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NEW YORK WINE & GRAPE FOUNDATION

Banded Grape Bug Injury Associated with Yield Loss in Concord Grapes

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In 1994, researchers and extension agents were confronted with a new and confounding problem in the Lake Erie region. Grape set malady, or 'millerandage', was starting to affect a significant number of vineyards and at the same time, baffling the experts. Visits to a badly affected vineyard revealed that the block had a large infestation of a small insect called the banded grape bug. We wondered whether the feeding activity of this insect could be causally related to the malady.

This observation prompted us to take a closer look at what banded grape bug (BGB) was doing out in the vineyard. Two years of research has led us to the conclusion that BGB was definitely not associated with millerandage. We did find, however, that BGB infestations can have a very strong and definite impact on yield. We can now say with confidence that BGB, when present in vineyards, has the potential to be one of the most damaging pests found on grapes in the Northeast.

Biology

BGB is classified as a 'true bug' in the order Hemiptera by entomologists. What this means is that it has piercing-sucking mouthparts, and feeds by inserting its stylet (tubular mouthparts similar to those of a mosquito) into plant tissue and sucking out liquid food. Insects that feed in this way insert saliva into the plant tissue, which often contains enzymes and toxins that have a disproportionate effect on tissue development. This appears to be the case with BGB, based on the types of injury we have observed.

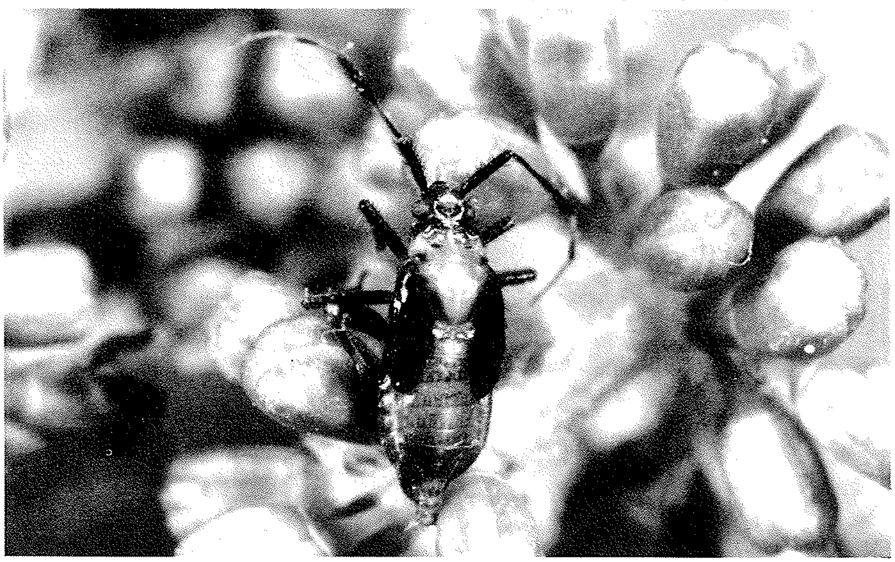

__Figure 1.__ Banded grape bug nymph feeding on grape cluster.

BGB completes one generation per year on grapes, and is active in vineyards from shortly after bud break to early July. BGB spends most of the year as an egg, which is the overwintering stage. Eggs are laid in crevices on second-year wood and vine trunks. They hatch when shoots are approximately 3–5 inches long, and the nymphs (immature BGB) then begin feeding on shoot-tips and newly emerged leaves. As flower clusters start to develop, BGB nymphs appear to move to the clusters and feed almost exclusively there (Fig. 1). Feeding appears to be concentrated in the pedicels (stalks) of individual florets, and also on the rachis (cluster stem). Nymphs pass through five stages before becoming adults. Development takes about 3 weeks at prevailing spring temperatures, and adults start appearing after the first week in June. In contrast to the nymphal stage, adult BGB are predators. They feed almost exclusively on insect larvae, and *do not feed on plants.* For this reason, all injury to grapes occurs when BGB is in the nymphal stages.

