Hop Pest Control

H. E. Morrison, associate entomologist

Hop aphids and red spider mites are the most important pests of Oregon hops. The omnivorous leaf tier, western spotted cucumber beetle, and several species of cutworms may also require control measures in some years. Growers will find the following information helpful in controlling these pests.

The Hop Aphid

The hop aphid has been a serious pest in Oregon since 1891. Heavy populations can devitalize hop plants and lower yields. In addition, aphids move into hop cones during warm weather where they secrete honeydew. This secretion supports growth of a sooty mold fungi which discolors hops and lowers their market value. An excess of aphids or aphid parts in harvested hops constitutes a violation of the 1938 Federal Food and Cosmetic Act.

Aphids overwinter as eggs on prunes and related plants. Normally these eggs hatch in April or early May and pass through several generations on the foliage. Migration to the hops usually starts late in May and is completed late in June.

In some seasons eggs may hatch in February if warm weather prevails. Aphids appearing this early usually perish for lack of food because the prune foliage has not developed. If cold, wet weather prevails during the spring, overwintering eggs may not hatch until late May. In such years prolonged migration into hop yards may extend into late July.

Seasonal development of hop aphids is favored by cool, humid conditions. Heavy populations, if encountered in June, may be suppressed by warm weather during July and August. However, enough survivors normally remain to form the nucleus of a heavy population at harvest time if favorable weather conditions prevail during August.

It is important to control hop aphids either before or during the period while hops are in the bloom (burr) stage. Aphids are thus prevented from entering hop cones and the threat of fungus damage is lessened.

Red Spider Mites

The common two-spotted mite has been a major pest on hops since about 1892. In western Oregon, adult female mites overwinter on grass and other perennial crops which remain green during the winter.
Activity is resumed in the spring and eggs are laid during April and May. When the overwintering hosts begin to dry up or become unattractive, the mites move to hops and other crops. They feed on the undersurfaces of hop leaves and devitalize the plant. When populations are heavy, mites move into the hop cones causing a reddish color.

Usually mite movement to hops occurs during July. It is estimated that about nine generations of mites develop on the hops during summer months, with the greatest numbers being found during the latter part of August. Unlike hop aphids, mites find warm, dry weather most favorable for development.

**Cutworms**

Cutworms are the larvae of medium-sized, dull-colored moths (millers) which are often attracted to lights in early summer and fall months. They spend the winter in the soil either as partially grown larvae or as pupae.

The adults emerge in late spring and lay eggs during June. After the eggs hatch, the larvae feed on hop plants' stems and foliage. Feeding often is done at night, with the larvae burrowing beneath the soil during the daytime. In cutworm control, best results are obtained by applying poison bait or DDT dust in the evening at the plant base when the soil surface is moist.

**Omnivorous Leaf Tier**

This insect overwinters as a small larva on rough wood surfaces such as provided by tree bark, farm buildings, and fence posts. Activity is resumed in March when they spin silken threads and are carried away by winds and air currents. After the small larvae float to the ground, they burrow into leaves of grass and other plants where they spend part of their life cycle as leaf miners. As they become larger, the larvae leave their mines and feed on the growing tips of many plants such as hops, vetch, and flax, and often enter into ripening strawberries.

Their feeding on terminal hop shoots causes the plants to send out lateral arms. This injury does not appear to reduce yields. However, the additional time consumed in training and retraining hop plants results in additional labor costs.

**Western Spotted Cucumber Beetle**

The yellowish-green, black-spotted adult beetles overwinter beneath leaves and trash. They begin egg laying in the soil during the first warm days of early spring. The larvae hatching from these eggs feed on potato tubers and roots of other crops.

Adult beetles emerge in June and feed on the foliage of hops, vegetables, fruit trees, and other crops. This species is limited in distribution to western Oregon.

**Symphylids**

Symphylids are small, pearly white, centipede-like animals that feed on roots and root hairs of many different plants. In recent years they have become troublesome in hop yards.

