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IMPROVED CONTROL OF THE WESTERN CHERRY FRUIT FLY, *RHAGOLETIS INDIFFERENS* (DIPT.:TEPHRITIDAE), BASED ON AREA-WIDE MONITORING

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ABSTRACT

A monitoring program, using spherical wooden traps of Saturn Yellow® color, was tested on an area-wide basis for control of the western cherry fruit fly, *Rhagoletis indifferens* Curran. All calendar sprays were eliminated and substituted by sprays applied only after the first female flies were caught on any of 8 traps/acre. This approach resulted in elimination of all spray treatments for *R. indifferens* control in 4 of 10 study orchards during the 1977 season. The remaining study orchards required one fewer spray treatment. In 1978, 1 of 14 study orchards required 4 fewer treatments. Among the remaining orchards, 3 sprays were eliminated in 2 orchards, 2 sprays in 4 orchards and 1 spray in 6 orchards. It is estimated that the average saving in spray costs alone amounted to about $31.00/acre in 1977 and $26.00 in 1978. The overall reduction in number of sprays applied was about one-half during 2 seasons. The orchard blocks under the fly monitoring program had about the same level of infestation in the fruit as the calendar treatment blocks.

INTRODUCTION

The western cherry fruit fly*Rhagoletis indifferens* Curran, is the most important pest of cherries in the Pacific Northwest. More than 80% of all insecticide sprays applied to cherry trees are directed against this pest. Untreated orchards sustain between 50 and 100% fruit infestation. Almost all commercial growers in Oregon and Washington rely on preventative sprays ranging from 3 to 6 ULV sprays of malathion or ground sprays of diazinon per season, and causing excessive over-spraying, with resultant environmental contamination and financial loss. As an alternative to this method, AliNiazee (1978) suggested a program of minimum presticide use based on trap catches. This involved the use of suspended or hanging spherical traps of 5 cm diam., painted with Saturn Yellow® fluorescent paint or Zoecon's AM standard traps, at the rate of 4-8/acre. The application of control treatments was delayed until the flies were trapped in each individual orchard. Frick et al. (1954) also suggested the use of traps to determine the emergence of flies and the timing of control treatments. Other workers (Madsen and Vakenti 1973, Riedl and Croft 1974, Minks and DeJong 1975, Neilson *et al.* 1976, Westigard and Graves 1976) used pheromone or attractant traps to monitor pest emergence and population fluctuations, to provide a basis for pest control decisions.

Reported here are the results of an area-wide application of a cherry fruit fly management program involving 22 cherry growers throughout the Willamette Valley of Oregon.

MATERIALS AND METHODS

Fly emergence in study orchards was monitored by using 5 cm diam. wooden shperical traps (AliNiazee 1978), at 8 traps/acre.

The spheres were painted with fluorescent Saturn yellow paint (Day Glo Co., Cleveland, Ohio) and a thin coat of Stickem Special® (Michael Pelton Co., Emeryville, California) for catching the attracted flies. The traps were placed randomly throughout the study blocks

about 2-2.5 m above ground, hung on 20-30 cm-long wires, mostly in the outer canopy where they were easily visible. A number of border traps were placed to check for incoming flies. The traps were made locally at a cost of about $0.25 each.

In 1977, 11 orchards were involved in the study whereas in 1978 there were 15. The growers were selected from different cherry growing areas within the Willamette Valley to encompass differences in elevation and varieties. The study orchards were located within a 2589

