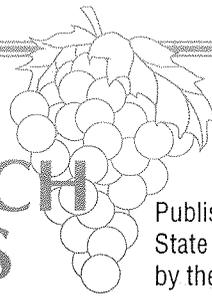


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RECORD COLD TEMPERATURES IN JANUARY 1994 What do they mean for New York Vineyards?

Bob Pool

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factors. First, we learned to grow healthier grapevines through the identification of better varieties and clones, appropriate rootstocks and development of good disease and insect management programs. Secondly, we developed a unique production strategy. In most grape production regions the primary goal is to grow vines which can endure cold temperatures (are cold hardy). In New York we have learned not only to strive to attain cold hardiness, but also to be prepared to endure cold damage to the vines.

The current winter has supplied cold weather in abundance. Winter injury to dormant compound buds may be mild, result in death of the primary bud (Fig. 1) or in death of primary and secondary buds. As a result, grape growers of normally cold-hardy grape varieties are wondering how much cold damage their vines may have. Many growers are faced with a decision as to whether they should alter their normal practices to accommodate possible bud injury. Fortunately, the development of improved technology to measure grape



Figure 1. A mid-winter compound bud ("eye") of Concord grapevine, cut to reveal a dead and darkened primary bud subtended by a living secondary bud.

The problem – enduring cold weather and enduring cold injury

There is no viticultural Eden; every grape production region has its limitations. In California, among other things, growers must worry about droughts and availability of suitable water, but for New York grape growers our cold winter weather is probably the major concern. New York has the coldest winter climate of any major grape producing area in the world. To avoid injury in the past, we grew mostly very winter-hardy grape varieties, such as Concord. In recent years plantings of relatively cold-tender grapes have greatly expanded. This expansion was made possible by two

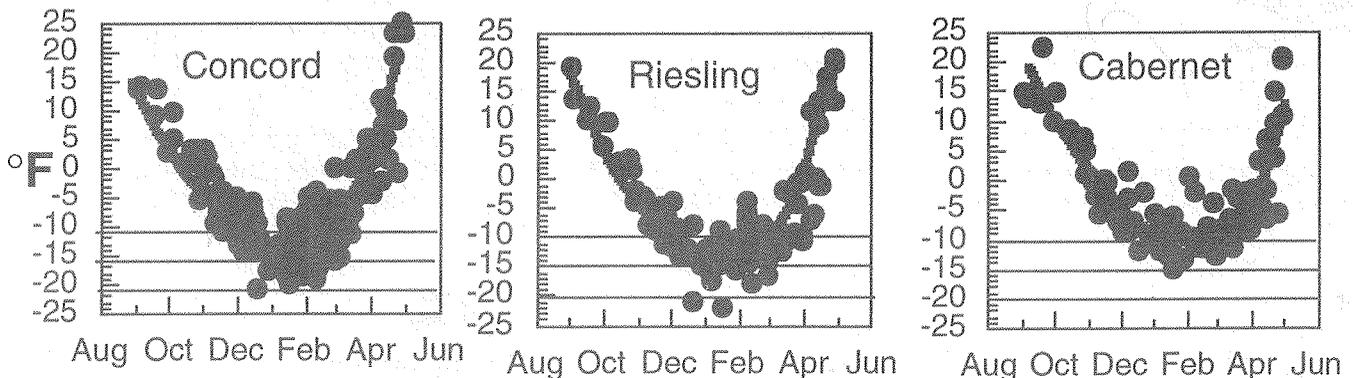


Figure 2. Seasonal changes in primary bud cold hardiness of three grape varieties growing at Geneva, NY during the period 1986–1993. Each U-shaped line is the best-fit line for the data points.

cold hardiness and the experience gained growing cold-tender grape varieties in New York allow us to supply growers with the information they need.

What have we learned from previous research?

In the past, knowledge of cold hardiness was gained through a combination of experience and laboratory tests which estimated vine killing temperatures using a statistical approach. Bundles of buds were subjected to different low temperatures, the amount of cold damage was estimated, and a thermal death curve was fitted. These data were useful, but suffered because hardiness had to be averaged over several vines. We knew the values obtained gave only relative ranking and greatly underestimated actual field cold hardiness. About eight years ago we applied a technique to grapes called differential thermal analysis, which accurately measures the freezing point of individual buds. Using this equipment we can ask much more precise questions and obtain information which has proven to reliably predict field survival.

