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Potato Leafhopper Control in South Dakota Alfalfa

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Potato leafhoppers migrate into South Dakota each year and are capable of causing extensive damage to first-year and established alfalfa stands. This pest is difficult to detect, and it often damages alfalfa before producers are aware of its presence. Potato leafhoppers can be especially damaging to newly seeded alfalfa stands.

Description

Adult potato leafhoppers are small, green, wedge-shaped insects about 1/8 inch long. Adults are winged, move quickly between plants, and are very difficult to detect.

Potato leafhopper nymphs (immatures) are light green and similar in shape and appearance to the adults, except they are smaller and wingless. Nymphs have a characteristic habit of rapidly moving sideways when disturbed.

Life Cycle

Potato leafhoppers do not overwinter north of the gulf states but move up to South Dakota each year on air currents originating in the southern United States. Arrival in our area varies from year to year, but potato leafhoppers usually arrive by late May to early June. Adults are long-lived and will deposit one to six eggs daily into stems, leaf petioles, and leaf veins of alfalfa plants. Nymphs will emerge in about 10 days.

Leafhopper nymphs remain on plant tissue and feed by inserting piercing-sucking mouthparts into plant tissue and removing plant sap. Nymphs go through five growth stages (instars) before becoming winged adults. Nymphal development requires one to two weeks depending on temperature.

Once potato leafhoppers arrive, they remain in suitable fields until frost occurs, producing several overlapping generations throughout the season.

Damage

Potato leafhoppers insert piercing-sucking mouthparts into leaf tissue and withdraw plant sap, which causes wilting and reduced vigor of plant tissue.

While feeding, leafhoppers inject a toxin into the plant which results in a yellowing of the tissue, commonly referred to as "hopper burn." This damage initially appears as a wedge-shaped yellowing at the tip of individual leaflets, but later the damaged area may take on a red or brown color.

Feeding damage by potato leafhoppers affects alfalfa production in several ways. The largest impact is a reduction in forage protein content. Feeding damage causes the buildup of sugar in alfalfa plant tissue, with a corresponding decrease in protein content. Additionally, insect feeding results in reduced plant vigor and vitality, which may predispose plants to winter injury. Feeding damage by unchecked potato leafhopper populations also may reduce alfalfa yield the following year.

Monitoring

Because potato leafhoppers migrate to South Dakota from southern states, damaging populations are difficult to predict. The only effective way to monitor for this pest is by using an insect sweep net. Monitor established alfalfa fields weekly throughout the second and third alfalfa cutting periods. New alfalfa seedings can be wiped out completely by potato leafhoppers, so more frequent monitoring of these fields is essential -- at least twice weekly.

Table 1. Potato Leafhopper Economic Thresholds

Stem Height in inches	Avg. No. Leafhoppers Per Net Sweep
Under 3	0.2 adults
6	0.5 adults
8 to 10	1.0 adult or nymph
12 to 14	2.0 adults or nymphs

Established economic thresholds are based on the number of leafhoppers captured per sweep of the net and the growth stage of the alfalfa crop (Table 1).

If the economic threshold is reached and the crop is within a week of harvest, early cutting and monitoring of the regrowth is advised. If an early harvest is taken, many adults will leave the field and most nymphs will starve.

Control Study

SDSU conducted a study* in 1993 to evaluate control strategies for potato leafhopper in established alfalfa. In South Dakota, the main strategies include a rigorous monitoring program and application of an insecticide or early harvest of the crop when an economic threshold is reached. This study evaluated several registered insecticides for potato leafhopper control and compared them to untreated checks and early harvested alfalfa plots.

Methods

Plots were established in a 3-year old stand of alfalfa at the SE Research Farm near Beresford and a 7-year old stand near Brookings. Plots measured 30 feet by 30 feet. Treatments consisted of eight registered insecticide treatments, an untreated check, and an early harvest treatment. Each treatment was replicated four times in a randomized complete block design.

Starting shortly after the first cutting was removed, plots were monitored twice weekly using a standard 15-inch diameter sweep net. Ten sweeps were taken from the center area of each plot and the total number of adult and nymphal leafhoppers per ten sweeps was recorded.

Insecticide applications were made using a hand-held spray boom. Treatments were applied in a final spray volume of 20 gallons per acre. Insecticide applications were made on July 22 at Beresford and on August 31 at Brookings.

*This study was made possible in part by a North Central Region Integrated Pest Management Grant.

On the same two days, early-harvest plots were harvested by removing total forage from approximately a 45 square foot area in the center of each plot. Alfalfa was weighed in the field, and a subsample was taken and dried. Alfalfa dry matter yield was calculated from total plot fresh weight and dry matter concentration data.