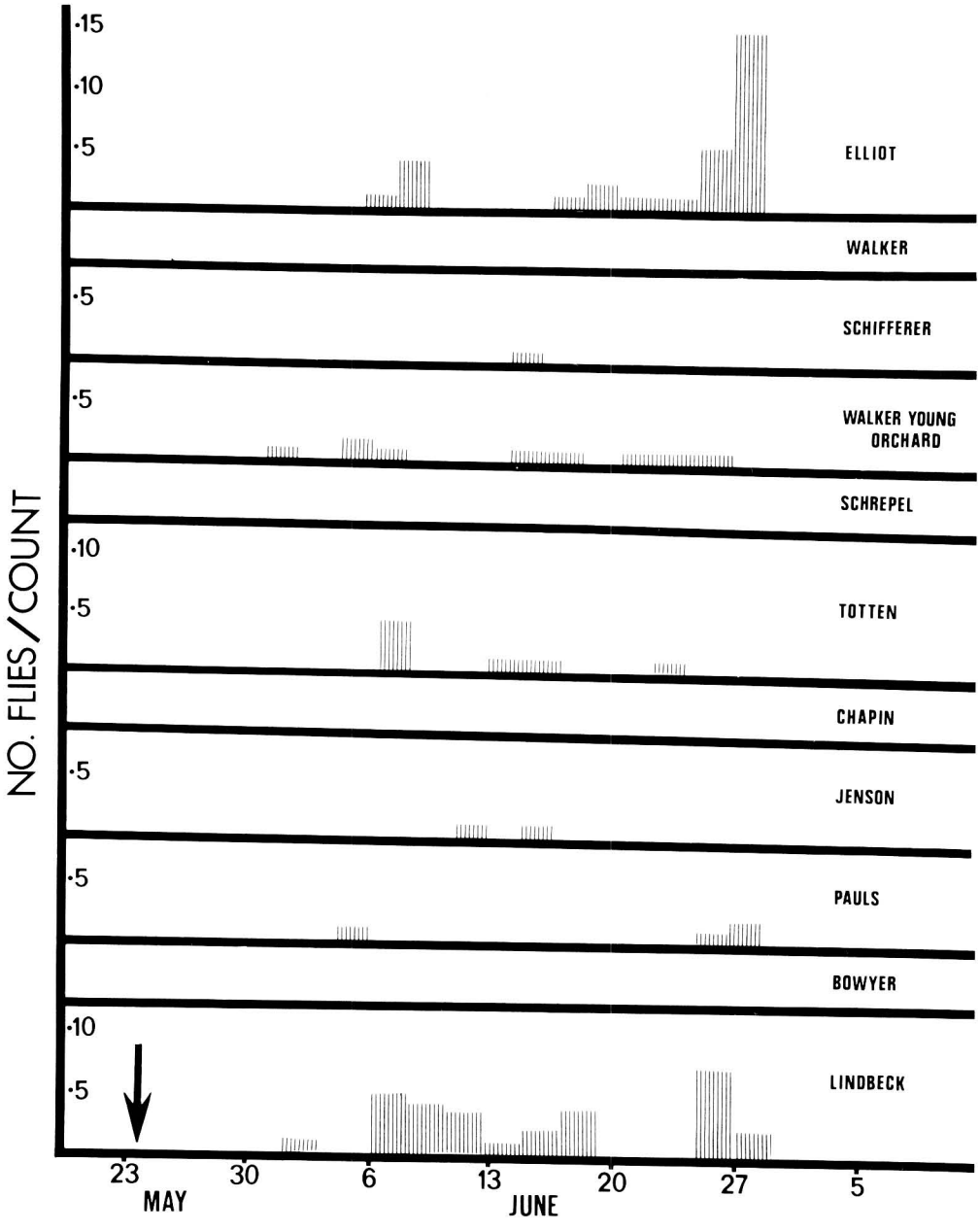

Fig. 1. No of western cherry fruit flies trapped/3-4 days/8 yellow sphere traps showing emergence pattern for 1977 in different study orchards. Arrow indicates 1st fly emergence in the area.

km^2 (=1000 mi^2) area of the mid-Willamette Valley. All the orchards except one had been under a commercial spray program during the previous year. The study blocks varied in size from 0.75 to 2.0 acres.

The traps were placed in the 2nd week of May. The flies caught on each trap were counted and removed 3 times/week, when the traps were cleaned and serviced. Captured flies were sexed and females were brought to the laboratory to determine the stage of ovarian development. The study was continued until the fruit was harvested, normally in the 1st week in July. As soon as one female fly was taken on any of the traps, the grower was informed and a regular spray program initiated. Thus, no sprays were applied if no flies were found on the traps for the entire season. By contrast, in blocks using a calendar spray program, the grower applied regular sprays on scheduled dates. These sprays were initiated by the growwers immediately after the 1st fly was caught in the area and notices were sent by the County Extension Agents.

The effectiveness of the program was evaluated by randomly collecting 500 - 1000 cherries/acre and examining them for eggs and maggots, 5 to 10 days before harvest. Similar samples were collected and examined from adjacent standard-treatment blocks where a calendar spray program was used.

RESULTS AND DISCUSSION

In 1977, the first fly was caught in the area on May 24. The cherry growers of the Willamette Valley were informed and fruit fly sprays began on May 26, and continued for 6 weeks at 8 - 10 day intervals. But in the study orchards, no fly activity was noticed until the 1st week of June. In Walker's young orchard near Salem, the 1st fly was caught on June 1 (Fig. 1). A total of 9 flies (Fig. 1) was caught by the end of the growing season. Flight activity increased in August and early September mostly due to migration of flies from the surrounding orchards. Trap counts from Elliot's orchard near Dalles, indicated the presence of a large number of flies. A total of 30 flies were trapped before the July 4 harvest, however, the first fly was not caught until the end of the first week in June, indicating late emergence. A large number of flies was trapped in this orchard towards the end of the season. Lindbeck's orchard (North Salem) also had a substantial number of flies (28 total on 8 traps by July 5th), but the first emergence did not occur until June 3. A late season increase in trap catches was also noticed in this orchard. No flies were caught in Walker, Bowyer and Chapin orchards throughout the study period; a very small number of flies was caught in the other 4 orchards (Totten, Pauls, Schrepel and Jensen), mostly towards the end of the season. In general, the fly emergence in study orchards was about 1 - 3 weeks later than the 1st fly emergence in the valley (Fig. 1).

