

E DIAGNOSIS

APPLICATIONS OF PLANT DISEASE DETECTION KITS FOR TODAY'S TURF MANAGER *By Dr. Sally A. Miller*



root tissue does not hold up a sign with its name on it. So I make a water mount of the tissue and what do I find: Usually my little banana shaped friends with inside cross walls are there and say "Hi, we're *Fusarium* spores. Try to guess if we have caused this state of affairs or if we are covering up for one of our other fungus friends."

There are bacteria galore upon which some wiggly nematodes are feeding. Or are they feeding just on the bacteria and dead tissue? The answer to this is to act a bit like a traffic cop. I put on the red light, in this case a bit of heat on the slide. This gets them to slow down. They have to be quiet enough to see whether or not they have stylets. (These are little "spears" with which they pierce the root cells.) If I apply too much heat, I cook them, and while the bacteria might like par-boiled nemas for lunch, I don't gain much insight into the problem. If my heating technique has become skilled and I find that the nematodes are without stylets I can cross them from my list of suspects. If they do have stylets, then I have another game to play. It's called threshold guessing or speculation. Are there enough present to have really caused the root problem? To solve this involves a trip up to fourth floor for a conference with Dr. Ann MacGuidwin. In my enthusiasm I may have

(Continued on page 8)

One of the many challenges faced by managers and growers of turf-grass, ornamental plants and other high value crops is the timely and accurate diagnosis of plant diseases. Many diseases are caused by highly aggressive pathogens that can cause severe damage within a short time after symptoms are spotted. Other diseases develop more slowly but in the end may be just as devastating. Often, diagnosis is hindered by the absence of 'classic' symptoms. Pathogens may also infect and colonize plants but fail to induce symptoms until environmental conditions favor disease development. Until recently, few analytical tools have been available to assist the turf manager in detecting and diagnosing plant diseases. However, advances in biotechnology during the past decade have made it possible to develop rapid, specific, user-friendly tests for the detection of pathogens in plants, soil, and water. Such tests utilize antibodies in formats designed to take advantage of the unique properties of these 'reagents': their ability to recognize and bind to specific substances such as components of plant pathogens. One of the most popular types of assay is the enzyme-linked immunosorbent assay (ELISA), in which the pathogen-detecting antibodies are tagged with an enzyme. When an appropriate substrate is added to the reaction mixture, a positive reaction is visualized by a color change as substrate is converted to a colored product. There are a number of different types of assay formats that are applicable to plant disease diagnosis. One that has been developed recently is the dipstick assay. In this assay, the reactive end of the dipstick is incubated in the sample extract with the enzyme-tagged antibody solution, washed, then transferred to substrate. A positive reaction is indicated by the deposition of insoluble colored product onto the dipstick. Semi-quantitative results can be obtained by comparing the color of the dipsticks to known standards. Quantitative results are obtained by using an inexpensive, field-adaptable reflectometer that measures the intensity of the color on the dipstick. Dipstick assays can be carried out rapidly, often in a few hours.

Plant disease detection kits should be viewed as tools for managing agronomic practices. They can provide a turf manager with information that will help him or her to make the right choice of disease control remedy. Some of the decisions are: selection of pesticides and timing of pesticide applications, selection of plant varieties, and use of cultural control practices. For the turf manager, the availability of such kits will make it possible to diagnose plant diseases quickly and accurately, often before symptoms are present. Where symptoms are indistinct or confusing, kits can be used to confirm a preliminary diagnosis based on the appearance of the plant and/or signs of the pathogen. Used in conjunction with crop and weather data and forecasting systems, the kits will make it easier to predict the occurrence of disease outbreaks in a variety of crops.

Once diagnostic tests are widely available, they will plan an integral role in crop management. The primary components of the assays, the antibodies, can be produced for most plant pathogens, and in the coming years more and more tests will become available as part of the crop manager's arsenal against plant disease.

Editor's Note: Dr. Sally Miller was raised in Ohio and received her B.Sc. degree in 1976 from Ohio State University with an undergraduate major in biology. Her interests in graduate studies included mechanisms of disease resistance in alfalfa and she graduated with a Ph.D. degree in Plant Pathology from the University of Wisconsin—Madison in 1982. Currently, she is Unit Head of Plant Pathology Research for Agri-Diagnostics Associates, Cinnaminson, NJ. Her responsibilities included the development of diagnostic kits for detection of turf pathogens.