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ALFALFA WEEVIL SURVEY, FALL OF 1937

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PURPOSE OF SURVEY

Annual surveys of alfalfa weevil[2] abundance in the fall of the year were begun in 1932 in order to indicate the outlook for weevil damage in the following year and to create a reliable record of regional abundance which might later be useful for studying the effects of climate upon the weevil. The surveys also reveal the gross abundance of cocoons of the larval parasite Bathyplectes curculionis (Thoms.)[3] and, by dissection, the number of these that are viable. As the survey results are of immediate practical value to entomologists and county agents in a large part of the weevil-infested region, the policy of publishing them was begun with the results of the 1936 survey.[4]

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[1] The work on which this report is based was carried out under the direction of J. C. Hamlin. The survey in Jackson County, Oreg., was planned and executed by R. C. Newton. General assistance was provided by L. J. Jones and J. B. Duncan.

[2] Hypera postica (Gyll.).

[3] All later mention of parasites in this paper has reference to this species.

[4] McDuffie, W. C., Alfalfa Weevil Survey, Fall of 1936. U. S. Dept. Agr., Bur. Ent. and Plant Quar., Insect Pest Surv. Bul. 17: 29-42, March 15, 1937.

EXTENT OF SURVEY

As in 1936, the districts surveyed were restricted to those considered most important in regard to alfalfa culture and weevil damage. Twelve districts were sampled, and these included portions of Oregon, Idaho, Utah, Colorado, Nevada, and Nebraska.

METHODS

The sampling plan was the same as that followed in 1936, 4 representative square-foot samples being taken from each of 25 fields in a district, except in the smaller districts, where 12 fields were considered sufficient. Such sampling does not give highly accurate estimates for individual fields but provides a useful indication of the general level of weevil abundance in a district.

Each sample was taken by forcing into the soil a metal die 1 foot square and removing all alfalfa crowns, litter, and weeds enclosed by the die, as well as the soil from the enclosed area to a depth of from 1 to 2 inches. Later, each sample was reduced in volume by washing, so that its content of weevils, parasite cocoons, and litter remained in the lower of two screen-bottom tubs. These washed samples were individually wrapped in absorbent-paper towels to remove excess moisture and were examined in the laboratory on a white porcelain tray.

LIMITATIONS ON USE OF DATA

Obviously no forecast of weevil damage (or parasite effectiveness) can be exact. Nevertheless it is believed that considerable loss can be averted if interested State entomological workers and county agricultural agents will watch developments in those localities in which the survey has indicated a prospect of important damage by the alfalfa weevil. Our interpretation of survey data is based on the generality that an average population of two adult weevils per square foot is necessary to produce economic damage in most of the older weevil-infested territory. However, the outlook gained from surveys made in the fall is subject to modification by mortality of adult weevils during the winter. Also, the amount of damage in any locality depends on whether spring weather favors or hinders weevil development. Again, certain field conditions manifested by thin stands or poor growth may aggravate the damage in any field or in any district where these conditions prevail, because fewer adult weevils are required to create a larval concentration sufficient to cause damage. Finally, injury in any field populated by a menacing number of larvae is increased by delay in harvesting after the plants are mature. Such maturity is indicated by budding of the top crop, together with scattered blossoms and appearance of the earliest basal shoots of the succeeding crop.

RESULTS

Results of the 1937 fall survey are grouped by States and tabulated by districts, each tabulation being accompanied by a brief discussion. All averages in the succeeding tabulations have reference to areas of 1 square foot. It has also been considered helpful to include a brief summary of the extent of weevil damage which occurred in each State during the growing season of 1937.

OREGON

First-crop damage by the alfalfa weevil in 1937 amounted to 10 and 35 percent, respectively, of fields in Jackson County and in Eagle Valley, Baker County. Economic loss, however, was slight in both areas, larval feeding being largely restricted to the tips of alfalfa plants. In Eagle Valley (table 1) one-sixth of the alfalfa fields surveyed were populated by a menacing number of weevils. Additional injury may develop in hillside fields occupied by smaller weevil populations, because of poor growth and thin stands, as was the case in 1937.

