# AN EVALUATION OF TRAPS FOR THE WESTERN CHERRY FRUIT FLY (DIPTERA: TEPHRITIDAE)[1]

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ABSTRACT

Four traps and six lures were tested for attractiveness to adult western cherry fruit flies, **Rhagoletis indifferens** Curran, in cherry plantings in the Okanagan Valley of British Columbia. Staley Protein Insecticide Bait #7, a combination of corn protein hydrolysate and corn steep liquor, mixed into tanglefoot (Stikem Special) on double-faced, yellow, plywood boards attracted about twice as many flies as similar traps baited with corn hydrolysate and three times as many as single-faced, nonbaited boards. Nevertheless, nonbaited, single-faced, yellow boards were moderately attractive and the easiest to prepare, install and maintain. Thus they seem the most practical for large-scale trapping of cherry fruit flies. Traps caught male and female flies soon after emergence from pupation in a ratio of about 1:1. Most female flies lacked ovarial development and none had fully developed ova.

## INTRODUCTION

Yellow sticky board traps similar to those described by Kaloostian and Yeomans (1944) and Wilde (1962) have been used since 1966, to determine the occurrence and emergence dates of the black cherry fruit fly, *Rhagoletis fausta* (Osten Sacken), and since 1968, of the western cherry fruit fly, *R. indifferens* Curran, in the Okanagan and Similkameen valleys of British Columbia. Madsen (1970) reported that in the Okanagan Valley, single-faced, yellow boards baited with ammonium carbonate caught the most *R. indifferens* but nonbaited, yellow boards were equivalent in attractiveness to glycine-lye bait pans. In contrast, Peters and Jack (1965) and Peters (1966) reported that in the Kootenay Valley, glycine-lye bait pans were more effective than nonbaited, yellow boards and those baited with ammonium carbonate or other attractants. At both locations the most effective traps were more complex to build and more difficult to install and maintain than the nonbaited, yellow boards.

The continuing spread of *R. indifferens* in the Okanagan and Similkameen valleys has resulted in an annual requirement for 5000 to 7000 simple, effective traps to sample this species in over 3000 acres of cherries. Growers need to determine if flies are present and the optimum time for control, and inspectors of the Plant Protection Division, Agriculture Canada, need traps to establish quarantine areas. In 1970, four traps and six lures were evaluated to determine the most suitable type for large-scale surveys of *Rhagoletis* species in cherry plantings.

[1]Contribution No. 364, Research Station, Agriculture Canada, Summerland, British Columbia.

## MATERIALS AND METHODS

The traps used were as follows (Table 1.): 6.4 mm plywood boards 14 x 29 cm painted vivid yellow (Munsell Key 2.5Y 8/12 (Nickerson, 1957)) on one face and coated with Stikem Special (polymerized butene, methylpropene, isobutene and butane, 97% ; inert ingredients, 3% ; Michel and Pelton Co., 5743 Landregan Street, Emeryville, California, 94608, U.S.A.); double-faced yellow boards of the same dimensions, coated with Stikem on both sides having a wide-mouth half-pint jar suspended beneath containing 170 ml of Staley Protein Insecticide Bait #7 (acid hydrolysate of corn protein and corn steep liquor in a 60:40 mixture, A. E. Staley Manufacturing Co., Decatur, Illinois, 62525, U.S.A.); double-faced yellow boards sprayed on each face with 2.5 ml of Staley Bait which was mixed into the Stikem; double-faced yellow boards sprayed on each face with 2.5 ml of corn acid hydrolysate (Nutritional Biochemicals Corporation, Cleveland, Ohio, 44128, U.S.A.) which was mixed into the Stikem; double-faced yellow boards dusted on each face with 1 g of casein enzymatic hydrolysate (Nutritional Biochemicals Corporation) which was mixed into the Stikem; double-faced yellow boards dusted on each face with 1 g of soy enzymatic hydrolysate (Nutritional Biochemicals Corporation) which was mixed into the Stikem; 2-quart frozen food cartons with 20 g of ammonium carbonate (Frick, Simkover and Telford, 1954 and Blanc, 1969), fitted with replaceable, Stikem-coated liners (Proverbs, Newton and Logan, 1966); and glycine-lye bait pans (Barnes and Madsen, 1963) containing 227 ml of bait mixture. The total catching surface area of the

single- and double-faced yellow sticky board traps was equalized by using 12 of the former and 6 of the latter.

