, leaf spots and anthracnose.

Mostly conidial stages of *Glomerella*.

The name is used for many very diverse fungi. Arx (1957) lists 735 sp. from lit. and refers 288 to *Colletotichum* state of *Glomerella cingulata* (Stonem.) Spauld. & Schr. and others to 48 other genera.

G. musarum causes, 'Anthracnose', 'black rot' or ripe fruit rot of banana. Many fruits including guava fruits being liable to infection in the field, in local market and during transport. The disease may also occur on immature unreaped banana fruit in the field, when infected fruits ripen prematurely and finally turn black and rotten, and stalk becomes stunted and dry, leaves droop and shrivel up. *G. alborubrum* causes the *Gleosporium* leaf disease of rubber, where it causes abnormal leaf fall much like that incited by *Phytophthora palmivora*

17 species recorded.

(1) *G. affine* Sacc.
On Orchidaceae P : 69

(2) *G. alborubrum* Petch
On *Hevea brasiliensis* P : 69

Plate XXXIV Figs. 191 — 192

191. *Gloeosporium*

a — G. *phomoides* on tomato x1

b — e *G. musarum*

b — infected banana bunch, reduced

c — ripe fruit rot of banana, reduced

d — section fruit, showing acervulus conidiophores and conidia x 500

e — conidia x 1100

192. *Melanconium*

a — habit acervulus x 5

b — section, acervulus x 400

c — conidiophores and conidia, enlarged

d — conidia, much enlarged

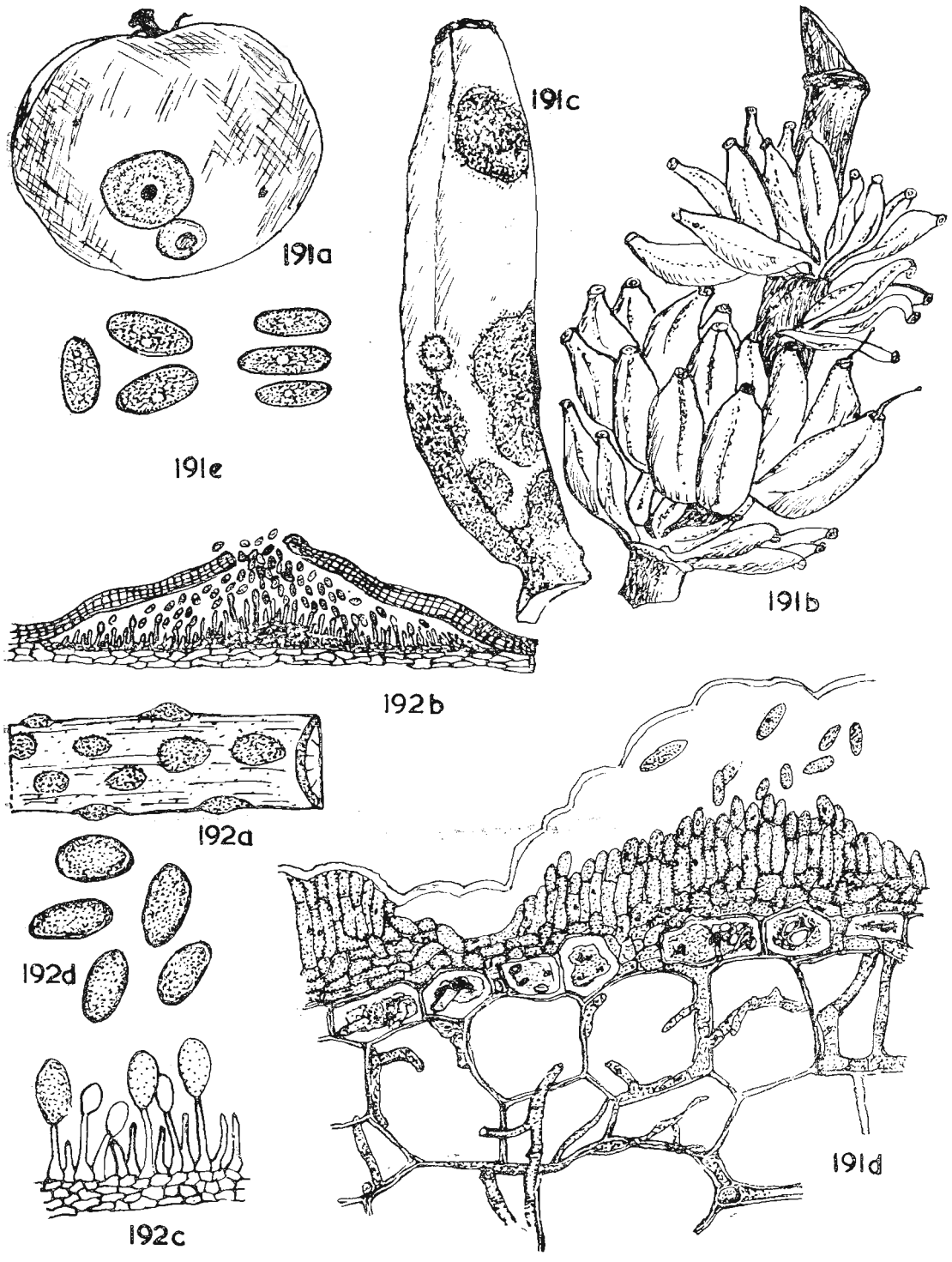

Plate XXXIV Figs. 191 — 192

(3) *G. bussei* P. Henn.
On *Vanilla* — P : 69

(4) *G. cocophilum* Wakef.
On fruits of *Cocos nucifera* — P : 69

(5) *G. coffeanum* Delacr.
On *Coffea robusta* — P : 69

(6) *G. heveae* Petch
On leaves of seedings of *Hevea brasiliensis* — P : 69

(7) *G. cryptum* Petch
On fruits of *Cocos nucifera* — P : 69

(8) *G. holstii* P. Henn.
