PP-187

UF UNIVERSITY of FLORIDA IFAS Extension

Mushroom Identification Through Distance Diagnostic and Identification System (DDIS)[1]

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Introduction

University of Florida/IFAS extension and research faculty have developed a system that uses digital cameras and the World Wide Web to send photographs of pests from the counties to the specialists at the Gainesville Campus and at the Research and Education Centers for rapid diagnosis and identification.

This system created a great opportunity for timely identification of mushrooms, some of which may be toxic to humans and/or animals. Images, by themselves, are one aspect of identification. They should be used in conjunction with laboratory assays if necessary. Sending digital images rapidly and over long distances can reduce the turn around time for identification of the mushroom in question for possible earlier implementation of treatment. In case of emergency situations due to mushroom poisoning, photographs of mushrooms could be sent to the state specialist, Dr. Jim Kimbrough through DDIS for rapid identification. This information will be extremely helpful to the medical doctor or veterinarian who is treating the patient in any location in Florida.

Figure 1. *Amanita bisporiga*: one of a dozen white, deadly poisonous species that are referred to as the "death angel" because of its milk-white color. Digital images will allow for a quick identification of this group of mushrooms and a quick recommendation of how it should be treated. Credits:

In this fact sheet we are reviewing the necessary information, techniques and tools that will help to identify mushrooms through DDIS.

1. This document is PP-187, one of a series of the Plant Pathology Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date March 2000. Revised March 2001. Reviewed May 2008. Visit the EDIS Web Site at http://edis.ifas.ufl.edu.

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Figure 2. *Amanita chloronosma*: superficially similar to the *A. bisporiga* group, but digital imaging will be sufficient to allow us to say that it belongs to the Lepidella section of *Amanita* and is not toxic. Credits:

Importance of Mushrooms

Mushrooms are fleshy to leathery Basidiomycota with normally umbrella-shaped sporulating structures. They usually possess a stalk topped by a cap or pileus. The underside of the cap bears either gills or pores, which forms spores insides. The basidiospores are borne at the tips of club-like structures call basidia, hence the name Basidiomycota. Spores fall from beneath the cap at maturity and are wind dispersed to other areas. If they land on the proper substrate and moisture is present, spores will germinate, establish microscopic threads (mycelium or spawn), and grow within the substrate. When sufficient spawn is formed and environmental conditions correct, primordia or buttons will form and grow into mushrooms.

Figure 3. *Lactarius indigo*: easily recognized by the fact that it exudes blue milk and is a choice edible species. All species of *Lactarius* exude milk; only those with dull, yellow-brown milk can cause digestive irritation. Credits:

Because of their large size, bright colors, and ephemeral nature, mushrooms have long been a fascination to mankind. Earlier cultures learned through trial and error that some were toxic, others edible, and yet others had supernatural mystic qualities. During the Middle Ages, people learned to cultivate the edible species. Yet, a limited number would lend themselves to cultivation. Most of the choice edible species could only be found in the wild and many ethnic groups became avid collectors of wild mushrooms for food. This hobby followed many to North America and throughout our country. This is a popular pastime in Florida with its many retirees. Unfortunately, there are many cases of misidentification, resulting in mushroom poisoning, or a toddler finding mushrooms on the lawn and deciding they would like to munch on them. These individuals often find themselves in the doctors office or, in severe cases, in the emergency ward of their local hospital.

With the curiosity about mushrooms, County Extension offices often receive requests for mushroom identification. The current identification procedure is to take notes on specimens, dry them somewhat, and mail them to the Mycology Laboratory at the University of Florida. Doctors and hospital personnel will often express mail specimens whenever quick identifications are needed. In life or death emergency cases, Florida Highway Patrol personnel have often delivered specimens directly to campus. Thus, there is a great need for quick accurate identification of specimens.

