Cyanoacrylate Adhesives in the Study of Plant Diseases

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ABSTRACT

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The surfaces of apple leaves with powdery mildew were attached to microscope slides, using cyanoacrylate adhesives. After 3 min, the unattached tissue was removed leaving epidermal sections and the associated fungal spores and mycelium on the slide. Extreme clarity was achieved with these preparations, which serve as permanent mounts.

We reported earlier on the use of cyanoacrylate adhesives for making sections and imprints of plant epidermal tissue (5) as a modification of procedures used in human dermatology (3). The primary advantage of this method over previously reported techniques (1,4,6,8) is that preparations are not merely imprints but contain a thin section of the actual tissue.

Because it was found that tissue is stripped from the plant and preserved as a permanent mount, we thought pathogens associated with plant tissue might also possibly be removed and preserved for study. In addition to use for cytological and histological aspects of diseases, cyanoacrylate adhesives could aid in diagnostic work. The technique was demonstrated with powdery mildew of apple.

MATERIALS AND METHODS

Cyanoacrylate adhesives with the trade names Superdrop (Ornsteen Chemicals,

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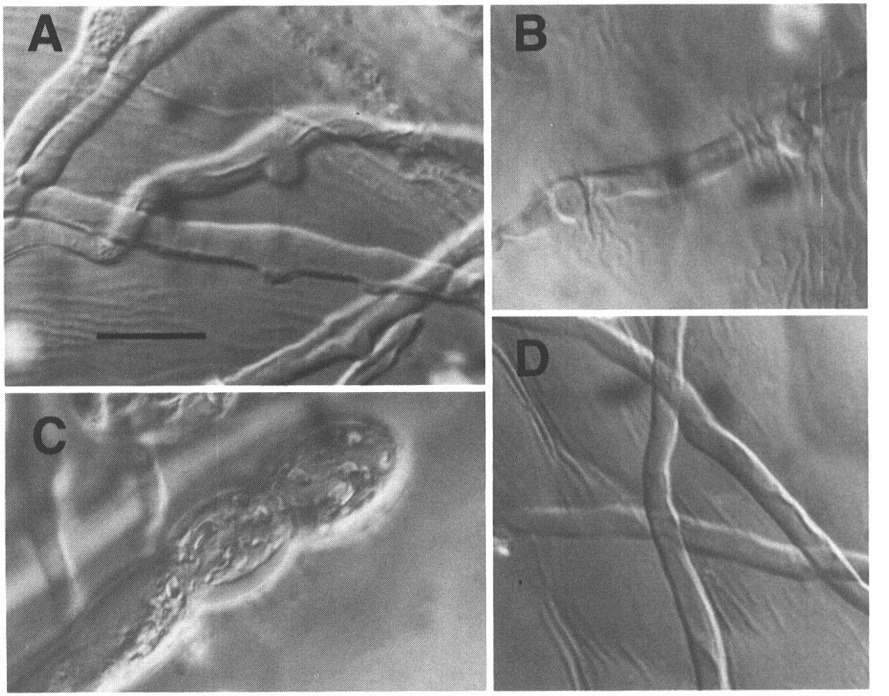

Fig. 1. Epidermal sections of apple leaves infected with powdery mildew. **(A and B)** Hyphal strands of *Podosphaera leucotricha* with secondary haustoria. Leaf surface is apparent in background. **(C)** Asexual spores attached to conidiophore. **(D)** Hyphal strands overlaying outline of cells. All micrographs are at the same magnification; the bar in **(A)** represents 10 μm.

Seabrook, NH 03874) and Superglue (Loctite Corporation, Cleveland, OH 44101) were applied to the upper surfaces of apple leaves infected with *Podosphaera leucotricha* (Ellis & Everh.) Salm. The freshly glued leaf was placed against a microscope slide previously cleaned with absolute ethanol and a second slide was placed on top so it contacted the nonglued leaf surface. Pressure was administered by holding the two slides firmly together with a wooden clothespin. After 3 min, the two slides were separated and the leaf section was peeled away from the first slide by grasping one edge of the tissue with forceps and pulling. The adherent tissue and fungal mycelium was examined with a Zeiss microscope equipped with differential interference contrast optics.

RESULTS AND DISCUSSION

Features of *P. leucotricha* as well as characteristics of the leaf epidermis were remarkably distinct (Fig. 1). The material was examined at various magnifications, using dry and oil-immersion objectives. Good resolution was achieved with oil applied directly to the sections without using a coverslip. The stripped sections of infected tissue (no coverslip) served as permanent mounts. Preparations have retained initial clarity for months.

The technique may be of value in studies of penetration and growth of plant pathogens or may serve as a diagnostic tool. The procedure is inexpensive and very simple, certainly less elaborate than the technique (7) devised for light microscopy studies of powdery mildew. Permanent mounts can easily be made in the field and examined later in the laboratory. In addition to stripping plant surfaces, sections of internal tissues have been obtained by placing cyanoacrylate adhesives on a freshly cut surface, pressing the glued surface against a microscope slide, and later lifting the tissue from the slide. This technique could possibly be used to examine diseased internal tissues if structural breakdown is not severe.

Lavker and Leyden (2) were able to remount skin tissue adhering to slides for electron microscope examination. They found that the cyanoacrylate adhesive gave good fixation at the fine-structure level. The potential exists for using cyanoacrylate adhesives to prepare diseased tissues for examination with the electron microscope.

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