On leaves of *Tabernaemontana dichotoma* — P : 69

(9) *G. impatientis* Petch
On stems of *Impatiens balsamina* — P : 69

(10) *G. litseae* Petch
On leaves of *Litsea* sp. — P : 69

(11) *G. mangae* Noack.
On *Mangifera indica* — P : 69

(12) *G. musarum* Cooke & Massee
On *Musa paradisiaca* — P : 69

(13) *G. opuntiae* Ell. & Everh.
On *Opuntia dillenii* — P : 69

(14) *G. papayae* P. Henn.
On *Carica papaya* — P : 69

(15) *G. Phomoides* Sacc.
On fruits of *Lycopersicon esculentum* — P : 69

(16) *G. psidii* Delacr.
On fruits of *Psidium guajava* — P : 69

(17) *G. vanillae* Cooke
On *Vanilla* — P : 69

245. *Melanconium* Link ex Fr. (Fig. 192 a—b)

Acervuli sub-cutaneous or sub-cortical, or discoid,, black; conidiophores simple; conidia single, dark, one-celled, globose to oblong; masses setose; parasitic or saprophytic.

50 species, widespread. States of *Melanconis*.

Melanconium sacchari Massee (Syn. *Pleocyta sacchari* (Mass.) Petrak & Syd. fide Edgerton, Sugar cane and its Diseases 1955) causes 'rind disease of sugar cane', where in severely affected fields the important symptoms are retardation of the growth of plants, yellowing of the leaves, shrivelling of the stalks and dying of the tops of many plants. On the rind of these dead and dying tops conspicuous black smutty fungus develops.

6 species recorded in Sri Lanka.

(1) *M. circumscissum* (B. & Br.) Grove
On bamboo — P : 70

(2) *M. confusum* (B. & Br.) Petch
On bamboo — P : 70

(3) *M. dendrocalami* Petch
On *Dendrocalamus giganteus* — P : 70

(4) *M. fructicola* Petch
On unripe fruits of *Punica granatum* — P : 70

(5) *M. palmarum* Cooke
On *Cocos nucifera* — P : 70

(6) *M. sacchari* Massee (Syn. *Pleocyta sacchari* (Massee) Petrak & Syd.)
On *Saccharum officinarum* — P : 71

246. *Neobarclaya* Sacc.