(continued on page 2)

Injury Evaluations

We have evaluated BGB injury through two types of studies. In 1995, we evaluated the effect of BGB injury on development of individual grape clusters at the Vineyard Laboratory in Fredonia, NY. The study design was simple — on each of 25 Concord vines, we enclosed two shoots (or individual clusters) with mesh bags. Into one bag we introduced 5 BGB nymphs. The other bag served as an uninjured control. Insects were caged for one week, and the cage treatments were repeated (on different shoots) over time. We caged insects for four different tme periods: Pre-bloom (first week in June); Bloom (mid-June); Post-bloom (first week in July); and Pre-bloom to post-bloom (6 weeks from late May through the first week in July). In this way we were able to pinpoint the time at which clusters were most susceptible to injury.

Results of this study were dramatic (Figure 2). Effects of injury during the pre-bloom period started with a 25% reduction in the number of florets per cluster. Further effects became apparent at fruit set, where the number of berries per cluster was reduced by 57%. Berry weight at harvest was reduced by 14%. The combined result of these effects was that cluster weight was reduced by 63%. Feeding during the bloom and post-bloom periods had no effect on cluster development, while the pre-bloom to post-bloom treatment showed effects almost identical to the pre-bloom treatment. Although anecdotal evidence for this type of injury was noted in a 1914 publication, this was the first evidence from a controlled study that BGB had such a significant effect on cluster development.

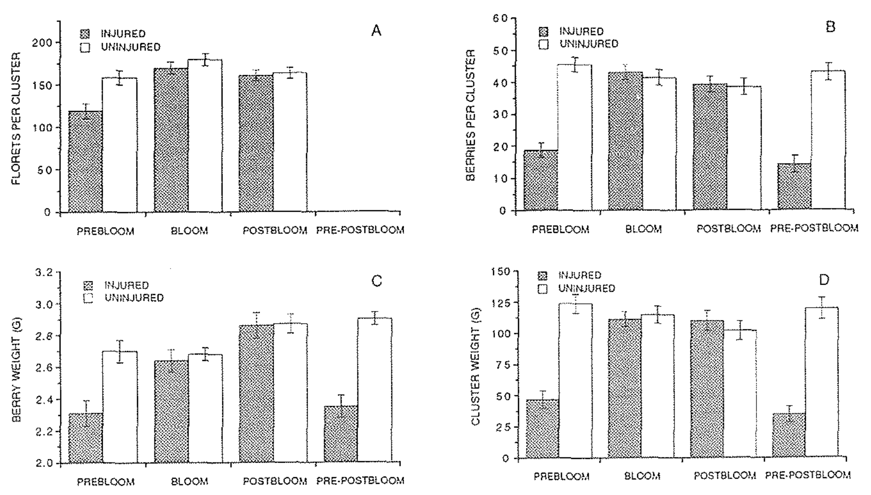

Figure 2. Effect of banded grape bugs placed in cages on Concord grape clusters during pre-bloom, bloom, post-bloom, and pre-bloom-to-post-bloom on florets per cluster (A), berries per cluster (B), berry weight (C) and overall cluster weight (D).

Table 1. Effect of banded grape bug injury on yield components of 'Concord' grapes in a commercial vineyard in 1996.

Attribute	Carbaryl-Sprayed Vines	Unsprayed Vines	% Reduction in Unsprayed Vines
Bugs per vine before treatment	18.5	19.5	-
Bugs per vine after treatment	0	21.4	-
Bearing shoots per vine	55.1	60.3	-
Yield (kg per vine)	14.1	10.4	26%*
Clusters per vine	165.4	131.8	20%*
Cluster weight (g)	84.6	78.8	7%
Berries per cluster	30.5	27.3	10%
Berry weight (g)	2.8	2.9	-
Juice soluble solids (%)	13.6	14.2	-

* means that differences were statistically significant at $P < 0.025$

We followed up the 1995 study in 1996 with a commercial vineyard trial in which BGB was eliminated in late May from one of the treatments with an application of carbaryl. We then made harvest evaluations where we measured yield and associated components. Results of this study were equally as surprising as the results from the bag experiment (Table 1). Total counts of BGB nymphs before spraying showed similar infestation levels of about 20 per vine in both sprayed and unsprayed plots. After treatment, there were no BGB nymphs in the sprayed plots. Sprayed vines yielded 31 lb per vine (9.4 tons per acre), while yield in unsprayed vines was reduced by 26% to 23 lb per vine (6.9 tons per acre). Separation of yield into its components showed that the major cause of this yield difference was a 20% reduction in the number of clusters per vine. Cluster weight was slightly lower, due to a small (but not statistically different) reduction in the number of berries per cluster.

