MONITORING
APHID
POPULATIONS
CIP SLIDE TRAINING SERIES

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CIP Series IV, Potato Diseases and Pests, is designed specifically for individuals interested or involved in controlling the major diseases and pests of the potato.

This second set in Series IV, Monitoring Aphid Populations, describes three common techniques for monitoring aphid populations. The first set, Major Potato Diseases, Insects, and Nematodes, introduces viewers to the major diseases, nematodes, and insect pests affecting the potato.

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MONITORING APHID POPULATIONS

K. V. RAMAN

1

Monitoring Aphid Populations

MONITORING APHID POPULATIONS

2

INTRODUCTION

Few insects transmit viruses to the potato as efficiently as the tiny, soft-bodied aphid.

3

While feeding on the sap of potato plants, these insect pests can infect a crop with damaging viruses such as potato leafroll virus, potato aucuba mosaic virus, and potato viruses Y, A, and M.

This One

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Controlling the spread of aphid-borne viruses is particularly critical in potato crops grown for seed tubers. Virus-infected seed tubers produce poorer stands and fewer tubers than healthy seed. For example, note the difference between the full, healthy rows on the left planted with virus-free seed tubers and the rows on the right planted with virus-infected tubers.

Moreover, with each successive planting, the quality of the stock continues to degenerate. Eventually yields are so low that growers are forced to buy costly clean tubers to replenish their stock.

When selecting potential areas for seed tuber production, growers should first monitor fields for aphid infestation. From these data, they can better decide where, when, and how to produce seed tuber crops.

Monitoring Techniques:

- Aphid/plant counts
- Aphid/leaf counts
- Yellow water traps

This slide presentation describes three common methods for monitoring aphid populations:

- aphid/plant counts,
- aphid/leaf counts, and
- yellow water traps.

But, before studying each method, let's take a look at the potato's most destructive insect vector, *Myzus persicae*, or, as it is commonly called, the green peach aphid.
THE APHID

Many aphid species transmit viruses to the potato, but the greatest damage is caused by *Myzus persicae*.

Found worldwide, *Myzus persicae* is the main insect vector of potato leafroll virus and potato virus Y. It is approximately 1.5 to 2.5 mm long and has wingless and winged forms.

The body of the wingless form is egg-shaped and its head is noticeably indented. This aphid is usually light green to almost translucent in color, but it may also be deep pink or peach. Its cornicles, or siphunculi, are slightly swollen.

Although found in fields, wingless aphids generally play a very minor role in spreading virus diseases.

The winged form, on the other hand, can do considerable harm. Because it flies, this aphid can quickly spread viruses throughout an entire crop. Consequently, growers should monitor its behavior closely.

The winged form is distinguished by a dark brown to black head and thorax. Like the wingless aphid, its head is indented. The abdomen may be green, pink, or dull red and is marked with a characteristic black patch.

Its cornicles are slightly swollen and are the same color as the abdomen. The tips of the cornicles are somewhat darker.
Monitoring Techniques:

- Aphid/plant counts
- Aphid/leaf counts
- Yellow water traps

Now, let's take a look at three common techniques for monitoring aphid populations. While these techniques work well for monitoring the behavior of most aphids, this slide presentation is geared specifically to monitoring the green peach aphid.

Aphid/Plant Counts

APHID/PLANT COUNTS

The aphid/plant count, or "beating method" as it is sometimes called, is a quick and efficient technique to use early in the growing season when plants are young and the aphid population is low. Growers should use it primarily to detect the initial migration of winged aphids into a potato field. This migration usually cannot be detected by trapping alone.

Procedure: Monitor approximately 50 plants selected at random from the first few rows on the windward border of the field. The first influx of winged aphids usually settles on plants in these rows.
To collect aphids, place a light-colored board or piece of paper approximately 25 x 45 cm under one side of the plant. Gently shake the plant over the board. Count the aphids that fall on the board. Counts are fairly reliable, although some winged aphids might fly away when the plant is disturbed.

A tray cut in half or two trays with a notch in the center to fit around the stem of the plant also work well to catch the falling aphids. When taken weekly, aphid/plant counts usually provide growers with sufficient data to schedule aphicide spraying. This technique should not be used when aphid populations are high.

**Aphid/Plant Counts:**
- Detect early aphid infestations in young crops
- Provide data for aphicide spraying
- Can be used with other aphid monitoring techniques

In summary, there are several advantages to using aphid/plant counts:
- they detect early aphid infestations quickly and efficiently in young crops,
- they provide reliable data for aphicide spraying, and
- they work well with other monitoring techniques, particularly with yellow water traps.

**APHID/LEAF COUNTS**
As plants mature and develop more leaves, growers should take aphid/leaf counts at least once a week to monitor aphid infestations. This technique can also be used in fields that growers cannot visit often enough to monitor with water traps.

**Procedure:** Monitor approximately 50 plants selected at random throughout the field. Carefully examine three fully expanded leaves from each plant — one each on the top, middle, and lower parts of the plant.

Aphids settle on the underside of the leaves, but be careful not to disturb them when turning over the leaves. Use a hand lens to count the number of winged and wingless aphids on each leaf. This technique also provides growers with sufficient data to schedule aphicide spraying.