Conidiophores simple, or ramose, short; conidia 2- celled dark, ovoid or fusoid, 1-3 ciliate at apex.
3 species, widespread.

1 species recorded in Sri Lanka.

(1) *N. congesta* (B. & Br.) Petch
On leaves of *Eugenia jambolana* — P : 70

247. *Pestalotia* de Not. (Fig. 193 a-e)

Acervuli dark, discoid or cushion shaped, subcutaneous; conidiophores short, erect, simple; conidia dark, several celled, with hyaline (or nearly so) pointed end cells, median cells dark, coloured, lower end of the spore bearing a hair like pedical and upper end furnished with a crest of 2—5 long colourless hairs. (Appendages show up well in water but not easily in lactophenol mounts).

Some species are weak parasites of plants, whilst several have been found as causes of damage to materials made of cellulose.

For a long time the standard taxonomic treatement of the Genus was that of Guba (1929, 1932). But Steyaert (1949, 1953) has maintained that the genus *Pestalotia* include one species only (with 1 dark cell) and has transferred all the remainder to two new genera *Truncatella* with 4 celled conidia (2 dark cells) and *Pestalotiopsis* with 5 celled conidia (3 dark cells). However Servazzi (1954) retains the name *Pestalotia* to include all three genera of Steyaert and this view has been supported by Guba (1955). At present the matter remains sub judice.

50 species, cosmopolitan.

P. theae Suwada incites the disease called 'Grey blight' of tea (*Camellia sinensis*) where only old bushes are attacked resulting in brownish spots on leaves which soon turn grey, increase in size, finally coalescing to form large patches and killing the leaves.

P. palmarum causes the 'Grey blight' of coconut, again commonly affecting the older and declining leaves of the palm resulting in premature yellowing and yellow brown or grey spots which would coalesce to give large grey patches.

12 species recorded in Sri Lanka.

(1) *P. cinnamomi* Petch
On *Litsea fuscata, Cinnamomum zeylanicum* — P : 70

(2) *P. disseminata* Thum.
On leaves of *Eucalyptus* — P : 70

(3) *P. flacourtiae* Petch
On leaves of *Flacourtia inermis* — P : 70

(4) *P. lupini* Sorauer.
On *Lupinus* — P : 70

(5) *P. mangiferae* P. Henn.
On leaves of *Mangifera indica* — P : 70

(6) *P. palmarum* Cooke
Common on palms and on *Cocos nucifera* — P : 70

(7) *P. piperis* Petch
On leaves of *Piper nigrum* — P : 70

(8) *P. suffocata* Elle. & Everh.
On *Rosa* — P : 70

(9) *P. theae* Saw.
On *Camellia sinensis* — P : 70

(10) *P. theobromae* Petch
On leaves of *Theobroma cacao* — P : 70

(11) *P. vangueriae* Petch
On leaves of *Vangueria edulis* — P : 70

(12) *P. versicolor* (Speg.) Steyaert
On Cashew leaf — Personal Communication, Cashew Corporation 1976.

(13) *P. viticola* Cav.
On *vitis vinifera* — P : 70

248. *Septogloeum* Sacc. (Fig. 194 a-e)

Acervuli sub-epidermal, erumpent pale; conidiophores short, simple; conidia hyaline or sub-hyaline, single, several celled, oblong to fusoid; parasitic on leaves.

40 species, widespread.

4 species recorded in Sri Lanka.

(1) *S. dumasiae* Petch
On leaves of *Dumasia villosa* — P : 71

(2) *S. manihotis*
On *Manihot esculenti* — A : 133, 134

Plate XXXV Figs. 193 — 197

193. *Pestalotia*

a — *P. palmarum* spots on coconut leaflet, reduced
b — *P. theae*
b — grey blight of tea, reduced
c — section through on acervulus x 400
d — stages in the development of conidia x 600
e — mature conidia x 600

194. *Septogloeum*

a — b habit of acervulus, enlarged
c — section of acervulus x 400
d — conidiophores, enlarged
e — conidia, enlarged

195. *Vermicularia capsici*

a — acervulus, enlarged
b — setae and conidiophores, much enlarged
c — conidia, much enlarged

