HOST SELECTION BY *Hylemya antiqua*\(^1\)
Laboratory Bioassay and Methods of Obtaining
Host Volatiles\(^2\)

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Abstract—An oviposition bioassay for the onion maggot, *Hylemya antiqua* (Meigen), is described in which females, in response to volatile stimulants, oviposit through small apertures onto moistened filter paper. Onion volatiles that act as attractants and oviposition stimulants were captured in Porapak Q from air passed over chopped onions in glass chambers. Pentane extracts from odor-impregnated Porapak Q induced ~30-50% of the oviposition that occurred in response to 15-g onion-slice stimuli. Extracts presented in pentane on waxed dental cotton wicks induced more constant oviposition over a 3-day period than extracts on unwaxed wicks. Extract of the Porapak Q-captured volatiles from bulbs of fresh, actively growing onions elicited a much stronger response than did stem and leaf extracts from the same onions. The bioassay techniques and chemical procedures developed in this study could be used in chemical isolation programs for host attractants or oviposition stimulants for *H. antiqua* or similar species.

Key Words—onion maggot, *Hylemya antiqua*, onion volatiles, host selection, oviposition.

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INTRODUCTION

Studies to determine the chemical basis for attraction to and oviposition on particular host plants have met with increasing success (Hedin et al., 1974). Oviposition stimulants have been isolated and/or identified for a number of economically important Diptera: n-propyl mercaptan and dipropyl disulfide for the onion maggot, *Hylemya antiqua* (Meigen) (Matsumoto and Thorsteinson, 1968); sinigrin, allyl isothiocyanate, β-phenylethylamine, and carbon disulfide for the cabbage maggot, *H. brassicae* (Bouché) (Traynier, 1967); and methyl isoeugenol for the carrot rust fly, *Psila rosae* F. (Berüter and Städler, 1971).

For *H. antiqua*, known or suspected volatile constituents of *Allium cepa* L. (Niegisch and Stahl, 1956; Carson and Wong, 1961; Matsumoto and Thorsteinson, 1968) have been tested for activity. Because there have been no systematic chemical isolation programs, however, no conclusions can be reached as to whether n-propyl mercaptan and dipropyl disulfide, the active compounds identified (Matsumoto and Thorsteinson, 1968), represent the entire range of oviposition stimulants present in onions. Recent studies on the capture of small amounts of insect pheromones in Porapak Q chromatograph packing (Byrne et al., 1975; Peacock et al., 1975) suggest that this technique would also be effective in capturing small amounts of host-plant volatiles in a chemical isolation procedure.

Our objectives were to devise a reliable and efficient technique for capturing onion volatiles, and to develop a simple bioassay for testing candidate attractants and oviposition stimulants for *H. antiqua*. These techniques were considered necessary prerequisites for the systematic identification of all possible attractants and oviposition stimulants for *H. antiqua*.

METHODS AND MATERIALS

*Capture and Extraction of Host Volatiles*

Onions (varieties unknown, ~2.5 kg) were peeled, quartered, and placed in one to four sterilized, borosilicate-glass chambers. The two-piece, cylindrical chambers (15.5 cm inside diameter (I.D.) × 27 cm) were fitted with a 1.5-cm-wide ground-glass flange about 9 cm from the top. The two pieces were held together by two plastic rings that rested on the flange and were drawn together by four screws. The top and bottom of the chamber were fitted with centered S-19 female and male spherical ground joints.

Porapak Q (50/80 mesh, Applied Science Laboratories, Inc.) was conditioned by extraction with anhydrous, reagent-grade ether in a Soxhlet