Dividing the difference in yield (8 lb per vine) by the number of nymphs (20 per vine) leads to the surprising conclusion that each BGB nymph was responsible for 0.4 lb/vine of the observed yield difference. On a per-acre basis, that amounts to 245 lb/acre, or 0.12 tons per acre yield loss associated with 1 nymph per vine. At $200 per ton, the dollar loss per nymph would be roughly $24—an amount that would easily justify an insecticide application.

These results suggest that growers should examine their vineyards carefully to determine if and where BGB are present. Our experience is that this pest is most commonly observed in vineyards near woodlots, and that infestations are heaviest in border areas, much like grape berry moth. We also believe that BGB infestations are most common in the Lake Erie region. To date, we have not observed any significant infestations in the Finger Lakes region. We do not recommend routine insecticide treatments, as the abundance of BGB varies greatly from year to year and vineyard to vineyard. If an insecticide treatment is warranted, it must be applied between mid-May (6"–12" shoot growth) and early June (pre-bloom) to reduce injury. Further research and observation will help determine which types of sites and areas within vineyards are most likely to have significant infestations of this pest.

FROM THE EDITOR

Martin Goffinet

As the growing season is now upon us, it is the time once again for growers to anticipate grape bloom and its promise of the fruit to come. It is also the time to consider the various aspects of grape growing that cause growers so much concern. As outbreaks of pests and diseases are often most controllable in the pre-bloom period of the vines, it is important that we educate ourselves about what we can do about plant protection and when to do it for greatest effectiveness. New pests always seem ready to pounce if opportunity presents itself. Sometimes it seems that even our once-effective chemical spray program has lost its clout. Indeed, certain chemicals may even seem to promote outbreaks of resistant fungal pathogens. In this issue you will find two articles that touch on such problems. In the first, entomologists Gregory English-Loeb and Timothy Martinson (now Finger Lakes Grape Extension Educator) give a research overview of the banded grape bug, which is a pest deserving growers' attention. In the second, plant pathologists Wayne Wilcox, David Gadoury and Robert Seem review a 20-year history of research into grapevine powdery mildew.

Each year I try to provide an updated listing of research projects funded through partnerships between industry contributions and matching State dollars administered by the New York Wine & Grape Foundation. The Wine & Grape Foundation itself is funded by the State to run its annual programs and to sponsor research programs. Today, industry dollars are contributed towards grape, juice and wine research through several individuals and organizations, both in New York State and Pennsylvania. As university and State dollars remain steady or even drop each year, funding support by industry becomes more important. Listed in the table below are the research projects funded for the 1997–98 year through the Wine & Grape Foundation. In addition to the projects listed, the Foundation also lends financial support to such areas as New York's annual Wine Industry Workshop, the Geneva Experiment Station's Wine & Juice Analytical Lab, and this publication, "Grape Research News."

Grape-related research projects funded for 1997–98 by the New York Wine and Grape Foundation through matching money contributed by the grape industry

