

# Tree Fruit and Grape Industry NEWS



Ministry of Agriculture,  
Food and Fisheries

## Inside February, 2001

Replant grant increased .....	2
B.C. Pesticide Return Program .....	2
SIR report .....	3
Ambrosia meeting .....	5
Ambrosia Consumer Study ...	5
Grape Specialist Position .....	6
Sovran – A new apple fungicide .....	7
Grape powdery mildew Resistance to Nova in Ontario .....	9
BOTRAN 75W .....	12

## Production Guide Meetings

Tree Fruit Production Guide meetings are planned for late February and March. Growers can earn 2 Pesticide Applicators Credit points for attending a meeting. The meetings will present insect, disease, weed and nutrition changes for the tree fruit production guide as well as upcoming pest and disease alerts. A Sterile Insect Release report will be presented as well. Changes to the 2000-2001 guide will be mailed to growers, but will also be available to growers who may not have received one at these meetings.

### Plan to attend one of these meetings!

Feb 27/01- 8:30am	South Valley Sales Spring Seminar, Oliver Community Hall
March 12/01 -1:00pm	Cawston Community Hall, Cawston, BC
March 12/01 - 7:00pm	Main Conference Room, Pacific Agri-Food Research Centre, Summerland
March 13/01- 9:30am	Oyama Community Hall, Oyama
March 13/01 - 1pm	East Kelowna Hall, Kelowna
March 27/01 - 7pm	Creston & District Community Complex, Rec Center, Canyon Room ▲

## Contact

Ministry of Agriculture,  
Food and Fisheries

Jim Campbell,

Prov. Tree Fruit & Grape Industry Specialist

Phone: (250) 498-5254

Fax: (250) 498-4952

EMail: Jim.Campbell@gems1.gov.bc.ca

Oliver District Office

Box 5000, 9971 350th Avenue

Oliver, BC V0H 1T0

## PLUM POX VIRUS UPDATE

### Border Re-opens to Prunus Imports from the US

In November 1999, the Canadian Food Inspection Agency (CFIA) suspended the entry of susceptible *Prunus* propagative material, including apricot, nectarine, peach and plum (but not cherry) from the United States after an outbreak of Plum Pox Virus was detected in Pennsylvania.

The Canadian Food Inspection Agency (CFIA) has re-opened the border for *Prunus* imports from approved PPV-free states, as of January 8, 2001. This decision was based on the results of the first year of a national US survey focussing mainly on propagative sources of plants. PPV was not found outside of Pennsylvania in the United States.

(continued...)

## **Plum Pox Virus Update continued..**

### **Import Requirements For 2001**

To import PPV-susceptible *Prunus* species from the USA, including peach, apricot, plum, prune, and nectarine, as well as many ornamental *Prunus* species, a *Permit to Import* is required. Only stock from U.S. states with approved virus certification programs are permitted entry into Canada. Approved states include Washington, Oregon, California, Idaho, Michigan, Minnesota, Missouri, Montana and South Carolina. All nursery stock must originate from mother stock that has been tested as negative for PPV by the United States Department of Agriculture or an accredited laboratory. The mother material and

nursery stock must have been grown under a Canadian approved virus certification program. Propagators, exporters and importers must keep detailed records of all related paperwork, including species, variety, source of budwood and rootstock and year of propagation and where distributed. A *USDA Phytosanitary Certificate* is also required, and must be issued within 14 days prior to shipment.

For complete details on the current two-year interim import policy for *Prunus*, please refer to the CFIA website at:  
<http://www.cfia-acia.agr.ca/english/plaveg/protect/dir/d-99-07e.shtml>

### **Movement Within Canada**

The CFIA is currently developing an eradication plan for PPV-affected areas in Ontario and Nova Scotia. Requirements for movement of plant material within Canada have not yet been finalised. Currently properties with known or suspected PPV infection are under "prohibition of movement" orders. It is anticipated that a quarantine zone or zones will be established around PPV-infested areas in Ontario and Nova Scotia. For the current time, it is highly recommended that BC growers do not import any *Prunus* plant material from Ontario.

*For more information contact Gayle Jespersen, Plant Pathologist, BCMAFF, Kelowna ▲*

### **OVTFA Replant Grant Increased**

The OVTFA Board has announced an increase in the Replant grant to \$5 per tree subject to certain limitations. Applications will be accepted until February 28, 2001. Contact OVTFA at 1-800-665-5254 for further information. ▲

### **B.C. Pesticide Return Comes to the Okanagan and Creston Valley**

It is time to sort the pesticides in your storage shed and identify any unwanted pesticides. Later this spring you will have an opportunity to dispose of unwanted agricultural herbicides, insecticides, fungicides, growth regulators, rodenticides and other pesticides. There will be three or four temporary collection sites in the Okanagan Valley and one in the Creston area. This will be a one-time opportunity with no legal implications to producers and at no cost to producers.

Get your pesticides ready by making sure they are all labeled and in leak proof containers. If you do not know what the pesticide is, label it "Pesticide - Unknown". This is important for the safety of the people receiving your pesticides.