Ordinarily the parasite population would be effective in minimizing production of the new-generation adult weevils, which will form the basis of attack in 1939, but the late-cutting practice prevalent in this area largely nullifies the beneficial effects of parasitization.

Table 1.--Survey results, Eagle Valley, Baker County, Oreg., sampled September 29, 1937

Field No.	H. postica adults	B. curculionis cocoons	
		Present	Viable
	Number	Number	Number
1	1.00	3.50	1.00
2	.75	11.25	.75
3	1.25	7.00	1.50
4	1.00	7.00	.75
5	2.25	2.25	.25
6	1.25	1.25	.50
7	.75	3.75	1.75
8	1.75	2.25	.75
9	2.75	13.00	4.25
10	0	8.75	1.75
11	1.75	2.75	.50
12	0	2.75	.50
Average -	1.21	5.46	1.19

Malheur County was omitted from the 1937 fall survey, two seasons' study having shown no appreciable differences between alfalfa weevil conditions in this county and in Canyon County, Idaho. The latter county is typical of the lower Snake River Valley of western Idaho and eastern Oregon, and survey results for it serve as an indication for adjoining counties in Idaho and Oregon.

In Jackson County (table 2) approximately 50 percent of the fields surveyed were inhabited by threatening weevil populations. The parasite, first introduced into this area in 1934, was recovered from every field examined in the fall of 1937. Its increasing abundance indicates that it may develop into an important factor in alfalfa weevil control for this area.

Table 2.--Survey results, Jackson County, Oreg., sampled October 5-28, 1937

Field No.	H. postica adults	B. curculionis cocoons	
		Present	Viable
	Number	Number	Number
1	2.50	4.25	.50
2	3.50	2.00	.75
3	1.00	9.75	3.25
4	1.50	6.00	.75
5	1.00	2.50	1.50
6	0	2.50	1.00
7	1.25	6.50	3.75
8	.25	4.50	2.75
9	.75	3.00	1.75
10	1.25	.25	.25
11	.25	2.25	.50
12	1.50	6.50	2.50
13	.25	6.00	1.50
14	2.50	4.25	2.00
15	2.50	3.75	1.50
16	2.00	7.25	3.75
17	3.00	5.25	2.50
18	1.75	1.75	0
19	2.25	8.00	2.25
20	4.50	8.25	1.25
21	3.25	3.50	1.00
22	2.25	5.25	.75
23	4.00	2.75	2.00
24	4.25	.50	.25
25	1.75	2.50	1.50
Average	1.96	4.36	1.58

IDAHO

Alfalfa weevil damage in the lower Snake River Valley of western Idaho was negligible in 1937, affecting only about 2 percent of the fields. The injury was largely concentrated in Ada County. Approximately 10 percent of fields in eastern Idaho (upper Snake River Valley) were injured, but only in Bingham County was the damage severe.

The survey in eastern Idaho again included parts of five counties, viz, Bingham, Bonneville, Jefferson, Madison, and Fremont. The first two counties were treated as a subdistrict, because a somewhat longer growing season occasionally permits harvest of three alfalfa crops. The other three counties are strictly two-crop areas and were treated as a separate subdistrict. In Bonneville and Bingham Counties (table 3) potentially injurious weevil populations existed in approximately one-fourth of the fields examined. Fall abundance of viable parasite cocoons promised highly effective parasitization for 1938.