Figure 4. *Russula emetica*: recognized by its white stipe, no volva or annulus, and red pileus cuticle sets this apart from other species of the genus. It causes severe nausea when eaten. *Russula & Lactarius* are morphologically similar, but *Russulas* do not exude milk. Credits:

Basic Rules for Imaging and Submitting Samples

Successful treatments for toxic mushroom consumption starts with an accurate identification of the mushroom eaten. Careful and accurate observations are essential. Some of the most essential features are:

1. Color images of the mushrooms that will show the overall size, shape, and color of the specimens. Images with a digital field camera should be taken from various angles, carefully removing some specimens from the soil or substrate in order to show the manner of attachment, presence of a cup or volva, or any peculiar rooting structures. Close-up images to show the manner of gill or pore attachment to the stalk may be critical. Select the best of images for submission. In many situations, the genus, or even the species of mushroom may be identified (Fig.1-8).

2. Small mushrooms may require the use of a stereo dissecting microscope with a magnification 25-75x. At this magnification, membranes, veils, and other structures on the stalk or cap will be obvious; these may be needed in accurate species identification. Pertinent images such as scales on the stalk or pileus, presence or absence of an annulus or ring on the stalk, a volva or cup at the base, or membranes on the edge of the pileus should be considered for DDIS transmission.

3. Use of Compound Microscope: If needed, mushroom spores and other structures should be examined under a compound microscope. The magnification range of the compound microscope is typically 100-1000x. Each objective provides a different magnification (e.g. 10x, 20x, 40x), which when multiplied by the magnification of the eyepiece gives the final magnification. For most mushroom spores the highest magnification needed is 400x. Always start with the lowest magnification and gradually increase the magnification as needed. Wet mount or clear-tape mounts will be used to view fungal spores under the compound microscope, and a weak iodine solution like Melzers solution may give a red or blue staining reaction. Some mushroom groups may be identified based on spore shape, size, color, and ornamentation, for example: spores of *Russula* and *Lactarius* have globose spores with ornaments that turn blue in iodine, most species of *Boletus* have long, cylindric, greenish to olive brown spores, and *Coprinus* has large, black football-shaped spores with colorless germ pores in each end.

4. Odor and taste of fresh specimens: It is often very useful for quick, accurate identification of species of some groups of mushroom to determine the taste and odor of a specimen. It is safe, even with the most toxic mushrooms to break off a small portion and tip it to your tongue to determine if it is mild, bitter, acrid, or peppery. Any odors such as flowery, fruity, fishy, etc. should be recorded.

Figure 5. *Lentinus velutinus*: the mushroom is striking because of its dark velvety color and long stalk, but also it forms large dark sclerotia in the wood on which it grows. Credits:

Submit at least 4-5 images (entire mushroom and close-up --handheld camera, from stereo microscope, and compound microscope) through the UF/IFAS/DDIS Web site (http://ddis.ifas.ufl.edu/) to Dr. Jim Kimbrough. Fill out the DDIS sample submission form as completely as possible.

Figure 6. *Macrocybe titans*: The largest mushroom found in North America. It grows normally in clusters and each mushroom may reach from 15 to 20 inches in diameter. Visuals enable quick identifications. Credits:

Any digital image sample submitted to Dr. Jim Kimbrough at the mycology laboratory should be accompanied by a live sample in case of identification is not possible through DDIS (early submission of live sample might save lives). Send live samples by express mail to the Attention of Dr. Jim Kimbrough, Plant Pathology Department, P.O Box 110680, University of Florida Gainesville, FL 32611. Fresh mushrooms should be expressed-mailed in loosely wrapped dry paper towels in a box, not in plastic bags or containers, or otherwise they will start to putrefy overnight. In emergency situations, telephone numbers and contact persons should be identified.

Figure 7. *Tylopilus plumbeoviolaceus*: one of hundreds of species of what are referred to as "poroid mushrooms" or boletes, because there are pores, not gills, below the cap. Most species are edible; some that turn blue when bruised or have apple-red pores should be avoided. (see Fig. 8) Credits:

Figure 8. *Boletus frostii*: one of several "boletes" that are toxic and produce severe gastrointestinal irritation. Digital imaging would distinguish it by its bright red color and pores with red mouths. Credits:

References

Kimbrough J.K. 1999. Common Mushrooms of Florida. Published by UF/IFAS Cooperative Extension Service and the University of Florida Press.