196. *Rhizoctonia solani*

a — section of loose sclerotium, much enlarged

197. *Sclerotium*

a — leaf sheaths of rice showing sclerotia, reduced
b — sclerotium x 400
c — portion of section of a sclerotium, much enlarged

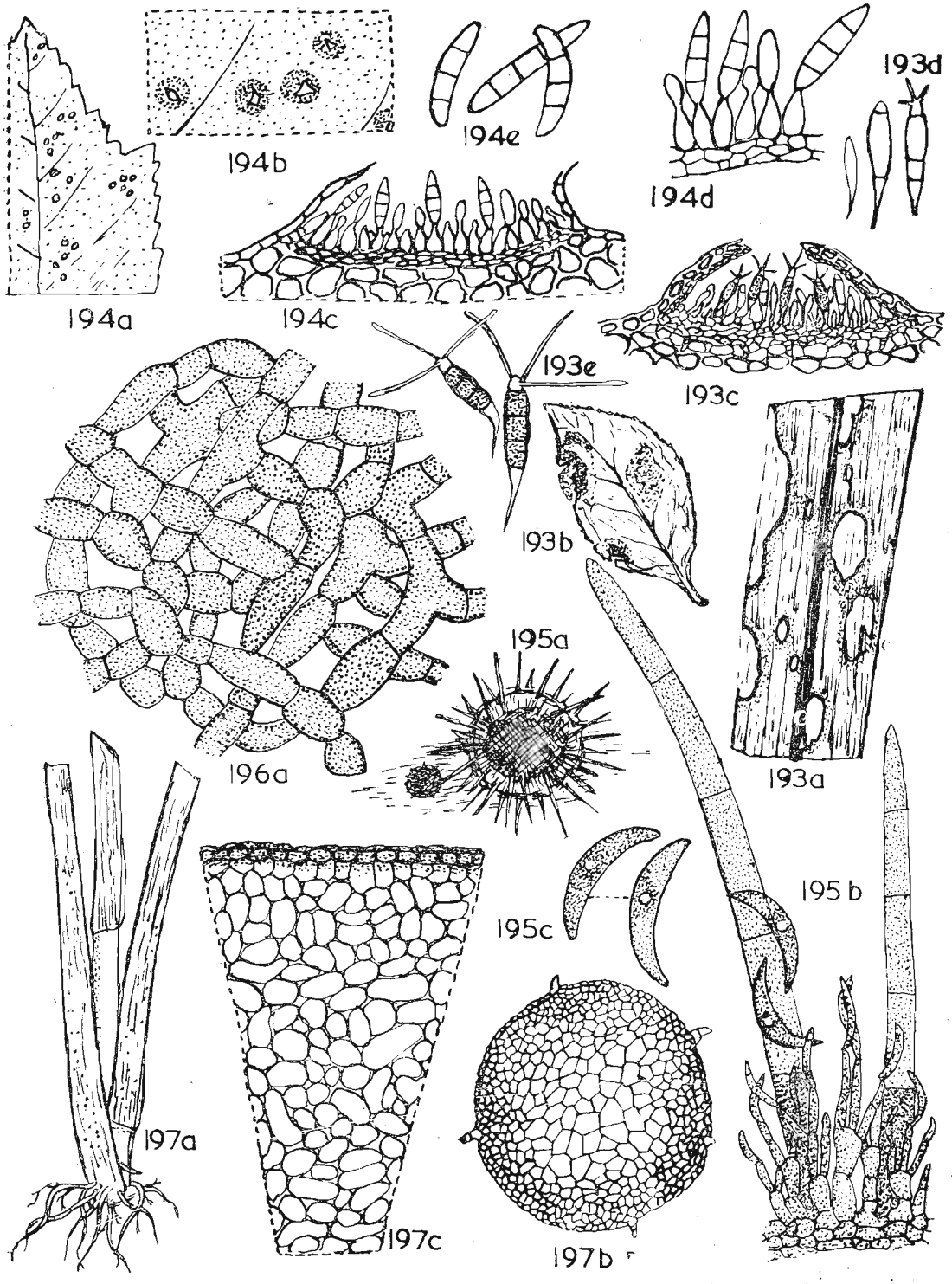

Plate XXXV Figs. 193 — 197

(3) *S. limoniae* Petch
On leaves of *Limobia crenulata* P : 71

(4) *S. mappiae* Petch
On leaves of *Mappia ovata* P : 71

249. *Vermicularia* Tode ex Fr. (Fig. 195 a-c)

Conidia, unicellular, rarely bicellular, generally spindle shaped, embedded amongst brown, septate hairs. The species are frequent cause of leaf spots.