The B.C. Agriculture Council obtained funding for this collection from the Crop Protection Institute of Canada and the B.C. Investment Agriculture Foundation. The two collections that were held in 2000 (Fraser Valley and Vancouver Island) brought in 60 cubic yards of solid pesticides and 280 drums (205 liters each) of containers with liquid pesticides. The oldest pesticide collected was a container of Black Leaf 40 with PCP# 47. This product was registered in 1938. Watch for more details on this collection program later this spring.

*For more information contact Madeline Waring, Pesticide Specialist, BCMAFF. ▲*

# Report to Commercial Growers From the Okanagan-Kootenay Sterile Insect Release Program – January 2001

## 2000 Summary

The lowest codling moth levels in the history of the SIR Program were achieved last season in the South Okanagan and Similkameen Valleys and the Creston Valley made solid progress despite much political upheaval. In Zone 2, the clean-up effort continued with the addition of an area-wide application of Isomate C+ Mating Disruption and for the first time, Zone 3 actively joined the Program as one per hectare trapping and large-scale tree removal began in preparation for a full area-wide mating disruption program in 2001.

## Zone 1 (South Okanagan/Similkameen)

96.3% of commercial apple and pear acreage harvest sampled in the South Okanagan and Similkameen Valleys was completely free of damage due to codling moth in 2000. These results are based on a random sampling of 5,560 of the 6,692 Zone 1 acres by SIR staff. Sterile moths were released once per week, trapping took place at one per ha and 740 acres of mating disruption was applied either by SIR or by individual growers. Approximately 300 acres of corrugated cardboard banding was applied to commercial orchards with higher wild moth levels and also to all non-commercial sites in close proximity to commercial orchards.

## Creston Valley

73% of Creston acreage harvest sampled had no damage due to codling moth, only 1.1% was considered to have high levels of wild codling moth and the remaining

25.9% of acreage surveyed had low damage levels recorded. SIR used sterile moth release in conjunction with mating disruption in 248 acres of commercial orchards in the Creston Valley. Local commercial growers were given the option to attend a spring training session to receive instruction on mating disruption application and then qualify for a rebate of up to \$16 per acre for applying the SIR supplied mating disruption in their orchards. Field staff will repeat the combination of technologies this season at which time wild moth levels in most orchards are expected to be extremely low and more in line with the rest of Zone 1. Increased attention is being paid to removal of wild trees in all areas of the district.

## Zone 2 (Peachland to Duck Lake)

At harvest in 2000, 46.5% of Zone 2 orchard blocks sampled were codling moth free. SIR is continuing with the clean up program and no sterile releases will take place until at least 2002 to allow wild moth populations to decrease to the point where sterile moth release would be most effective. Area-wide mating disruption was placed in all commercial acreage in Zone 2 last season in an effort to accelerate the reductions and all growers were asked to apply two first brood and if necessary a second brood cover spray.

Trapping was carried out at one per ha with 10mg lures to compensate for the mating disrupted environment. SIR plans to repeat the mating disruption application next season

and follow in 2002 with a combination of sterile moth releases and if necessary mating disruption only in hotspot areas. A Clean-Up Compliance Grant of \$20 per acre was made available to all commercial growers in Zones 2 and 3 who made an effort to assist in the cleanup campaign. In addition, commercial growers were given the option to attend a spring training session to receive instruction on mating disruption application and then qualify for a rebate of up to \$16 per acre for applying the SIR supplied mating disruption in their orchards.

## Zone 3 (Winfield to Salmon Arm)

At meetings last winter, commercial growers asked SIR to begin the clean-up program in 2000 instead of the scheduled 2001. As a result, all commercial growers in Zone 3 were charged a parcel tax of half the amount paid by growers in Zones 1 and 2. All Zone 3 growers who made the appropriate effort to lower wild populations were eligible to receive the \$20 per acre Clean-Up Compliance Grant.

Codling moth traps were placed at one per ha and all conventional growers were asked to apply a full spray program of two first brood and at least one second-brood spray in preparation for a full area-wide mating disruption program in 2001. To further ready the area for a mating disruption campaign, SIR is in the process of removing thousands of wild, unwanted or derelict trees. These removals will

*(continued...)*

# Report to Commercial Growers From the Okanagan cont...

continue throughout the winter months. Releases of sterile moths are currently scheduled to commence in 2003.

## 2001 Parcel Taxes

Parcel Taxes for 2001 are as follows:

Zone 1	\$90.04
Rural Zone 1R	\$94.77
Zone 2	\$90.04
Rural Zone 2R	\$94.77
Zone 3	\$90.04
Rural Zone 3R	\$94.77

The SIR Program, in conjunction with the BCFGAs continues to lobby the Federal and Provincial Governments for additional funding to lower grower cost. Growers can be assured that every effort is being made on their behalf to make SIR more cost effective and affordable in the long term.

