

WEDNESDAY AFTERNOON SESSION

October 16, 1968

WALTER KRAUSE: Our first session this afternoon will be on pathogen-free propagating materials and certification programs. I am sure we have a good program ahead of us this afternoon. Our moderator is Dr. John Rodebaugh, Soils and Plant Laboratory, Orange, California. I will turn the program over to him at this time to have him execute it as he sees fit.

MODERATOR RODEBAUGH: Thank you Mr. Chairman. Our program this afternoon will discuss the propagation industry in a little broader aspect than we did this morning. My topic deals primarily with the development and maintenance of pathogen-free propagating material.

DEVELOPMENT AND MAINTENANCE OF PATHOGEN-FREE PROPAGATING MATERIAL

JOHN RODEBAUGH
Soil and Plant Laboratory, Inc.
Orange, California

Success in horticulture depends directly upon a grower's ability to maintain his plant material in a disease-free condition. Good growth depends upon many factors being in proper balance, but if we were to single out any single factor as being the most important, it might be the health of the plant the grower starts with. A quality plant never develops from a diseased seed or an infected cutting or liner.

The importance of keeping plants healthy has long been recognized. One of the first papers on this subject was published in 1723. Since that time, much progress has been made in this field, but there continues to be room for improvement. The key to any program depends upon knowing the life cycle of the pathogens that you are trying to control and then developing the necessary sanitary facilities to keep these pathogens from the plant's environment. This goes back to the old phrase often used by Dr. Baker, which is; "don't fight 'em. eliminate 'em".

One of the best reviews on sanitation in the nursery industry continues to be University of California Manual 23 commonly referred to as the UC Manual. This publication is now in its sixth printing and over 30,000 copies have been sold. Apparently growers are still discovering this publication, for the demand continues to be a fairly constant 150 copies per month. While the publication is now several years old, the ideas presented regarding sanitation apply as much today as when they were written. A quick review of this manual often reveals items that were overlooked in an earlier reading.

Unfortunately, a good sanitation program does not give the grower the satisfaction that is derived from using a spray or dust to control a disease that has already started. Much time and money is spent each year for the development and utilization of chemical controls. Unfortunately, progress in this field is slow. In the late 1800's fungicides were already being used for control of plant diseases and at the same time, many people were dying annually from malaria and small pox. Today, these two diseases and many others have been eliminated, but in agriculture, we are still using practically the same chemicals for the control of plant diseases.

Until recently, systemic fungicides were only a dream. Now, several are being developed, and this could be one of the major breakthroughs in the chemotherapy of plant diseases. Chemicals play only a small role in our topic today; consequently, we will not go into this subject in greater detail.

Once a grower decides to upgrade his propagation facilities, several things should take place. First of all, he should evaluate the plant material that is grown and outline the most serious disease problems. The disease cycle should be analyzed and methods of breaking this cycle should be devised. The key to all of these programs is sanitation, but it must be sanitation that is headed in the right direction. For example, it would make very little sense to dip cutting knives in disinfectant to control a virus disease that is transmitted only by insects.

The classical approach to clean propagating material consists of establishing a mother block of plants that are disease free and using these as a source of all further cuttings. The mother block is kept under hospital-like conditions with foot baths and white coats for the workers being common practice in the ranges of commercial propagators. The mother block stock is checked for the presence of systemic pathogens by culturing.

The idea of culture indexing was first proposed in a crude form prior to 1900. However, it wasn't until the early 1940's that this method was used commercially to free chrysanthemums from verticillium wilt. Since that time the culturing has been adopted by the commercial propagators of carnations and even more recently, geraniums.

In addition to culturing indexing, the cuttings for the mother block are also checked for the presence of virus diseases. This subject will undoubtedly be discussed in greater detail by our next speaker. The shoot tip culture technique developed from the need to establish a source of plant material that was not only free of vascular pathogens, but also free of any fungal or bacterial contamination on its surface. Basically, this technique consists of removing a very small tip from the vegetative shoot of a plant and growing it under aseptic conditions until a small plant has developed. Since only one plant develops from each tip that is cultured, no increase in the num-

ber of plants is accomplished until cuttings are taken. Going one step farther, it is now possible to use a few cells from a shoot tip to produce a callus tissue which can be increased in liquid broth under sterile conditions and then broken up and used to start a large number of plants, all having the same genetic characteristics as the parent. By either treating the plant from which these cells are taken or by careful selection, the offspring will be disease-free as long as they are kept under sterile conditions. Again, there is no substitute for sanitation. Already this technique is being used extensively for vegetatively propagating orchids. The current research will undoubtedly make this technique practical for other plants also.

On plant material that does not lend itself to these techniques, other methods of therapy are possible. Heat treating either with hot water, hot air, or aerated steam is successful on a variety of plant material. There is usually very little margin between the death point of the plant and the temperature required for successful treatment. Cell temperatures must be controlled rather carefully and considerable experimenting done before large—scale treatments are carried out. The condition of the plant prior to treatment often plays a very important part. Considerable research can still be done in this field and undoubtedly methods of hardening the plant or plant part prior to treatment can be worked out. The hot-water treatment is now used on many types of seed, and, in most cases, the use of aerated steam would be equally effective. Generally, the only thing lacking is the proper equipment to carry out this type treatment.

Once plants are disease-free, then maintaining them in this state becomes the important consideration. It is in this phase that knowing the disease cycle of the pathogen is important. The methods of spread and the environmental requirements for infection are both important considerations. With this information a grower should be able to emphasize portions of the program that will give greatest benefits. With very few exceptions, the chemical controls should be saved as the "ace in the hole" and used only to supplement sanitation. Rather than waiting for the next big breakthrough in chemotherapy to solve your current problems, why not resolve to upgrade the program today.

MODERATOR RODEBAUGH: Our next speaker is Dr. George Nyland of the Department of Plant Pathology, University of California at Davis. Dr. Nyland will give us a review on cleaning up virus diseases in our propagating material.