UNIVERSITY OF FLORIDA
EXTENSION
Institute of Food and Agricultural Sciences

A Web-based Distance Diagnostic and Identification System for Extension[1]

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Introduction

Plant protection involves the correct and timely identification and control of weeds, insects, and diseases. Plant pests appear in many forms. All pests may ultimately lead to decline in the general health of agricultural crops, may cause other types of damage, such as structural; and most importantly, can threaten human health and safety. If these problems are left untreated for too long, they could lead to substantial economic loss and even human health problems. Although pest management information is available on the Internet and from other sources, plant pest identification and diagnosis are in many cases difficult and often require consultation with a specialist. When there is a pest problem, a common approach is to collect samples and mail them to a specialist for identification. The delivery process using regular mail can take days, leading to delays in pest control recommendations. Sometimes, samples cannot be used for problem identification due to deterioration in the mail. An accurate and rapid diagnosis can avoid costly mistakes by applying timely and appropriate management practices. Correct and timely identification and control of insects and plant diseases could have a large impact on human health and agricultural production.

The Web-based Distance Diagnostic and Identification System (DDIS) for Florida Extension was developed jointly by extension agents, specialists and the faculty of UF/IFAS Information Technologies. The system allows users to submit digital samples obtained in the field for rapid diagnosis and identification of pests, plants, diseases, insects, and animals. DDIS provides an environment for agricultural extension agents and specialists to share information on plant insects and diseases. Through interactions on the Internet between extension agents and specialists, problems can be quickly communicated and assessed. Specialists around the state can perform diagnosis and identification and provide UF/IFAS recommendations to the users. The system creates a digital image library with associated location, crop, and pest or disorder data that could be used in educational programs, assisted diagnosis, and data mining.

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DDIS Hardware and Software

Meiji1 trinocular zoom stereo microscope (EMZ5TR) and compound microscope (ML2100) and a digital camera were selected for this project. The camera was chosen for its features of image quality, ease of use, and mounting capability of an adopter such as MM99 (Martin Microscope Co. SC) to the microscope so that the same camera can be used in the field and laboratory. Figure 1 shows some examples of DDIS equipment. Users also can use any camera to capture digital samples without using a microscope. Since DDIS supports multimedia files such as audio or video clips, a digital video camera may be used to capture a video clip. DDIS hardware requirements change when new technology is available. For latest DDIS hardware configuration, please visit the DDIS Web site at http://ddis.ifas.ufl.edu.

There are no special software requirements for using DDIS besides a Web browser and Internet connection. To become a DDIS user, one needs to register first on the DDIS Web site.

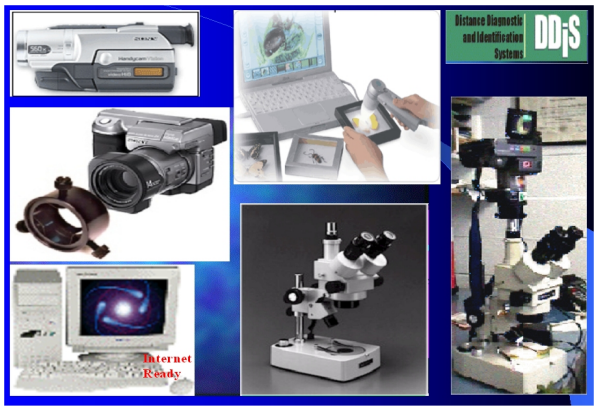

Figure 1. DDIS sample equipment.

How Does DDIS Work?

Figure 2 shows the interaction among DDIS users. From a user's viewpoint, the system operates like a sophisticated e-mail system with a centralized database. First, extension agents collect digital samples of weeds or cultivated plants, insects or diseased plants using a digital camera, a stereoscope, and/or a compound microscope mounted with a digital camera. Agents then login to the DDIS Web site to submit the digital samples and field data to a database. Instructions on how to submit a sample can be found at the DDIS help web page. These on-line submission forms mimic the paper form for diagnosis of insect, disease, plant/weed, and livestock. After a user sends a sample to the server, it automatically notifies the specialist(s) that a diagnosis is needed. Specialists can then retrieve the submitted sample from the Web site, and make an identification or diagnosis along with appropriate recommendations. After diagnosis and identification are complete, specialists submit their recommendations to the database. The system automatically notifies the sending agents that the diagnosis and recommendations are available. Agents can then retrieve a report of the diagnosis and recommendations. Agents can also send a sample to multiple specialists for diagnosis. For example, a sample can be sent to a pathologist and a physiologist so that they can collaborate on an answer. Multiple specialists then send their responses to the database.

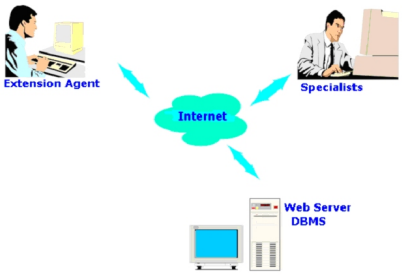

Figure 2. Collaboration among DDIS users.

What Is New?

The Web-based DDIS includes many updates to adopt new technology. The system provides the following new functions:

1)Support multimedia digital samples (video, images, and audio, etc.).

2)Provide search options for DDIS samples.

3)Provide a personalized sample organizer.

4)Eliminate software download and firewall problems.

5)Web-base tracking available through the "live sample status" feature.

How Do I Register as a Web-based DDIS User?

The system currently is restricted to University of Florida faculty, staff and students. To become a DDIS user, visit the DDIS Web site at http://ddis.ifas.ufl.edu and select "Sign up as a user" from DDIS home page. Fill in all required data entries and follow the screen instructions.

Summary

DDIS was designed, implemented, and evaluated for use in diagnosis and identification. Early field results show DDIS to be a robust and effective tool for diagnostic and identification, once agents become trained on techniques for preparation of digital samples. Although DDIS provides a successful means for quick identification and diagnosis, the system will not replace laboratory analysis, in particular for some plant disease samples. When used properly, the system not only provides an environment for rapid diagnosis and identification, but it creates an archive of images with associated location, host crop, and pest or disorder data statewide. These archived images stored in the databases become a digital reference library to aid in identification and understanding of plant insect and disease management, as well as for education of extension personnel and their clients. For additional information on the DDIS system, please visit the Web site at http://ddis.ifas.ufl.edu.