

# Control of Potato Virus Y for Seed Potato Production: Mineral Oils



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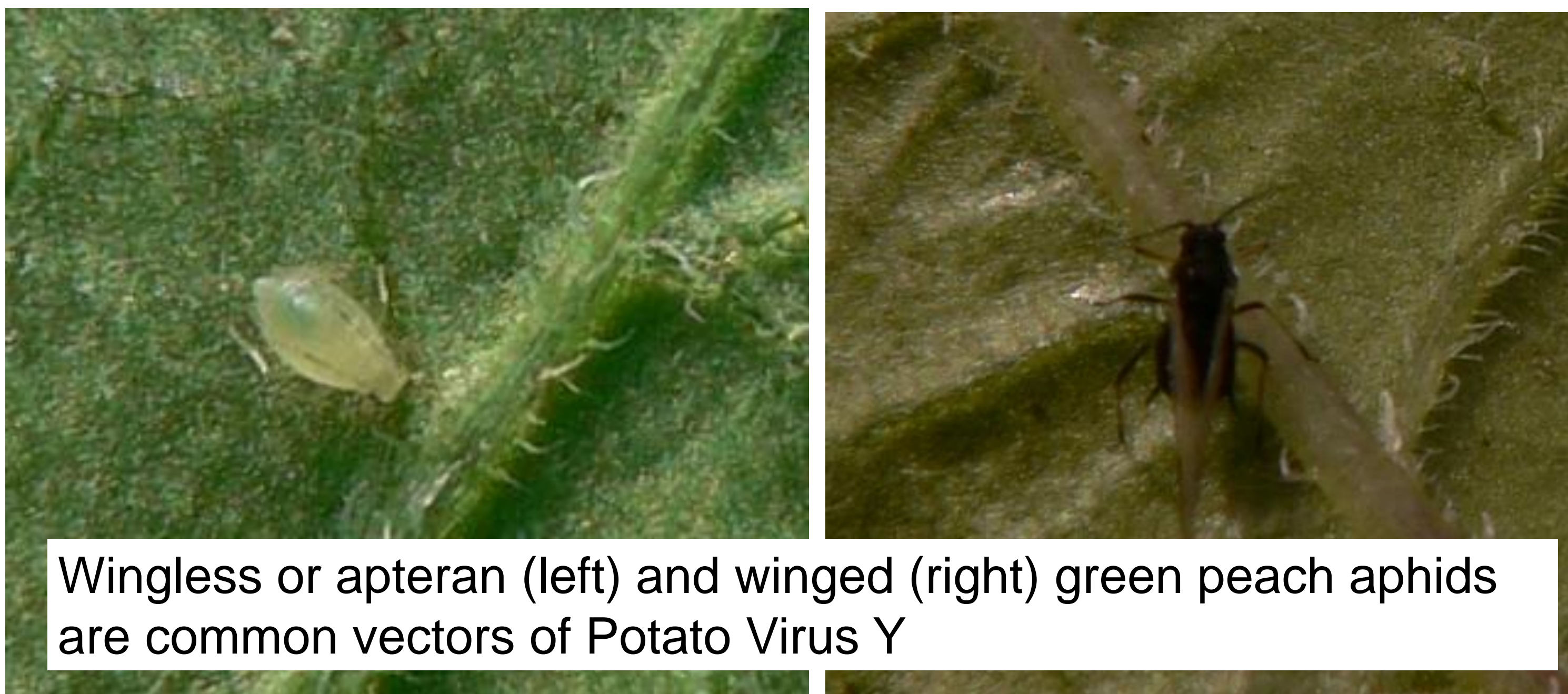
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## Potato Virus Y Background

