DEPARTMENT OF AGRICULTURE, VICTORIA.

SYSTEMATIC ARRANGEMENT

OF

AUSTRALIAN FUNGI,

TOGETHER WITH

HOST-INDEX AND LIST OF WORKS ON THE SUBJECT,

BY

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PREFACE.

In dealing with the diseases of plants due to Fungi, it is necessary to determine the name and nature of the Fungus causing the disease, in order to be able to cope with it and to take effectual measures for its prevention, palliation, or cure. Accordingly I considered it essential to have the various known Australian Fungi recorded for reference, just as the various higher forms of Australian vegetation are so ably set forth by the Government Botanist, Baron von Mueller, in his Systematic Census. The very useful *Handbook of Australian Fungi*, prepared by Dr. M. C. Cooke, the veteran mycologist, under the sanction and authority of the various colonial Governments, has been taken as a basis and prepared the way for the present publication. This *Systematic Arrangement of Australian Fungi* aims at giving in a compact and handy form a complete enumeration of all the known species up to date, systematically arranged so as to show their relationships, and briefly described, together with such additional information as may be of use in a future detailed and more directly useful account. The object being to bring together all the species recorded by the various workers in this field, to take stock, as it were, of what has been done, I had to consult the different works bearing on the subject previous to the addition of a large number of hitherto unrecorded Fungi to the list. I have accordingly prepared a "List of Works on Australian Fungi," the first of its kind. A complete list of Fungi having been compiled from the various publications, including several papers of my own read before the Royal Society of Victoria, together with the plants or parts of plants on which they occurred, in the case of parasitic forms, the material was supplied for a provisional Host-index; the term "host" being applied to the plant on which the Fungus lives or preys, the Fungus being an unwelcome guest as a rule. The necessity for a Host-index became apparent from the time I was appointed Vegetable Pathologist.

There are thus three connected and interdependent divisions in this publication, which may now be briefly glanced at and explained.

I.—Systematic Arrangement of Australian Fungi.

The plan pursued is the following:—

1st. A consecutive number is given to each species, for convenience of reference, and all future additions will be numbered consecutively. Varieties are distinguished by having a letter added to the number of the species.

2nd. The number in Dr. Cooke's *Handbook of Australian Fungi* is next given for ready reference to the description of any species in that work. This serves a double purpose, and shows not only the species recorded in that work, but also species omitted.

3rd. The volume and number is next quoted for every Australian species given in Saccardo's *Sylloge Fungorum*, consisting at present of ten thick volumes, which are in the Melbourne Public Library. This is the standard work on Fungi, and is the most complete and exhaustive at the present time. The references to Cooke and Saccardo will leave no doubt as to the particular Fungus meant.

4th. The scientific name adopted for each species of Fungus follows next. It is absolutely necessary, for purposes of accuracy, to have the scientific names as well as the common names, for otherwise serious mistakes may arise. Thus, the name of "Peach Yellows" (the dreaded American disease) is often applied to a disease of the Peach in this colony, but, fortunately, it is a very different and much more harmless disease, being none other than the Peach-leaf Rust (*Puccinia Pruni*). It may be noted that the sub-genera of *Agaricus* are raised to the rank of genera; and, as the original generic name is thus set free, it is retained for the species to which the common Edible Mushroom belongs, and which were formerly included in the sub-genus *Psalliota*.

5th. The authority for the name is next stated. With so many different names often applied to the same Fungus, and even the same name often applied by different authors to entirely different plants, it is necessary to give the authority for the particular name, in order to indicate the precise Fungus meant. The name of the authority is usually given in a contracted form, and it will be noticed that it is sometimes printed in italics. The reason of this is that it is customary in works on Fungi often to give two authorities, the first to indicate the original describer of the Fungus, and the second where some one has classified it differently on good scientific grounds. I simply give one authority, the name of the original describer being printed in Roman characters; and, where the original name has been set aside, the correct classifier is given in italics. The year of publication is also stated.

As an illustration of the variety of naming, I may mention one kind of Rust of Wheat met with in the colony, and the following nine names have been given to it by the authors whose names are appended :—

Uredo rubigo-vera, De Candolle,	Puccinia rubigo-vera, Winter,
Uredo rubigo, Berkeley,	Puccinia striæformis, Westendorp,
Cæoma rubigo, Link,	Puccinia straminis, Fuckel,
Trichobasis rubigo-vera, Leveille,	Æecidium asperifolii, Persoon.
Trichobasis glumarum, Leveille,	

By a recognised principle the name of *Puccinia rubigo-vera* is adopted, although Dr. Cooke in his Handbook uses the name of *Puccinia straminis.*

6th. The English name follows. This is merely an attempt to give an English rendering to the specific name, and something of the kind is necessary in naming Fungus diseases to the average farmer or fruit-grower; but, as these diseases become better known as to their cause, some characteristic feature of the disease may be used as a distinguishing name, such as Leaf-curl, Shot-hole, Bitter-rot, Club-root, &c.