The attractiveness of the traps and lures to cherry fruit flies was determined in an abandoned, 1-acre, mixed block of 15-year-old Lambert, Sam and Van sweet cherries at Okanagan Mission, B.C. Two types of trap were hung 1.2 to 2.4 m above the ground on opposite sides of each of 27 randomly selected trees, so that there was no contact with the foliage. Cartons with ammonium carbonate were suspended in a nearby horizontal position with the open end tipped downward to prevent accumulation of rain and irrigation water (Blanc, 1969). The traps were installed June 6 and 8 and inspected at 3- to 4-day intervals until June 23, when the trial was terminated. Water was added at 3- to 4-day intervals to maintain the volume of the glycine-lye and Staley bait lures. The Staley bait was replaced and the ammonium carbonate cartons recharged, weekly.

*Rhagoletis* species were identified by wing patterns as illustrated by Bush (1966) and by dorsal abdominal markings. Most flies caught on the single- and double-faced boards and in the glycine-lye bait pots were identified in the field during inspections. When masses of insects, including fruit flies, were collected in the bait pans, they were removed by straining the solution through a 20-mesh wire screen and then stored in 70% ethanol for later examination. The sex of the flies was determined in the laboratory. At the end of the experiment, 50 female *R. indifferens* caught on three types of trap were removed and cleaned in petroleum solvent. Each was dissected and the ovaries were examined for the presence and development of eggs to determine their physiological age.

## RESULTS

Double-faced, yellow boards with Staley bait mixed into the Stikem were significantly more attractive to *R. indifferens* than the other trap and lure combinations. They caught 1.9 times as many flies as similar traps with corn protein hydrolysate in the Stikem and for an equivalent surface area, three times as many flies as nonbaited, single-faced, yellow boards. The nonbaited traps were about as effective as double-faced, yellow boards with corn protein hydrolysate in the Stikem, double-faced boards with pots of Staley bait, glycine-lye bait pans and cartons with ammonium carbonate. Double-faced, yellow boards dusted with casein hydrolysate or soy hydrolysate did not catch any *R. indifferens* or insects of other orders in numbers comparable to those collected by the other traps.

Two *Rhagoletis* species other than *R.*

Table 1. Average numbers of adult R. indifferens caught by traps, Okanagan Mission, B.C., June 6 to 23, 1970

| Trap | No. Traps | No. of Flies |
|---|---|---|
| Double-faced y.s.b.[1] + Staley bait | 6 | 13.5 |
| Double-faced y.s.b. + corn hydrolysate | 6 | 7.0 |
| Single-faced y.s.b. | 12 | 4.5[2] |
| Bait pan + glycine-lye | 6 | 3.3 |
| Double-faced y.s.b. with pot + Staley bait | 6 | 2.5 |
| 2 qt. carton + ammonium carbonate | 6 | 1.2 |
| Double-faced y.s.b. + casein hydrolysate powder | 6 | 0.0 |
| Double-faced y.s.b. + soy hydrolysate powder | 6 | 0.0 |
| L.S.D. for averages at 5% level | | 4.3 |

[1]Yellow sticky boards.

[2]Corrected number for an equivalent surface area of double-faced yellow boards.

*indifferens* were trapped. These were a few *R. ribicola* Doane and *R. berberis* Curran, taken on nonbaited, single-faced boards, on double-faced, yellow boards with Staley bait in the Stikem or attached bait pots and in cartons with ammonium carbonate. No *R. fausta* were trapped.

Corn protein hydrolysate or Staley bait mixed into the Stikem darkened the adhesive and made trapped flies difficult to identify in the field. *Rhagoletis* species were easily confused with other Diptera having fuscous wing markings such as *Palloptera* species (Pallopteridae) and *Suillia* species (Heleomyzidae). Casein and soy hydrolysates mixed into the Stikem made the adhesive cloudy and reduced the intensity of the vivid yellow background on the boards.

