PROCEEDINGS

of the

90th Annual Meeting

of the

NEW YORK STATE HORTICULTURAL SOCIETY

HELD AT ROCHESTER, NEW YORK

Wednesday to Friday, January 10, 11, 12

EASTERN MEETING AT KINGSTON

Wednesday to Friday, January 24, 25, 26

1945

Next Annual Meeting at Rochester, N. Y.
Wednesday, Thursday and Friday
January 16, 17, 18, 1946

Next Eastern Meeting at Kingston, N. Y.
January 30, 31, Feb. 1, 1946

Press of the Gazette-News Company, Le Roy, N. Y.

90th Annual Meeting

held at

Seneca Hotel, Rochester, N. Y.

January, 10, 11, 12, 1945

WEDNESDAY MORNING SESSION

The meeting was called to order at 10:20 A. M. by the President, Mark E. Buckman.

Invocation by the Rev. Mr. John De Ward, Emanuel Presbyterian Church, Rochester.

Practical Use of Our Newer Knowledge of Apple Scab Control

DR. A. B. BURRELL, Department of Plant Pathology, Cornell University, Ithaca

As we look ahead several years we may envision glittering and revolutionary possibilities in methods of controlling diseases and insects. We may dream of airplanes superseding ground vehicles. We may see high-powered sprayers and dusters employing new principles of application. We may see high-powered organic chemicals, capable of arresting the development of the fungus after infection has occurred, yet non-injurious to foliage

and fruits. We may see new varieties of fruits resistant to attack by diseases and insects.

A preview of some of these things will be offered in discussions by other speakers on this week's program. My remarks will deal with meeting one of our older problems with the knowledge and equipment available in 1945. Many of you already are employing the newest information and doing an excellent job in the face of great difficulties; to you I offer congratulations!

Two developments have kept the scab problem in a prominent position in New York. One is the increase in the proportion of trees that are of the scab-susceptible variety, McIntosh. The other is the trend toward summer spray programs devised specifically for the control of the codling moth, and employing petroleum oils. The use of summer oils prevents the use of sulfur immediately before as well as during the period when oils are being applied, and throws greater urgency on the matter of getting scab control before the first codling moth cover spray goes on.

New information on the following topics will be interwoven with the standard information on the relation of rain periods to infection, in an attempt to suggest an economical, effective approach to the scab-control problem:

1. Which spray and dust materials may be used on wet foliage including during rains.
2. Which fungicides are adapted to use at different stages of the scab infection period.
3. What significance may be attached to the splashing about of fungicides by rains.
4. Ways of reducing the cost of the scab control program.

In the early part of the season the greatest limitation is the time to get the spray job done. This suggests dusting, for it was the demand for greater speed that was chiefly responsible for the introduction of the dusting method. This does not belittle the advantage of the light weight of the dusting machine which makes it possible to get through mud more easily. However, dusters being sold to fruit growers today offer a saving of perhaps only 30% in man-hours required to cover the orchard, compared with the time required with the dusters of 20 years ago. In contrast, the standard, high pressure sprayers offer a saving of perhaps 60% in the man-hours required to cover the orchard, compared with 20 years ago. Thus, while dusting is much faster than spraying, the relative advantage of the dusting method, so far as speed is concerned, is less than it used to be. Is this not a challenge to the duster manufacturers? Possibilities of more drastic changes in methods of applying sprays and dusts will be covered by pictures and discussions at to-morrow's machinery forum.

Can you remember how heatedly, 20 years ago, some said that dusting was a panacea, while others said it was worthless? Many thought lime sulfur the only good fungicide for apples. One specialist (semi-facetiously) said wettable sulfurs would control scab if there wasn't any scab to control! Some had their favorite brand of material with its magic constituent. My talk presents no single all-purpose program or material. Rather, it represents an effort to illustrate how we should fit each type of material and each method of application into the situation for which it is best adapted.

In the control of scab, it is utterly impossible to achieve efficiency through a hard and fast schedule laid out in advance. Rather, the schedule must be developed according to the precise situation from day to day. While bulletins and advice from Farm Bureau spray service men can be of immense help, there is no adequate substitute for a grasp of the subject by the grower himself. In the keen competition that lies ahead, the grower dependent solely on a routine schedule, plus outside advice, will be at a handicap.

Since the crucial problem often is finding time to get the scab control applications on, how can time be conserved?