Researcher	Department/Organization	Project
VITICULTURE		
Thomas Burr	Plant Pathology, NYSAES, Geneva	Cultural and biological management strategies for crown gall.
Ling-Mei Chang	Biology Department, SUNY Geneseo	Genetic engineering of grape for disease resistance.
Gregory English-Loeb, Timothy Martinson	Entomology, NYSAES, Geneva	Increasing the effectiveness of native egg parasites and biorational insecticides for grape berry moth and eastern grape leafhopper control.
David Gadoury, Robert Seem, Wayne Wilcox	Plant Pathology, NYSAES, Geneva	Development of practical models for use in the management of grape powdery mildew.
		Forecasts of downy mildew for use in NY and PA grape programs.
Martin Goffinet	Horticultural Sciences, NYSAES, Geneva	Structure and development of grapevines in the Northeast.
Wolfram Koeller	Plant Pathology, NYSAES, Geneva	Novel opportunities for biological control of grape diseases.
Alan Lakso, Barry Shaffer	Horticultural Sciences, NYSAES, Geneva & Lake Erie RegionalGrape Extension Program,Fredonia	Supplemental irrigation, vine performance and economic feasibility for New York vineyards: interactions with pruning in mature vineyards and improved establishment of new vineyards.
Robert Pool	Horticultural Sciences, NYSAES, Geneva	Testing varieties, clones, rootstocks and production methods of *Vitis vinifera* for NY.
		Enhancing the competitiveness of the New York grape industry by optimizing yield, reducing environmental vulnerability and developing mechanized production systems.
Curt Petzoldt, Timothy Weigle	IPM Program, NYSAES, Geneva & Viticulture Lab, Fredonia	Operating funds for Northeast Weather Association.
Bruce Reisch, Leroy Creasy	Hort. Sci., NYSAES, Geneva; Dept. Fruit & Veg.Sci., Cornell, Ithaca	Resveratrol content in grapevine varieties and selections.

Grape-related research projects *(continued from page 3)*

Researcher	Department/Organization	Project
Warren Stiles, Robert Pool, Jose Saenz, Martin Goffinet, Richard Dunst, Philip Throop and Timothy Martinson	Cornell University Depts. of Fruit & Veg. Sci., Hortic. Sci., Vineyard Lab at Fredonia, and Finger Lakes and Lake Erie Viticulture Extension Programs	Nutritional factors affecting berry set and yield.
James Travis and P. Northover	Plant Pathology, Penn State University	Inoculum production and infection requirements for black rot.
Wayne Wilcox	Plant Pathology, NYSAES, Geneva	Inducing natural resistance to manage grape fungal diseases.
Wayne Wilcox, Robert Seem, David Gadoury	As Above	Epidemiology and control of black rot.
		Sustaining effective and efficient programs for control of grapevine powdery mildew.
PROCESSING/ENOLOGY		
Thomas Henick-Kling, Christoph Egli, William Edinger	Department of Food Science & Technology, NYSAES, Geneva	Yeasts in New York wines.
William Edinger, Thomas Henick-Kling	As Above	Production of grapeseed oil from pomace.
WINE AND HEALTH		
Leroy Creasy	Fruit & Vegetable Science, Cornell, Ithaca	Analysis of NY wines and juice for resveratrol and phenolic antioxidants.
		Control and application of resveratrol in grapes, juice and wine.
R. Curtis Ellison	Department of Medicine, University Hospital, Boston	Relation of wine and other alcoholic beverages to cancer and obesity.

MEETINGS & EVENTS

7–9 June 1997. "Wine and Juice Production and Practical Monitoring" Workshop. Holiday Inn Washington Dulles, 1000 Sully Road (Route 28), Dulles, VA. Sponsored by the American Society for Enology & Viticulture/Eastern Section. For more information contact Cynthia Wood, Viticulture & Enology Research Center, 2360 E. Barstow Avenue, Fresno, CA 93740-8003. Phone: 209-278-2089; Fax: 209-278-4795; E-mail: cynthia_wood@csufresno.edu

30 June–2 July 1997. American Society for Enology & Viticulture, Annual Meeting. San Diego Convention Center, San Diego, CA. In conjunction with the annual meeting, the ASEV is sponsoring a **Zinfandel Symposium** at the San Diego Hyatt Regency Hotel on 30 June. For pre-registration and exhibitor information contact the ASEV, P.O. Box 1855, Davis, CA 95617-1855, or E-mail to: asevdavis@aol.com