Three important facts have been learned which will help us interpret cold injury in 1993/94:

1. There are three different phases of cold hardiness. In New York, acclimation begins in the fall (early to mid-September), reaches a maximum about Christmas time and is maintained through February. Beginning in March, cold hardiness is gradually lost and completely disappears in mid- to late-April.
2. Summer growing conditions primarily affect the rate at which cold hardiness is attained, but also affects maximum cold hardiness. "Vintage" years (those with above average sunlight and warm weather, combined with adequate rainfall) produce the best wine grapes and the most cold-hardy buds.
3. During January and February continuous cold (below freezing) weather will further lower bud freezing temperatures and induce increased cold hardiness.

Expected cold hardiness in January 1994

Summer of 1993 was excellent in regard to vine growth and fruit development. The first half of the growing season produced average heat, sunlight and rainfall. During the second half of the season, when the fruit and vine mature, conditions were above average in regard to temperature and sunlight. Rainfall was below average. All of these augured well for winter cold development. This was confirmed by our laboratory studies which showed that grapevines reached maximum cold hardiness earlier than we have before observed at Geneva. Similarly, conditions during late December through early February were anything but ideal for people, but nearly ideal for grapevine hardiness. During the period, maximum temperature at Geneva exceeded 32°F on only 3 days. Even then, because of cloudiness, most buds probably never thawed. Thus, most grapes were near maximum potential cold hardiness during nights and days of below zero temperatures.

What is maximum potential grape hardiness?

Since the fall of 1986, we have been measuring seasonal changes in the freezing temperature of buds of Concord, White Riesling and Cabernet Sauvignon on a weekly or bi-weekly basis. Figure 2 plots all these data for the years 1986 to 1993. Lines of best fit are shown, but difficult to interpret. They correctly show that Concord and Riesling acclimate quickly and that Concord de-acclimates early in the spring. However, during mid-winter (January and February) the lines only indicate relative hardiness. There is a lot of variation in mid-winter hardiness within a given variety among the different years. However, remember that in January 1994, hardiness was near maximum. Thus the more extreme (lower) killing temperatures apply. The data indicate that considerable survival can be expected for Concord even at temperatures as low as -20°F. White Riesling bud survival can be expected

at temperatures near -20° F, but Cabernet Sauvignon buds probably should not be expected to survive much below -15°F.

How is this information of use to the industry?

First, it tells growers what to expect, and can help them validate and interpret winter injury data they collect in their own vineyards. Secondly, it can help buyers plan for potential supply problems. Third, and most importantly, the techniques we use can help us identify better varieties, clones and ways to grow grapes so as to maximize hardiness.

Previous experience - the "Christmas Massacre" of 1980

What does it all mean, and how can I use cold injury data? To answer that and put the present injury situation in perspective, let's review what happened when we last had a major cold injury event in New York. Christmas Eve and morning of 1980 produced record cold temperatures in the Finger Lakes and Hudson Valley regions and resulted in the "Christmas Massacre" of grape buds - widespread cold injury. Fortunately, Western New York and Long Island were spared. Temperatures experienced in the Finger Lakes in 1980 were very similar to those experienced in 1994, but circumstances for survival were not so favorable in 1980. In late December, vines are just reaching maximum cold hardiness, especially with late-acclimating varieties like Cabernet Sauvignon, and there was no prolonged cold period of weather before the "Christmas Massacre" to further harden the grape buds.

Table 1 lists cold injury in the two years, 1980 and 1994, and also grape yield following the "Christmas Massacre" event. Note that a traditional variety (Delaware) suffered little injury. The hybrid varieties, Seyval and Cayuga White suffered more injury but bore full crops in 1981. The more tender vinifera varieties, White Riesling and Chardonnay, had more than 80% dead buds in 1981 but yielded respectable crops. However, vinifera varieties which

Table 1. Bud Kill during the 1980 Christmas Massacre and January, 1994. Vine yield in 1981 for different varieties growing at Geneva, NY.

Variety	1980 Bud Kill (%)	1981 Yield (Tons/Acre)	1994 Bud Kill (%)
Delaware	2	8.1	8
Seyval	71	8.2	18
Cayuga White	81	6.0	13
White Riesling	85	2.6	19
Chardonnay	89	1.9	39
Pinot noir (Gamay Beauj. clone)	96	0.7	23
Pinot noir (Geneva clone)	98	0.4	15
Chasselas d'Ore	98	0.6	39
Gewurztraminer	99	0.3	19
Cabernet Sauvignon	99	0.2	28
Chenin blanc	100	0.0	29

suffered more than 95% injury had little crop the next year. The fact that vines were able to produce fruit in spite of cold injury was because we were able to compensate for the winter injury by leaving more buds when pruning the vines. Where injury exceeded 60%, we essentially did not prune, and only removed buds which would interfere with future operations.