7th. The "Habitat" is next given, the various colonies in which the species have been found being recorded. It has been thought advisable to add B. for British when it occurs there, as there may have been preventives or remedies applied in the old country which it would be profitable for us to know. I make no apology for dealing with Australian Fungi, including the five colonies of the Australian Continent and Tasmania, for Fungi do not respect our political boundaries and restrict themselves to artificial limits. There must be federation in the treatment of disease if it is to be thoroughly effectual, and this has been happily illustrated in dealing with the Rust in Wheat question, in which all the colonies are united for devising measures against a common enemy.

8th. The "Occurrence" follows, indicating on what plants or parts of plants the different kinds of Fungi may be looked for. This is afterwards collectively shown in the Host-index, each plant having all its known diseases due to Australian Fungi ranged under it.

9th. "General characters" conclude the whole, giving such superficial and easily-recognised characters as may serve as a guide in the rough discrimination of many species requiring immediate attention to check their spread.

From the very nature of this work and from our present very limited knowledge of the Fungi of Australia there will be constant additions made (in fact, I have quite a number of new species awaiting determination myself), and this will be met by the issue of supplements, when necessary, on the same lines. As Dr. Cooke truly says in his introduction to the Handbook—"It is quite probable that in the course of a few years, by working up the minute species, the total number contained in this volume would be more than doubled, even without the investigation of unexplored districts."

It ought also to be borne in mind that many of the more conspicuous Fungi—such as what are popularly called Mushrooms and Toadstools—work considerable mischief, although unseen and unnoticed. Thus, the Honey Agaric (*Armillaria mellea*), which is even considered edible, does a deal of damage, and by attacking the roots undermines the tree. It spreads from root to root in the soil by means of long purple-black cord-like strands, even in the absence of the tawny-yellow "Toadstools," which are simply the fructification of the Fungus, and I have seen orchard trees killed by this cause. In the soil and in the rotting roots or wood these strands are found, attacking the roots and bases of stems and often causing copious "gumming" there. The Vegetable Pathologist should therefore not only be more or less conversant with the Fungi of the different colonies, as they spread so readily by means of their spores, but he should be acquainted with Fungi as a whole, since even Mushrooms and Toadstools are not beyond his province.

II.—Provisional Host-index of Australian Fungi.

The list of Fungi, systematically arranged, enables us to classify them under their respective Host-plants. Strictly speaking, it is only those which are parasitic, or which prey upon living plants, that should be included; but it is so difficult with our present knowledge to distinguish between those which cause disease and those which attack decaying or decayed parts, that I have given all the Fungi found upon any particular plant. While special attention is paid to the Fungi occurring on the various vegetable products grown in the colony for commercial purposes, as given in the Government Statist's returns, the Fungi on so-called "weeds" are not neglected, because they may and often do pass over to the cultivated and therefore more delicate forms of vegetation. For example, the Fungus causing "Club-root" in Cabbages, Cauliflowers, Turnips, Radishes, Kale, &c., also infests two of our common weeds, viz., Shepherd's Purse (*Capsella Bursa-pastoris*, Mœnch) and Hedge Mustard (*Sisymbrium officinale*, Scop), and many similar instances could be given. This fact is strikingly put by Mr. Bailey, who says—"As we find in the animal kingdom the wild man preferring sheep to kangaroo, the flying fox peaches to quandong, the grasshopper the more succulent vegetation of our gardens to the dry herbage of the plains, so in like manner we shall doubtless find from time to time blight-fungi, at present unknown, will come from the indigenous plants to exotic ones which may be more congenial to their development."

There can be no doubt that many of the Fungi on our native vegetation will attack introduced plants, and it would be very desirable, both in the interests of science and of practical utility, to have a record of the Fungi preying upon our native plants. I have seen some of our richest soils with the decaying roots of Eucalypts and the mycelium of Fungi passing from them to the roots of orchard trees and causing their decay.

The Host-index should serve various useful purposes. First of all, it will enable the intelligent grower to determine with some degree of certainty the cause of the disease when it is due to a Fungus, and that is often the first step towards its eradication. Thus, if his Peach trees are affected with some Fungus disease on the leaves, he turns up the Index and finds two Fungi recorded there. He then turns to the General Characters in the "Systematic Arrangement" and can easily tell whether it is the "Peach-leaf Rust" or the "Leaf-curl." Or if his Cabbages and Cauliflowers begin to turn yellow and the roots become distorted, he finds from the Index that it is due to a Fungus, a knowledge of which enables him to battle with the disease. Having traced the disease to its source, he may find treatment already prescribed in some of the Government publications, or can apply to the Department for advice. If there is no record of the disease in the Index, then the grower knows it is a subject requiring investigation.