1. By having the machines well overhauled and tuned up before the growing season starts.
2. By developing a faster way of refilling the sprayer.
3. By spraying from the tank in those applications where the diseases and insects present can be controlled by spraying from this position. Apple scab usually can be controlled by tank spraying.
4. By using as many nozzles as the machine will carry without losing pressure.
5. By having one man handle as many nozzles as possible. When riding the tank, one man ordinarily can carry a short-handled gun with 10 nozzles, when the machine is operated at 500 pounds of pressure. If the gun is mounted on a standard, as described in a separate article in this volume, the number of nozzles may be increased to 16.
6. By having three forms of sulfur on hand so the form best suited to the occasion may be used:

1. A flotation sulfur paste (a dry wettable sulfur with many particles below 5 microns in cross-dimension is a good substitute, but usually more expensive)
2. A fine-particle sulfur dust, if the grower owns a duster.
3. Lime sulfur solution (dry lime sulfur would be a good substitute if cost were not a factor)

Let us elaborate on point No. 6. Suppose we are making our pre-bloom protective sprays with a flotation sulfur. The Extension service says ripe spores are present in the old leaves. The forecaster says a rain is coming within 2 days.* We spray through the day, but in the evening the leaves become wet with dew. We have been warned not to make lime sulfur sprays on wet foliage because of the risk of burning. May we continue putting on flotation sulfur? The answer is definitely "Yes!" There may be a little extra run-off because of the wetness of the foliage but there is no danger of burning with a flotation sulfur on account of slow-drying. The use of one pound or more of hydrated spray lime per 100 gallons may increase the deposit through flocculation of the sulfur.

Suppose we see that even by spraying into the nights we shall be unable to complete the application before the rain. That is one place where dust may have unique advantages, if the atmosphere is quiet. For complete assurance of thorough coverage, dust should be applied from both sides of the row. Yet in practice many fruit growers have learned that dusting from one side often gives a large measure of protection against scab, especially on small or medium-sized trees.

Suppose we get a south wind just before the rain, as we often do. Then we had better go back to spraying with the wind with flotation sulfur, as dust will not give good coverage in the wind.

Let us assume that not all of the orchard is covered when the rain starts. If the rain comes down hard for several hours, that may be the time for us to get a little rest. Perhaps the rain stops in a few hours and leaves blow dry in less time than Dr. Mills has found required for an infection period. Then we can quit worrying about scab infection in that particular rain. Instead, it may turn into a drizzle, with indications of keeping the leaves wet more than the minimum period required for infection. That is when we should resume the application with flotation sulfur spray or sulfur dust.

* See Dr. W. D. Mills' Cornell Extension Bulletin No. 630 for the period of wetting required to cause scab infection at different temperatures.

Much will wash off, but enough usually will be left to protect the foliage and buds through that particular rain. The sulfur we have applied will be washed and splashed from place to place leaving a deposit of sulfur on some spots originally missed. This re-distribution of sulfur by rains, which Dr Hamilton has demonstrated in some of his experiments, probably is of immense importance in control of scab. Obviously, it is that sulfur applied to the top of the tree which is most likely to be moved to some new location not perfectly covered; conversely, there is little chance for the tops to receive sulfur splashed from lower portions of the tree. This situation provides a potent reason for a special effort to provide heavy coverage of the tops. Some growers feel that it pays to increase the flotation sulfur per 100 gallons from the usual 10 pounds to 12 or 14, when spraying in the rain, or to apply a larger poundage of dust per tree. There is evidence that the use of an oil-type sticker sometimes improves the control of scab when sprays are applied in the rain. Good results often are achieved without it, however. Some manufacturers have urged the use of a moisture-penetrating dust (i. e. one containing a wetting agent) for applications on wet foliage including those made during rain. Fine-particle sulfur dusts not containing wetting agents, however, have proven effective. Usually it is doubtful if it would be economical to include lead arsenate in sprays or dust applied during rain, as the lead arsenate residue is likely to be washed down to too low an amount to control chewing insects.

Let us assume that, when the weather has cleared and the trees have blown dry, we find on Mills' chart that they have been wet long enough to have permitted scab infection, and we still have trees that were not protected. This is where lime sulfur, 2-100, comes in. We must wait until the leaves have become dry, because in a soaked condition, they are especially subject to burning. We have a period up to 60 or 70 hours, after the start of the infection period, during which a heavy application of lime sulfur may prevent the appearance of lesions. Inevitably there will be some injury from the use of lime sulfur. Even in the absence of visible scorch, food manufacture by leaves is cut down for a few days by lime sulfur. This appears to be chiefly from that part of the spray that reaches the lower surfaces of the leaves. The injury is worst under high temperature, slow drying conditions, and on sensitive varieties such as Baldwins. Low-vigor trees have poor ability to recover from lime sulfur injury. There is some risk of causing excessive dropping of fruits on light-setting varieties like

McIntosh, especially in the case of sprays at the petal-fall period. The grower must decide whether the risk of scab is sufficient to offset the anticipated injury. As mentioned earlier, less injurious eradicant fungicides may ultimately be introduced to supplant lime sulfur for arresting scab development.