## 2001 SIR Services

Next season, commercial growers can expect to see the following services from SIR:

### Zone 1

- \_ SIR staff monitoring
- \_ Pheromone trapping
- \_ Sterile release
- \_ 200/acre Isomate C+ Mating Disruption and banding in any remaining high pressure sites

### Zone 2

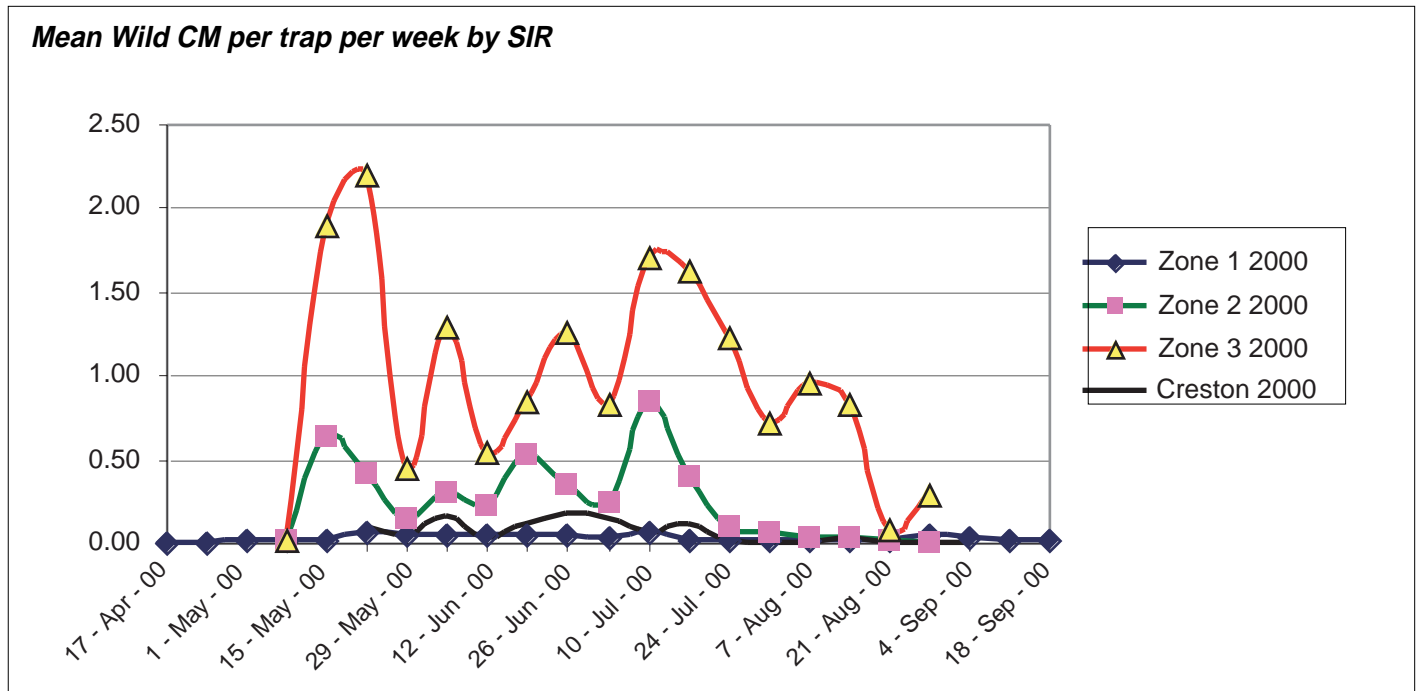
- \_ SIR staff monitoring
- \_ 200 Isomate C+ Mating Disruption dispensers per acre in all commercial pome fruit orchards
- \_ Intensive banding
- \_ Pheromone trapping
- \_ Continued clean-up and tree removal

### Zone 3

- \_ SIR staff monitoring
- \_ 200 Isomate C+ Mating Disruption dispensers per acre in all commercial pome fruit orchards
- \_ Intensive Banding
- \_ Pheromone trapping
- \_ Continued clean-up and tree removal

SIR is here to serve growers. If you would like more information, please call toll free at 1-800-363-6684. ▲

## Zone Trap Capture Comparison



## Overflow Crowd attends Ambrosia Meeting

- A meeting was held January 23 in Summerland to discuss cultural, handling, storage and marketing aspects of new variety. Approximately 175 growers attended.
- Growers are responding enthusiastically to this new variety by planting a projected 180 acres by 2001.
- Consumer tasting studies indicate very positive acceptance to the new variety and a willingness to pay premium prices over other leading varieties.
- Growers have appointed a steering committee to examine alternatives to develop an Ambrosia Council to undertake promotion and develop quality standards.
- Ambrosia is the highest priced apple received by BC growers in 2000
- Proceedings from this meeting are available from your nearest BCMAFF office or PICO. ▲

## Ambrosia Consumer Marketing Study - Summary of Findings

This project was coordinated by BC Tree Fruits Ltd and was funded by the B.C. Ministry of Agriculture, Food and Fisheries, the Okanagan Valley Tree Fruit Authority, the Tree Fruit Industry Development Fund and Wilfred and Sally Mennell (variety owners). The full report can be obtained by contacting Jim Campbell at 1-888-812-8811.

