AGRICULTURAL EXPERIMENT STATION

ADMINISTRATIVE OFFICERS

W. C. Coffey, M.S., Director
Andrew Boss, Vice-Director
F. W. Peck, M.S., Director of Agricultural Extension and Farmers' Institutes
C. G. Selvig, M.A., Superintendent, Northwest Substation, Crookston
M. J. Thompson, M.S., Superintendent, Northeast Substation, Duluth
P. E. Miller, M.Agr., Superintendent, West Central Substation, Morris
O. I. Bergh, B.S.Agr., Superintendent, North Central Substation, Grand Rapids
R. E. Hodgson, B.S. in Agr., Superintendent, Southeastern Substation, Waseca
G. F. Wiggin, B.S. in For., Assistant Superintendent, Forest Experiment Station, Cloquet.
Fred Haralson, Assistant Superintendent, Fruit Breeding Farm, Zumbra Heights, (P.O. Excelsior)
W. P. Kirkwood, M.A., Editor
Alice McFeely, Assistant Editor of Bulletins
Harriet W. Sewall, B.A., Librarian
T. J. Horton, Photographer
R. A. Gortner, Ph.D., Chief, Division of Agricultural Biochemistry
J. D. Black, Ph.D., Chief, Division of Agricultural Economics
Andrew Boss, Chief, Division of Agronomy and Farm Management
W. H. Peters, M.Agr., Chief, Division of Animal Husbandry
Francis Jager, Chief, Division of Bee Culture
C. H. Eckles, M.S., D.Sc., Chief, Division of Dairy Husbandry
W. A. Riley, Ph.D., Chief, Division of Entomology and Economic Zoology
William Boss, Chief, Division of Farm Engineering
E. G. Cheyney, B.A., Chief, Division of Forestry
W. H. Alderman, B.S.A., Chief, Division of Horticulture
E. M. Freeman, Ph.D., Chief, Division of Plant Pathology and Botany
A. C. Smith, B.S., Chief, Division of Poultry Husbandry
F. J. Alway, Ph.D., Chief, Division of Soils
C. P. Fitch, M.D., D.V.M., Chief, Division of Veterinary Medicine

The University of Minnesota
Agricultural Experiment Station

The Parasitism of Colletotrichum lindemuthianum

By J. G. Leach
Division of Plant Pathology and Botany

UNIVERSITY FARM, ST. PAUL

In
H
M

E
B
M
P

Pl
Co
Sp
In

Su
Li

CONTENTS

ILLUSTRATIONS

THE PARASITISM OF COLLETOTRICHUM LINDEMUTHIANUM

By J. G. Leach[1]

INTRODUCTION

It has been a matter of common knowledge for many years that some species and varieties of plants are more resistant than others to certain diseases. The discovery of the causes for these differences in resistance has been the object of numerous investigations, and, while much has been learned, the question is still far from solved. It is quite evident from what is known that no single factor can explain resistance in all cases and it is probable that several factors, working together or independently, may be involved in most cases of disease resistance. It is also obvious that a more thoro knowledge of the factors underlying normal parasitism and of the relations normally existing between host and parasite must be obtained before much progress can be made in the solution of this difficult problem. The investigations reported here constitute the first steps in a study of the parasitism of *Colletotrichum lindemuthianum* (Sac. and Mag.) Bri. and Cav. They were made with the purpose of obtaining information which might be applied to the solution of the general problem of disease resistance in plants.

HISTORICAL

The literature on disease resistance in plants has been so thoroly reviewed by Butler (14) that it will be necessary here only to indicate the trend of the development of our knowledge of the subject. Early workers, basing their conclusions chiefly on observation, often confused disease-escaping and disease-enduring varieties with disease-resistant varieties. Ward (50), Orton (37), and others soon pointed out and clearly distinguished between these phenomena. Further study of the question has demonstrated that true resistance must depend either on some anatomical character of the host tissue or on the physiology of its protoplasm. As an example of the former, Hawkins and Harvey (31) recently have proved that the resistance of the McCormick potato to *Pythium deBaryanum* is due to the thick-

---

[1] This work was done under the direction of Dr. E. C. Stakman, head of the section of plant pathology. The writer wishes to express his appreciation of much helpful criticism and advice.

ness of the cell walls of the tuber, which is sufficient to withstand the mechanical pressure exerted by the fungus. Valleau (48) has shown that certain varieties of plums are more resistant to *Sclerotinia cinerea* because the stomata become plugged with masses of small corky cells.

Ward (50), Gibson (30), and Marryat (36), however, proved for several different species of rust fungi that resistance could not be due to anatomical characters of the host as had been claimed for *Puccinia graminis* by Anderson (1) and Cobb (17). On the other hand it was shown to depend on the "physiological reactions of the protoplasm of the fungus and of the cells of the host."

Resistance to certain fungous parasites has been correlated with a greater degree of acidity of the sap of host plant tissues. Averna-Sacca (4) found that the resistance of grapes to species of Oidium and Peronospora was correlated with a relatively high acidity of the cell sap.

Comes (18) has correlated the rust-resistance of Rieti wheat with a high acid and low sugar content of the sap. With the discovery by Stakman and his co-workers (43, 46) of the numerous biologic forms of stem rust (*Puccinia graminis*) attacking wheat it became very evident that the degree of acidity of the cell sap can not explain all the facts of resistance to this rust. The writer (34) pointed out in an earlier paper that the factors responsible for the resistance to the biologic forms of stem rust of wheat must be specific in relation to each form of rust, and suggested a tentative hypothesis based on a possible specific food requirement on the part of the fungus and a corresponding specific food substance within the host. It was very difficult to secure any direct evidence for or against this hypothesis, as we were unable to culture the rust fungi on artificial media. For further work on the subject it was desirable to secure a fungus, specialized in its relation to host varieties and at the same time capable of growth on artificial media. Since *Colletotrichum lindemuthianum* appeared to meet these requirements, it was selected for study.

Colletotrichum lindemuthianum, the fungus causing the pod spot or anthracnose of beans, was first observed in Popplesdorf, Germany, in 1875, by Lindemuth. It was described by Saccardo and Magnus (38) and named *Gloeosporium lindemuthianum.* A few years later Briosi and Cavara (8) discovered the presence of setae and changed the generic name to Colletotrichum. Since that time the fungus has been the subject of numerous investigations, most of which have dealt principally with its life history and control. Barrus (5), however, in 1911 reported the discovery of strains of the fungus which differed in their ability to attack certain varieties of beans. Edgerton and Moreland in 1916 (27) reported the results of inoculation experiments