FUNGI AND FUNGICIDES; A PRACTICAL MANUAL, CONCERNING THE FUNGOUS DISEASES OF CULTIVATED PLANTS AND THE MEANS OF PREVENTING THEIR RAVAGES

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CLARENCE M. WEED

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Trieste

PLATE I. ANTHRACNOSE OF RASPBERRY.

FUNGI AND FUNGICIDES

A PRACTICAL MANUAL

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Fungous Diseases of Cultivated Plants

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MEANS OF PREVENTING THEIR RAVAGES

BY

CLARENCE M. WEED, D. Sc.

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NEW YORK
ORANGE JUDD COMPANY
1896

By the Same Author

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Nothing illustrates so practically and satisfactorily the importance and value of scientific investigation as the results obtained by recent experiments in spraying with arsenites for the destruction of insects, and with the copper solution or Bordeaux mixture for the treatment of fungous diseases. After long and patient study and experiment, scientific experts have discovered several causes of the failure of the fruit crop, and have recommended remedies which are proving effective and reliable.

These discoveries are of inestimable value, since without the remedies suggested the spread of diseases and the ravages of injurious insects would soon have put an end to several branches of the fruit industry.—*W. C. Barry.*

The day is not far distant when fungicides, and the means of applying them, will be as much a part of the equipment of a first-class farm—particularly one devoted to fruit or truck—as is the cultivator or market wagon.—*B. D. Halsted.*

We shall conquer when we know how. When we, with open eyes and unstopped ears, as true students of nature, acquire the knowledge within the possibilities of our reach, we shall be able rightfully to assert our royal authority and effectually to have dominion over every living thing that moveth upon the earth.—*T. J. Burrill.*

The time is rapidly approaching when a farmer or gardener will as little dare to neglect the study of the physiology and pathology of plants, as a surgeon dare practice without a knowledge of anatomy, or a sailor hope to become a captain without studying navigation.—*H. Marshall Ward.*

PREFACE

The fungous diseases of cultivated plants inflict annually upon American agriculture an enormous loss, a large proportion of which might be saved by the application of the various methods of prevention and remedy now known to be available. The purpose of this book is to bring together in easily accessible form, the information concerning the injuries, life-histories, characteristics and preventives of these diseases, now widely scattered through scores of periodicals, bulletins, reports and transactions. In preparing it, free use has been made of all accessible writings upon the subject, a list of which would include the contributions of nearly every American economic mycologist, and of many in other lands. It pretends only to the dignity of a compilation in which the compiler has utilized both the facts and very often the language of others.

It would be difficult to find, in the annals of agriculture, an instance in which knowledge of the highest practical value, concerning a subject of first importance in the successful production of the fruits of the earth, has been so rapidly evolved, as has been the case during the last decade, in the investigation of plant diseases and their remedies. Scarcely ten years have passed since there were barely half a dozen scientific men in the United States working upon these problems, from an economic standpoint. Of these, perhaps no one was doing so much, both in original investigation, and in urging the necessity that such studies be fostered by the State and general government, as Professor T. J. Burrill, of the University of Illinois. In 1886 Hon. Norman J. Colman, Commissioner of Agriculture, recognized the importance of the subject, by establishing a mycological section of the botanical division of the Department of Agriculture, and appointed Professor F. Lamson-Scribner to take charge of the work. The wisdom of creating the section was soon made manifest to the public at large, by Professor Scribner's demonstration of the practicability of preventing the ravages of the black rot of grapes, and other mala-

dies of cultivated crops; and the Department has been, ever since, the chief center of interest in the development of knowledge upon the subject. In 1888, Professor Scribner resigned, for a professorship in the University of Tennessee, and was succeeded by Mr. B. T. Galloway, under whose administration the mycological section has been elevated to the Division of Vegetable Pathology, and has constantly increased in efficiency and usefulness, now having a corps of trained experts who are doing much to alleviate the ills of American agriculture.

When, in 1888, the experiment stations were established in the various States, the subject of plant diseases was at once recognized as one of the important lines of work—it being, in fact, specially mentioned in the organic law upon which they were founded—and in many stations, investigators at once began work upon the problems involved. Although scarcely six years have since passed, results of immense practical importance have already been obtained in these investigations and experiments—such as the demonstration of the value of the hot water treatment for grain smuts; of the effects of the Bordeaux mixture, and other fungicides, in preventing potato blight and rot, as well as the plum leaf-spot, raspberry anthracnose, apple scab, pear leaf-blight, and many other maladies; of the nature of various onion diseases, and methods of their prevention; and of the final discovery of the cause and cure of the potato scab. It is safe to say that, had the experiment stations done nothing more for agriculture than to obtain these and other similar results concerning plant diseases, the money spent upon them by the government would have been wisely invested.

The authors, in connection with whose publications the illustrations on the following pages originally appeared, are indicated in the following list: After Arthur, figures 78, 79; Atkinson, figure 53; Bailey, plates II, XI, figures 10, 11, 21, 32, 33, 36, 37, 39; Beach, plates VI, XIV, XV; Burrill, figure 87; Chester, plate IX, figures 9, 88; Clinton, figures 47, 48; Dudley, plate XIII, figures 22, 23, 65, 66; Miss Detmers, plates I, XII; Fairchild, figures 34, 54; Farlow, plate III, figure 7; Galloway, plates IV, VII, figures 8, 31; Garman, figures, 16, 18, 19, 49; Halsted, 17, 20, 24, 46, 57–60, 64, 70–72, 75, 76; Miss Howell, figures 89, 90 (in part); Jones, figure 73; Kinney, plate XVI; Kellerman and Swingle, figures 77, 80, 81; Lamson, plate V; Lugger, figure 2; Maynard, plate X; Pammel, figure 90 (in

part); Scribner, figures 38, 42–44, 50–52, 61–63; Seymour, 45, 86; E. F. Smith, plate VIII; W. G. Smith, plate XVII; Sorauer, figures 13, 14; Thaxter, figures 56, 67–69; Tulasne, figure 84; Waite, figure 15; Ward, figure 6.

I have aimed to treat of only the more destructive and wide-spread fungous diseases, especially those for which practical remedies are known; and have endeavored to give such a concise account of the more important facts concerning these as will enable the cultivator to combat them intelligently. A few of the paragraphs in the following pages have already been printed in my series of articles on Plant Diseases in the *National Stockman* and the *American Agriculturist;* and in a few other instances I have drawn upon my previous writings. I desire also to express my obligations to the directors and other officers of a number of experiment stations—notably those of Connecticut, Cornell University, Delaware, Kentucky, Massachusetts, New York, New Jersey, New Hampshire, Ohio, Rhode Island, and Vermont—for the use of plates of illustrations.

C. M. W.

New Hampshire College of Agriculture and Mechanic Arts.
Durham, January, 1894.