These findings are from 257 Overwaitea shoppers who responded to mail-return surveys provided during Ambrosia demonstrations/taste tests November 16 and 17 at 35 stores throughout B.C. Also included in the summary are results from two focus groups conducted in Vancouver, December fifth and sixth.

### Purchasing Habits

- Frequency of purchase:
  - 56% buy apples once per week
  - 28% buy apples once every two weeks
- Most consumers purchase apples from supermarkets (76%). Produce stores (11%), packinghouse and farmers' markets each around 5%.
- Only 19% purchase the same variety all the time (most often Royal Gala).
- Most common varieties purchased:
  - Royal Gala - 19%
  - Macintosh - 18%
  - Spartan - 17%
  - Golden Del. - 12%
  - Red Del. - 11%
  - Granny Smith - 9%
  - Fuji - 8%

### Feedback on Ambrosia Apple Variety

- Ambrosia ratings compared to the variety usually purchased by consumers.

Factors	←—————→					Mean Rating
	Poor 1	2	3	4	Excellent 5	
Appearance	1.7%	1.7%	13.1%	36.0%	47.5%	4.26
Flavour	1.6%	4.4%	13.2%	38.8%	42.0%	4.15
Juiciness	0.8%	2.9%	17.8%	44.8%	33.6%	4.07
Price	4.1%	16.4%	36.1%	27.4%	16.0%	3.35

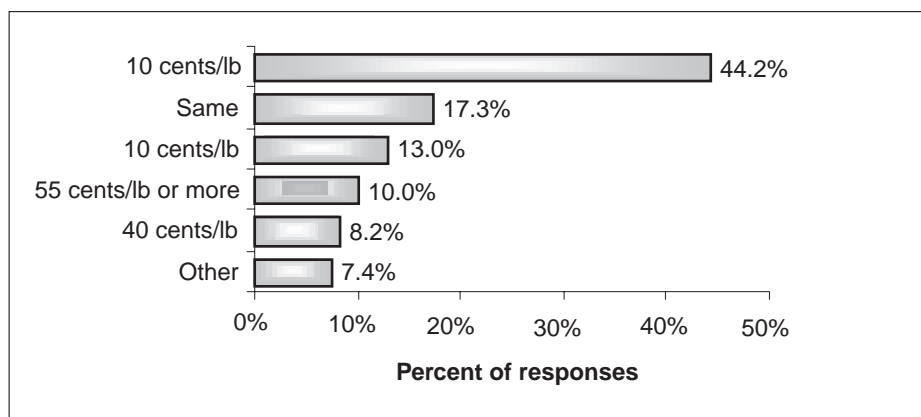
Likelihood of purchasing Ambrosias	←—————→					Mean Rating
	Not at all likely	2	3	4	Very likely	
Ambrosias	4.1%	3.7%	18.2%	28.9%	45.0%	4.07

- Those likely to purchase are those who currently buy Fuji, Royal Gala, Golden Delicious, Macintosh.

(continued...)

## Ambrosia Consumer Marketing Study cont...

### Reasonable Premium Over Current Variety Pricing



- On average, respondents revealed an approximate premium of \$0.18/lb as being acceptable.
- Focus group participants accepted the Ambrosia as a premium variety over others and revealed a price of approximately \$1.00-\$1.20/lb was reasonable.

### Marketing Considerations

- Most popular methods revealed by consumers to promote Ambrosia variety in supermarkets are: Sampling/taste tests – 40%, Price specials – 32%, In-store displays/promos – 13%.
- Factors in Choosing an Apple

Factors	Not at all important ←————→ Very important					Mean Rating
	1	2	3	4	5	
<b>Flavour</b>	0.8%	0.8%	1.2%	15.2%	82.0%	<b>4.77</b>
<b>Juiciness</b>	0.8%	2.5%	10.0%	33.2%	53.5%	<b>4.36</b>
<b>BC Grown</b>	5.0%	5.5%	16.8%	16.4%	56.3%	<b>4.13</b>
<b>Price</b>	3.7%	3.7%	19.1%	24.8%	48.8%	<b>4.11</b>
<b>Appearance</b>	2.1%	5.4%	20.4%	32.9%	39.2%	<b>4.02</b>

- Freshness & appearance were the most important factors identified in focus groups. When choosing apples from a display, participants seemed to be drawn to those with more red featured than those more green/cream in colour. ▲

## “No appointment has been made re MAFF's Grape Specialist position”

The team of industry and ministry staff who conducted the recent Grape Specialist competition have decided not to proceed with the competition at this time. Although there were a number of good candidates, none had the combination of skills and experience in viticulture, extension and the grape and wine industry the position requires. The ministry will consider posting this position again in six months time. ▲

# Sovran, a new apple fungicide: how does it compare?

Peter Sholberg, Pacific Agri-Food Research Centre, Agriculture & Agri-Food Canada, Summerland, B.C. VOH 1Z0

Recently, Sovran, a new fungicide, was registered by BASF Canada Inc. for use on apples for control of powdery mildew and scab. The fungicide is available from various local distributors in British Columbia (B.C.) as a 50% water dispersible granule. The active ingredient in Sovran is Kresoxim methyl, which belongs to a new class of fungicides, the strobilurins. Strobilurins are synthetic derivatives of antifungal compounds produced by a small mushroom found in European pine forests. Sovran prevents disease by blocking electron transport in the mitochondria which leads to cell death as a result of depleted ATP, the energy currency of the cell.

