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Potato Leafhopper Control Important in Alfalfa

The potato leafhopper (Empoasca fabae Harris) is the most destructive insect pest to alfalfa in Maryland. It can be one of the primary limiting factors to high yields if not properly controlled. It is responsible for reduced yields, reduced quality (especially lower protein content), and contributes to reduced longevity of stands. The stress applied to alfalfa plants by leafhoppers can result in increased root rot incidence and contribute to stand failure. This can be particularly true in new seedings.

The potato leafhopper is a problem primarily from mid-June through mid-August. This insect does not overwinter in Maryland. Each spring potato leafhoppers migrate northward on the wind currents from the Gulf States, where they breed continuously. Wind currents carry them from the Gulf States up the Mississippi and Ohio Valleys and disperse them throughout the eastern United States. They generally arrive in Maryland in late May or early June. Since they do not survive the winters in Maryland, we generally escape their damage on first cutting and second cuttings made by late June. It is the new spring seedings and regrowth of later second and the third and fourth cuttings that are most severely damaged. Normally, the population drops off rather sharply after mid-August.

Adult potato leafhoppers are tiny, pale yellowish-green, wedge-shaped insects, about 1/8-inch long. They are very active, especially when it is warm, and either jump or fly when disturbed, hence the name leafhoppers. The best time to find them is between 10 a.m. and 4 p.m. when it is warm and dry and they have moved to the top of the foliage.

The female lays eggs in the small stems and the leaf veins and petioles. The eggs hatch in 6 to 9 days into whitish nymphs which soon turn yellowish-green. In warm weather it takes about three weeks for development from eggs to adults, so very large populations can build up in a short period of time. The nymphs resemble adults, but are wingless and have more pronounced yellow coloring, ranging from bright yellow to yellowish-green. The nymphs are also very active and move quickly. A particular characteristic of the nymphs is the ability to walk sideways or backwards at a rapid pace when disturbed.

Both the adults and nymphs have piercing-sucking mouth parts and feed by sucking plant juices from the leaves and stems. As they feed they also
secrete a toxic substance into the plants that apparently causes a plugging of the vascular system. This plugging interferes with normal translocation of carbohydrates in the plant and can cause discoloration and even dried out areas at the leaf margins. A typical symptom of potato leafhopper injury is yellowing followed by bronzing, especially in a triangular or wedge-shaped area at the tip of the leaflets. On some plants these areas may dry out and turn brown. This symptom is commonly referred to as "hopper burn". As the damage increases, the vascular system becomes plugged and the whole plant develops symptoms. Discoloration spreads throughout the leaves and the crop is stunted.

Types of losses. Potato leafhopper feeding damage may result in several types of losses:

1. **Stunting of plants.** Growth is greatly reduced, sometimes more than half that of a normal plant. Stunted plants do not recover after the leafhoppers are eliminated. Once severe yellowing has occurred, the plants ceases further growth. In this case it is usually better to harvest the crop and monitor leafhopper populations for possible insecticide treatment of the regrowth.

Potato leafhopper damage in mid-summer is sometimes mistaken for drought damage since the stunting and yellowing of the plant can resemble drought damage. In fact because of the plugging of the vascular system, damage by leafhoppers is more severe in dry years when the plant is under moisture stress.

2. **Loss in quality.** As mentioned earlier the leafhopper injects a toxin as it feeds, which causes a chemical change within the plant. Plants produce less protein and more sugars, resulting in a major reduction in feed value. Protein is the most serious loss in alfalfa due to potato leafhopper feeding. Purdue University research data suggests that protein loss occurs very quickly with relatively low insect populations (Wilson). Five percent loss in protein occurred when the leafhopper population increased from 5 to 50 leafhoppers per sweep, the latter being a common population level attained in Indiana when controls have not been applied.

3. **Loss in yield.** Loss in dry matter yield occurs, but is usually less significant than quality loss, according to Wilson.

4. **Loss in plant vigor.** Leafhoppers can drain alfalfa of its vigor, resulting in serious carryover effects on later cuttings. These effects are reflected in:

   (a) Slow recovery of regrowth following harvest.

   (b) Winterkill, causing stand loss due to plants entering dormancy in a weakened condition.

   (c) Loss in yield the following season. Purdue University research data showed not only greater vigor, but a production increase of 1/2 ton of hay per acre on the first cutting where leafhoppers had been controlled the previous year.