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**Aphid/Leaf Counts:**

- Detect aphid infestations in crops too mature for aphid/plant counts
- Work well in seed production areas that are monitored infrequently
- Provide data for aphicide spraying

In general, the advantages of the aphid/leaf counts are:

- they detect aphid infestations in crops too mature for aphid/plant counts,
- they work well when potential seed production areas are monitored infrequently, and
- they provide reliable data for aphicide spraying.
The most commonly used aphid trap is the yellow water trap. This simple-to-use device works well alone or when combined with other monitoring techniques throughout the growing season. Its bright yellow color is especially attractive to *Myzus persicae*. Consequently, data obtained from the trap provide growers with accurate information on aphid flight.

There are two types of yellow water traps: rectangular and circular. Rectangular traps are popular in developing countries because they are easy and inexpensive to make. They should be approximately 50 cm long, 32 cm wide, and 8 cm deep, and constructed of sheet metal which will not deteriorate in the field.

Plastic circular trays also work well. They should be large enough to cover an area the size of a mature potato plant, that is, approximately 30 cm in diameter.

Whether growers use rectangular or circular trays is unimportant. But, to get comparable data within a field or region, they must use trays of the same shape and size.
Yellow water traps have an outlet approximately 20 mm in diameter at the bottom of the tray to drain the water. The outlet is closed from the inside with a rubber stopper.

The inner bottom and lower 2 cm of the inner sides are painted yellow and the remaining sides and exterior are dark grey. Entomologists recommend using British Standard prime yellow (B.S. 0-011), commonly called canary yellow.

If the crops are grown under rainy conditions or irrigated by a sprinkler, traps need an overflow hole on one side. A simple screen or piece of muslin placed over the hole allows excess water to drain without losing the aphids.

Procedure: Place two traps, approximately 5 m apart, in the field. Mount them on platforms approximately 60 cm above the ground. Remove any plants touching the platform to prevent wingless aphids from crawling into the traps.
While traps are usually placed within the field, some growers prefer to place them immediately outside the field. In that way, workers do not have to enter the crop to check the traps.

Fill traps with fresh, clear water 2 cm above the yellow paint line. To break surface tension and to prevent aphids from escaping, add a few drops of liquid detergent to the water.

When cleaning the trap, first attach a small muslin bag to the outlet with a rubber band. Remove the stopper and drain the water into a bucket. Collect the aphids from the muslin bag and those remaining in the trap. If monitoring is to continue, refill the tray with water but only reuse the water from the trap if it is clear. When monitoring is complete, either turn the trays over or remove them from the field.

How often traps are checked depends on the reason for the monitoring. If growers are looking for good seed tuber production areas, traps should be checked daily or at least twice a week throughout the growing season.
Identifying the various aphid species in the trap may require assistance from an experienced laboratory technician. If so, separate the aphids from the other insect species and...

...store them in 60-70 percent alcohol. For long-term storage, place aphids in 98 percent alcohol properly labeled giving details of date and place of collection. Based on the number of aphids collected and the presence of virus in fields, growers can tell which areas are suitable for seed tuber production.

In summary, the advantages of yellow water traps are:

- They attract *Myzus persicae*, the major insect vector of potato leafroll virus and potato virus Y,
- They provide accurate data on aphid populations which helps growers select suitable seed production areas, and
- They work well alone or in combination with other monitoring techniques.

Yellow Water Traps:

- Attract *Myzus persicae*
- Provide data for selecting seed production areas
- Work well alone or with other monitoring techniques
for Aphid Monitoring

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<th>Date of evaluation:</th>
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<table>
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<th>Euphorbiae</th>
<th>Others</th>
<th>Other observations</th>
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<tbody>
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<td>Winged</td>
<td>Wingless</td>
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<td></td>
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Green Peach Aphid

Wingless

Antenna (6 segments)

Swollen corns same color as with dark tips
Myzus persicae

Winged

Head and thorax dark brown to black

Legs

Body

Dark patch
## Data Recording Form

<table>
<thead>
<tr>
<th>Region:</th>
<th>Country:</th>
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<tbody>
<tr>
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<td>Date planted:</td>
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<tr>
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<td>M.</td>
</tr>
<tr>
<td></td>
<td>winged</td>
<td>wingless</td>
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</tbody>
</table>

Mean number of aphids
Yellow Water Traps (continued):

- Used during entire growing season
- Are easy and simple to use
- Provide data for scheduling planting, harvesting, and aphicide spraying

Yellow water traps also:

- can be used anytime during the growing season,
- are easy and simple for field workers to use, and
- provide data to help growers schedule planting and harvesting dates, and aphicide spraying.

### CONSIDERATIONS

Data on aphid populations should be recorded on forms similar to the one shown here. By keeping accurate records, growers can determine when a build-up of aphid populations might seriously affect the health of their crops.

Each of the three monitoring techniques has specific applications and is useful for studying aphid populations. Although the best correlation exists between the number of aphids caught per day in water traps and the spread of potato leafroll virus, entomologists recommend combining this method with plant or leaf counts for the best results.

Aphid/plant counts detect the start of aphid infestation in a crop, while aphid/leaf counts are useful for measuring population build-up. For example, according to data from some countries, when leaf counts show that populations of *Myzus persicae* exceed 20 aphids per 100 leaves, the area is regarded as unsuitable for seed tuber production.
By monitoring aphid populations, growers will know when aphid populations are very low or when the critical level is reached. Critical level determines when aphid populations are large enough to cause a higher percentage of virus disease in the crop than is permitted in a seed certification program. Based on this information, growers can then select the areas best suited for producing healthy seed tubers.

For more information on monitoring aphids, contact the International Potato Center (CIP), P.O. Box 5969, Lima, Peru.
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