

# Sticky Stake Traps For Monitoring Fly Populations of the Sugarbeet Root Maggot and Predicting Maggot Populations and Damage Ratings

C. C. BLICKENSTAFF and R. E. PECKENPAUGH<sup>1</sup>

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## Introduction

Swenson and Peay (3)<sup>2</sup> compared sticky stake traps of several colors with 2 types of bait traps for monitoring populations of adult sugarbeet root maggots, *Tetanops myopaeformis* (Röder) (Diptera, Otitidae). From work done in 1965-67, they concluded that black and green colored stakes caught more flies than other colors and said that there was "a high correlation between numbers of flies trapped on sticky stakes and damage caused . . ." during those 3 years.

We report here additional work done during the period 1968-75 with traps of other colors, heights, and directions of exposure and the relationship between trap catches and subsequent maggot populations and damage ratings.

## Procedure

All comparisons of color utilized 1 × 12 in. garden stakes stuck in the ground. These were colored with oil paints obtained locally. Painted stakes were matched with color charts (2) as follows:

Color	Plate	Column and Row
Red	3	L 6
Orange	2	I 12
Blue	37	L 10
Brown	7	L 12
Green	31	J 11
Yellow	10	L 5
Natural, unpainted	11	B 4 (approximately)

In the comparisons of catches at different heights and directions, the same stakes were used, but the tips were cut off to make them 10 in. long. These were stapled vertically to the sides of 2 × 2 in. posts painted white. Thus a height of 1 ft. actually means that the stake was 1 ft. to 1 ft. 10 in. above ground level. The garden stakes were coated with a thin layer of Stickem<sup>®</sup> and examined at least twice weekly during the

<sup>1</sup>Research Entomologist and Agricultural Research Technician, respectively. ARS, USDA, Kimberly, Idaho 83341.

<sup>2</sup>Numbers in parentheses refer to literature cited.

flight period, May and June. At each examination flies were counted and removed, and the sticky coating was renewed. In 1968-70, twenty such posts were set up at 3-mile intervals along roadsides in the beet growing area from Paul to Minidoka, Idaho. In 1971, ten of the same 20 locations, where the greatest number of flies had been trapped previously, were used again. In 1975, rough, unpainted lath posts were compared with the 2 × 2 in. white posts. Also in 1974 and 1975, stakes were maintained in a series of survey fields where, in mid-season, maggot populations were determined in untreated check plots by sifting cores of soil each containing a beet. In 1975, damage ratings (1) were obtained at mid-season. Data in 1974 and 1975 were obtained in cooperation with research personnel of The Amalgamated Sugar Company and the Utah-Idaho Sugar Company. Unless otherwise stated, all work was done in south-central Idaho.

### Results

The effect of color on fly catches is summarized in Table 1. The data from Swenson and Peay (3) are included. All data are presented as percentage of the number of flies caught on black stakes since black was included in all 6 years of testing and averaged better than green (the only other color present in all years). Colors ranked in essentially the same order each year: red and orange caught more flies than black in 4 of 5 comparisons. The lighter colors (yellow, white, silver, and unpainted) consistently caught fewer flies. Blue, brown, and green were intermediate and seldom attracted as many flies as black. Orange is our color of choice since there appears to be little, if any, difference between it and red, and the black-bodied flies are more easily identified and counted on the lighter background.

Table 1.—Catch of sugarbeet root maggot flies on sticky stake traps of various colors as a percentage of those caught on black traps.<sup>1</sup> Southern Idaho, 1965-1972.

Color	1965 <sup>2</sup>	1966 <sup>2</sup>	1967 <sup>2</sup>	1968	1969	1972	Average
Red				108.3		112.8	110.6
Orange				114.6	111.7	97.0	107.8
Blue				86.4	99.0		92.7
Brown				82.4	100.7		91.6
Green	79.6	97.6	100.9	77.3	99.9	73.5	88.1
Yellow	56.2	89.9			99.5	70.7	79.1
White	66.7	73.8					70.2
Silver				47.9	87.9		67.9
Unpainted	47.5	76.0					61.8

<sup>1</sup>The number of flies collected on black stakes, the number of stakes tested per color, and the number of trapping days each year were: 1965- 1248, 5, and 78; 1966- 3879, 47, and 104; 1967- 910, 37, and 56; 1968- 683, 6, and fly season; 1969- 1076, 10, and 18; 1972- 461, 4, and 48

<sup>2</sup>Based on data from Swenson and Peay, 1969.

The effect of stake height on fly catches is summarized in Table 2. In 1968 when stakes were placed from ground level to 7 ft., those with the stake bottom 1 ft. above ground level caught 48.1% of the total trapped. Lesser numbers were caught above and below this level. In

subsequent years, stakes at the 1-ft. level invariably caught more flies than stakes at the 2 or 3-ft. levels.

The effect of trap exposure (compass direction) is summarized in Table 3. Duncan's multiple range test showed north to be superior to the other directions though east did not differ significantly from north at the 5% level.

