Thin line bands will appear across the width of the strip (Fig. 1), indicating the position of the metabolites with the R_f values shown in Table 1.

With sharp scissors, cut out the bands and cut into ½-in. segments. Drop these into a scintillation vial for counting. Add 0.2 ml methyl alcohol to the segments to help disperse the dye through the scintillation fluid. Add 15 ml of the scintillation fluid and count the bands after the dye is uniformly distributed through the fluid. Quench curves should be run to determine the amount of quenching caused by the dye and the methanol. This is usually less than 10%.

The conjugated carbofuran derivatives are found in the section immersed in 0.25 N HCl. Attach a Snyder column to the 125-ml flask and place on a steam bath for 1 hr to liberate the 3-hydroxy and phenolic conjugates. Remove from the steam bath, cool, and quantitatively transfer with two or three 5-ml portions of water to a separatory funnel. Rinse the flask with 10 ml methylene chloride and add to the acid water solution. Extract 3 times with 25-ml portions of methylene chloride. Combine the extracts, dry over Na_2SO_4, and transfer to a Kuderna-Danish concentrator. Distill all but about 0.5 ml of the methylene chloride using a warm-water bath. Transfer to a centrifuge tube with three 1-ml portions of acetone. Reduce the volume to 0.5 ml with a gentle air stream and apply to an TLC strip as before. Results will give information on phenolic nature of the conjugates.

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Synthetic Attractants for Some Dipteran Species[1]

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During 1970, a screening program was conducted at the Humid Areas Citrus Insects Investigations Laboratory, Orlando, Fla., to find attractants for the so-called sugarcane rootstalk borer weevil, *Diaprepes abbreviatus* (L.), a pest of citrus recently found at Apopka, Fla. (Woodruff 1968). Among the compounds tested, 2,4-hexadienyl butyrate (2,4-HDB) showed a high degree of attraction for several species of chloropid gnats (ca. 3000-4000 caught in 48 hr). A subsample of this catch, examined by C. W. Sabrosky, Systematic Entomology Laboratory, Washington, D.C., contained 17% *Hippelates pusio* Loew, which is among the most common pestiferous species of eye gnats in the southeastern United States (Axtell and Edwards 1970a). Because *H. pusio* is extremely annoying to man and animals and is a possible vector of eye diseases, we included a study of the attraction of Diptera to compounds being tested in the screening program for *D. abbreviatus* attractants.

Materials and Methods.—Sticky traps were prepared by coating the inner surface of 1-qt ice cream cartons with Stikem®, cutting away the upper ½ of each end of the carton to allow entrance into the trap, and suspending a dental roll (1 in. long, ⅜ in. diam) containing 1 ml of the test compound inside the carton ca. 2 in. below the upper surface. The traps were suspended horizontally ca. 6 ft above ground and spaced 75–100 ft apart on the north side of 'Hamlin' orange trees at a site north of Apopka for 3–4 days/test. Tests were conducted at various intervals from Aug. 5 until Oct. 29, 1970, when cool weather precluded further testing. The gnats were removed from the Stikem by washing the traps with chloroform, and the number of gnats collected was calculated from the following equation after determining the mean number present in three 0.05-g subsamples:

gnats collected =

$$\frac{\text{total weight of gnats} \times \text{mean number in 0.05 g}}{0.05\ \text{g}}$$

The candidate compounds were supplied by the Pesticide Chemicals Research Branch, Entomology Research Division, Beltsville, Md. Most of the esters were synthesized by reacting the appropriate alcohol and acid chloride in the presence of an acid acceptor and processing the product in the usual manner.

Results and Discussion.—Twenty-seven of the compounds (24 esters and 3 acids) attracted at least 100 Diptera in one or more tests. Table 1 lists the compounds in the order of total number of gnats caught.

Table 1.—Compounds attracting Diptera in field tests at Apopka, Fla. Aug. 5 to Oct. 29, 1970.

Attractants	No. of tests	No. trapped
2,4-Hexadienyl hexanoate	3	6949
2,4-Hexadienyl butyrate	3	5010
Hexyl butyrate	2	1685
Heptyl butyrate	3	1289
Hexyl hexanoate	2	1133
2-Ethylbutyric acid	2	858
2,4-Hexadienyl valerate	1	628
2,4-Hexadienyl-2-pentenoate	2	611
Octyl butyrate	2	455
2,4-Hexadienyl cyclobutanecarboxylate	1	375
Valeric acid	1	373
3-Methoxypropyl hexanoate	1	356
2,4-Hexadienyl 3-chlorobutyrate	1	350
2,4-Hexadienyl crotonate	1	348
Heptyl hexanoate	1	344
2,4-Hexadienyl 4-chlorobutyrate	1	340
Isopentyl p-isopropylbenzoate	2	306
2-Chloroethyl hexanoate	1	231
Ethyl hexanoate	1	226
2-Methylbutyl hexanoate	1	217
1-Methylhexyl hexanoate	1	215
Nonyl butyrate	1	156
2,4-Hexadienyl cyclopentanecarboxylate	1	151
2,4-Hexadienyl isovalerate	1	131
Hexyl valerate	1	128
1-Methylheptyl butyrate	1	118
2-Methylbutyric acid	1	112
Untreated control (mean for 8 tests)	8	4

[1] Mention of a proprietary product does not constitute an endorsement by the USDA. Received for publication Mar. 16, 1972.