40 species, cosmopolitan. A synonym of *Colletotrichum* fide Miss Duke. (Ainsworth 1963)

2 species recorded for Sri Lanka.

(1) *V. dematium* (Fr.) Fr.
On various stems P : 71

(2) *V. herbarum* Westend.
On *Dianthus caryophyllus* P : 71

CLASS — AGONOMYCETES

This includes those fungi whose mycelium is sterile. Many form hyphal aggregates known as sclerotia. Some of the sclerotial forms included here (eg. *Rhizoctonia*) are known to be Basidiomycetes. Other genera (eg. *Sclerotium*) contain species proved to be imperfect stages of Ascomycetes.

This has a single form-order Mycelia sterila, with the same characters as described for the class.

KEY TO THE GENERA OF THE FORM ORDER MYCELIA STERILA

Sclerotia of indefinite form ... *Rhizoctonia* **(250)**
Sclerotia, of definite globose bodies ... *Sclerotium* **(251)**

250. *Rhizoctonia* de Candolle ex Fr. (Fig. 196 a)

Mycelium brown, sclerotia without definite form, often grown together, horny, fleshy, with thinner undifferentiated edges, frequently embedded in the mycelium and bound together by mycelial strands.

15 species, cosmopolitan (see *Corticium*, *Macrophomina* and *Helicobasidium*). R. *solani* (perfect state *Corticium solani*) Kuhn) causes 'black scurf disease' or 'stem canker' of potato. Canker forms on the underground region of the stem. It also causes the damping off or 'black root' of beet and 'collar disease' of tobacco and betel. In tobacco and betel there is a collar rot accompanied by brown-black discolouration of the mature plants.

3 species recorded in Sri Lanka.

(1) *R. bataticola* (Taubeuh.) Butler See *Macrophomina phaseolina*
On more than 50 hosts P : 77

(2) *R. solani* Kuhn
On rice and other hosts P : 77

(3) *R. oryzae-sativae* Sawada
= *Sclerotium oryzae-sativae* Sawada — CMI Description of pathogenic Fungi No. 409
On *Oryza sativa*

251. *Sclerotium* Tode ex Fr. (Fig. 197 a-c)

Mycelium light, sclerotia variously formed, globose elongate, swollen or flattened often bandlike, single or confluent, sometimes, covering wide surfaces, mostly dark coloured, commonly black, hard, particularly when dry; rind tissue sharply differentiated from the interior by colour and cell structure.

100 species, cosmopolitan. *S. oryzae* Catt. causes stem rot of rice (see also *Helminthosporium sigmoideum*), S. *rolfsii* causes southern blight or collar rot of ground nut where affected plants wilt, leaves gradually turn brown and are finally killed. *S. rolfsii* also cause damping off and black root of beet and collar rot of betel.

3 species recorded in Sri Lanka.

(1) *S. oryzae* Catt. (perfect state in *Leptosphaeria salvinii*)
On *Oryza sativa* — P : 77

(2) *S. ricini* Godfrey
On *Ricinus communis* and *Acalypha* — P : 77

(3) *S. rolfsii* Sacc. (perfect state in *Corticium rolfsii*)
On *Mucuna pruriens*
Arachis hypogea, *Piper betel* — P : 77
Beta — A : 138, 237