Several Sovran trials were conducted between 1993 and 1997 by the Pacific Agri-Food Research Centre (PARC), Summerland in co-operation with BASF Canada, Inc. The trials evaluated the ability of Sovran to act as a protectant during the primary scab infection period, its effectiveness as an eradicant, and its ability to control secondary powdery mildew. The first apple scab trial was conducted in 1993 in Creston, on the very susceptible 'McIntosh' cultivar. The climate in Creston is more conducive to apple scab than in the Okanagan Valley and in 1993 nine moderate to heavy infection periods were recorded from May to July. Subsequent apple scab trials were conducted in Kelowna on McIntosh. Powdery mildew trials were conducted at the Research Centre orchard in Summerland on the cultivar 'Jonagold' known to be very susceptible to powdery mildew.

The Creston, apple scab trial consisted of eight treatments including the control with four treatments applied on a 7 to 10 day protectant schedule beginning on May 14 and ending on July 3, 1993 (Table 1). The remaining three treatments were applied as eradicants 72 to 89 hours after an infection period. This all-inclusive trial for evaluating Sovran for use in control of apple scab provided much useful information. It showed that Sovran with seven applications, used as a protectant at a rate of 0.20 kg/ha was as effective as the standard Nova + Polyram treatment in preventing the occurrence of apple scab on McIntosh foliage. When used as an eradicant, with two less applications, it was slightly less effective than Nova for preventing scab on leaves but was more effective in preventing fruit infection. Therefore, it appears that Sovran will provide control comparable to Nova as a protectant or eradicant apple scab spray. The Sovran label provides a range of 0.18 to 0.36 kg/ha for control of apple scab advising the use of the high rate only during heavy infection pressure. In the B.C. interior, infection pressure does not normally reach the high level with the possible exception of the Creston area. In general, the low rate would be adequate as evidenced by the 0.20 kg/ha rate that gave good control under typical disease pressure.

The curative ability of Sovran to eradicate apple scab infection was studied on the McIntosh apple in Kelowna (Table 2). Primary infection was determined by the "Mill's Chart" using hours of leaf wetness and temperature recorded at the site.

Curative applications of Sovran were initiated on May 2 at full bloom, 27 hours after the first moderate infection period. Curative applications followed on May 3, 4, and 5; 51, 72 and 98 hrs, respectively after the first infection period. A curative application of Nova was also made after 98 hrs. Foliage scab was recorded on June 9 and fruit scab was recorded on August 23. Sovran at the 0.24 kg/ha rate was not as effective as Nova in curing established infections on foliage 51, 72, and 98 hours after infection. On the other hand, it was as effective as Nova in controlling fruit infection, even after 98 hours. The label recommends 0.36 kg/ha for curative scab applications, probably because the lower rates used for protection are not high enough.

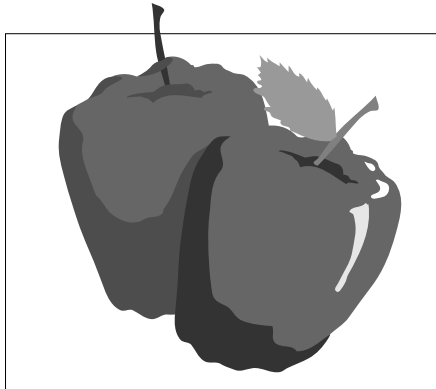
The ability of Sovran to control powdery mildew was evaluated on Jonagold apple at PARC, Summerland. The first trial was conducted in 1993, however very little powdery mildew occurred and it was difficult to draw any conclusions on the effectiveness of Sovran from this trial. The trial did show that under light disease pressure Sovran was as effective as Nova. Another powdery mildew trial was conducted in 1997 in the same 'Jonagold' orchard block (Table 3). Powdery mildew incidence and severity had increased several fold from 1993 values. Sovran and Nova treatments were applied at tight cluster, pink, bloom, and petal fall. Powdery mildew was recorded on foliage on June 20 immediately after it first appeared, and again on August 1 after terminal growth had