9–10 July 1997. Riesling Symposium. The Corning Radisson in Corning, NY. In conjunction with the annual meeting of the American Society for Enology & Viticulture/ Eastern Section (See below), a 1.5 day symposium will be offered on the viticultural effects and enological processes on Riesling wines. Topics include environmental requirements for growing Riesling, rootstocks and clones, viticultural effects on character of the fruit, winemaking variations, tastings, late-harvest and ice wines, Riesling-like varieties, regional styles, as well as a Riesling theme luncheon. For more information, contact Dr. Thomas Henick-Kling, Dept. Food Science & Technology, NYSAES, Geneva, NY 14456-0462. Phone: 315-787-2227; Fax: 315-787-2284; E-mail: th12@cornell.edu

10–11 July 1997, The 22nd Annual Meeting of the American Society for Enology & Viticulture/Eastern Section. The Corning Radisson in Corning, NY. The annual meeting (1.5 days) will be preceded at the same location by the pre-conference Riesling Symposium (1.5 days) (See above). The program includes research presentations on viticulture and enology from universities and industry, student paper and scholarship awards, trade show, wine reception, a luncheon featuring Riesling wines, and a an evening banquet featuring an awards ceremony and sparkling wine tasting. For registration or exhibitor information contact Dr. Charles Edson, 11 Agriculture Hall, Michigan State University, East Lansing, MI 48824-1039. Phone: (517)353-5134; Fax: (517)353-4995; E-Mail: (edsonc@msue.msu.edu).

Recent Findings on Control of Grapevine Powdery Mildew

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Over the last 20 years, grapevine powdery mildew has been the subject of intensive research at the Geneva Experiment Station. Following is a summary of some recent findings with practical implications for controlling this disease on *labrusca*, *vinifera*, and hybrid grapes.

When does fruit infection occur? We analyzed powdery mildew epidemics over a number of years, comparing the severity of fruit infection on unsprayed 'Rosette' vines with different weather factors during the season. This revealed a very strong relationship between the severity of fruit infection at harvest and the number of primary infection periods (>0.10 inches rain + temperatures >50°F) that occurred from just before bloom until fruit set (Table 1). Similarly, years in which 4 or more such events occurred during this fruit growth stage were typified by severe outbreaks of powdery mildew region-wide. Thus, we speculated that fruit might be most susceptible to infection during a relatively brief period during the initial stages of fruit development.

Field trials were established to test this hypothesis on Concord berries in 1995 and 1996, and on Chardonnay and Riesling fruit in 1996. Different clusters were inoculated with powdery mildew spores at approximately 2-week intervals beginning near the start of bloom and extending into the summer. Concord fruit were not sprayed with fungicide throughout the experiment. The *vinifera* vines were kept clean with Nova, but inoculated fruit were shielded within plastic bags during all spray applications from 3 weeks before their inoculation onwards.

Table 1. Relationship between powdery mildew severity on 'Rosette' fruit and the number of primary infection periods from prebloom through fruit set.

Year	%Fruit surface infected	Number infection periods* prebloom to fruit set
1988	<1	2
1989	25	7
1991	1	2
1994	61	7
1995	7	3
1996	31	6

*Infection period = > 0.1 inch of rain and temperature > 50° F

Concord berries were highly susceptible to infection at prebloom and fruit set, but they were nearly immune when inoculated 2 weeks or more after fruit set (Table 2). Results were nearly identical in both years, and have been confirmed by five different spray timing trials on Concords in the Lake Erie region over the last two seasons. That is, fungicides applied immediately before bloom and 2 weeks later provide as much protection against fruit infection as did sprays applied from prebloom through August. Rachises (cluster stems) and leaves retained their susceptibility later into the season.

Results similar to Concord were obtained with Chardonnay and Riesling fruit (Table 3). Although Chardonnay and Riesling fruit retained some susceptibility into mid-summer, *berries were **much** more susceptible to infection during the prebloom through fruit set* period than they were 4 weeks or more after bloom. In fact, fruit were relatively resistant to infection a full month before reaching 8° Brix.

Table 2. Development of powdery mildew on berries and rachises of Concord following inoculation at different stages of growth.

