

FOLIAGE DISEASE CONTROL

by

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As forest nurserymen I imagine that you are more interested in the control of seedling diseases than in the diseases themselves. So rather than bore you with a listing of foliage diseases, their description, and classification, I have tried to fashion this talk on foliage diseases around the development of control program, specifically around the development of fungicide spray programs- I have an ulterior motive in that by using this approach I can also acquaint you with some of the problems one is faced with when trying to develop a spray program

The major need in the development of any control program is information. What information do we need and why do we need it? If we have a foliage disease problem, have determined what fungus is responsible, and have decided to control this disease by a fungicide spray, we are faced with two main questions, First, what do we spray? Second, when do we spray? Answers to these rather simple questions require a great deal of information. What information must we have in order to select the proper fungicide? We must *knew* (1) what fungicides are available, (2) which of these are most effective against the casual fungus, and (3) which are not harmful (phytotoxic) to the host seedlings. Often we must draw heavily on fungicide information from general agriculture to help in the selection, Even then we often lack a portion of the information, required for a definite answer. In this case, unless an emergency situation exists, some field testing is usually required before the program can be developed further.

The "when" question -- when do we spray is often the more difficult of the two questions to answer. To answer this question we need to know fairly well the disease cycle of the disease in question. Why is timing so important in the use of a foliar fungicide? Most fungicides are classed as protectants. That is, they protect the plant by forming a chemical surface barrier which kills the fungus spore or inhibits its germination while the spore rests on the plant surface. Once the fungus spore has germinated and the fungus has penetrated into the host tissue, these protectant type fungicides are no longer effective. Therefore, in order to control a foliage disease we must apply the fungicide prior to penetration. But, we can not apply this fungicide too far in advance of inoculation because those plant parts formed between the spraying and the inoculation will not be protected by the fungicide. The longer this interval between the spraying and inoculation the larger is the unprotected portion of the plant. Also the watering from the overhead irrigation system tends to erode the protective fungicidal coating away so that the efficiency of this chemical barrier diminishes with time. We could spray every week throughout the growing season and thus keep a protective coating of fungicide on the seedlings at all times. But in most cases in the arid West this intensity of spraying is not necessary if we know the disease cycle of the disease involved.

How do we use the information about the disease cycle to help us time our spraying correctly? In figure 1 you see a diagram of the disease cycle of a general type foliage disease. We are mainly interested in that portion of the cycle from sporulation to penetration. This is the portion of the cycle in which spread to new hosts occurs and also the period when the pathogen is free and unprotected by host tissues. By knowing the how, when, where, and requirements of each of these activities, sporulation, dissemination, inoculation and penetration, we can predict when the plants are in danger of becoming infected and spray only on these occasions.

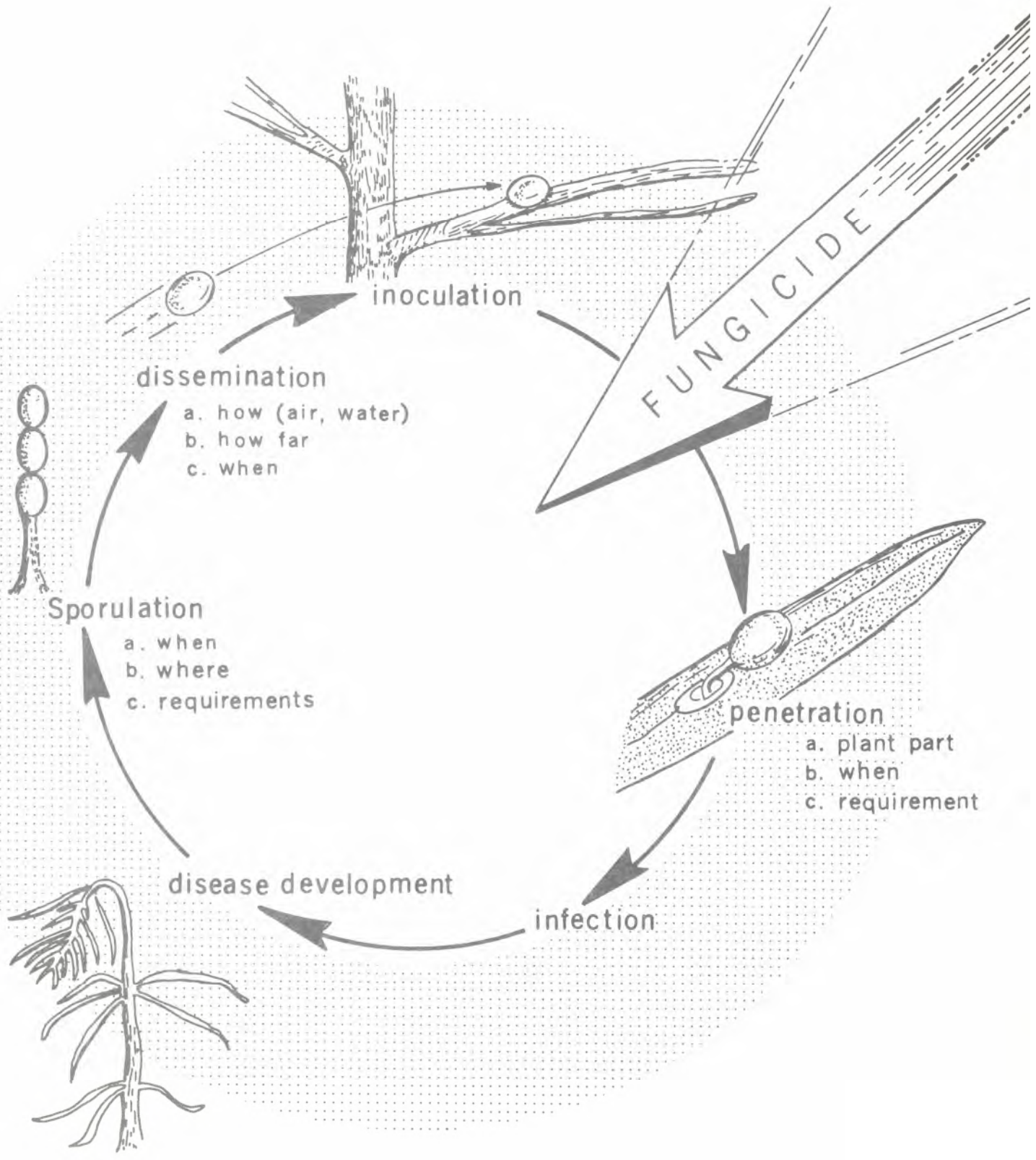
For example, the source of gall rust, a disease found in several western nurseries, can usually be traced to infected galls in the pine stands surrounding the nursery. These galls sporulate in late spring and early summer. Preliminary investigations indicate that by midsummer those spores left on the galls are no longer viable. With this information we can then limit spraying for gall rust control to a period from seedling emergence in late May and early June to, say, mid-July or early August when the rust spores lose their viability. Furthermore, rust spores -- although wind disseminated -- require several hours of free moisture and high humidity in order to germinate. Thus if our irrigation practices are such that free moisture is not left on the plants overnight, we can further limit our application of fungicides just to those rainy periods in June and July when viable spores are present on the needle surface and conditions for spore germination are met.

In conclusion I would like to repeat that there is more to controlling foliage diseases than just spraying. The choice of the fungicide and the proper timing of its application are of extreme importance.

DISCUSSION

Q: There is no schedule then or life cycle that you can predict when these sporophores will be released?

A: Yes, they will be released in late summer or early spring.



General Foliage Disease Cycle