About 60-70 hours after the start of the infection period, the scab fungus will have gotten too far inside the leaf to be halted in its growth by any spray. Any fungicide applied from now until scab spots become visible can be serviceable only as a protectant against infection in the next rain. As a protectant, lime sulfur has no superiority over flotation sulfur. Therefore, with no scab visible on the leaves, and the period for after-rain effectiveness gone by, there is no excuse for choosing lime sulfur.

If scab becomes visible on the foliage some 10-12 days after the infection period, it indicates that our timing or thoroughness was at fault. As soon as a scab spot is visible, there are countless spores present, capable of causing secondary infection during rains. A heavy covering of the spot with lime sulfur 2½-100 or 2-100 will inactivate a scab spot on a leaf. At times, eradication is not complete, part of the fungus surviving beneath the cuticle or waxy coating of the leaf and breaking through later. A second lime sulfur spray may be necessary to bring about complete cessation of activity. Frequently, a second infection period occurs 3 or 4 days after the first one. The fungus that became established during the second rain period may be growing beneath the waxy coating of the leaf, hence protected from a lime sulfur spray after the spots from the first infection period have become visible. A lime sulfur spray may inactivate the visible scab spots of the first infection period, but have no effect on those from the second period. The breaking through of such scab spots on a leaf well covered by spray residue sometimes is mistakenly taken as evidence that lime sulfur will not check development of foliage scab. For any individual scab spot, there is a period of at least a week, during which lime sulfur cannot reach it to arrest its development.

If scab is extremely abundant, say 10-12 scab spots present on the leaves of each fruit spur, then the damage from lime sulfur often exceeds the benefits from eradicating the scab. Thorough and persistent spraying with flotation sulfur often brings through clean fruits, even when foliage is scabby. Only a broad knowledge of the whole subject will enable the fruit grower to decide wisely whether he should resort to lime sulfur or depend

upon milder, protective sprays. It usually is possible to avoid such a predicament, if the grower is enough of a student to have an adequate grasp of the complex factors involved, and enough of a businessman to apply his knowledge vigorously. If weather factors make the best procedure uncertain, it is far better to apply one or two extra dusts or sprays as insurance during the primary infection period, than to run the risk of permitting foliage infection.

No attempt has been made in the foregoing discussion to indicate the place of the organic fungicide, Fermate. However, in our Champlain Valley experiments, when used with a spreader and lead arsenate, its performance against scab has been similar to that of flotation sulfur. It has functioned as a protective rather than as an eradicant fungicide against scab. It is compatible with summer oils, and seems to be the logical fungicide for use immediately before or with a summer oil.

To summarize, the crucial point in early-season scab control in these days is finding time to get the job done. To utilize the time to the best advantage with equipment now available, the grower must (1) have machinery well overhauled before the spraying season starts, (2) develop fast ways of refilling the sprayer, (3) spray from the tank in as many of the applications as possible, (4) use as many nozzles as the machine will carry, (5) have one man handle as many nozzles as he is able, and (6) utilize as many of the 24 hours as possible through choice of the proper form of sulfur spray or dust. If his knowledge is adequate and he has provided himself with several forms of sulfur, he seldom will have to stand helplessly by, watching the rain while the disease develops. Each main type of sulfur fungicide has its distinctive use. When more materials are introduced, study by the grower will become increasingly urgent, as each material has its special characteristics, and the problem of compatibility with other constituents of the spray mixture will become increasingly complex. True, you can stick to a routine spray program with a few old standard materials like lime sulfur, lead arsenate and nicotine sulfate, at specified stages of tree development, if you wish. But your competitor, with superior knowledge and a wider range of materials, will produce fruit of higher quality, and do it at a lower cost per bushel. Despite the recognized shortage of machinery, the greatest loss from apple scab comes from failure to make the wisest use of available machinery and to utilize the range of materials that make it possible to apply a fungicide with a minimum of interruption by adverse weather. The grower must understand these things, to be able to make full use of the information provided by the Spray Information Service.