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Table 2.—Diptera captured with lures in sticky traps at Apopka, Fla. Aug. 5 to Oct. 29, 1970.

Family[a]	2,4-Hexadienyl butyrate	2,4-Hexadienyl hexanoate	Heptyl butyrate
Chloropidae			
Hippelates pusio	x		
Olcella spp.	x	x	x
Conioscinella sp.	x	x	x
Milichiidae			
Milichiella sp.		x	
Neophyllomyza sp.		x	
Paramyia nitens (Loew)	x	x	
Leptometopa latipes (Meigen)	x		
Ceratopogonidae			
Forcipomyia (Thyridomyia) nana (Macfie)			x
Drosophilidae[b]	x		
Phoridae[b]	x		
Dolichopodidae[b]	x		

[a] Identification made from subsamples.
[b] Not identified below family level.

2,4-Hexadienyl hexanoate and 2,4-HDB were the most attractive of 575 chemicals tested. Of the 24 esters (Table 1) 22 contained moieties of these 2 compounds; i.e., they are 2,4-hexadienyl esters or esters of butyric or hexanoic acid. Interestingly, all the 2,4-hexadienyl esters, except for the hexanoate (the most attractive), attracted yellow jacket wasps on the West Coast (Davis et al. 1967, 1968) and the heptyl, octyl, and nonyl butyrates also attracted these insects (McGovern et al. 1970). Also, Table 2 lists the 6 families identified by Dr. Sabrosky in subsamples taken with 3 of the compounds. Although the greatest numbers were collected in the family Chloropidae, which includes the genus *Hippelates*, no *Hippelates* were trapped except for the initial 17% catch with 2,4-HDB on Aug. 5.

Therefore, on Sept. 28 we indexed the number of *Hippelates* spp. present in the test area by exposing a single trap baited with 2,4-HDB and another baited with decomposed fish, which is known to attract *Hippelates*. The 2,4-HDB caught more Chloropidae (172) than the decomposed fish (8) but none were *Hippelates*. Three species of *Hippelates* were caught by the decomposed fish trap, *H. bishoppi* Sabrosky, *H. pusio*, and *H. dissidens* (Tucker). Thus, the population of *Hippelates* was low in late September, which may explain why 2,4-HDB was effective Aug. 5 but ineffective subsequently. Axtell and Edwards (1970b) indicated that *H. bishoppi* in North Carolina was most abundant in June and July and *H. pusio* was most abundant in July, August, and early September.

Fluno et al. (1972) also reported collecting chloropids when testing 2,4-HDB, 2,4-hexadienyl propionate, and heptyl butyrate as yellow jacket attractants in 5 States from 1963 to 1970, but none were *Hippelates* spp.

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Codling Moth:[1] A New Pheromone Trap[2]

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Since surveillance of codling moth, *Laspeyresia pomonella* (L.), in individual orchards is a vital step toward integrated control in deciduous fruits (Batiste 1972), an all-purpose pheromone trap was designed to meet research and commercial needs for an overall efficient trap design. Currently used traps (Madsen 1967, Batiste et al. 1970), while adequate for research purposes, are not well suited for commercial use because they are often difficult to tend, and because of their usual paper construction the entire trap must be periodically replaced.

The new trap, herein designated the "U.C. Pheromone Trap," was designed for trapping codling moths with either live females or synthetic lure as the source of attractant. The trap, however, has potential use for other species and other types of attractants. The trap was designed for permanence, all-weather operation, low-cost maintenance, and simplified servicing. It consists of a hollow metal cone cover suspended over a metal pie plate containing a disposable catching surface. The cover portion in a prototype commercial version of the trap (Fig. 1) was constructed from sheet aluminum and is 28 cm diam and 10 cm high. A standard 10-in. (25 cm) tin-plated steel funnel may be used for this portion of the trap (Fig. 2); however it will rust under field conditions if not provided with a protective coating. The bottom of the trap, an aluminum pie plate, 25.5-cm diam × 3.8-cm deep, accepts a commercial paper plate as a disposable catching surface. In our studies, Stickem Special® was applied to the paper plate by hand with a spatula. However an aerosol-packaged material such as Bird Tanglefoot® provides a convenient means of coating the paper plate in the field.

Easy access to the attractant and captured insects is

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