A comparison of number of sprays applied and the infestation levels (Table 1) of the management blocks vs. standard blocks (where no traps were used and chemicals were applied on a calendar basis) indicates the usefulness of this approach for cherry fruit fly management. Out of the 10 commercial orchards involved in the 1977 program, 4 did not require any sprays, saving \$45.00 - \$60.00/acre. The remaining orchards used one less spray, although some of these could have saved more by delaying the 1st treatment. On an average, 2.1 sprays/season were eliminated, which is almost one half of the total spray program for cherry fruit fly control.

In 1978, the program was further expanded, growers were allowed bigger blocks (2 - 5 acres), and several new growers were added. The overall performance of the program was comparble to that in 1977. Of the 14 commercial orchards involved in the program, few had appreciable numbers of flies (Fig. 2). Most of the flies were caught towards the end of the season, consequently, they posed little threat. Among the study orchards, Walker and Jensen orchards had only one fly throughout the season. Small numbers of flies were caught in Bowyer, Askey, Shingler, Nusom, Totten, and Kubin orchards. Most of these orchards had late fly emergence (for instance Bowyer on June 29, Nusom on June 16, Askey and Shingler on June 19, Totten on June 12, Kubin on June 19), thus eliminating the need for a number of sprays. Lindbeck, Pauls, and Wilson orchards had moderate number of flies, mostly towards the end of the season. Precise monitoring of fly emergence and the subsequent population trends resulted in reduced use of spray treatments in the management blocks. In 1978, the management blocks received an average of 1.8 sprays/season whereas the standard blocks, using calendar treatments based on County Agent's recommendations received about twice as many, or 3.9 sprays/season. Using a conservative figure of \$15.00/spray/acre including the cost of material and labor, the program resulted in an average saving of about \$26.00/acre.

Attempts were made to estimate the cost of traps and the monitoring program. The initial cost of the traps was about \$2.00/acre. Their maintenance and checking will depend on individual growers and how the program is run. We estimated \$10.00/acre for running this program, primarily based on our costs for the 2 years. We believe that costs could be reduced substantially if growers would monitor their own orchards. Even after the deduction of these costs, the saving in 1978 was about \$16.00/acre, but in 1977 it was about \$21.00/acre (Table 2). Further benefits were the re-

TABLE 1. A comparison of spray schedules and % infestation in management vs. standard block of cherry trees. Willamette Valley, OR, 1977.

Fields	Day 1st fly caught on traps	No. of sprays applied in management block[1/]	No. of sprays applied in standard block[2/]	% infestation at harvest in P.M. block	% infestation at harvest in standard block	No. of sprays saved using a P.M. program	$ savings per acre
Linbeck	6/3	3	4	0	0	1	15
Bowyer	7/12[4/]	0	4	0	0	4	60
Chapin	7/1	0	4	0	0	4	60
Elliot[3/]	6/8	3	4	0	0	1	15
Jensen	6/13	3	4	0	0	1	15
Pauls	6/6	4	5	0	0	1	15
Shiffeger	6/15	3	4	0	0	1	15
Totten[3/]	6/8	3	4	0	0	1	15
Walker	7/19[4/]	0	4	0	0	4	60
Schrepel	7/1	0	3	0	0	3	45
Walker-Young Orchard	6/1	3	4	0	0	1	15

1/ Pest management blocks, where traps were used to monitor fly emergence and sprays were applied only if flies were caught.

2/ Standard blocks, where spray treatments were applied on calendar dates based on County Agents; recommendations.

3/ Microscopic examination of the cherries revealed the presence of two unhatched eggs in cherries from both the P.M. blocks and Standard blocks, however no maggot, or maggot infested fruit was found at harvest.

4/ During or after harvest.

TABLE 2. A comparison of spray schedules and % infestation in management vs. standard block of cherry trees. Willamette Valley, OR, 1978.

