Strawberry Virus Project

Activity 6: Strawberry Virus Management Plan

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One of the most important factors in controlling the strawberry virus situation is that industry players need to work together. As much as decisions need to be based on what is best of feasible for an individual operation, one also needs to look at the larger picture and consider what is going to benefit the industry, i.e. a decision to leave a infected plants in a field in order to re-coup some production value from them or to remove infected plants in order to reduce the potential spread of viruses to other fields. The only way this situation will be successfully handled is if the industry as a whole chooses to look at the bigger picture when making decisions. It should be noted that PEI has a fairly small number of strawberry operations, approximately 20, and those operators have, to date, demonstrated that they are thinking of the industry as opposed to just their own operation when dealing with strawberry virus. The PEI Strawberry growers Association appears to be successful in bringing producers together to find ways to deal with this issue.

The general plan for handling the strawberry virus situation is:

- Prevention – removal of alternate hosts for aphids and virus (weeds and volunteer strawberry plants)
- Avoidance – use of disease free plant materials
- Monitoring – scouting fields for aphids and virus symptoms
- Suppression – through the use of pesticides, beneficial organisms and habitat management

There are really two ways to approach the strawberry virus situation, through the plants that become infected with the virus or through the aphids that transmit the virus.

<u>Plant Approach</u>

The most important thing a strawberry producer can do is to start with clean plant materials.

Producers should also keep in mind that strawberry plants have a finite life expectancy. The longer plantings are kept, the greater the chance of infection by one or more viruses.

Producers should not maintain plantings for more than 3 fruiting years. Producers in areas of high virus infection may consider adopting an annual production system until virus levels have been reduced.

Virus testing is absolutely necessary. Producers should test established fields for both SMYEV and SMoV and should demand the same of any nurseries they receive plant materials from. Without virus sampling it is not possible to have an accurate view of virus infection as most strawberry varieties will not display visible symptoms from a single virus infection. Virus testing should be done even in fields not displaying any visible virus symptoms.

Currently strawberry virus testing is performed by Peter Ellis, Phyto Diagnostics Company Limited in BC. SMYEV may be tested for by ELISA or RT-PCR, at costs of $2-7 or $35-100 respectively. SMoV may only be done by RT-PCR. Producers may also choose to test for other strawberry viruses, SCV, SVBV, SPaV.

Strawberry Virus Plant Sampling:

Collect 60 random leaf samples from each field and test for both SMYEV and SMoV – this is not the most financially feasible sampling method for most producers

In trying to get producers the most bang for their testing buck, the following sampling/testing plan should be followed. This plan is adapted from the technique John Lewis used in 2013 to monitor strawberry virus in NS.

60 random samples are collected per field. The first fully expanded leaf should be collected. These 60 leaves are combined into groupings of 3 leaves to give 20 composite samples per field. These 20 composite samples will be tested for SMYEV using ELISA technique. ELISA testing has a small cost per sample, this means producers can test a large number of samples and use SMYEV as an “indicator virus”. What this means is that if SMYEV is shows up in a field, a producer would know that they have to take precautions to prevent the spread of the second virus, SMoV, by controlling aphids. By doing composite samples a producer is reducing their testing costs while still getting determining if SMYEV is present in their fields. Should SMYEV be present in any of the 3 leaves, a positive test result will be observed. While a producer may not quantify exactly how much virus is in a field, they will know if SMYEV is present or not.

Some sampling should also be done for SMoV. This can be done at a 10% rate of the sampling for SMYEV, so 6 leaves collected per field. These can also be combined into composite samples comprised of 3 leaves each.

If one virus is found in a field, a producer should maintain monitoring for both viruses and aphids. Scouting should be done for virus symptoms. Should virus symptoms be observed, it is important to determine if they are in fact caused by virus infection as there are several other issues that can cause similar symptoms including bacteria damage, viroid damage, insect feeding, herbicide damage, nutritional deficiencies, extreme temperatures, air pollutants or genetic abnormalities. It is important that producers not "give up" on their fields if one virus is present. Producers should continue managing fields for nutrition, soil health, etc. The healthier plants are, the more they will be able to tolerate a single virus infection.