	Inoculation dates	Growth stage	Cluster surface infected (%)	Rachis surface infected (%)
1995	9 June	Prebloom	69	95
	21 June	Fruit set	50	79
	6 July	6 mm fruit	3	28
	17 July	10-13 mm fruit	<1	19
	Uninoculated		0	8
1996	20 June	10% bloom	5	88
	4 July	4 mm fruit	6	88
	17 July	10 mm fruit	1	71
	2 August	(4.2° brix)	2	82

Table 3. Severity of powdery mildew on Chardonnay and Riesling fruit inoculated at various stages of growth.

Inoculation date 1996	Growth stage	Cluster surface infected (%) Chardonnay	Cluster surface infected (%) Riesling
21 June	10% bloom	50	16
4 July	2-5 mm fruit	74	70
17 July	4-6 mm fruit	62	
2 August	4.0° Brix	<1	<1
15 August	4.5 Brix	0	0
29 August	7.2-9.3 Brix	0	0

Why do these results conflict with "conventional wisdom," which holds that fruit are susceptible to infection until sugar levels reach 8.0° Brix, and that established infections continue to sporulate and expand until 15.0° Brix? There are two likely reasons:

(i) Previous experimental work has been confined to laboratory inoculations of detached fruit of *V. vinifera* cultivars. Such studies neither account for continued maturation and natural resistance that develops as fruit age on the vine, nor have they been pertinent to *labrusca* and hybrid cultivars that are significantly less susceptible than *vinifera*.

(ii) Disease symptoms are very slow to develop on the fruit following infection. For instance, when the Concord fruit shown in Table 2 were inoculated at fruit set on 21 June 1995, only 12% of the cluster surface showed symptoms 5 weeks later (July 28), yet 50% of the surface was mildewed by August 25. So, if the inoculation experiments didn't show that these fruit were immune to new infections by early July, it might seem rational to assume that many new infections occurred during August. In fact, the increase in disease severity during August was due merely to the continued expansion of infections that occurred back in June.

The take-home message: Serious fruit disease that you see in mid-to-late summer is usually the consequence of events that occur during the early stages of fruit development, e.g., rainy weather and/or a problem with the spray program.

Controlling epidemic development on leaves. Recall that initial (primary) powdery mildew infections are caused by spores (ascospores) that overwinter in fungal fruiting bodies on the bark of the vine. Such primary infections occur during favorable weather between bud break and fruit set. Yet, even in a vineyard with a large supply of overwintering inoculum, the early waves of infection often are present in very low numbers that are hard to detect. Nevertheless, they are important. By studying the progress of powdery mildew epidemics on both sprayed and unsprayed vines over a number of years, we have determined two basic principles that govern how the disease increases from this inconspicuous phase into the all-too-conspicuous phase that everybody knows.

(1) Early epidemic development involves an increase in disease *incidence*, or number of infected leaves. Although the powdery mildew colonies remain small and scattered until mid-July or later, this number keeps increasing at a steady pace during the spring and early summer on both un-sprayed and sprayed vines (control is never complete). However, the earlier that the fungicide program starts and the more efficiently it's applied during this period, the fewer colonies that develop.

(2) The *severity* of leaf infection (larger, more conspicuous colonies) doesn't increase until late in the epidemic, generally mid-July or later. Often, this isn't until 50% or more of the leaves have at least one small colony on them. Fungicide sprays applied during this time greatly slow the rate of colony expansion, keeping more of the foliage healthy.

The take-home message: Early fungicide sprays hold down the number of leaves that become infected. Later sprays reduce the severity of those infections that do slip through. Both are important for maintaining healthy leaves.

Managing SI fungicide resistance. Resistance to the sterol-inhibitor (SI) class of fungicides (Bayleton, Nova, Rubigan, Procure) is complicating powdery mildew control programs throughout the region. (For an in-depth treatment of this topic, see the Spring 1996 issue of Grape Research News). Bayleton resistance is severe and widespread enough that we no longer recommend its use against powdery mildew. Surveys of resistance levels that we conducted in Finger Lakes and Lake Erie vineyards during 1996, plus recent grower experience, both suggest that the remaining SI's are still effective **if thorough spray coverage** is provided. However, previous margins for error are gone.