Because they can move deeply into the soil, symphylids are difficult to control. This is especially true in established plantings such as mint, hops, strawberries, and other crops. Satisfactory results have been obtained with the use of soil fumigants before planting. Details of symphylid control are given in Oregon State College Circular of Information 574.
Control of Hop Pests

Use of insecticides for the control of hop pests, as suggested in this publication is based on research by the Oregon Agricultural Experiment Station. If used as recommended, excessive chemical residues should not appear on the raw agricultural product.

Insecticides recommended for hop pest control, such as nicotine, TEPP, parathion, and demeton, are highly toxic to warm-blooded animals and the following precautions should be taken when they are used.

1. Read the label carefully.

2. Follow instructions on the label: Use protective clothing and approved respirators.


4. Dispose of containers safely.

In case of emergency, physicians or hospital representatives may obtain emergency consultation by calling -

Oregon Poison Control Registry,
Physicians Consultation Center,
Doernbecher Hospital,
University of Oregon Medical School,
Portland, Oregon.

Phone - Day - CApitol 8-9181
Night - CApitol 8-5546

Materials such as TEPP, parathion, nicotine, and demeton have different characteristics in controlling hop pests. Growers should understand these differences in order to obtain more efficient use of the materials.

Nicotine

Nicotine dusts are specific for hop aphid control and will not kill spider mites, beetles, and other insects. Accordingly, parasites and predators of hop aphids, and spider mites are not harmed by the material. In certain seasons the beneficial insects are a definite asset to growers in holding aphid populations in check.

TEPP

TEPP is a phosphate insecticide which will kill both hop aphids and spider mites. It also kills beneficial insects which may be present at the time it is applied.

It does not have a long residual life and is ineffective on mite eggs or mites in the process of moulting. For this reason, repeated applications are necessary if heavy mite populations are present when initial application is made.
Parathion

Parathion is another phosphate insecticide effective on aphids, mites, and other insects (both injurious and beneficial). Although it is not toxic to mite eggs, it has a 5- to 7-day residual action which will kill young mites after they hatch. When efficiently applied, parathion may be expected to hold populations of aphids and mites in check for 10 to 14 days.

Demeton (Systox)

Demeton is a systemic organic phosphate insecticide absorbed and translocated by plants. Aphids and spider mites feeding on the sprayed foliage are killed. Experimental trials have shown that this material is an effective control for both hop aphids and spider mites. It has also been indicated that the degree of plant succulence at the time of treatment has a direct influence on efficiency of pest control. Poor results may be obtained if demeton is applied in August or after plants have ceased their vigorous growth. In the case of hops, demeton does not appear to be translocated from one leaf to another. It seems to remain in the leaf for a long period of time and continues to be effective for three weeks or longer. For these reasons it is necessary to wet all hop leaves thoroughly when the material is applied.

Kelthane

Kelthane is a chlorinated hydrocarbon pesticide less toxic to warm-blooded animals than DDT. Experimental trials, limited to spray applications, show that it rapidly kills spider mites on hops and prevents reinfestation for over two weeks. Like nicotine, it is harmless to most beneficial predatory insects.

Other points to remember:

Hop aphid control should be completed by the first week in July to prevent aphids from moving into hop cones. Spider mites often do not become numerous on hops until late July or early August. As a result, one application of TEPP or parathion may not adequately control both pests.

Nicotine, TEPP, and parathion should be considered as contact insecticides. Their efficiency in controlling hop pests is dependent on their contacting aphids and mites on the undersides of hop foliage. For this reason, satisfactory results are not always obtained when such materials are applied by aircraft. When aircraft application is used, it is advisable to apply dilute dusts at a rate of 50 to 60 pounds per acre. Dust application at the rate of 40 pounds per acre is adequate with ground dusters.

If airblast sprayers are used to apply insecticides to hops, equipment should be driven down every other center of the hop rows. A spray delivery rate of 100 to 150 gallons per acre gives adequate coverage early in the season. When plants are full grown, this rate should be increased to 200 gallons per acre.

Sprays or dusts give their best results when there is little or no wind. Using organic phosphate insecticides under windy conditions increases the hazards.