These data are reassuring for two reasons. First, in spite of massive injury in 1980, most vines were able to produce good crops in 1981. Secondly, injury levels we have measured this year are much lower than what we found after the "Christmas Massacre," even though the low temperature experienced in this particular vineyard was identical both times.

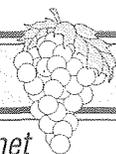
Strategies to endure cold injury

These data suggest what we recommend to growers. First, assess bud injury. If it is less than 20-30% probably nothing needs to be done. For 30-60% bud kill, extra

The future – nature of resistance, effect of rootstock, hardy clones

We will continue to monitor cold hardiness in the future, with several goals in mind. We are investigating how the rootstock may affect the seasonal patterns shown in Figure 2. We are continuing to test clones of major varieties to identify hardier forms. We are examining bud development in an attempt to identify the critical tissues which ensure cold hardiness. And, as more data are obtained, we will be able to model the vine response to changing weather conditions. This will allow us to identify critical events and to alert growers as to the need to check for cold injury. ■

FROM THE EDITOR



Martin Goffinet

The number one concern of grape growers and processors at this time is the cold hardiness of grapevine buds, canes and trunks. This has been one of the most prolonged and severely cold winters on record for New York and many other states. Reports of severe cold injury to vines are coming in from all over the eastern half of the U.S. and Canada. Because of these concerns I have asked Bob Pool, Professor of Viticulture, Cornell University, to present findings from his research program on the physiology of grapevine cold hardiness. Bob has been looking at varietal and rootstock differences and contributions to cold hardiness for many years. His article will give readers a good idea of how this winter compares to others and just what damage has been seen. As a companion piece, Dave Peterson, Finger Lakes Grape Specialist, has provided an updated survey of primary-bud damage taken from a number of Finger Lakes vineyards.

For a second article Alan Lakso, Cornell's grapevine physiologist, discusses factors limiting yields, yields vs. fruit quality relationships, and interactions of mechanized practices and the basis of yield. This article is excerpted from a longer version published by Alan in the 1993 Proceedings of the Second N.J. Shaulis Grape Symposium, "Pruning Mechanization and Crop Control." The proceedings' editor,

Bob Pool, and the author have graciously allowed its inclusion in this issue.

So, on the one hand we have an article examining the problem of winter cold hardiness and survival of live buds for spring growth, and on the other an article lending insight which growers can use in furthering their understanding of the limitations and opportunities posed by vine management and the environment. In this coming season we should genuinely appreciate any knowledge we can bring to bear on the question of optimal vine growth and yield. ■

COLD INJURY UPDATE: FINGER LAKES REGION

David Peterson, Finger Lakes Regional Grape Specialist
Yates County Cooperative Extension,
110 Court Street, Penn Yan, NY 14527

The cold blast that gripped the Eastern US in mid January set record temperatures in many areas and has caused great concern about potential injury to grapevines. Lows in the Finger Lakes ranged from approximately -8°F to -20°F. The warmest sites were once again on Seneca and Cayuga Lakes, although some sites on these lakes also reached -15°F or colder. Nearly all Keuka and Canandaigua Lake sites were in the -15 to -20°F range. Temperatures stayed cold over the entire last 2 weeks of January, with some days barely breaking 0°F as a high.

Variety	% Dead Buds:		# Sites Tested
	Average	Range	
Catawba	30	22-45	5
Concord	26	9-40	10
Niagara	37	24-50	6
Aurore	32	20-59	9
Cayuga White	49	37-73	5
Dechaunac	48	37-59	2
Seyval	72	58-95	3
Chardonnay	64	29-95	12
Gewurztraminer	76	60-98	3
Pinot noir	50	35-76	3
Riesling	63	46-92	9

I have been examining many vineyard sites and many varieties over the past several weeks to determine the extent of bud mortality within the region. At left is a summary table of my findings so

far. Also included in the data are reports from several growers who called in their findings to my office. It is important to keep in mind that these are ranges for only primary buds killed in the several vineyards examined for each variety; individual vineyards and varieties will vary.

I tried to include samples taken from colder as well as warmer sites for each variety, which likely contributes to the large extent of the ranges in some varieties. Other factors in the management of the vineyard (crop load, harvest date, disease incidence, nutritional status, etc.) are also likely to influence hardiness. Therefore, it is important that growers check their own vineyard blocks to determine the extent of damage, and to assess the need for changes in pruning and other potential adjustments. This report is by no means a comprehensive listing of the range of severity of injury within the region, and there are likely vineyards outside of the ranges reported (especially in varieties with data for only a few sites). ■

Viticultural and Physiological Parameters Relating Yield and Fruit Quality

(Extracted from The 1993 Shaulis Symposium:
Pruning Mechanization and Crop Control)

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Department of Horticultural Sciences
New York State Agricultural Experiment Station
Geneva, NY 14456 USA

Although yields are always important, a hallmark of grape production has been the emphasis on not only yield, but also quality. Over centuries of grape growing, especially for wine production, the concept has evolved that grape and wine quality are negatively related to yields. This simple concept has gained the power of law in many European wine producing regions, with strict limits on allowable yields in districts historically identified as high quality producers. Although undoubtedly true in many cases, the question here is what is the relationship of quality to yield or crop load, and what can we do to change or influence this relationship with viticultural practice?