Table 2.—Catch of sugarbeet root maggot flies trapped at various heights by sticky traps.

Year	Ground	Percentage Captured When Bottom of Stake Was At Indicated Height (ft.)				
		1	2	3	5	7
1968	36.9	48.1		12.3	2.4	0.3
1968		78.9		21.1		
1969		62.0	38.0			
1970		45.1	37.8	17.1		
1971		74.5	25.5			
1973		69.8	30.2			

Table 3.—Percentage of sugarbeet root maggot flies<sup>1</sup> collected on sticky stake traps facing each cardinal direction, 1968-70.<sup>2</sup>

Direction	Percentage Flies Collected In				Average
	1968	1969	1970		
North	33.2	28.5	26.9		29.5 a <sup>3</sup>
East	25.5	26.8	25.7		26.0 ab
South	19.8	24.1	23.5		22.5 b
West	21.5	20.6	23.9		22.0 b

<sup>1</sup>Total flies trapped were 2,393 in 1968, 9,922 in 1969, and 16,343 in 1970.

<sup>2</sup>Trap height in 1968 (3 ft.-3 ft. 10 in.); 1969 (2 ft.-2 ft. 10 in.); 1970 (1 ft.-1 ft. 10 in.).

<sup>3</sup>ANOVA showed significant differences at the 5% level. Means followed by the same letters do not differ significantly from each other.

Table 4.—Number of sugarbeet root maggot flies collected by sticky stake traps on 2 types of posts. South-central Idaho, 1975.

Post type	No. Flies Collected In Indicated Field								
	1	2	3	4	5	6	7	8	9
White									
2 × 2 in.	0	9	63	28	87	279	222	21	839
Lath,									
unpainted	1	4	39	7	33	178	120	18	704

Because rough laths are relatively cheap and require no preparation as compared with the 2 × 2 in. posts painted white, the two were compared in 1975. Three of each were placed in pairs on the margins of 9 survey fields in south-central Idaho. Orange sticky stakes were stapled at the 1-ft. level facing east. The results are shown in Table 4. A t test showed that significantly more flies were caught by stakes mounted on the white posts.

The relationships between sticky stake fly catches and maggot counts in 1974 and 1975 are given in Table 5. Correlations were highly significant except for the series of 8 survey fields in eastern Idaho in 1974. The changes in stake color and exposure from 1974 to 1975 are

**Table 5.—Relationship between seasonal total of flies caught per sticky stake trap<sup>1</sup> and maggots per beet in sugarbeet root maggot survey fields. Idaho.**

Year	Area	No. Fields	Mean No. Flies/ Stake (X)	Mean No. Maggots/ Beet (Y)	Regression Equation ( $\bar{Y} = a + bX$ )		r Value
					a	b	
1974	Eastern	8	154.5	1.31	.82	.0032	.29 ns
1974	South-central	9	144.8	2.07	-1.63	.0276	.83**
1974 & 1975	South-central	12	145.6	2.40	1.51	.0269	.91**
Combined							

<sup>1</sup>All sticky stake traps were stapled to 2 × 2-in. white wood posts between 1 ft. and 1 ft. 10 in. above ground level. Traps were black in 1974 and faced N and E. Traps in 1975 were orange and faced E.

considered to be of no consequence. The 1974 data for eastern Idaho showed a non-significant correlation. Plots in eastern Idaho were established by personnel of Utah-Idaho Sugar Company (now U & I, Incorporated). These plots were often narrow strips bounded by treated areas and their exact location and history was sometimes uncertain. We, therefore, consider these data to contain errors markedly affecting results. When we combined the data for 1974 (9 fields) and 1975 (3 fields) in south-central Idaho, a correlation value of 0.91\*\* was obtained which means that 82% of the variation in maggot populations could be explained by variations in fly populations as measured by the sticky stake traps.

The relationship between fly populations and damage ratings is presented in Figure 1. Of a total of 12 sets of data available, two were discarded because no flies were trapped and damage ratings were also either zero or nearly so. A third set was discarded due to an obvious error. The correlation for the remaining data (n=9) was .91\*\*. The regression formula is given in Figure 1.

### Summary and Conclusions

Either orange or red sticky stake traps 1 × 10 in. stapled vertically with the bottoms 1 ft. above ground level on white 2 × 2 in. posts facing either east or north and located at the margins of sugarbeet fields were found to be superior to other colors, heights, and exposures in trapping adult sugarbeet root maggots. An additional advantage of orange-colored traps is that flies are more easily identified on this background than on darker colors. Advantages of placing stakes 1 ft. above ground rather than simply sticking pointed garden stakes in the ground is that the higher level collects less dirt and trash, and birds are less likely to remove the flies. In the area of our tests, prevailing winds are from the west or southwest, and this may be the reason why we had larger fly catches on north and east exposures. The number of flies trapped with orange and black stakes mounted at the 1-ft. level and exposed to north or east directions were found in 1974 and 1975 to correlate well with both maggot populations and damage ratings. Such counts thus can be used to predict maggot populations and damage ratings.