Contacting mites with insecticides may be difficult if the hop leaves are badly webbed. Greatest efficiency is obtained if control measures are applied before mite populations become severe. Most spray insecticide formulations contain sufficient wetting agents to properly wet most crops. However, hop foliage is very difficult to wet and additional wetting agents (Collodial X-77 or Treton B-1956) will improve results. The amount of any additional wetting agent to be added will vary with the hop variety and insecticide used.
<table>
<thead>
<tr>
<th>Pest</th>
<th>Material</th>
<th>Rate per acre for sprays or dusts</th>
<th>Tolerance p.p.m.</th>
<th>Restrictions Safe interval, last application to harvest</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hop aphids</td>
<td>TEPP</td>
<td>As a spray: 1 pt. 20% or 1/2 pt. 40% per 100 gal.</td>
<td>0</td>
<td>3 days</td>
<td>Read precautions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40 lbs. 1% dust</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Parathion</td>
<td>As a spray: 0.4 lbs. toxicant</td>
<td>1</td>
<td>15 days</td>
<td>Read precautions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40 lbs. 1% dust</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Demeton</td>
<td>As a spray: 0.5 lbs. toxicant</td>
<td>1.25</td>
<td>21 days</td>
<td>Read precautions</td>
</tr>
<tr>
<td></td>
<td>Nicotine</td>
<td>40 lbs. 4% dust</td>
<td>-</td>
<td>2 days</td>
<td>Read precautions</td>
</tr>
<tr>
<td>Spider mites</td>
<td>TEPP</td>
<td>As a spray: 1 pt. 20% or 1/2 pt. 40% per 100 gal.</td>
<td>0</td>
<td>3 days</td>
<td>Read precautions</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Parathion</td>
<td>As a spray: 0.4 lbs. toxicant</td>
<td>1</td>
<td>15 days</td>
<td>Read precautions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40 lbs. 1% dust</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Demeton</td>
<td>As a spray: 0.5 lbs. toxicant</td>
<td>1.25</td>
<td>21 days</td>
<td>Read precautions</td>
</tr>
<tr>
<td></td>
<td>Kelthane</td>
<td>As a spray: 1 lb. toxicant. (6 lbs. 18 1/2% W.P. or 3 qts. 18 1/2% emul. conc.)</td>
<td>30</td>
<td>7 days</td>
<td></td>
</tr>
<tr>
<td>Cutworms</td>
<td>Poison baits</td>
<td>20 to 25 lbs.</td>
<td></td>
<td>No restrictions if used as directed</td>
<td>Apply at base of plants in evening when soil is damp</td>
</tr>
<tr>
<td></td>
<td>DDT</td>
<td>20 to 25 lbs. 10% dust</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Omnivorous</td>
<td>Methoxychlor</td>
<td>20-25 lbs. 5% dust</td>
<td>-</td>
<td>No restrictions if used as directed</td>
<td>Apply before hops are in bloom</td>
</tr>
<tr>
<td>leaf tier</td>
<td>DDT</td>
<td>20-25 lbs. 5% dust</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western</td>
<td>Methoxychlor</td>
<td>20-25 lbs. 5% dust</td>
<td>-</td>
<td>No restrictions if used as directed</td>
<td>Apply before hops are in bloom</td>
</tr>
<tr>
<td>spotted</td>
<td>DDT</td>
<td>20-25 lbs. 5% dust</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cucumber</td>
<td>TEPP</td>
<td>See hop aphid or spider mite recommenda-</td>
<td>0</td>
<td>3 days</td>
<td>Applications for control of aphids and mites</td>
</tr>
<tr>
<td>beetle</td>
<td>Parathion</td>
<td>tion</td>
<td>1</td>
<td>15 days</td>
<td></td>
</tr>
</tbody>
</table>

In early season, apply sprays at a rate of 100 to 150 gallons per acre. In late season, increase this rate to 200 gallons per acre. Apply dusts with ground machinery at the rate of 40 pounds per acre. Increase this rate to 50 to 60 pounds per acre if applied by aircraft.