Catches of flies from the effective traps and lures did not differ significantly in sex ratio. The totals averaged 47.4% male and 52.6% female. Most dissected females collected from nonbaited, single-faced, yellow boards, double-faced, yellow boards with pots of Staley bait or pans of glycine-lye bait showed a lack of ovary development. Two of 50 females had fully developed ovaries but no fully developed eggs.

## DISCUSSION

The results of this study show that the attractiveness of yellow boards to adult *R. indifferens* can be greatly increased by mixing small amounts of Staley bait into the adhesive; but large amounts of this lure were not attractive and may have confused or repelled the flies. Thus, double-faced, yellow boards with 5 ml of Staley bait mixed into the Stikem caught 5.4 times more flies than similar boards with 170 ml of Staley bait in a pot suspended below. Much of the attractiveness of small amounts of this lure appeared to be due to the corn steep liquor fraction. Traps with Stikem and Staley bait containing 40% corn steep liquor caught 1.9 times more flies than those with Stikem and corn hydrolysate.

Madsen (1970) reported nonbaited, single-faced, yellow boards to be as effective as glycine-lye bait pans for catching adult *R. indifferens*. These results confirm this and indicate that the former is a simple, moderately effective alternative to more complex types. Nonbaited, single-faced, yellow boards are durable and easy to prepare, install and inspect. Until a clarified or near-transparent formulation of corn hydrolysate and corn steep liquor is available that is equal to Staley bait, or until other more attractive lures and traps are discovered, then nonbaited, single-faced, yellow boards remain the most practical trap for large-scale surveys of cherry plantings.

Cartons baited with ammonium carbonate and hung in a nearly horizontal position were as effective as nonbaited, single-faced, yellow boards. Frick *et al.* reported good results with inverted, 1-quart cartons baited with the same lure. They also found that inverted, 1-pint cartons were inferior to inverted, 1-quart cartons. In the Okanagan Valley, 2-quart cartons were used. These were twice the size of those recommended by Frick *et al.* and presumably because of their larger size would have emitted more ammonia attractant. Horizontal positioning may have made this trap too directional and thereby reduced the numbers of flies caught. The attractiveness of yellow boards suggests that increased catches might result from painting the cartons vivid yellow.

Failure to trap any adult *R. indifferens* or insects of other orders in significant numbers suggests that powdered baits mixed into the Stikem on double-faced, yellow boards altered the surface of the adhesive so that flies did not become entangled. This contradicts that reported by Howitt and Connor (1965) who dusted 3 g of various powdered protein hydrolysates over each face of a 206 sq. cm trap coated with Stikem. In the Okanagan Valley, 1 g of hydrolysate was applied to each face of a 406 sq. cm board and mixed into the Stikem.

The presence of nearly equal numbers of male and female flies in or on the traps suggests that both sexes emerge from pupation in the soil at about the same time and are soon attracted to the cultivated cherry host.

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# *PHYTODECTA ARCTICA* MANN. (COLEOPTERA: CHRYSOMELIDAE) INCORRECTLY DETERMINED FROM GARIBALDI PARK, B.C.

W. LAZORKO

The holarctic species *Phytodecta (Gonioctena) arctica* Mann. was reported from Garibaldi Park by Hardy (1927). Hardy had collected several insects there in the previous year between July 24 and August 12, on the glacier and on leaves of willow (*Salix commutata denudata*). The identification of the specimens was questioned by Hatch (1971), who thought they might be *P. occidentalis* Brown.

Through the kindness of Prof. G. G. E. Scudder of UBC and the cooperation of Drs. B. D. Ainscough and R. H. Carcasson of the Provincial Museum in Victoria, I have been able to examine six specimens labelled "Garibaldi, B.C." and collected between July 24 and August 7, 1926 on the glacier at 6600 feet. One specimen also bears the label "Phytodecta arctica Mann." written in ink. There is no doubt that these specimens are some of those collected by Hardy and reported as *P. arctica*.

My study shows that the specimens are not *P. arctica*, but *Chrysomela aeneicollis* Schaeff. The latter species has been reported from Garibaldi Mt. by Brown (1956) and there are many specimens from this locality off willow, in the Spencer Entomological Museum at the University of British Columbia. *P. arctica* should thus be removed from the list of Coleoptera from Garibaldi Mt., and perhaps also from the list of Coleoptera of B.C.

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