*(continued...)*

## **Sovran, a new apple fungicide continued...**

ceased, and finally on fruit at harvest. Powdery mildew recorded on June 20 was controlled by 0.30 kg/ha of Sovran alone or 0.24 kg/ha of Sovran combined with Polyram and was as effective as 0.34 kg/ha Nova. The later evaluation on August 1 provided similar results except that the 0.24 kg/ha rate of Sovran alone provided similar disease control. Less than 2% russetting of the fruit attributed to powdery mildew occurred. The Sovran label provides a range of 0.24 to 0.45 kg/ha for powdery mildew control with applications starting at half inch green and continuing on a 10-14 day interval. Studies conducted at PARC and by other researchers indicate that the pink to petal fall stages of blossom development requires the most protection from infection and sprays should be timed to coincide with this period of fruit development. Earlier sprays are probably beneficial but likely are not economical unless control of apple scab is also a priority. The label states to use the high rate of 0.45 kg/ha during periods of heavy infection pressure. This is extremely vague because it is not clear what is meant by 'periods of heavy infection pressure' and an attempt will be made to provide some guidance on the rates to use in this area. Powdery mildew on apple is almost always a consequence of the susceptibility of the apple cultivar and the amount of primary inoculum in the orchard. If the cultivar is one of the susceptible ones, such as 'Gala' or 'Jonagold', and overwintering inoculum of powdery mildew was very high as evidenced by several white tips on each tree, a higher rate of Sovran would be advisable, otherwise the lower rate of .24 kg/ha would be adequate.

Two important points about Sovran are that its use requires a conscious effort at resistance management and that it can be extremely phytotoxic to certain cherry cultivars. Very little information is available on its phytotoxicity but a report recently surfaced from a reliable source stating that drift from its application on apples defoliated 'sweetheart' cherry trees and damaged leaves on nearby 'van' cherry trees. Orchardists need to be very careful when applying Sovran near cherry trees and should be absolutely sure that any nearby cherry trees are not susceptible.



Laboratory tests have demonstrated that this fungicide and others in the same class are candidates for resistance by pathogenic fungi although no field resistance has been found yet. The label provides guidance on resistance management by stating that no more than two sequential applications should be made. The total number should not exceed four applications per season, and the total amount of Sovran should not exceed 1.8 kg/ha per season. This means that an effective alternative fungicide with a different mode of action needs to be used between Sovran applications. These requirements should not be difficult for interior

orchardists because disease pressure is generally relatively low compared to Eastern North America and lower rates with less application are the norm. Furthermore, several fungicides are available as alternatives to Sovran with different modes of action. Some suggestions are Nova and Nustar, known as sterol biosynthesis inhibiting fungicides. Both are very effective against apple scab and are able to control infections for over 96 hrs after they have occurred. In trials and laboratory tests conducted at PARC, Nustar was more active than Nova against apple scab but Nova was more effective against powdery mildew. Other suggestions for fungicide alternatives to Sovran are one of the cheaper EBDC fungicides. Dithane, Mancozeb, and Polyram provide effective protection from scab but lack good curative effect and are ineffective against powdery mildew. Benomyl and Easout, although effective against apple scab and powdery mildew are not recommended because the apple scab fungus is already resistant to them in B.C. However, they could be considered for control of powdery mildew and for control of some postharvest diseases. Recently, Novartis Crop Protection, Inc registered Vangard for control of apple scab. This fungicide belongs to a completely different fungicide class and has a mode of action that inhibits biosynthesis of methionine, a building block of proteins, enzymes and cell membranes. It is effective as a protectant with limited curative ability and only suppresses powdery mildew. Vangard's strong

*(continued...)*



## **Sovran, a new apple fungicide continued...**

point is its ability to control *Botrytis cinerea* at very low rates. *B. cinerea* causes dry-eye rot that occasionally causes serious losses in B.C. and gray mold rot that is responsible for about half the decay that occurs in storage. Interior orchardists with these particular disease problems should consider using Vanguard as a bloom spray. In conclusion, orchardists need to consult with field personnel before setting up spray schedules in the spring so they can take advantage of the strengths of the many materials available to them for optimum disease control and effective fungicide resistance management. ▲

## **Grape Powdery Mildew Becoming Resistant to Nova in Ontario**

**T**his article was written by Dr. Northover, Research Scientist at the Vineland Research Station, Agriculture and Agri-Food Canada, in the Niagara area of Ontario, for the Jan/Feb. 2001 edition of the "Tender Fruit and Grape Vine Newsletter". We thought the article would also be of interest to B.C. Grape Growers. Although Nova resistance has not yet been documented in the Okanagan, it could become a problem here as well.

### **Introduction**

Nova failed to control powdery mildew (PM) in an experimental vineyard at Jordan Station, Ontario in 1999. This was confirmed in 2000 and supported by laboratory studies. We do not know the distribution of resistance in Niagara, but we may be seeing the "tip of the iceberg". These are results, background information, views and suggestions to help growers plan their PM control strategy for 2001.

### **Summary of Conclusions:**

1. Start controlling powdery mildew (PM) when shoots are 10-15cm high.
2. Clusters are very susceptible to PM between bloom and berry touch, a 4-week period.
3. Use a 7-day spray program between bloom and berry touch, where PM is threatening.
4. Resistance of PM to Nova has been confirmed in vineyard and in laboratory tests.
5. Avoid relying on Nova and Benlate for PM control between bloom and berry touch.
6. Never use Nova or Benlate in consecutive sprays; alternate with other fungicides.