Table 3.--Survey results, Bingham, and Bonneville Counties, Idaho, sampled September 13-14, 1937

Field No.	H. postica adults	B. curculionis cocoons	
		Present	Viable
	Number	Number	Number
1	1.00	4.50	3.25
2	.75	17.75	4.75
3	1.75	21.75	3.75
4	1.00	4.50	.50
5	2.50	10.25	2.00
6	2.50	5.25	2.75
7	1.00	2.00	1.00
8	.25	3.50	0
9	.75	1.00	.50
10	1.00	19.50	4.50
11	1.25	16.50	2.00
12	.75	12.00	2.25
13	3.00	3.75	.50
Average -	1.35	9.40	2.13

In Jefferson, Madison, and Fremont Counties (table 4) one-third of the fields surveyed were populated by a menacing number of weevils, and considerable damage for 1938 was indicated. Viable parasite cocoons were sufficient to minimize production of new-generation weevils in 1938.

Table 4.--Survey results, Jefferson, Madison, and Fremont Counties, Idaho, sampled September 14-15, 1937

Field No.	H. postica adults	B. curculionis cocoons	
		Present	Viable
	Number	Number	Number
1	.50	9.00	1.75
2	3.25	30.00	3.50
3	3.25	9.25	1.75
4	1.25	4.50	.50
5	1.25	6.50	.50
6	.75	17.25	5.75
7	1.00	14.75	.75
8	.75	15.75	.75
9	5.50	5.75	.50
10	1.25	10.75	.75
11	2.75	14.25	1.00
12	1.25	2.25	1.00
Average -	1.90	11.67	1.54

The survey of western Idaho was limited in 1937 to Canyon County, it being considered typical of the important alfalfa-growing area of western Idaho and eastern Oregon.

In Canyon County (table 5) only slight weevil damage is expected in 1938. Of 25 fields, 2 were populated by threatening numbers of weevils. No adult weevils were found in about half the fields examined. Parasite cocoons were scarce but were commensurate with the small weevil populations.

Table 5.--Survey results, Canyon County, Idaho, sampled September 30-October 1, 1937

Field No.	H. postica adults	B. curculionis cocoons	
		Present	Viable
	Number	Number	Number
1	0	1.25	.50
2	0	.25	.25
3	0	0	--
4	0	1.25	.50
5	0	0	--
6	.50	13.50	1.25
7	0	2.00	1.00
8	1.00	1.50	.25
9	.25	1.50	.25
10	0	1.00	0
11	1.25	17.00	1.25
12	1.00	1.25	.50
13	.25	5.50	0
14	1.25	1.50	.25
15	0	1.75	.25
16	0	.75	0
17	.50	.50	0
18	0	2.00	.25
19	1.00	1.25	.25
20	3.00	7.75	1.25
21	2.50	10.00	.75
22	1.00	1.75	0
23	.50	1.25	.25
24	0	1.25	.25
25	0	2.00	.25
Average	0.56	3.14	0.38

UTAH

Weevil damage in 1937 occurred in 5 percent of the alfalfa fields in Box Elder, Salt Lake, and Sanpete Counties and amounted to less than 1 percent in Sevier County. The most general injury occurred in Millard County, where 50 percent of the first crop was severely damaged. In Box Elder County (table 6) serious damage is indicated for 1938, as threatening weevil populations existed in 40 percent of the fields during the autumn. Abundance of parasites promised usual effectiveness in minimizing production of new-generation weevils from larvae on the first crop in 1938.

Table 6.--Survey results, Box Elder County, Utah, sampled October 20-21, 1937

Field No.	H. postica adults	B. curculionis cocoons	
		Present	Viable
	Number	Number	Number
1	.25	1.00	1.00
2	1.00	8.50	0
3	1.00	3.00	1.75
4	2.50	1.75	.75
5	.75	2.25	1.00
6	3.00	8.00	2.25
7	2.50	16.50	3.00
8	2.25	5.25	1.50
9	1.25	16.75	2.25
10	2.50	6.25	4.00
11	0	3.75	1.50
12	1.00	.25	0
13	1.25	7.50	1.75
14	6.50	7.25	3.00
15	.50	14.00	6.00
16	.75	5.25	4.00
17	2.50	4.50	1.00
18	0	0	--
19	1.25	.50	.50
20	.75	3.75	2.25
21	2.25	2.50	.25
22	3.00	8.25	.50
23	.25	4.75	2.50
24	1.50	3.25	1.25
25	3.00	14.75	3.50
Average -	1.66	5.98	1.82

In Salt Lake County (table 7) one-sixth of the fields surveyed were inhabited by potentially injurious numbers of weevils. Viable parasite cocoons were very abundant and indicated highly effective parasitization in 1938.