The explanation is simple. Individual powdery mildew isolates have a wide range of sensitivities to individual SI fungicides. To obtain a given level of control, a small percentage of individuals in a wild population need a very low dose, most need an "average" dose, and another small percentage need a significantly higher dose than average. After years of spraying, most of the survivors tend to be those individuals needing doses in the higher range. That's why 2 oz per acre of Bayleton routinely provided good control in the early 1980's, but 5 oz per acre now gives poor control in many vineyards. For this reason, we have suspected that the control problems sometimes encountered with SI's are typically rate-related, i.e., low dosages on certain tissues (incomplete spray coverage) are not sufficiently inhibiting the increasing population of less-sensitive isolates.

Table 4. Effect of rate, timing, and number of Nova sprays on disease control and selection of resistant isolates.

Treatment, rate per acre, (timing)	% Cluster area infected	Resistant isolates: % of Control*	Resistant isolates: % Selected**
Nova, 4 oz (Sprays #1-6)	6.2	76	21
Nova, 2 oz (Sprays #1-6)	15.9	40	38
Nova, 4 oz (Sprays #1-3) + Microthiol, 4 lb (Sprays #4-6)	5.2	81	9
Microthiol, 4 lb (Sprays #1-3) + Nova, 4 oz (Sprays #4-6)	14.8	44	data not available
Microthiol, 4 lb (Sprays #1-3) + Nova, 2 oz (Sprays #4-6)	25.3	3	data not available
Unsprayed	26.3	--	

* % control relative to the unsprayed check
** Product of (% isolates surviving treatment) x (% isolates resistant)

In order to maintain the usefulness of the SI's and avoid disease losses, we've promoted three basic anti-resistance strategies:

- Use no more than 3 or 4 SI sprays per year. This provides fewer chances to select resistant isolates.

- Apply SI's early in the season rather than late, not after the 1st or 2nd postbloom spray. This exposes fewer powdery mildew colonies to the SI than if you wait until mid-summer, hence fewer resistant colonies that can be selected and cause disease. Mid-summer is also a better time to use alternative materials than is the early season: sulfur because it is more active at higher temperatures, copper because it is potentially less phytotoxic then.

- Maintain good fungicide rates on susceptible tissues (good tank rates PLUS good coverage). As described above, this provides better control of isolates whose sensitivity level puts them "on the edge."

These three concepts were tested during 1996 in a Seyval vineyard near Dresden, New York, where Bayleton no longer provides adequate control but Nova and Rubigan have remained effective. Various fungicide programs were imposed, using six spray applications at 14-day intervals from early June (10-inch shoots) through mid-August. Sprays were applied with a hooded boom unit delivering 100 gal per acre before bloom and 200 gal per acre after, so coverage was thorough (thus, we figured that our 2 oz per acre rate might approximate the deposits provided on some tissues in a commercial vineyard when a "4 oz" rate is applied with poor coverage). Disease severity was rated in September, and a number of individual powdery mildew "survivors" were tested from each plot to determine their sensitivities to Nova.

Results (Table 4) indicate several things: (1) Approximately 36% of the powdery mildew isolates in the vineyard were controlled by a 4 oz/A rate of Nova but not by a 2 oz/A rate (76% control vs. 40% control). (2) When three sprays of Nova were followed by three of sulfur, control was as good or better than when six seasonal sprays of Nova were applied, but fewer resistant isolates were selected (the survivors made it simply because sulfur had its problems on a 14-day schedule in a wet year, rather than because they were resistant to the Nova). (3) Allowing mildew to build up with sulfur applications early and then spraying Nova provided poor control with the 4 oz rate and virtually no control with the 2 oz rate.

Take-home message: The anti-resistance strategies listed above really work. Poor spray coverage = low rates on susceptible tissues = poor control and increased resistance development.

Conclusion. Start spray schedules early to keep mildew colony numbers down. Do everything right in the immediate prebloom and first postbloom sprays: good material, good rate, good spray conditions, good coverage (every row and enough water for canopy penetration). Recognize that this will be doubly (triply?) important if weather is wet during the bloom and early post-bloom periods. Use SI's early and finish with alternative materials rather than the other way around.

