

IMPACT OF COMMERCIAL PLANT DISEASE LABORATORIES ON THE FLORIDA CITRUS INDUSTRY

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Abstract. New and more sophisticated procedures for identifying common citrus pathogens are rapidly being developed. Complexity of these procedures and lack of the means to apply them on the large scale necessary has delayed implementation of this technology. Commercial plant disease laboratories are filling this need by promoting rapid technology transfer from research laboratories to the citrus growers and nurserymen. Commercial laboratories help focus research and development in areas likely to bring immediate benefits to the citrus industry. The most obvious benefit to the citrus industry is more effective detection and control of disease agents. Citrus disease testing can be performed on a much larger scale than has been possible in the past and commercial plant disease laboratories provide an additional resource in the event of future disease epidemics. Costs for disease testing and the elimination of infected plants will be offset by higher quality trees. Commercial plant disease laboratories can help provide healthier trees for the Florida citrus industry.

An offspring of the recent biotechnological revolution, the commercial plant disease laboratory is a company in the business of plant disease detection. This type of laboratory has been in existence for approximately 10 years but until recently the primary focus of commercial labs has been the development of plant disease diagnostic kits. These kits are a product sold to a user who performs the disease assay. Test kits are designed to test small numbers of samples, the cost per sample is high, and the accuracy of the assay is directly related to the experience of the user. The use of test kits has been limited to small scale applications by researchers, regulatory agencies, and large agricultural companies with in-house research facilities.

Many areas of agriculture, including citrus, require accurate, large scale, and low cost testing procedures for effective control of plant diseases. Disease detection technology must also be made available to those who need it the most, the citrus nurseryman and grower. Commercial plant disease labs can meet these requirements with trained laboratory personnel and the necessary equipment to provide disease testing faster, cheaper, and on a larger scale than would otherwise be possible. Proper sample collection and handling can have a major effect on the accuracy of a plant disease assay and this is a service that can only be provided by a commercial lab located within the agricultural industry it will serve. A local commercial plant disease lab can also be involved in the affairs of that agricultural industry and respond more effectively to local needs and concerns.

The objective of this paper is to define the impact of commercial plant disease diagnostics labs on researchers,

regulators, nurserymen and growers involved in the Florida citrus industry.

Citrus Research

Improving "technology transfer" has been a goal of state and federally funded research institutions in recent years. Simply put, this means moving research from the lab bench to some practical field application. Before technology transfer can occur there has to be someone to do the transferring and someplace to transfer it to. This is where commercial labs can have a major impact on research and technology. As an example, consider the situation of Edison's Menlo Park, New Jersey lab over 120 years ago. They were involved in an area of rapidly advancing science and technology where important new discoveries were commonplace. This commercial lab did not do basic research, but took available research and technology and improved it, modified it, and adapted it with the focus on practical application. One of the most famous products of this lab, the electric light bulb, had been patented many years before. Their real contribution was the first *practical* electric light. An equally impressive, but less well known contribution of this lab was the development of the infrastructure to provide power for this new electric light. Again they modified and improved existing research and technology to provide more efficient dynamos, mains, connectors and the other parts necessary to provide a unified system for generating electric power. In the process of putting the system together, they were able to identify what technology was missing and focus research and development in those areas.

Edison's Menlo Park lab is still a valid model for commercial labs today. That is to bring elements of research and technology together to produce a practical product and to provide the infrastructure to make the application of that product possible. In the commercial plant disease lab this means turning research testing procedures into practical disease assays. Examples of common Florida citrus diseases for which rapid assays are currently available or are likely in the near future are citrus tristeza virus, citrus blight, exocortis, cachexia, and many of the other unnamed viroids. Providing infrastructure means developing techniques for large scale sample collection, data handling capabilities, testing procedures and providing the laboratory to apply these techniques. The biotechnology revolution has made available many new procedures for disease identification including immunological probes, nucleic acid amplification and detection, and improved gel electrophoresis. As the sophistication of these procedures has increased so has the need for skilled commercial laboratories to bring this technology to practical use.

Citrus Nurseries

Commercial citrus disease testing can have a great impact on effective control and prevention of citrus diseases in the nursery and scion block.

Budwood provided for the establishment of registered scion blocks is tested for a wide variety of citrus diseases. But after scion blocks are established they are still vulnerable to disease infection. Graft or mechanically transmissible diseases like exocortis can be spread from one tree to another by contaminated cutting tools. Insect vectored diseases such as Tristeza can be moved from an infected grove to nearby scion blocks by aphids. The longer a budwood source has been in the field the higher the probability it will become infected. Tolerant scion tree varieties can remain symptomless disease carriers for many years. Thousands of young trees can be propagated from the buds of one infected scion tree and the disease spread rapidly into the field. This is the most important problem in effective control of citrus diseases in Florida today. The solution to the problem is the availability of large scale testing for established scion blocks and other budwood sources. Regular testing of budwood sources is the most cost effective application of citrus disease assays and by identifying the source, the most effective means of disease prevention. Commercial plant disease labs have been providing this service in recent years.

Citrus Growers

Growers will benefit the most from increased disease testing and growers will most likely pay the costs of testing, either directly or indirectly. But costs need to be balanced against the potential benefits.

Disease testing in the grove can cut grower losses by identifying a problem and eliminating unnecessary treatments. As an example, if a young block of sweet orange on sour orange rootstock appears stunted, it can be rapidly tested to determine if it is infected with a severe CTV isolate and not suffering from a horticultural problem. If infected, the grower knows his only option is to pull the block and start over rather than wasting more money on

trees that will never produce. Disease testing at the budwood source has the greatest impact on citrus growers. Using the Tristeza example, if the budwood those trees had come from had been tested the growers losses could have been prevented at a very low cost.

Regulation of Citrus Diseases

Commercial labs can have an impact on the state's clean budwood program. As has already been mentioned, the state provides disease tested budwood for the establishment of scion and increase blocks. Commercial labs can extend the effectiveness of the budwood program by providing a means for large scale disease testing after these budwood sources are established.

A considerable amount of budwood in Florida does not come from registered sources, some estimates are as high as 50%. Commercial labs provide a means of testing non-registered budwood sources for citrus diseases. A nurseryman or grower who uses a non-registered budwood source can still be sure it does not contain serious pathogens.

Commercial labs can also provide a reserve or back-up for state testing facilities in the event of major disease outbreaks when large scale surveys are needed. It is often faster and more economical to contract for commercial testing then build and staff public facilities, especially if the need is short term.

Summary

The impact of commercial plant disease labs on the Florida citrus industry is in bringing the elements of research and technology together to produce practical citrus disease assays, providing the infrastructure for making large scale disease testing possible, and applying this testing in a way that reduces and ultimately prevents loss of production from citrus diseases.