GLOSSARY

acicular:	slender and pointed : needle shaped
acrogenous :	borne at the tip
acropleurogenous :	borne at the end and on the sides
acuminate :	gradually tapering to a point
acute :	pointed, less than a right angle
allantoid :	sausage shaped
alveolate :	pitted like a honeycomb
amoeboid :	not having a cell wall and changing in form like an amoeba
amyloid (of spore) :	turning blue with iodine because starch is present
anastomose :	forming a network
apedicellate :	without a support or pedicel
appendage :	a filamentous process
applanate :	flattened
arachnoid :	covered with, or formed of delicate hairs or fibres
arcuate :	arc-like
ascigerous :	having asci
basipetal :	development toward the base
botryose :	racemose, grouped like grapes
caespitose, cespitose :	in groups or tufts like grasses
calyciform :	cup-like
carbonaceous :	dark coloured and readily broken; charcoal-like
cartilagenous	firm and tough but readily bent
catenulate, catenate :	in chains or end-to-end series
clypeus :	a shield-like stromatic growth, with or without most tissue, over 1 or more perithecia
continuous :	without septae; 1-celled
coriaceous :	leathery
dactyloid :	finger-like
deciduous :	falling off
dehiscent :	opening when mature
dendroid :	tree-like in form
dimidiate :	appearing to lack one half, or having one half very much smaller than the other
dimorphic :	having two forms
doliform :	jar-shaped
ejaculate :	throw out
erumpent :	bursting through the surface of the substratum
evanescent :	vanishing early
exserted :	sticking out: protruding
falcate :	curved like the blade of a scythe or sickle
fasciculate :	crowded in bundles
floccose :	having tufts of soft wooly hairs which are often deciducus
fugacious :	disappearing early
fusiform :	spindle shaped
fusoid :	somewhat fusiform
geniculate :	bent like a knee
germ pore :	an area or hollow in a spore wall through which a germ tube may come out
gregarious :	scattered closely over a small area
hirsute :	hairy
hyaline :	colourless, transparent
immersed :	embedded in the substratum
innate :	immersed
invaginated :	covered by a sheath
involute :	rolled in

laccate :	polished; shining
lacerate :	as if roughly cut or torn
lenticulate :	shaped like a double convex lens
mucronate :	ending in a sharp point
muriform :	having cross and longitudinal septa
nodulate :	with intermittent thickenings
orbicular :	rounded in outline
pelliculate :	with a differentiated thin layer of hyphae
peridium :	outer wall of the fruit body
persistent :	remaining intact
pilose :	covered with long soft hairy filaments
plurivorous :	attacking a number of hosts
pseudoparaphyses:	distinct vertical paraphyses like hyphae in the locule or perithecial cavity
pyriform :	pear-like in form
radiate :	spreading from a centre
ramicolous :	living on branches
reflexed :	turned up or backwards
reniform :	kidney-like in form
resupinate: (of fruit bodies):	flat on the substrate with the hymenium on the outer side
retrorse :	backward
rhizomorph :	a thread-like or a cord-like structure made up of hyphae
rimose :	cracked; having many cracks or fissure
rimulose :	having small cracks
rivulose :	marked with lines like little rivers
scabrous :	rough with short rigid projections
sclerotium :	a firm, frequently rounded mass of hyphae
scolecospore :	a long thread- or worm-like spore
scrupose :	rough with very small hard points
scutate, scutellate :	like a round plate or small shield
scutellum :	a plate or shield-like cover
serrate :	edge with teeth
seta :	a stiff hair, generally thick walled and dark coloured
setaceous :	bristle-like
sorus :	a group of fruit bodies; a fruiting structure in certain fungi
sporangiole :	a small sporangium without a columella bearing a few spores
sporidiole :	a small spore
squamose :	having scales
staurospore :	star-like spore
stroma :	a mass or matrix of vegetative hyphae in or on which spores are produced.
subiculum :	a more or less dense felt of hyphae covering the substrate
synonym :	another name for a taxon
torulose :	cylindrical but having swellings at intervals
truncate :	ending abruptly
umbilicate :	having a small hollow
uniseriate :	in one line or series
ventricose :	swelling out in the middle
verticel:	a whorl of sporophores or phialides
weft :	felt-like mat of hyphae on certain fungi
zonate :	with concentric bands

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ADDENDA

The following species, observed in this country, during the progress of the work, shouldbe notified at the place indicated in the body of the book.

Meliola petchii Hansf.

