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DYING OF BEARING GRAPE-VINES

LOCALIZED STEM BLIGHT IN OHIO VINEYARDS

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Early in August, 1906, our attention was called to a serious dying of grape-vines in Ashtabula county, Ohio, near Unionville. The trouble had begun in 1905, at which time an entire row of 17-year old Concord vines had wilted and died. It was first thought that lightning had caused the death of the vines, as the trouble was apparently confined to a single row running east and west; but when the adjacent row on the north began to die in a very similar manner in 1906, a parasitic disease was suspected and the Station was called upon for assistance.

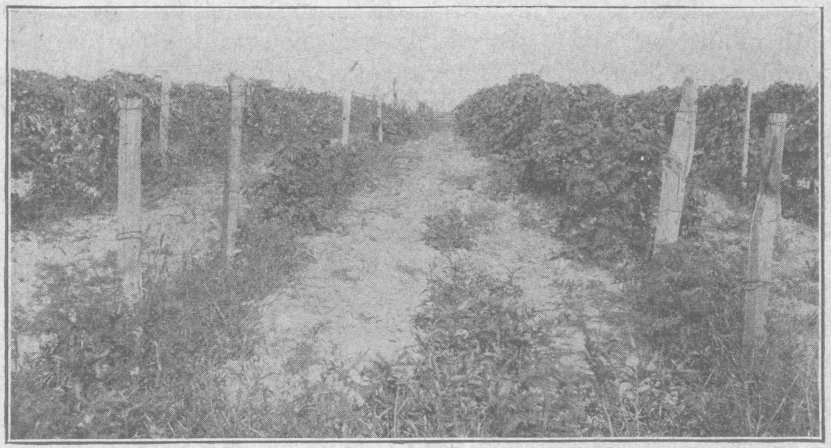

FIGURE 1. Badly diseased vineyard row, Unionville, looking from west, with occasional sprouts from roots of blighted vines; at left (north) many diseased shoots show dead leaves, while at south vines are healthy. From photograph August 16, 1906.

A visit was made to the diseased vineyard August 16, 1906; it was learned that in the one row first diseased, the vines had died and had been cut back to the ground. Many of the old roots had put out sprouts, some of which were wilting. New vines had also been set out. Figure 1 shows the appearance of this portion of the vineyard looking from the west. The row to the right (south) was perfectly healthy; the row to the left (north) was wilting badly. An examination of this row showed that all or a part of every vine was affected with a specific disease. Likewise, several in the second row to the north and an occasional one in the third row, were affected.

The vines wilted worst, beginning about the first of August. The leaves and tender shoots are the first to show that disease is present; they droop and finally dry up, while the berries shrivel.

SYMPTOMS OF THE DISEASE IN AUGUST

In Figure 1, the row at the left of the missing row shows a marked contrast to that at the right, having in places a much lighter shade on account of under leaf surfaces presented upon dying.

At the time of the visit, the affected vines showed the stages of wilting and drying up, following in turn the more or less gradual collapse of the plants. These phenomena are reported to have been most conspicuous early in August when leaves were hanging down, berries wilting and all these parts subsequently drying up. The advance of the trouble was marked by the collapse of additional vines in the rows to the left (north). Surviving branches from such vines as were previously attacked often completely dried up, while in cases of less disease, a branch collapsed in this manner, leaving the remaining parts erect and turgid. In examples which had suffered death of all parts above ground, the root, below the crown, showed no evidence of decay, while the basal or other portions of the diseased stem showed the fruiting stages of a fungus in the form of elongated, protruding growths from the inner bark. Figure 2, of which a fuller discussion appears elswhere, will show the appearance of such parts. The old wood of these vines was much discolored in whole or in part, while the parts above yet showed green color.

Early in January, the writers visited the vineyard to study winter conditions. At this time the younger growth, which had wilted in summer, appeared as dead canes and branches. These were easily detected by their gray or dark brown color. In the less seriously affected rows to the north, the death of the branches of the stock was frequently noted, without complete death of the latter.

Much of the old wood was dead to the ground, but the roots still seemed otherwise normal.

WHAT OF THE OLD DEAD STUBS ON THE GRAPE-STOCKS?

In August, the collapse of the seriously diseased vines, *in toto*, naturally raised the question of the danger of infection from the old dead stubs left by years of pruning, which is not always done with a view to having the least possible amount of dead wood exposed. Wounds so made do not heal in the grape, and conditions favoring infection through the stubs are suggested by the appearance.

Another view, namely, that of progressive attack, from the outer branches inward, would see in the dead stocks (aside from the dead stubs) the final stage of disease. Further studies should determine the actual course of the disease.