Losses due to leafhopper damage are frequently attributed to other factors, particularly dry weather since the effects of leafhopper feeding are similar to the effects of dry weather. Observing alfalfa fields around Maryland, particularly in July and August, it appears that many
farmers have not adequately controlled potato leafhoppers, resulting in yield losses of late second, third and fourth cuttings and possible carryover effects to the following year.

Wisconsin researchers (Smith and Medler, 1959) investigated the influence of potato leafhopper on yield and chemical composition of alfalfa hay grown at two soil fertility levels. Two alfalfa varieties were evaluated. After establishment in the spring, each variety was subdivided into two soil fertility plots. One plot received no further fertilization while the other was top dressed the first fall with 450 lb/A of 0-10-30 fertilizer and the second fall with 750 lb/A of 0-10-30 fertilizer. Each fertilizer treatment was subdivided into two plots. One plot was sprayed as needed to control insects while the other was left unprotected.

Yield and chemical composition data obtained in the third harvest year are presented in Table 1. Potato leafhopper reduced hay yields of Vernal 21% and of Narragansett 28% with high soil fertility, and 36% and 48%, respectively, with low fertility. There was only an 11% difference in hay yields with both varieties due to fertility alone. Smith and Medler pointed out that the lack of a marked response in the hay yields to soil fertility alone was due largely to the fact that the subsoil contained a good supply of P and K. As a result, difference in hay yields from soil fertility alone did not begin to appear until the second harvest year of the trial. Note that the two varieties used in this study were much less productive than varieties used today and the alfalfa cutting management less intensive than today.

Table 1. Dry matter, crude protein and crude fiber yields and percentage chemical composition of oven-dry hay from Vernal and Narragansett alfalfa as influenced by soil fertility and insect prevalence.

<table>
<thead>
<tr>
<th>Trts*</th>
<th>Yield lb/A</th>
<th>R**%</th>
<th>Crude Protein lb/A</th>
<th>Crude fiber lb/A</th>
<th>R %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Vernal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HF-Sp</td>
<td>2480</td>
<td>17.5</td>
<td>434</td>
<td>30.8</td>
<td>763</td>
</tr>
<tr>
<td>HF-I</td>
<td>1950</td>
<td>21</td>
<td>15.8</td>
<td>309</td>
<td>24.4</td>
</tr>
<tr>
<td>LF-Sp</td>
<td>2210</td>
<td>11</td>
<td>19.3</td>
<td>426</td>
<td>30.8</td>
</tr>
<tr>
<td>LF-I</td>
<td>1580</td>
<td>36</td>
<td>15.3</td>
<td>242</td>
<td>24.5</td>
</tr>
<tr>
<td>Narragansett</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HF-Sp</td>
<td>2430</td>
<td>19.1</td>
<td>464</td>
<td>32.4</td>
<td>789</td>
</tr>
<tr>
<td>HF-I</td>
<td>1750</td>
<td>28</td>
<td>16.9</td>
<td>295</td>
<td>23.7</td>
</tr>
<tr>
<td>LF-Sp</td>
<td>2170</td>
<td>11</td>
<td>20.5</td>
<td>445</td>
<td>31.1</td>
</tr>
<tr>
<td>LF-I</td>
<td>1270</td>
<td>48</td>
<td>16.3</td>
<td>207</td>
<td>24.0</td>
</tr>
</tbody>
</table>
*Treatments:  HF = high fertility, LF = low fertility,  
Sp = sprayed to control insects,  
I  = insects prevalent  
**R = percent reduction from high fertility, sprayed treatment.  
From: Smith and Medler,  
1959.

The percentage crude protein content was reduced considerably by leafhoppers in both varieties at both fertility levels. The percentage of fiber was reduced also. Smith and Medler indicated that the reduction in fiber probably resulted from the inhibition of stem elongation due to leafhopper damage. Reducing forage fiber content is a desirable characteristic to improve quality but in this case it is at the expense of yield and protein.

In general, leafhopper caused larger yield and chemical composition reductions with low fertility than with high fertility. This data reinforces the point that obtaining high yields requires an integrated management program for fertility, pest management and cutting management.

References


Prepared by: Dr. Lester R. Vough  Forage Crops Extension Specialist