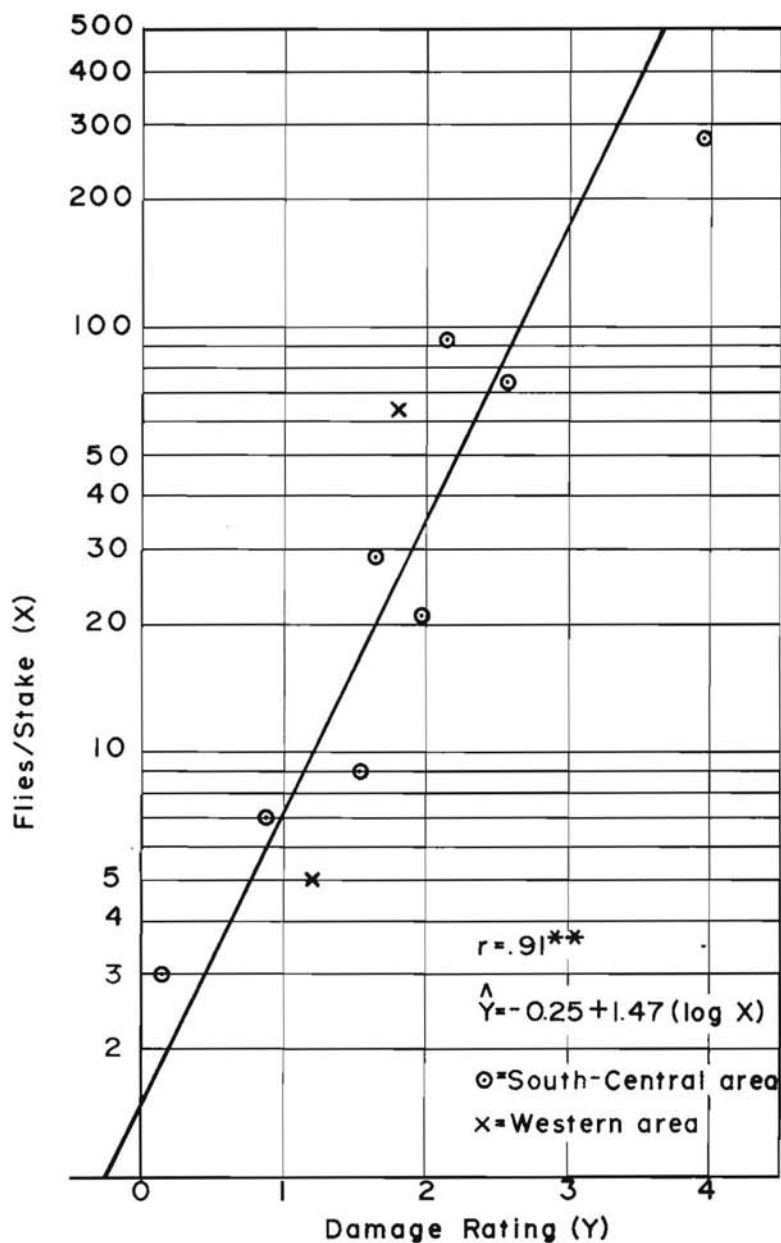
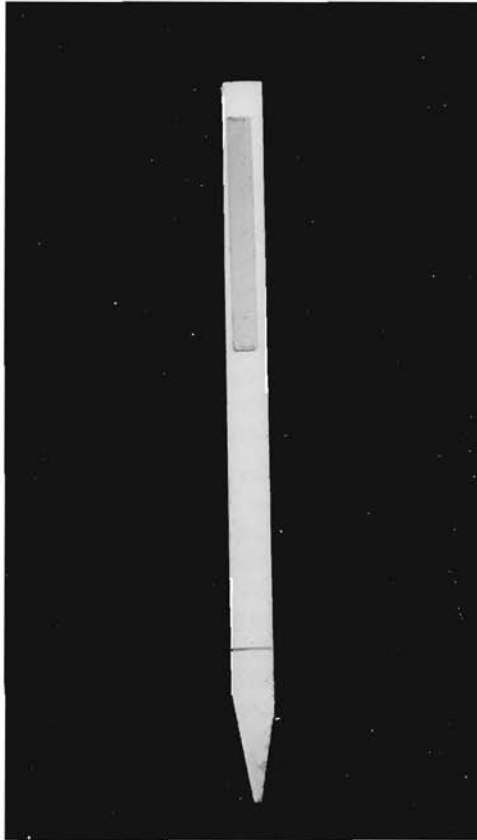


Figure 1. Relationship between total number of sugarbeet root maggot flies trapped per sticky stake and sugarbeet damage rating Idaho, 1975.

We propose to standardize survey stakes as shown in Figure 2.



**Figure 2.** Standard sticky stake trap for monitoring sugarbeet root maggot adults. Orange  $1 \times 10$  in. garden stake mounted with bottom 1 ft. above ground level on  $2 \times 2$  in. white post.

#### Literature cited

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