Further, the Host-index may be used in assisting growers to "spot" diseases due to Fungi before they have spread too far and become established. A great many Fungus diseases are overlooked for a number of years and allowed to spread freely before active measures are taken for their suppression, and thus what might have been easily nipped in the bud is now difficult to eradicate; so that another important use of this publication will be to enable Fungus diseases to be recognised at the earliest possible moment and action taken accordingly.

Onion Mould, Ergot in Rye and other Grasses, Powdery Mildew in Apple, and various other diseases, are not recorded in Cooke's Handbook, and, presumably, have been neglected.

A third use will be to assist in the carrying out of any legislation which may be passed for the suppression of Insect and Fungus pests. Many growers err in ignorance, because they are not aware of the disease being present until it has got a firm hold, but now a record of the various Fungus pests is available.

And there is a final purpose to be served which is not the least important. New diseases are continually cropping up, and the sooner they are recognised the better. If the disease is not recorded in the Index there is a strong probability of its being some new one, and then it can be traced to its source without delay.

The names of the Host-plants are given according to Baron von Mueller's *Second Systematic Census of Australian Plants* or Hooker and Jackson's *Index Kewensis*, as far as published. The Fungi belonging to Victoria are indicated by the letter V.

III.—List of Works on Australian Fungi.

It was necessary, as already stated, to draw up a list of works in order to have the list of Fungi as complete as possible. I have only included those publications in which there is special reference to Australian forms, and no doubt several have been overlooked. To Dr. Alexr. Morrison I am much indebted for bringing under my notice some references to the subject in scattered publications. The "List of Works," the "Systematic Arrangement," and the "Host-index" should serve to focus our present knowledge and prepare the way for further additions to it.

In giving the general characters of the various Fungi, I have endeavoured to use as simple terms as possible, but it was difficult to avoid the employment of technical terms occasionally. For those who wish to enter into the subject more fully and to study in an elementary way the disease-causing Fungi, the following works among others may be mentioned:—

Diseases of Plants, by Professor Marshall Ward, and published by the Society for promoting Christian Knowledge (2s. 6d.). This is a readable little book, and treats in a popular manner such diseases as Rust in Wheat, Smut of Corn, Ergot of Rye, Hop disease, Potato disease, &c.

Diseases of Field and Garden Crops, by Worthington G. Smith, and published by MacMillan and Co. (4s. 6d.). This work is beautifully illustrated, and treats of Onion, Pea, Parsnip, Lettuce, Potato, and other diseases, in addition to those of Wheat and Oats.

Diseases of Crops and their Remedies, by Dr. A. B. Griffiths, and published in Bell's Agricultural Series (2s. 6d.). The diseases of leguminous, gramineous, root, and miscellaneous crops are considered, together with the Fungi or insects causing them, and the best methods of prevention.

Fungus Diseases of the Grape and other Plants, and their Treatment, by F. Lamson-Scribner, and published in America (5s.). This is a thoroughly practical work, and deals with the principal Fungus diseases of Fruit trees as well as of the Vine.

Fungi and Fungicides, by Dr. C. M. Weed, and published in New York (5s.). It is divided into five parts—Fungi affecting the larger fruits, the small fruits, shade trees, &c., vegetables, cereals, and forage crops; and practical remedies, as a rule, are given.

There is still a want of proper works dealing with the subject of Fungus disease from an Australian standpoint and suited to the wants of our orchardists and vignerons especially, but the strong necessity which exists for such information will probably soon lead to its being supplied.

The preparation of this work has entailed a vast amount of labour, done single handed and in my spare time, but it was absolutely necessary as a preliminary for the proper carrying out of my duties. To all those who have supplied me with information my best thanks are due and are hereby tendered. It is hardly necessary to mention special names, since the "List of Works" will afford the best evidence of work done. The Government Botanist, Baron von Mueller, has always aided me with the free use of his library and the benefit of his rare and critical knowledge in connexion with some of the Host-plants. Mr. F. M. Bailey, F.L.S., Colonial Botanist of Queensland, has given me every assistance in his power in connexion with Queensland Fungi, and Mrs. Flora Martin is well known for her indefatigable labours in extending our knowledge of Australian species. I am indebted to A. de Bavay for a list of the Yeasts identified by him in Australia, and he adds that they will be largely increased from time to time. Wine Yeasts especially will yet play an important part in connexion with that industry, and there are kinds of Yeast causing decomposition and disease in Onions, &c. The officers in the neighbouring colonies have also willingly given me the benefit of their advice when asked. Amid such a mass of detail some important points may have been overlooked, and I shall be pleased to have any errors or omissions pointed out, such additions and corrections to be subsequently issued as a supplement.

It must not be imagined that because we have tabulated and briefly described a number of Fungi we therefore know all that is necessary about them. The most fascinating branch is the life-history—the story of their lives from year to year; and it is this knowledge as to their various and often disguised phases, how they spread, and where they winter, which will help us to cope with them successfully. There is room for plenty of workers, and it is hoped that some of our young and rising fruit-growers and farmers may be induced to attend to this subject, on account of its great interest and practical importance.

1st January, 1895.