On leaf of *Strychnos nux-vormica* (Sub. div-Ascomycotina, Class-Pyrenomycetes, Order-Meliolales; should follow *Meliola mollis* P. 23)

Mycosphaerella brassicola (Duby) Lindau.

On leaves of *Brassica olearacea.*
(Sub. div. — Ascomycotina, Class - Loculoascomycetes, Order — Dothideales; should precede *Mycosphaerella camelliae* P. 49)

Fusarium solami f. sp *heveae.*

From a wilted rubber plant — A. de S. Liyanage Personal communications.

252. *Phaeosaccardinula* P. Henn.

Phyllogenous fungi with superficial, globose to somewhat flattened — globose, parenchymatous perithecia, dark; asci various spored; spores oblong — cylindric, muriform, fuscous. 15 species. Tropical.

One unidentified species recorded in Sri Lanka.
(1) *P.* sp. on a leaf of a tree in Kottawa.

(Sub-div. — Ascomycotina, Class-Loculoascomycetes, Order—Dothideales, should follow the Genus *Chaetothyrium* P. 47)
The genus differs from *Chaetothyrium* in having ascospores with transverse as well as longitudinal septa.

253. *Acrocylindrium* Bonn.

Conidiophore elongate and distinct from conidia, branches verticillate, end branches straight and one spored; conidia one-celled, hyaline, acrogenous, cylindric to elongate.
4 species, Europe and Sri Lanka.
One species recorded in Sri Lanka.

(1) *A. oryzae*
On *Oryza sativa* Unpublished data. Div. of Plant Pathology, CARI, Gannoruwa.

(Sub-Div-Deuteromycotina, class-Hyphomycetes, order — Moniliales; should follow the Genus *Acladium* p. 107)
This genus differs from *Verticillium* in that conidia are cylindric to elongate.

254. *Chalara* (Corda) Rabenh.

Mycelium typically dark; conidiophore hyaline under some cultural conditions, but typically dark, unicellular or composed of a few cells the apical cell tapering upward slightly and producing conidia endogenously; endoconidia hyaline, rod-shaped, somewhat variable in length, often hanging together in chains. Parasitic or saprophytic.

15 species, Temperate.
One species recorded in Sri Lanka.

(1) *C.* c.f. *hughesii* Nag., Raj. and Kendrick
On a leaf of Zingeberaceae

(Sub-div. — Deuteromycotina, Class-Hyphomycetes, Order — Moniliales, should follow the genus *Cercospora* p. 119)
This genus differs from *Thielaviopsis* in the absence of chlamydospores.

255. *Ephelis* Fr.

Pycnidium with a stroma, glabrous, dark, carbonaceous to membranous; conidia acicular to filiform, typically hyaline. Imperfect states of *Balansiella*. *E. oryzae* cause 'udabatta' disease of rice.

4 species, especially tropical mostly in grasses.
One species recorded in Sri Lanka.

(1) *E. oryzae*
On *Oryza sativa* — 1976 Unpublished data. Div. of Plant Pathology, CARI, Gannoruwa.

(Sub-div — Deuteromycotina, Class — Coelomycetes, Order — Sphaeropsidales, should follow the genus *Asterostomella* P. 148)

(This genus differs from *Phlyctaena* in that pycnidia are in a stroma).

* * * * * *

The following list gives names of some fungi in the text and their current names

Names in the text	**Current names** (Rev. of Plant Pathology Vol 53. 1974)
Genus 148 — *Corticium*	
C. Solani	— *Thanatephorus cucumeris* (Frank) Donk.
Genus 224 — Gloeosporium	
G. musarum	*Colletotrichum musae*
Genus 188 — *Helminthosporium*	
H. incurvatum	— *Drechslera incurvata*
H. sacchari	— *Dreschslera sacchari*
Genus 67 — *Mycosphaerella*	
M. citrullina	— *Didymella bryoniae*
Genus 247 — *Pestalotia*	
P. palmarum	— *Pestalotiopsis palmarum*
P. theae	— *Pestalotiopsis theae*
Genus 151 — *Fomes*	
F. lignosus	— *Rigidoporus lignosus*
F. noxius	— *Phellinus noxius*

INDEX TO GENERA