APPEARANCE OF DISEASED CANES

If one strips off the old bark of such diseased stems, somewhere on the surface of the inner bark he will notice the condition shown in Figure 2. This is from a photograph of a section of an old branch and is enlarged about three diameters. The dark or black dots, which are often arranged in the form of longitudinal elevations, are the fruit-bodies of a fungus and contain thousands of spores.

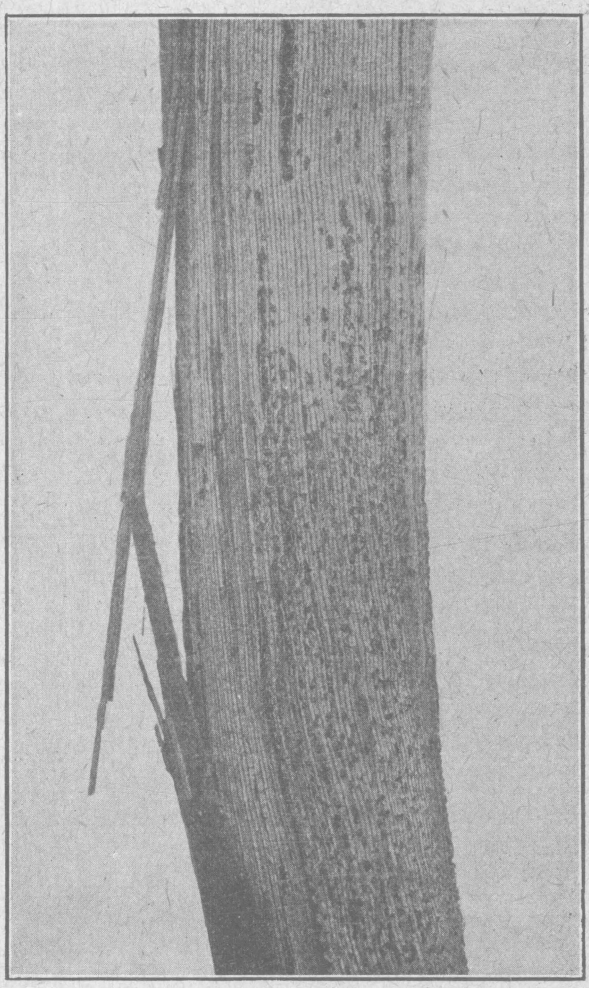

FIGURE 2—Section of a diseased grape-vine with outer bark removed showing protruding stroma-like, dark growth of the parasitic fungus believed to cause death of stock. These separate dot-growths are at times united into elongated ridges of the same nature. Countless spores will escape from these in spring or summer and probably infect new vines. (Winter condition, enlarged 3 diameters).

A cross-section of a stem at this point (even when the wood is only just beginning to discolor and the younger growth above is still green) when placed under a microscope, shows the vegetative part of the fungus all through the bark and wood vessels. This vegetative part, or *mycelium*, is in the form of numerous, colorless branching threads, which grow in every direction, not only killing the wood, but also stopping up the vessels, thereby preventing the upward flow of water and causing a very early wilting of the affected parts above.

Pure cultures of the fungus have been obtained, and although the disease has not yet been produced through inoculation, it seems at present to be clearly due to the fungus just described. It is desired to obtain specimens from vineyardists and to follow the matters of cause and prevention during the season of 1907.

DANGER AND PREVALENCE OF THE DISEASE

Attention was first called to the case described in Ashtabula county, but this doubtless stands as an example of closer observation. The same condition affecting, however, only occasional scattered stocks, was found to exist in a variety vineyard, 13 years old, at the Experiment Station, Wooster. This vineyard has been regularly and thoroughly sprayed since its planting, with Bordeaux mixture followed by ammoniacal copper carbonate; this spraying has held all diseases of the foliage and fruit in check, including among these the anthracnose upon the berries, and the vines have yielded satisfactory returns. The writers are advised of the occurrence of a similar trouble in the Grape District of New York State and in north-eastern Pennsylvania.

At this time it seems safe to draw at least two inferences from the preceding statements:

1. This dying of grape-vines is approaching the condition of general occurrence and calls for study and efficient handling, if death of stocks is to be prevented.

2. The evidence is against the efficacy of Bordeaux alone, as a remedy to be employed against this final death of stocks.

The second inference is based upon the loss of vines here at the Station despite the thorough use of Bordeaux mixture and its efficiency against diseases of fruit and foliage. the Unionville vineyard has been sprayed, but apparently less thoroughly. While there is nothing in the situation to excite undue alarm, there is urgency in determining the prevalence of the disease and the best means for its control.

Specimens examined are identical, as to the parasite, with those collected in New York State in 1904 and referred by Atkinson to the

Anthracnose fungus of the grape. This was published in Press Bulletin, Cornell University Experiment Station, No. 1, 1904, and dated April 25, 1904.

