

**U. S. - DEPARTMENT OF  
AGRICULTURE, BUREAU OF  
PLANT INDUSTRY - BULLETIN NO.  
51; MISCELLANEOUS PAPERS;  
ISSUED FEBRUARY 7, 1905**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649305247

U. S. - Department of Agriculture, Bureau of plant industry - Bulletin No. 51; Miscellaneous Papers; Issued February 7, 1905 by Various

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U. S.-DEPARTMENT OF AGRICULTURE. -  
BUREAU OF PLANT INDUSTRY—BULLETIN NO. 51.

B. T. GALLOWAY, *Chief of Bureau.*

## MISCELLANEOUS PAPERS.

- I. THE WILT DISEASE OF TOBACCO AND ITS CONTROL.  
By R. E. B. MCKENNEY, *Physiologist.*
- II. THE WORK OF THE COMMUNITY DEMONSTRATION FARM  
AT TERRELL, TEX.  
By SEAMAN A. KNAPP, *Special Agent.*
- III. FRUIT TREES FROZEN IN 1904.  
By M. B. WAITE, *Pathologist.*
- IV. THE CULTIVATION OF THE AUSTRALIAN WATTLE.  
By DAVID G. FAIRCHILD, *Agricultural Explorer.*
- V. LEGAL AND CUSTOMARY WEIGHTS PER BUSHEL OF SEEDS.  
By EDGAR BROWN, *Botanist in Charge of Seed Laboratory.*
- VI. GOLDEN SEAL.  
By ALICE HENKEL, *Assistant,* and  
G. FRED KLUGH, *Scientific Assistant.*

ISSUED FEBRUARY 7, 1905.



WASHINGTON:  
GOVERNMENT PRINTING OFFICE.  
1905.

Bot. Dept. 14  
26104

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## MISCELLANEOUS PAPERS.

B. P. I.—69.

V. P. P. I.—104.

### I.—THE WILT DISEASE OF TOBACCO AND ITS CONTROL.<sup>a</sup>

By R. E. B. MCKENNEY, *Physiologist, Vegetable Pathological and Physiological Investigations.*

#### THE DISEASE.

The wilt type of disease is a well-known one, affecting cotton, water-melon, cowpea, tomato, and other crops. Until the present there has been no publication bearing on tobacco wilt, although the writer has been acquainted with the disease for a number of years and some of the North Carolina growers have been troubled by it for at least ten



FIG. 1.—Field of bright tobacco in Granville County, N. C., affected with wilt disease.

years. Accordingly, before considering the control of the wilt it will be necessary to give a brief description of the disease and its cause.

<sup>a</sup>During the past few years specimens of tobacco suffering from what appeared to be a true wilt disease have been received by the Department from a number of tobacco districts. During the past summer, however, in a certain section of North Carolina the disease was found so destructive that it is deemed necessary to make this preliminary statement concerning the disease and its control.

A. F. WOODS, *Pathologist and Physiologist.*

OFFICE OF VEGETABLE PATHOLOGICAL AND PHYSIOLOGICAL INVESTIGATIONS,  
Washington, D. C., September 12, 1903.

So far as known the wilt disease does not make its appearance until the tobacco has attained about a third of its growth. The first evidence the grower has of the disease is the sudden wilting, or drooping, of one or more of the leaves. This wilting is not a temporary one caused by intense sunlight and excessive heat, but a permanent one, followed by withering of the wilted leaves. In some cases only a few of the leaves are killed. As a rule, though, the wilting of a few leaves is followed by wilting and the subsequent withering of all the leaves of the plant. (Fig. 1.) Later the base of the stem blackens and rots. An examination of the roots at this stage of the disease shows them likewise to be blackened, and usually soft and mushy. As a rule, the first diseased plants are found in the washes and lower parts of the field. In the sections where it is just making its appearance the disease may be confined to a few plants in the field. At times nearly the entire field will go down with the disease during the first year. In almost all cases the second crop planted on such infected fields is sure to be practically a complete loss.