Table 7.--Survey results, Salt Lake County, Utah, sampled October 8-13, 1937

Field No.	H. postica adults	B. curculionis cocoons	
		Present	Viable
	Number	Number	Number
1	.50	1.50	1.00
2	1.00	19.50	2.91
3	.50	6.25	2.50
4	.25	13.00	.50
5	.75	9.00	2.75
6	4.00	13.50	1.75
7	.75	16.50	4.75
8	2.25	21.00	4.91
9	1.25	24.75	2.15
10	.50	11.25	1.50
11	1.00	38.25	.31
12	.75	12.25	5.50
13	1.75	11.75	1.00
14	.75	22.00	4.32
15	.50	32.50	2.17
16	0	2.00	.50
17	1.75	6.25	.75
18	2.00	5.75	1.75
19	1.25	9.75	.25
20	6.25	12.75	2.25
21	.25	5.25	1.75
22	.25	0	--
23	1.00	39.00	10.74
24	.50	5.50	1.25
25	.25	10.00	.75
Average -	1.20	13.97	2.32

In Sanpete County (table 8) threatening weevil populations existed during the fall in approximately one-third of the surveyed fields. The survey indicated inadequate parasitization for 1938.

Table 8.--Survey results, Sanpete County, Utah, sampled November 19-23, 1937

Field No.	H. postica adults	B. curculionis cocoons	
		Present	Viable
	Number	Number	Number
1	3.00	16.75	1.25
2	1.75	9.00	1.25
3	.25	8.75	.50
4	2.25	4.75	.50
5	2.00	6.50	1.50
6	.75	3.50	.25
7	.50	11.67	2.00
8	.75	1.50	.50
9	5.00	4.50	1.00
10	0	7.50	.75
11	2.25	13.00	.33
12	1.50	4.75	1.00
13	1.25	7.25	.50
Average -	1.63	7.46	0.86

In Sevier County (table 9) fall abundance of weevils in surveyed fields indicated damage to approximately 8 percent of the alfalfa crop for 1938. Living parasites existed in small numbers but were commensurate with the low level of weevil abundance.

Table 9.--Survey results, Sevier County, Utah, sampled November 22-23, 1937

Field No.	H. postica adults	B. curculionis cocoons	
		Present	Viable
	Number	Number	Number
1	.50	3.00	1.00
2	1.50	9.00	1.50
3	1.75	.25	0
4	2.00	2.25	0
5	1.25	9.50	.50
6	.50	4.75	.75
7	1.00	2.25	.75
8	.50	7.50	.50
9	.25	1.25	.50
10	0	9.00	.50
11	0	2.25	.75
12	0	0	--
Average	0.77	4.28	0.55

COLORADO

Of the first alfalfa crop in Mesa, Delta, and Montrose Counties, 5, 25, and 5 percent, respectively, experienced slight economic damage from the alfalfa weevil in 1937. Damage was expected in 75 percent of the Mesa County fields but failed to materialize because of drastic winter kill of adult weevils present in the fall of 1936. In Delta County (table 10) approximately one-fourth of the surveyed fields were occupied by threatening weevil populations. Parasites promised to be effective in curtailing production of weevil adults from first-crop larvae.