METHODS OF PREVENTION OR CONTROL OF THE DISEASE.

The possible ineffectiveness of Bordeaux mixture alone is indicated by the development of the trouble in the Station's vineyards under thorough spray treatment from year to year. While it is true that applications were not always made before the opening of the buds in spring, thorough spraying was practiced during the usual period. Somewhat greater efficiency may be expected, perhaps, from stronger sprays or washes of Bordeaux mixture upon the vines in early spring, say immediately before the opening of the buds; this would be about May 1st in northern Ohio. This treatment was recommended by Atkinson in the reference given. More drastic measures upon the old stocks are indicated by the facts at hand.

For many years, in Europe and Algeria and more recently in South Africa and Australia, 5 to 10 per cent. solutions of sulfuric acid in water or of sulfuric acid and iron sulfate in water, have been employed and generally with reported favorable results. The following formula was recommended by Bolle in Italy, in 1892 (See Zeits. f. Pflanzenkr., 3;119):

Iron sulfate..... 50 parts by weight.
Sulfuric acid..... 5 parts by weight. (2¾ parts by volume.)
Water.....100 parts by weight.

This was applied on the vines 15 to 20 days before opening of buds, with a brush, after pruning and after outer bark of main stem had been removed with roughened gloves. More recently, in the Agricultural Journal of the Cape of Good Hope, July, 1906, Lounsbury reports the successful use of a similar solution applied by brush. His formula is:

Sulfate of iron crystals.....110 lbs.
Commercial sulfuric acid.....1 qt. (often 2 qts.)
Water .....22 gallons.

This solution was applied with a brush a week or two before opening of buds in spring. Neither of the formulae given could be used during the growing period and the applicability of both is restricted to the dormant period. In both cases hot water is recommended for the solution. Either formula might be applied by use of pumps with brass working parts, provided the parts were thoroughly washed out immediately after use; otherwise the acid would corrode the metal.

Sulfate of iron crystals .....200 to 225 lbs.
Commercial sulfuric acid (sp. gr. 1.82)..... ....15 lbs. (1 gal.)
Water, to make.....50 gallons.

Pour acid upon the crystals of sulfate in a wooden vessel. Dilute at first cautiously, using hot water if possible, with stirring until all sulfate is dissolved. This may mean to make the volume 30 or 40 gallons. Where smaller quantities are needed, fractional portions of the given formula may be employed. No more than needed should be made up. The danger of burns from the acid solution must always be heeded; protection of hands and face will moreover be wise when one undertakes to apply this acid solution.

RECOMMENDATIONS AND CAUTIONS

It is recommended that vineyardists give early attention to the examination of dying vines or groups of vines, and that in all such cases careful examination be made for such specimens as we have already described and illustrated. Every dead branch of a stock should call for examination as the disease may begin in this way. It is possible that centers of bird's eye rot upon the berries in summer may be centers of this stem blight as well, and specimens from such areas, accompanied by notes, will be doubly appreciated by the authors. Where very few vines show the blight, and these are widely scattered, to remove and burn the diseased stocks may be the simplest practice. However, where a series of vines show the trouble, it were better to prune separately from healthy ones, and to burn all litter, including possibly the rough bark from the stems, preparatory to treating the stocks with the acid iron sulfate mixture before described, either by spraying or by use of brush. When the disease is once known to occur in vineyards, it were much wiser to go over the vines before pruning and to mark those to be passed by the trimmers; these should be pruned separately, since it is not improbable that the disease is spread along the rows by pruning first diseased and then healthy stocks. Cutting dead stocks before pruning living ones is therefore to be avoided. It appears that like other vine growing countries we must now face the problems associated with this stem blight, which may be the same as with them.

SPECIMENS DESIRED

The Station Botanist is very desirous to secure specimens of diseased canes and to receive information concerning the dying of vineyard stocks in the state. For the season of 1907, much of the progress made must depend upon the cooperation and advice of vineyard owners. The same is true in the matter of treatment to be applied to diseased vines. For reporting data and observations the attached blanks may be used. Such correspondence and specimens will receive due attention and response

Vineyard owners are earnestly solicited to fill out, detach and mail to the Station the following report, whether specimens be sent or not:

VINEYARD MEMORANDUM REPORT

Area of vineyard,.....acres; age,.....years; varieties—

chief,.....others,.....; kind of

soil,..... ;high or low lying,.....; located in..... .....

township,.....county, near..... Railway or Traction } *Station;*

practice as to spraying,..... .....

Have you noticed dying of vines in vineyard?..... .... If so, at what age and to what extent and were these replanted? Report below and send specimens..... .....

Has there been recurrence of dead stocks? ..... Do you regard this as serious?..... What is your most serious disease, also worst insect trouble on the grape?.....

....

Name.....

Residence ....

Address.....

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