### **Nova, DMI Fungicide and Cross Resistance**

Nova belongs to the DMI group of fungicides, several of which interfere with the growth and spore production of PM populations. The repeated use of a DMI fungicide over several years, progressively selects spores that become increasingly more tolerant or resistant to the fungicide. At some point the fungicide may lose much of its initial effectiveness. The buildup of resistance is considered to be stepwise, resulting from increases in the number of resistance genes. This process is not quickly reversed. When fungal populations are resistant to one DMI fungicide, they may be partially resistant to other DMI fungicides, even though they have never been exposed to them. This phenomenon is called "cross-resistance".

Nova is a second generation DMI that was introduced in Canada in 1992, and in the USA in 1989. However, this followed the US introduction of

*(continued...)*

# **Grape Powdery Mildew Becoming Resistant to Nova in Ontario continued...**

Bayleton, a first generation DMI, in 1982. In California, Bayleton resistance developed quickly causing severe grape crop losses in 1985 and 1986. Resistance of grape PM to DMI fungicides has occurred in Europe and was first reported from Portugal in 1988. The early failure of Bayleton in California resulted from its almost exclusive use, often at reduced rates with long spray intervals of 21 days. The first application was often delayed until mildew was already visible. There was cross-resistance between Bayleton and Nova, but according to Rohm and Haas, Nova is effective and still widely used in California. However, Nova has been weak in New York, where growers prefer to use Rubigan, a more powerful and cheaper DMI.

## **Research Results From 2000**

Treatments were started just before bloom, when distinct PM lesions were already visible on the lower surface of a few leaves in the fruiting zone. Under this less-than-ideal condition, 96% of the crop (berries) in the unsprayed plots became infected. In contrast, Kumulus provided complete control - 0% infection. Six repeated applications of Nova resulted in a very severe 65% crop infection. When 3 applications of Nova were alternated with 3 of Kumulus, the crop loss was reduced to 27%. This confirmed the weakness of Nova observed in this vineyard in 1999, and provided evidence of DMI-resistance in PM under vineyard conditions. Repeated applications of the new "resistance-

prone" fungicides is not recommended, and the program of 6 consecutive applications of Nova was used merely to determine its activity when used alone.

A laboratory test for spore sensitivity/resistance to Nova was used to evaluate spore samples collected from unsprayed plots in June and from Nova-sprayed plots in August. Between June and August, the proportion of resistant isolates increased from 50% to 85%. These results were very similar to those obtained by Wayne Wilcox in 1996, where resistant isolates were associated with the failure of Nova under vineyard conditions in New York.

## **Local Sources of Resistance?**

Resistance to Bayleton in California developed after 4 years, perhaps from fewer than 25 applications, because of poor management. In Europe DMI resistance first appeared in Portugal in the 7<sup>th</sup> year of use (1988), possibly equivalent to fewer than 40 applications. In Ontario, Nova was the first DMI registered for use against grape PM, in 1992. Rohm and Haas believes that only 2 applications per year have been used in Niagara vineyards. So by the start of 1999, when Nova failed in our vineyard, Nova would have been used only about 15 times. Because our vineyard was planted in 1996, Nova had been used only 5 times between 1996 and the fall of 1998. Therefore it appears most unlikely that resistance had originated in our vineyard from our spray program, and equally unlikely that it was introduced into the new

vineyard on planting stock supplied by local nurseries.

## **Airborne Spores From New York?**

Could DMI-resistant spores have been blown into Niagara from the extensive Concord vineyards near Fredonia N.Y, which are only 80 km due south of us? NY grape growers have used DMI fungicides since 1982; first Bayleton, then Nova and now Rubigan. Wayne Wilcox confirmed resistance to Nova in the Finger Lakes regions and has acknowledged DMI weakness in the Fredonia region. If 2-3 applications had been used annually over 17 years (1982-1998) prior to 1999, a total of 34-51 applications would have been made, and resistance might have been expected.

The spores of cereal mildews are very similar to those of the grape PM fungus, and cereal mildew spores are often transported by wind over hundreds of kilometers. The history of grape PM in Europe illustrates the speed, and the distance that this disease can spread in just a few years. In 1845 PM was found for the first time on glasshouse vines in S.E. England. In 1847, PM was found near Paris on glasshouse vines, and by 1854 the disease had spread throughout Europe. During this period, the crop loss was so great, that wine production was reduced to only 20%, until control measures utilizing sulfur were introduced. Therefore it is not unreasonable to suggest that Nova-resistant mildew may be dispersed equally easily. Resistant-PM may

*(continued...)*

# **Grape Powdery Mildew Becoming Resistant to Nova in Ontario continued...**

have been blown into Niagara from New York or Ohio, on occasional strong southerly winds during recent years.