The insecticide-treated plots were harvested 14 days after treatment using the same harvest method. Potato leafhopper populations were measured in all plots 4, 7, 10, and 14 days after insecticides were applied.

Results and Discussion

Mean number of potato leafhoppers per sweep are recorded in Tables 2 and 3 for one day before and 4, 7, 10, and 14 days after insecticide treatment.

All insecticides used in this study provided adequate protection of alfalfa by maintaining populations below the economic threshold for at least 14 days after treatment. All insecticide treated plots had significantly fewer potato leafhoppers than the untreated check 4, 7, and 10 days after treatment.

However, 14 days after treatment at Beresford, the Sevin 80S + Dimethoate tank mix treated plots did not have significantly fewer potato leafhoppers than the untreated check.

Differences in yield due to potato leafhopper damage were not detected in this experiment, although similar studies have documented a reduction in yield from potato leafhopper feeding. Reduction of alfalfa quality due to potato leafhopper feeding generally is more significant than reduction in yield.

Two alfalfa quality components, crude protein and neutral detergent fiber, were evaluated for these plots. Early-harvest plots at Beresford had the highest percentage crude protein, and the Pounce and Furadan treated plots had significantly higher crude protein than the untreated check. At Brookings, the early-harvest plots again had the highest crude protein value, but differences between the insecticide treatments and the untreated check were not significant.

Results of this study suggest that while the insecticide and early-harvest treatments did not affect alfalfa yields, they did produce significantly higher quality forage than the untreated check.

Recommendations

These results reinforce the recommendation that South Dakota growers plan to sample their alfalfa fields at least weekly after the first cutting has been removed. Then be prepared to apply insecticides or harvest early if economic thresholds of potato leafhoppers are reached.

Tables 2 and 3. Influence of chemical and cultural methods on control of potato leafhopper populations, alfalfa yields, crude protein, and neutral detergent fiber concentrations from established stands of alfalfa at two locations in South Dakota in 1993.

Beresford

Treatment/form	Rate Product/acre	PLH/10 Sweeps 21 Jul	26 Jul	29 Jul	2 Aug	6 Aug	Yield lb/acre	Crude Protein (%)	Neutral Detergent Fiber (%)
Dimethoate 400	½ pt	43	4	2	4	5	2408	16.1	53.0
Sevin 80S	1¼ lb	49	3	4	3	3	2901	16.4	47.1
Sevin 80S +	9/10 lb								
Dimethoate 400	⅛ pt	53	6	5	7	9	3258	16.3	51.1
Furadan 4F	½ pt	39	7	3	7	5	2840	18.2	50.9
Lorsban 4E	1 pt	59	5	3	5	6	2803	17.4	52.3
Penncap-M	2 pt	54	3	4	3	5	2919	17.1	54.2
Pounce 3.2EC	4 fl oz	79	1	2	1	6	3622	18.0	49.6
Malathion 57EC	2¼ pt	43	6	4	6	3	2629	17.4	49.6
Early Harvest		55	--	--	--	--	2604	19.4	42.5
Control		49	24	28	24	13	3024	15.3	57.6
LSD (P = 0.05)		NS	12	11	12	4	NS	2.7	5.0

Brookings

Treatment/form	Rate Product/acre	PLH/10 Sweeps 30 Aug	1 Sep	4 Sep	7 Sep	10 Sep	16 Sep	Yield lb/acre	Crude Protein (%)	Neutral Detergent Fiber (%)
Dimethoate 400	½ pt	13	0.6	4	4	3	0.3	2448	16.6	53.7
Sevin 80S	1¼ lb	12	0.1	1	3	0.6	0.1	2364	16.9	53.3
Sevin 80S +	9/10 lb									
Dimethoate 400	⅛ pt	10	0.6	0.3	2	0.6	0.1	2475	16.7	55.5
Furadan 4F	½ pt	13	0.3	0.3	1	0.1	0.1	2534	16.5	55.6
Lorsban 4E	1 pt	13	0.1	2	3	1	0.6	2902	16.8	54.2
Penncap-M	2 pt	11	0.6	0.3	2	2	0.1	2338	16.9	54.7
Pounce 3.2EC	4 fl oz	10	0.1	0.3	1	0.1	0.1	2725	16.1	56.2
Malathion 57EC	2¼ pt	9	0.1	1	2	0.3	1	2165	16.5	55.1
Early Harvest		10						2429	19.1	47.6
Control		14	4	8	15	5	3	2485	15.2	57.8
LSD (P = 0.05)		NS	3	4.6	7	2.5	1.2	NS	1.9	4.0

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