If both SMYEV and SMoV are found in a field, Dr Robert Martin recommends eliminating plant materials, pulling plants and removing them from the field. Producers should wait no less than 3 weeks before replanting the field to strawberries. There are no "viricides"; once a plant is infected there is no way to eliminate that infection without eliminating the plant itself.

Aphid Approach

The second approach to dealing with the strawberry virus issue is to control aphids within fields.

It is important to scout for aphids; producers need to ensure their presence before applying aphicides. If aphicides are not present, applying aphicides will be of no benefit and will only result in needless production expenses. Timelines to consider are as follows:

Timeline	**Scout for**
Mulch removal	eggs
May	nymphs
June – August	Adults
Early June – Early August	Flight period

There are a limited number of pesticides available to strawberry producers to combat aphids. It is important that once aphids are noted as being present, producers rotate pesticides to avoid the development of a chemical resistance within aphid populations. The following products are registered with PMRA for use on strawberries to deal with aphids.

Admire 240F

Group 4

Active ingredient: imidicloprid

Soil Drench -

1 application per season

Re-entry time: 12 hours
PHI: 30 days

Foliar Spray -

2 applications per season (if no soil drench application)
Re-entry time: 24 hours
PHI: 7 days

Assail 70 WP

Group 4
Active ingredient: acetamiprid
2 applications per season (if no Admire soil drench application)
Re-entry time: 12 hours
PHI: 1 day

Cygon 48-AG

Group 1B
Active ingredient: dimethoate
2 applications per season fruiting years; 3 applications per season non-fruiting years
Re-entry time: 12 hours (default, nothing on label)
PHI: 7 days

Lagon 480E

Group 1B
Active ingredient: dimethoate
3 applications per season
Re-entry time: 12 hours (default, nothing on label)
PHI: 7 days

Thionex EC

Group 2A
Active ingredient: endosulfan
2 applications per season
Re-entry time: 4 days for weeding, scouting; 7 days for hand labour, including harvest
PHI: 7 days

Thionex 50W

Group 2A
Active ingredient: endosulfan

2 applications per season
Re-entry time: 7 days for weeding, scouting; 12 days for hand labour, including harvest
PHI: 12 days

A potential spray plan that would utilize the limited number of products available and extend the protection window would be as follows;

Admire – soil drench (4 weeks protection)
Cygon/Lagon – foliar spray (1 week protection)
Thionex – foliar spray (1 week protection)
Cygon/Lagon – foliar spray (1 week protection)
Thionex – foliar spray (1 week protection)
Giving a total of 8 weeks protection

It is important that leave the Admire soil drench application until aphids are actually present, at the beginning of the first flight period in order to ensure that they will have protection through their entire season.

There are two different techniques producers can use to monitor for aphids in their fields.

First is leaf sampling. This is a good technique for monitoring general aphid population increases. This can be done by collecting 60 random immature leaves per field, using a "W" or "X" pattern for collection. It is important for leaves to be immature, i.e. folded or partially folded trifoliates. Leaves should be stored in a cool dry place until inspection.

Inspection can be done on site with a 20X hand lens as strawberry aphids are easily identifiable by the bulbed hairs on their bodies.

Treatment threshold is ½ - 1 aphid per leaf

Figure from Publication HS1009 Horticultural Sciences Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida

Producers should also be watching for aphid eggs. Strawberry aphid eggs are initially white-yellowish in colour, but turn shiny black within a few hours.

Figure from Publication HS1009 Horticultural Sciences Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida

The second sampling technique is sticky trap sampling. This technique is good for monitoring winged aphid populations. Producers should place 8-10 traps per field, 2 in the interior of the field, the rest around the perimeter, about 5 meters from the edge. Traps should be placed at strawberry canopy level and should be checked weekly.

Treatment threshold is ½ - 1 aphid per leaf