ANNOUNCEMENTS

Two New Regional Viticulture Extension Educators Named to New York Regions

Timothy Martinson has accepted the position as Finger Lakes Viticulture Extension Educator, in the role recently vacated by David Peterson, who has resigned the position to work in his family's winery business. Tim comes to the Finger Lakes Program from a position as Research Associate in the Department of Entomology at the New York State Agricultural Experiment Station in Geneva, where he researched many aspects of grape insect problems. He served 12 years at Cornell, including his masters and Ph.D. degree work in entomology and his post-doctoral and research associate work in the grape entomology program at Geneva. During that time Tim took many opportunities to participate both in research and extension programs in the Finger Lakes and our other grape regions, so he is familiar with many industry people and industry problems. Many of his projects have included meeting and working with grape growers in their vineyards.

Tim has had a long and varied involvement in various aspects of field, horticultural and forest crop production. He grew up in a dairy farming community in Iowa. After high school he attended the University of Idaho, where he worked summers as a forestry technician for the US Forest Service, and completed a degree in plant science. He returned to Iowa to work with the Soil Conservation Service on a variety of conservation projects. He went into the Peace Corps as a volunteer in Honduras, where he was assigned to an agricultural school. There he taught entomology in the field and classroom, and supervised insect, disease and weed management on the school farm.

Tim is directly responsible for serving the grape education programming for Ontario, Schuyler, Seneca, Steuben and Yates Counties. He is excited to be working with the Finger Lakes grape industry and looks forward to developing a first-class grape educational program to fit regional needs.

Philip Throop has joined the Lake Erie Regional Grape Extension Program as the area's Viticulture Extension Educator, replacing James Kamas, who left the position to return to his native Texas. Phil's role as Extension Educator is to provide sound, practical, research-based viticulture education to growers and to enhance communication between the grape, juice and wine research faculty of Cornell and Penn State Universities and the grape industry in the Lake Erie Grape Belt.

"I am impressed that there is a good infrastructure for maintaining industry dialogue through the various committees," says Phil. "This is not something you see in all communities. Also, it is quite an honor and challenge to serve in a position where specialists have historically been innovative and active in their approaches to meeting the educational needs of the community."

Phil is a Michigan native and received his B.S. and M.S. in horticulture (fruit science) from Michigan State University. While in Michigan, he worked as a nursery manager. He also worked as a tree planter in the reforestation programs of several states. For two years Phil was involved in a Community Garden Project organized through the Lansing Food Bank. The Food Bank organization provided resources and information for community members to grow their own food.

An important asset Phil brings to his position is a knowledge of mineral nutrition. This season, besides his other duties, he will "jump right in" as an active participant in a multi-disciplinary research project looking at nutritional aspects of the problem of flower development and fruit set in the Lake Erie Grape Belt. Also he has initiated two new nitrogen experiments comparing effects of varied timing and rates of application. Vineyards of several area growers will be used in the research.

Wine East Publishes Annual Buyers' Guide

Wine East has just published the 1997 edition of the *Wine East Buyers' Guide to Winery and Vineyard Equipment and Supplies.* Feature articles in the new guide include "Vineyard Economics from Years 1 to 30" by Carter Price and Justin Morris of the University of Arkansas; Which Grape Varieties are Right for You?"; and the annual round-up of "New Products for the Grape and Wine Industries" by Linda Jones McKee. The guide also contains 17 summaries of previously published articles on buying various kinds of equipment and supplies. The *Buyers' Guide* is published as a service to wineries and vineyards east of the Rockies in North America. Requests for the *Buyers' Guide* should be sent to *Wine East*, 620 North Pine St., Lancaster, PA 17603, accompanied by a check for $3.00 to cover postage and handling.

Gratitude is expressed to those organizations whose support makes possible ongoing and valuable research activities for the benefit of the State's grape industry. Major funding is provided by the
New York State Wine & Grape Foundation; the Grape Production Research Fund, Inc.; the J.M. Kaplan Vineyard Research Program; and the Lake Erie Regional Grape Program.

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