Table 10.--Survey results, Delta County, Colo., sampled November 22-30, 1937

Field No.	H. postica adults	B. curculionis cocoons	
		Present	Viable
	Number	Number	Number
1	2.50	5.75	2.00
2	.50	.75	.75
3	1.25	.75	0
4	.75	7.75	5.75
5	2.50	.75	.25
6	1.25	0	--
7	.75	1.75	1.00
8	1.50	6.75	1.25
9	.75	.50	.25
10	1.50	10.75	1.25
11	3.00	1.25	1.00
12	.25	0	--
13	.25	.50	0
14	.25	3.75	.25
15	.50	14.25	.75
16	.50	3.25	.75
17	0	.25	.25
18	8.00	11.75	3.00
19	1.75	9.25	3.25
20	2.50	9.50	4.25
21	.50	2.00	.50
Average	1.46	4.35	1.26

In Montrose County (table 11) approximately 10 percent of the fields surveyed were populated by potentially injurious numbers of weevils. Viable parasite cocoons occurred in small numbers but were in keeping with the weevil abundance.

Table 11.--Survey results, Montrose County, Colo., sampled November 22, 1937

Field No.	H. postica adults	B. curculionis cocoons	
		Present	Viable
	Number	Number	Number
1	.25	.50	.25
2	.25	3.00	0
3	1.25	6.00	2.50
4	2.25	6.25	1.00
5	.25	3.50	.50
6	0	2.75	.25
7	1.00	2.75	0
8	1.25	2.50	1.50
9	0	0	--
Average	0.72	3.03	0.67

In Mesa County (table 12) the survey indicated rather general weevil damage for 1938, as 24 percent of surveyed fields were inhabited by a menacing number of weevils. Injury to fields populated by smaller numbers of weevils may also develop because of generally poor growth of the first alfalfa crop in this area, and damage may affect as much as 40 percent of the crop. Fall abundance of viable parasite cocoons promised effective parasitization for 1938.

Table 12.--Survey results, Mesa County, Colo., sampled October 4-November 12, 1937

Field No.	H. postica adults	B. curculionis cocoons	
		Present	Viable
	Number	Number	Number
1	.75	6.50	1.75
2	2.25	8.75	3.50
3	.25	3.50	1.25
4	4.00	3.75	.25
5	1.50	6.00	1.25
6	2.25	4.00	1.00
7	1.50	2.50	.25
8	.25	15.75	1.75
9	1.25	6.50	.25
10	2.50	13.25	2.00
11	.25	8.50	.50
12	.25	4.00	0
13	.75	1.75	.75
14	.50	7.75	.25
15	1.25	14.75	1.00
16	0	3.00	.25
17	1.00	10.25	3.50
18	.50	1.25	.25
19	1.50	2.00	1.00
20	1.00	0	--
21	0	2.75	1.50
22	2.50	6.25	1.25
23	2.00	15.00	1.75
24	.50	.75	0
25	0	5.25	2.00
Average	1.14	6.15	1.09

NEVADA

Losses from the alfalfa weevil in western Nevada during 1937 were slight except in Douglas County, where 50 percent of the fields were severely damaged because very large acreages prevented timely cutting. Washoe County experienced from slight economic damage to 10 percent of the first crop. In Churchill County less than 1 percent was injured.

In Douglas County (table 13) one-sixth of the surveyed fields were inhabited by threatening numbers of weevils, as was the case in the 1936 survey. Because of the widespread damage in 1937, developments, especially on large alfalfa acreages, should be watched closely with a view to possible insecticidal treatment, as this is the most satisfactory means of control for this area. Living parasites were abundant and ordinarily would be highly effective were it not for the late cutting practiced in this district.

Table 13.--Survey results, Douglas County, Nev., sampled November 5-6, 1937

Field No.	H. postica adults	B. curculionis cocoons	
		Present	Viable
	Number	Number	Number
1	0	6.00	1.75
2	.50	1.25	.50
3	.25	13.25	1.50
4	1.25	21.25	2.30
5	3.00	29.00	5.43
6	4.75	39.50	2.34
7	1.50	7.50	2.00
8	1.25	9.75	1.75
9	.25	19.00	1.75
10	1.00	10.25	.75
11	1.00	8.50	0
12	1.25	22.25	1.43
Average	1.33	15.63	1.79

In Washoe County (table 14) menacing weevil populations existed in one-third of the fields surveyed. Parasite cocoons were abundant but their viability was very low and indicated ineffective parasitization for 1938.