Fields	Day 1st fly caught on traps	No. of sprays applied management block[1/]	No. of sprays applied in standard block[2/]	% infestation at harvest in P.M. block	% infestation at harvest in standard block	No. of sprays saved using a P.M. program	$ savings per acre
Askey	6/19	1	4	0	0	3	45
Bowyer	6/29	1	3	0	0	2	30
Jensen	6/5	3	3	0	0	0	0
Kubin	6/19	2	4	0	0	2	30
Lindbeck	6/7	2	3	0	0	1	15
Hanneman	6/19	3	5	0	0	2	30
Nusom	6/16	1	3	0	0	2	30
Pauls	6/7	4	5	0	0	1	15
Schifferer	6/12	3	4	0	0	1	15
Shingler	6/19	2	6	0	0	4	60
Totten	6/12	2	3	0	0	1	15
Walker	6/7	3	4	0	0	1	15
Walker - young orchard	6/5	3	4	0	0	1	15
Wilson	6/12	1	4	0	0	3	45

1/ Pest management blocks, where traps were used to monitor fly emergence and sprays were applied only if flies were caught.

2/ Standard blocks, where spray treatments were applied on calendar dates based on County Agents' recommendations.

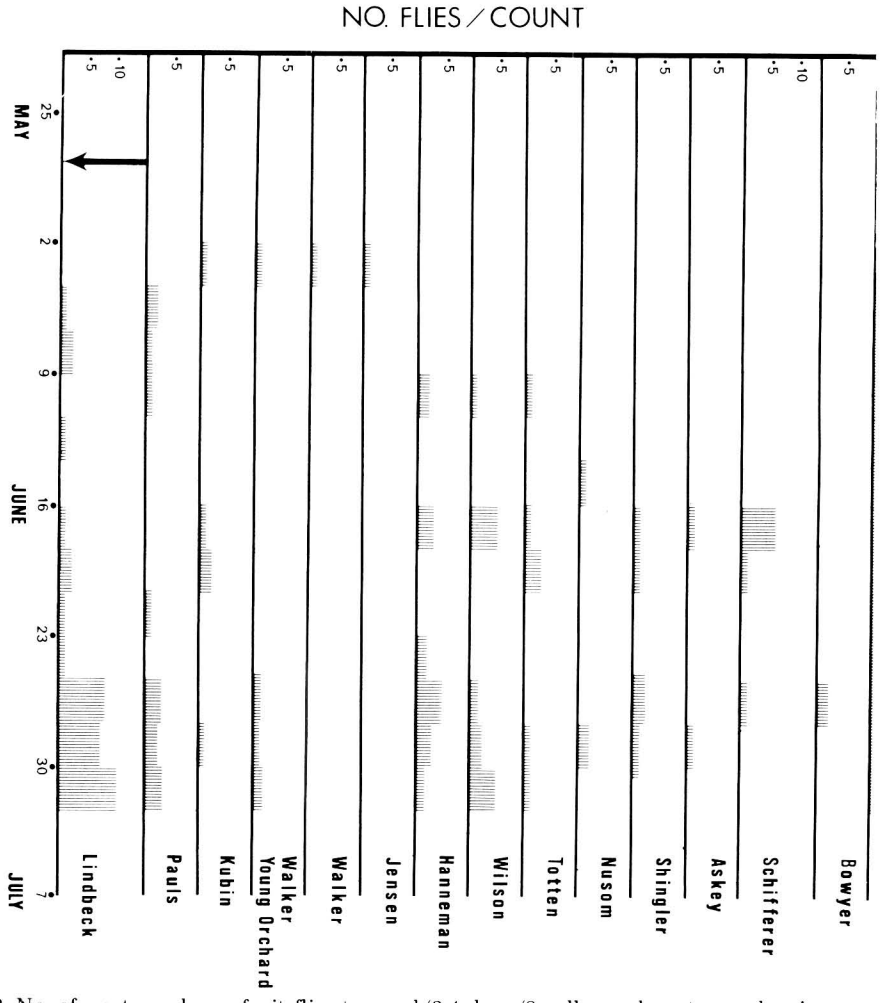

Fig. 2. No. of western cherry fruit flies trapped/3-4 days/8 yellow sphere traps showing emergence pattern for 1978 in different study orchards. Arrow indicates 1st fly emergence in the area.

duced environmental pollution and the grower's awareness of pest control problems.

This area-wide management study indicates that yellow spherical traps can effectively monitor the activity of western cherry fruit fly and that a control program based on trap catches instead of calendar dates can save a large number of spray. Other traps, such as Zoecon's Pherocon® AM Standard trap and Saturn yellow color cardboard rectangles (15 x 20 cm) could be equally effective. However, the cost of these traps, particularly the Zoecon's AM trap, might make them uneconomical. The present study substantiates earlier work by AliNiazee (1978) and shows the effectiveness of this program over a much larger area than reported before. Frick *et al.* (1954) also suggested the use of lure traps for timing of cherry fruit fly control sprays in eastern Washington. The success of a fly monitoring program using traps is primarily dependent upon the grower's confidence in the trapping system. Acceptance of this program indicates that in spite of the extremely low pest tolerance level, many growers are willing to adopt the approach mainly because of possible reduction in spray costs.

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