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USING THE FREEZE-DRY TECHNIQUE TO ENHANCE PRESERVATION OF INSECT LARVAE

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ABSTRACT. Some important reasons for collecting and preserving insect larvae are: (1) for teaching and research purposes, (2) for use as reference collections (of economically important species) in insect control work, (3) for museum collections, which document insect fauna of specific regions, and (4) for aesthetic purposes, including their sale by business enterprises. Insect larvae are generally preserved in vials using one of several different liquid chemical preparations. Consequently, they often lose much of their natural appearance after being in a liquid preservative for some time. The freeze-dry technique dries and preserves insect larvae through the sublimation of body water at -20° to -30°C while in a vacuum. The freeze-dryer unit used was a new benchtop 115v Yamato DC41 model. The 115v vacuum pump (model B-2) was built by Marva Scientific Manufacturing Company. This investigation illustrates specific examples of insect larvae that have been successfully preserved using the freeze-dry technique and the specific procedures used. The advantage of this technique is that there is very little body color loss or structural distortion as a result of preservation. It also provides for ease of handling and inspection of specimens.

INTRODUCTION

Insects comprise more species than that of all other plants and animals combined. Approximately three to four percent of insect species are considered pests of economic importance, while approximately seven percent are considered beneficial. Consequently, approximately 90 percent are neither pests nor beneficial and provide an interesting array of diversity in our environment. The collecting of insect specimens is important for a number of reasons. These include their use: (1) for teaching and research purposes, (2) for insect control work (as reference collections of economically important species), (3) for museum collections which document insect fauna of specific regions and habitats, and (4) for aesthetic purposes, including their sale by business enterprises.

Several different methods are employed to preserve insect larvae and other soft-bodied, fragile or minute insect specimens. Perhaps the most common is placing specimens in 70 percent alcohol or in some other

fixative such as Kahle's solution. These chemical methods are quick and easy; however, specimen colors will often change and specimens may become shriveled or distorted with time. Hot water treatment prior to placing specimens in preservatives improves retention of original colors to some extent. Other more laborious techniques of preservation include blowing or inflating larvae, and plastic embedding. Still another technique reported (but not commonly used on insect specimens) is freeze-drying (Woodring & Blum, 1963). This is a more time-consuming process than chemical methods and requires an initial investment in equipment. The end results, however, are superior in terms of color retention and reduced distortion of specimens (Roe & Clifford, 1976).

METHODS AND MATERIALS

The freeze-dry technique dries and preserves insect larvae through the sublimation of body water at -20° to -30°C while in a vacuum. "Sublimation" refers to drying specimens or products while in the frozen state (Flosdorf, 1949). Typically the freeze-dried specimen or product appears similar in color, shape, and volume to that of when it was in the frozen state.

The freeze-dryer unit used was a new benchtop 115v Yamato DC41 model. The 115v vacuum pump (model B-2) was built by Marva Scientific Manufacturing Company. Insect specimens were frozen in small beakers, which were then attached to the freeze-dry unit. The unit was operated for nine hours or more. After specimens were dried, the freeze-drier unit was then recharged periodically by drying the sieve pellets (which had absorbed moisture from the specimens) in a vacuum oven.

A new SZ 4045 Olympus trinocular zoom stereo microscope with photo tube and ringlight was used to photograph small insect larvae and other specimens.

RESULTS AND DISCUSSION

This investigation illustrates specific examples of insect larvae that have been successfully preserved using the freeze-dry technique. Specimens properly frozen retained their original characteristics; whereas, those not properly frozen turned black in color. The freeze-dry technique of preserving insects is an excellent option to permanently preserve large numbers of insect larvae simultaneously while maximizing retention of original phenotypic characteristics of the specimens. Preserving insects with this technique facilitates mounting them on insect pins rather than in

vials and thereby enhances their presentation for viewing and study. Body color loss and distortion are minimized. This investigation will continue on many other species of insect larvae. Woodring and Blum (1963) reported successfully freeze-drying larvae of twelve families of Lepidoptera, three families of Coleoptera, two families of Hymenoptera, and one family of Diptera.

CONCLUSIONS

The freeze-dry technique is an excellent option to preserve insect larvae if proper procedures are followed. There is an initial investment in equipment; however, the advantages of this technique are rewarding. Body color is preserved and structural distortion minimized. Handling, storage, and inspection of specimens are facilitated.

REFERENCES

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