## **Seriousness of Pre-Bloom Infections**

In Ontario, grape PM overwinters as very small black cleistothecia that are washed off the leaves in the fall and become trapped in the rough bark on the older canes, arms and trunk. During spring rains, the cleistothecia open and release ascospores which will infect leaves or clusters. In 2000 at Jordan Station, bloom occurred on wine grapes on 20 June, but mildew lesions were first noticed on the lower surface of Chardonnay leaves, in the cluster zone, on 7 June. That meant that a critical ascospore release and initial leaf infection must have occurred about 14 days before the lesions were noticed, on about 24 May. In fact there were three periods of rain and continued wetting in mid-May, one or more of which must have contributed to the primary infections on leaves in positions 4-8 from the base of fruiting canes.

As soon as lesions become visible, they are capable of releasing large numbers of spores for several weeks. When these lesions appear before or during the bloom to berry touch period, the risk of cluster infection becomes much greater than if only a few ascospores are involved. The PM protection program should be started when the shoots are only 10-15cm (4-6 inches) tall, about 4 weeks before bloom.

## **Clusters Very Susceptible at Bloom**

Recent research by Dave Gadoury and colleagues at the Geneva research station has shown that fruit clusters are very susceptible to PM infection during bloom, and for a further 4 weeks, until about berry touch. As grapes reach berry touch, the berries develop host resistance, and remain only slightly susceptible to new infections. In Ontario, we have noticed a severe worsening of bunch powdery mildew between late July and late August, but we do not know if this was due to new infections after berry touch, or to late-developing lesions from infections between bloom and berry touch. We have seen other examples where severe early cluster infections that appeared to threaten the crop, were well controlled leaving a good crop.

## **Spray Intervals And Spray Coverage**

The frequent rains during the early summer of 2000, prevented most growers from applying fungicides on schedule, resulting in stretched intervals, eroded deposits and poor control. With heavy mildew inoculum over-wintering from 2000, that will release ascospores in May 2001, it will be particularly important to spray early and often. In a year such as 2000, with high bud survival and vigorous shoot growth, some vines become too dense to allow good spray penetration and good spray coverage. The most serious problem is often in the center of the vine, where PM

often develops first, because it is closer to the sites where the mildew fungus has overwintered. Some shoot-thinning or leaf removal may improve fungicide performance during the critical bloom and post-bloom periods. Early-season weekly sprays are the best way of controlling mildew before it becomes established. If early-season PM is well controlled, later sprays with effective materials may be applied at 10-14 day intervals.

## **Fungicide Choices And Constraints**

The Nova-resistant PM that we observed in 1999 and 2000, may have been the "tip of the iceberg". It would be wrong to dismiss the mildew outbreak of 2000, as due entirely to difficult spraying conditions. A significant part of the problem may have been the partial failure of Nova during the bloom period, due to emerging resistant populations. Nova should not be relied upon for superior control at critical times. If Nova rates/ha are increased in a revised registration, and spray intervals shortened, control should be better, but the improvement may not be dramatic. Nova could be useful in the post-bloom sprays on Concord grapes, and in mid-summer (bunch-closure) sprays on wine grapes. With the threat of Nova failure, two Nova sprays should never be used together, instead Nova should be alternated with other effective materials. Based on our experiences of 1999 and 2000, it would be best to avoid using Nova during the critical bloom period.

*(continued...)*

## **Grape Powdery Mildew Becoming Resistant to Nova in Ontario continued...**

Some Niagara growers have recently used Benlate with moderate/good success against PM. However, the same precautions that are advised for Nova should be followed for Benlate. Benlate was first registered on grapes in Ontario in 1973, probably earlier in the USA. However, failure due to resistance was observed at Fredonia in 1979. So even

though Niagara growers may not have used Benlate very often, it could fail if resistance spores have been blown into Niagara from New York vineyards.

The critical shortage of effective fungicides for controlling powdery mildew is the reason to work towards an emergency registration for

Sovran. This is an excellent fungicide, but like Nova, it will have to be alternated with other materials to minimize the development of resistance. Quadris or Abound belongs to the same fungicide group as Sovran, and is registered in Canada, but it has not been made available by Syngenta. ▲

### **BOTRAN 75W**

It has come to our attention that Botran 75W was imported and distributed in Canada in 1998 and 1999 with the incorrect label included with the packaging. The USA label, with USA use instructions, was found in the pouches on the bags of Botran 75W. The USA label lists a number of crops not found on the Canadian label. Botran 75W PCP# 8772 is registered in Canada for use on Peaches, Onions, Beans, Greenhouse Tomatoes, Lettuce and Ornamentals. Botran 75W is not registered in Canada on any other crops and can only be used on those listed above.

The USA label can be distinguished from the Canadian label by the following:

<b>Canadian</b>	<b>USA</b>
PCP# 8772	EPA Reg. No. 10163-189
liters and kilograms	gallons and pounds

If you have a bag of Botran75W with the USA label in the pouch please contact one of the following to obtain a Canadian label.

CFIA Oliver: Diane Hood (250) 498-5307

CFIA Kelowna: Bill Smith (250) 470-4887

*If you have any questions please contact;  
Yvonne Herbison,  
Regional Pesticide Officier,  
Pest Management Regulatory Agency,  
Kelowna, BC*