- Potato Virus Y (PVY) is one of the most important viruses impacting potato production
- PVY is vectored by aphids in a non-persistent manner – the virus is carried on the aphid mouthpart for a short period of time
- PVY is spread as aphids insert their mouthparts (probing) in infected plants and then move to uninfected plants
- If aphid vectors are not controlled the virus can spread rapidly
- Most insecticides are not effective at controlling PVY spread by aphids because they do not kill aphids quickly enough to prevent probing into clean plants



Wingless or apteran (left) and winged (right) green peach aphids are common vectors of Potato Virus Y

## Symptoms

- Leaf mottling with dark and light green or yellow patches
- Leaf crinkling and curling
- Stunting of plants
- Dropping of lower leaves (palm tree appearance)
- Vein necrosis
- The type and severity of symptoms depends on the potato variety (e.g. leaf mottling is clearly noticeable in Yukon Gold but difficult to detect in Russet Norkotah)



PVY infected potato plants showing symptoms of leaf mottling, crinkling and dropping

## Damage

- Infected plants produce fewer and smaller tubers
- Early dying of infected plants
- PVY infection can reduce yield; for each 1% increase in PVY incidence yield can be reduced by 0.1805 t/ha in commonly grown varieties such as Russet Norkotah, Russet Burbank and Shepody (Nolte *et al.* 2006, *Plant Disease* 88: 248-252)

## Management

- Use certified clean seed
- Avoid planting potatoes near alternate hosts for aphids and PVY such as tomatoes and peppers
- Control weed hosts such as nightshades which are also alternate hosts for aphids and PVY
- Control volunteer potatoes (which may be infected with PVY)
- Avoid mechanical damage to the plants (as PVY can also be transmitted mechanically via machinery)
- Prevent transmission by aphids

## Mineral Oil Trial

- Mineral oils are a potential tool for both conventional and organic seed potato production in BC
- Mineral oils have been shown to:
  - 1) alter aphid feeding behaviour
  - 2) have a direct insecticidal effect on aphids
  - 3) alter the virus-aphid interaction and disrupt virus transmission.
- Based on anecdotal and limited research an effective program is to spray a 1% solution of paraffinic mineral oil weekly starting at the beginning of the season

## Methods (Treatments, Plot Description and Pest Inoculation)

- A field trial was conducted in a commercial potato field in 2012
- The trial consisted of three treatments (each replicated 6 times):
  - 1) Superior 70 Oil (Registered for PVY control in Canada)
  - 2) Purespray Green Spray Oil 13E (potential organic option)
  - 3) Water Control
- Plots were 4 rows wide X 8m long
- Plots were sprayed weekly, starting at full emergence until top kill (via mowing), for a total of 7 sprays; treatments were applied with a backpack sprayer
- PVY infected potatoes and aphids (10/plot) were also introduced to the trial area to insure both PVY and aphid pressure.

## Methods (Assessments)

- PVY pressure in the plot was determine prior to treating the plot (leaf testing) with mineral oil and at the end of the trial (leaf and tuber testing)
- Potato triplets were collected weekly and later twice weekly to evaluate the effect of the oil on aphid populations.



Leaf triplets were checked weekly to determine aphid response to mineral oil treatments

## Results

- No significant effect of the oil treatments on the total number of aphids over the course of the trial (Fig. 1)
- No PVY transmission to leaves or tubers in any of the trial plots, including the water Control over the course of the trial.
- This is most likely due to the low numbers of winged aphids which are the primary vectors of PVY.

