G157 Characterization of Cypsela-Pappus Units in the Asteraceae: A New Tool for Forensic Botany

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The goal of this presentation is to provide law enforcement personnel and botanists with a means to identify certain types of seeds and their appendages.

This presentation will impact the forensic science community by stressing the importance of forensic botany as a legimitate aspect of criminal investigation, where the smallest plant fragments may provide vital evidence that can help lead to a conviction. The field of forensic botany is slowly gaining recognition as an aspect of criminal investigation that can provide trace evidence previously overlooked either because its importance was not recognized or because investigators did not have the knowledge of how to recognize, seize, and preserve the material for later analysis.

Plant fragments may play a role either in linking a victim and perpetrator, locating a body if it has been moved to a site other than where the homicide took place, or linking either victim or perpetrator to a particular vehicle or location.

Two strategies for seed dispersal by plants are wind and animals. Seeds may be armed with hooks or have roughened seed coats that adhere readily to fur or clothing. Other seeds have tufts of fine bristles, termed a pappus, that aid in wind dispersal but also readily stick to fur or clothing. The daisy family, Asteraceae, is composed of many species that have evolved to use animals, including humans as a means of spreading their seeds, referred to as cypselae, far away from the parent plant. Furthermore, such plants are often found in droughty and nutrient-poor sites such as road sides and other waste places. It is in just such places to which, or across which, a body might be carried or dragged.

The present research explored 21, separate species of the daisy family growing in a single geographic region (Sudbury, Ontario, Canada) to determine if recognizable differences existed between seeds and their tufts of bristles and whether these differences were great enough to allow identification to species.

Cypselae and pappi were examined separately and systematically at increasing levels of magnification to distinguish cypselae and pappi from each other, first by eye, then with a dissecting microscope, followed by a compound microscope, and, finally, under Scanning Electron Microscopy (SEM). Cypselae were distinguished on the basis of size, shape, and surface texture. Under the dissecting microscope alone, it was possible to identify to the level of species in 12 of the 21 cypselae examined.

The pappus was removed from the seed and treated separately because it often becomes detached from the seed head when brushed up against and, therefore, might be the only evidence seized. Intact pappi were separated on the basis of shape, size, and number of bristles using the dissecting microscope. The tuft of bristles was mounted on a microscope slide using glycerin jelly and viewed both under dissecting and compound microscope as was dictated by the level of detail being examined. Bristles were observed in terms of length, bristle width and number of cells, shape of the bristle terminus, and ornamentation of the bristle, such as barbs or spurs. Examination of the pappus alone or its individual bristles made it possible to distinguish six species using the dissecting microscope and eleven species using the compound microscope. The two keys that were devised for separating both cypselae and pappi were submitted to a blind test by three individuals with no previous experience with the material to ensure that the keys were functional and unambiguous.

A small number of species could not be distinguished one from another even when examined under the compound microscope. This group was observed using SEM and an atlas of images made to allow comparisons with unknown specimens.

The field of forensic botany is slowly gaining recognition as an aspect of criminal investigation that can provide trace evidence previously overlooked, either because its importance was not recognized or because investigators did not have the knowledge of how to recognize, seize, and preserve the material for later analysis. The present work indicates that the smallest plant fragments may provide vital evidence that can help lead to a conviction.

Cypsela, Pappus, Asteraceae

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