#### CAUSE OF THE DISEASE.

Although the disease has not been studied to the same extent as the wilts of cotton, watermelon, and cowpea, still the history of the wilt in the field and the microscopic examination of diseased plants show this disease to be of the same type as the wilts of cotton, watermelon, and cowpea already worked out by Dr. E. F. Smith and Mr. W. A. Orton, of the Department of Agriculture. Microscopic examination of wilted tobacco always reveals the presence of a fungus belonging to the genus *Fusarium* (*Neocosmospora*). This is found in the woody parts of roots and stem. The black lines running up through the wood of the stem readily reveal to the naked eye when cut or broken across the passage of the fungus up the stem.

As shown by the work on other wilt diseases, the *Fusarium* is a soil fungus, and gains entrance to the plants through the *fine roots*. It rapidly spreads into the larger roots and up into the stem. The path of the fungus is through the woody vessels which conduct the sap upward. In many cases the growth of the fungus is so great that the woody vessels are almost, if not completely, plugged up. The flow of crude sap up to the leaves is either very much decreased or entirely stopped. Since there is no supply of water from the roots to replace that evaporated from the surface of the leaf, the leaf wilts and dies.

#### CONTROL OF THE DISEASE.

Once a plant becomes affected by the disease there is no hope of its recovery, and when the larger part of the field is affected the crop is a total loss to the grower. Sudden droughts have been said to arrest the progress of the disease, but they do not save the crop. The treatment

of the wilt must be one of prevention—that is, the spreading of the disease must be prevented, and an effort made to rid the infected fields of it. In treatment of the disease, it is of the greatest importance that the long-lived character of the moldlike threads of the fungus in the soil and its manner of reproduction, or, more popularly speaking, of seeding itself, be borne in mind.

The *Fusarium* has been known to live in the soil for a number of years and still be able to produce the disease. This is particularly true in districts with mild winters. It is therefore useless to plant tobacco on infected fields until they have been rested for a period of from five to eight years, depending upon the amount of disease present. During this resting period sorghum, corn, wheat, oats, or any other crop of the grass family may be planted with safety, since these are not subject to this disease. Sorghum and corn are particularly recommended. Tomato and eggplant also suffer from a wilt disease. That the tobacco wilt is the same as that affecting these plants has not yet been proved, but the relations of the tomato and eggplant to tobacco make it not improbable that all three may suffer from the same disease.

In order to eradicate the disease, it is necessary that all source of infection of new fields be destroyed. All diseased plants should therefore be *burned on the field where they were grown*. The burning of the plants does not mean any loss to the grower, because the chief fertilizing value of the tobacco stems lies in the amount of potash which they contain. In the burning the potash is not lost, but is retained in the ash, and has fully as much value as before burning. If the diseased plants are not burned, they are scattered about and serve to inoculate new fields. Plows and other tools used on the infected lands should be cleaned where used. Since the growth is favored by acid substances and hindered by alkaline substances, washing the tools with soap and water is advised, since the slight alkalinity of the soap acts injuriously on the fungus. None of the diseased tobacco should be mixed with manure or compost heaps, since the fungus spreads rapidly through the manure, and when that is placed on the land, of course the land becomes infected with the disease. Manure barns in which diseased tobacco has been placed should be burned and barns erected on new land. A number of cases are known where the disease has lived in the manure sheds for years.

As an additional means of getting rid of the fungus it is advised that the tobacco stubble be plowed up in the *autumn* and burned on the field. The reason for this is twofold. In the first place, this stubble is a good breeding place for the fungus during the winter; secondly, of the three kinds of fruiting or seedlike bodies formed by the *Fusarium* the one most difficult of destruction is produced on the roots during the autumn and winter. By turning up the stubble in *autumn* and burning it these seedlike bodies are either prevented