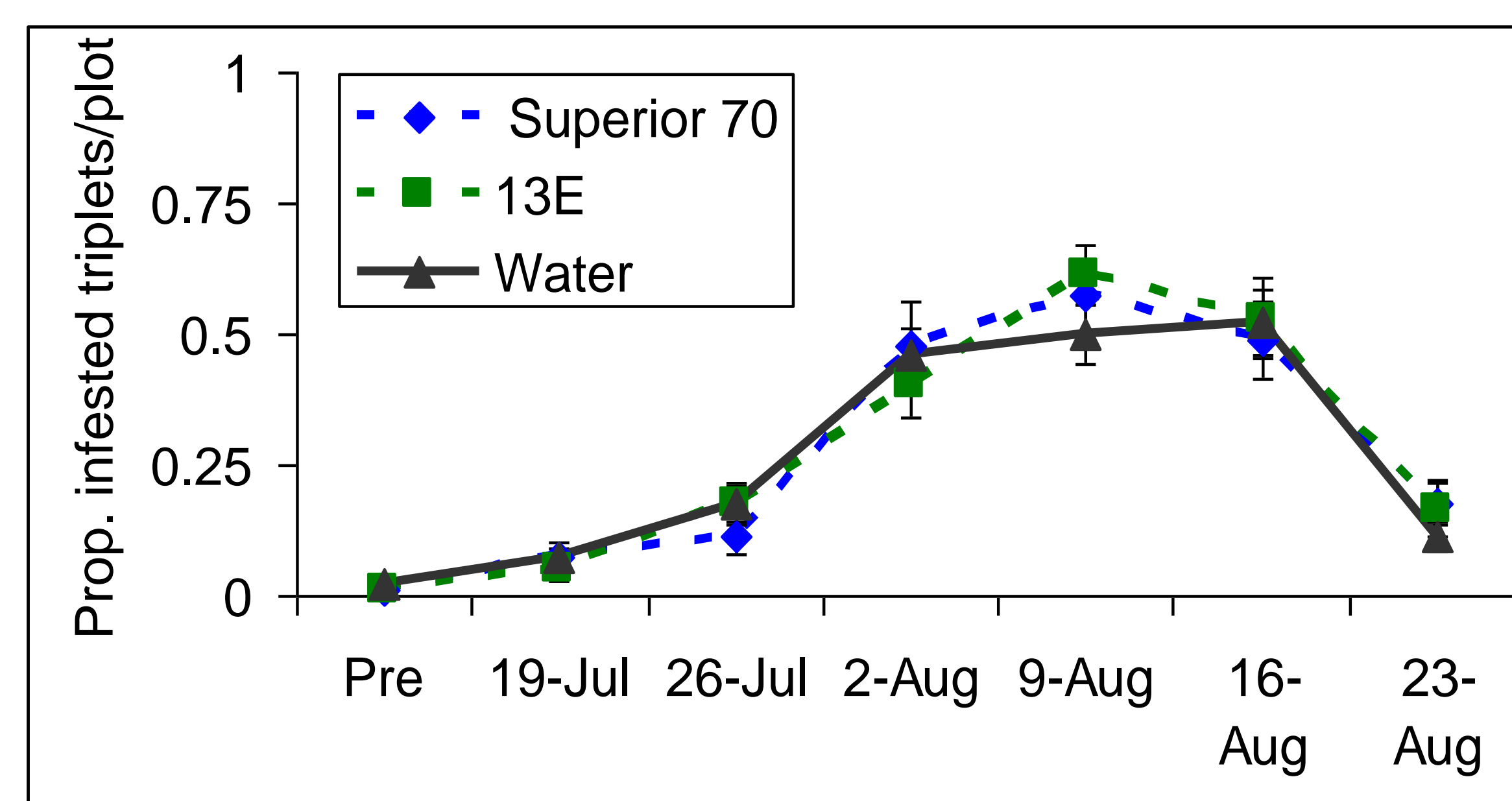


Figure 1. Effect of weekly mineral oil treatments on aphids (apteran and winged) on potato triplets prior to treatment and seven days after each weekly treatment. Each point is the mean  $\pm$  s.e. of six replicates.

## Next Steps

- Based on experience in both national and local trials, small field plots do not appear to be an effective way of evaluating mineral oil for PVY control
- National trials are planned for 2013-2015 to evaluate mineral oil in large plots (e.g. 10 rows X 10 m); efficacy of different rates of mineral oil and combinations with conventional insecticide will to be examined