Table 14.--Survey results, Washoe County, Nevada, sampled November 7-8, 1937

Field No.	H. postica adults	B. curculionis cocoons	
		Present	Viable
	Number	Number	Number
1	2.25	19.50	1.33
2	3.25	3.25	1.50
3	1.25	4.25	.75
4	1.00	8.75	.50
5	.50	8.25	.25
6	2.00	17.25	1.25
7	1.25	3.25	0
8	.75	2.50	0
9	.75	.75	0
10	.25	13.50	1.25
11	1.00	8.25	2.00
12	9.50	68.75	.50
Average	1.98	13.19	0.77

In Churchill County (table 15) the level of alfalfa weevil abundance was very low. Only 2 of 25 fields were inhabited by menacing numbers of weevils and in 10 fields no weevils were found. The number of living parasites was also low but they were sufficiently numerous to be effective, except where large acreages make cutting very late.

Table 15.--Survey results, Churchill County, Nev., sampled November 3-5, 1937

Field No.	H. postica adults	B. curculionis cocoons	
		Present	Viable
	Number	Number	Number
1	0	1.75	.50
2	0	6.00	0
3	.25	10.00	1.00
4	1.00	15.25	1.75
5	.50	15.50	.25
6	.25	.25	0
7	.25	2.25	.50
8	.25	10.00	.50
9	0	1.00	0
10	1.00	37.00	2.14
11	.25	1.50	.50
12	2.00	25.25	.89
13	.75	6.25	.75
14	.25	15.75	0
15	2.25	13.00	.25
16	0	16.25	0
17	.50	4.75	0
18	0	1.00	.25
19	0	2.25	.25
20	0	.25	0
21	0	4.25	.50
22	0	.50	0
23	0	23.25	0
24	.50	4.75	0
25	.25	10.50	1.50
Average	0.41	9.14	0.46

NEBRASKA

The consistently cold winter of 1936-37, with little protective snow covering, followed by a cold, damp spring, prevented development of weevil injury in Sioux County in 1937. In Sioux County (table 16)

only 1 of 12 fields surveyed was populated by a potentially injurious number of weevils. Parasite cocoons were scarce but the high percentage of them alive indicated effective parasitization for 1938.

Table 16.--Survey results, Sioux County, Nebr., sampled October 10-12, 1937

Field No.	H. postica adults	B. curculionis cocoons	
		Present	Viable
	Number	Number	Number
1	0	13.25	5.00
2	0	0	--
3	2.75	4.75	2.25
4	0	.50	0
5	.25	0	--
6	0	.25	0
7	0	0	--
8	0	.50	.50
9	.25	.25	0
10	0	1.50	.50
11	.25	1.25	.50
12	0	.25	0
Average	0.29	1.88	0.73

OUTLOOK FOR WEEVIL DAMAGE IN 1938

The fall survey of 1937 showed that alfalfa weevil populations had increased generally in the infested territory since the fall of 1936. Most severe damage for 1938 is indicated for Box Elder County, Utah, and Jackson County, Oreg., where from 40 to 50 percent of the surveyed fields had damaging numbers of weevils. From 17 to 33 percent of the fields are menaced in Salt Lake and Sanpete Counties, Utah, the several counties constituting the upper Snake River Valley of eastern Idaho, Eagle Valley in Baker County, Oreg., Douglas and Washoe Counties, Nev., and Delta and Mesa Counties, Colo. Damage to approximately 10 percent of alfalfa fields is indicated for Sevier County, Utah, the lower Snake River Valley of western Idaho and eastern Oregon, Churchill County, Nev., Montrose County, Colo., and Sioux County, Nebr.