In the simplest case there is a clear negative relationship between juice Brix and yield. Juice Brix may be the primary determinant of crop quality as in the case of juice grapes, but crop value is not linearly related to Brix, but more often to a threshold of adequate Brix (15° Brix standard for Concorde for example). The Brix-yield relationship can be used to evaluate strategies or practices to produce the highest yields of adequate Brix grapes. For example, Brix-yield plots show that besides sugar there are other aspects of the yield/quality question. The first is the importance of localized light exposure for both fruit yield and many attributes of quality. One of the most important contributions of the study of productivity was the finding that the basal portion of the shoots, where the clusters and the buds retained for next year's crop are located, has a localized requirement for good exposure to sunlight for high

productivity. This finding has been the basis of many modern training systems, such as the Geneva Double Curtain (GDC) that has essentially turned the vine inside-out in order to expose the basal leaves. Combined with canopy division, the GDC appears to have increased not only localized exposure for good quality, but also the total number of shoots that have good exposure giving high yield potential as well. In general, training systems that combine both good total sunlight capture while maintaining good localized exposure patterns can change the old assumption of low-yield/high-quality. Generally, such relationships are evaluated by expressing a supply/demand balance of leaf area (supply) to fruit (demand).

Leaf Area to Fruit Ratio

The physiological basis of this supply/demand relationship has been described as the increase in berry size, Brix, color or other maturity factors, with increase in well exposed, functional leaf area per gram of fruit (Fig. 1). After the final leaf area

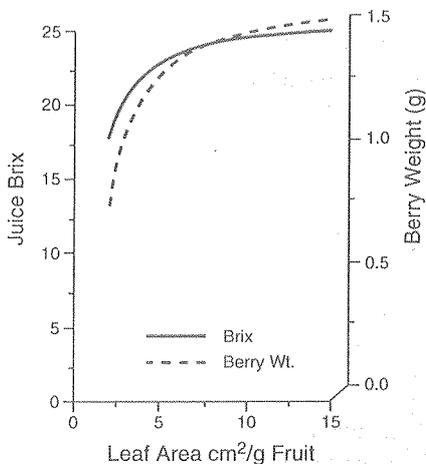


Fig. 1. Relationships of juice brix and berry weight to exposed leaf area per gram of fruit. From the work of Peter May and Nelson Shaulis.

above, this approach is very commonly used in many areas and is enforced in some by law. As discussed by Albert Winkler and others in their textbook, General Viticulture, the traditional method to reduce crop is to prune to low bud or shoot numbers to limit cluster numbers. The problem with this heavy-pruning approach is that vines with little crop and relatively few shoots have low capacity or supply but will tend to grow very vigorous canopies of large leaves with many laterals. Large berries result that may not have the skin-to-volume ratio needed for high wine quality. Consequently, the reduction in crop via heavy pruning leads to great efforts to fight vine vigor, because high vigor induces problems of internal shading that reduces grape quality and bud development and increases disease problems. To overcome vine shading problems many studies, pioneered by Dr. Shaulis here in New York, have been done to develop a great range of vine training and trellis forms and related practices such as summer pruning and leaf removal. Where crop reduction via pruning works best is in regions and with practices that inherently reduce vine vigor via shallow stony soils with low water-holding capacity, low fertilization, and other practices that stress the vine such that the leaf area side of the ratio is already equivalently reduced.

A better approach that was explained by Winkler, but felt not to be economic at that time, is to leave vines unpruned, but control the crop by fruit thinning. This gives a vine of high capacity and an excellent crop of good fruit quality due to a proper

balance of supply and demand. In the past such thinning was not commercially feasible except for table grapes, but now with mechanization there are excellent possibilities.

Leaf Area/Function Adjustments

The leaf area, or supply, side of the leaf/fruit ratio can also be influenced in many ways as discussed earlier. There are several aspects as indicated by the terms “exposed” and “functional”, as well as leaf area, that may be influenced. Decreases in the function of the exposed leaves due to poor fertilization, environmental stresses (e.g. drought or very cloudy weather), or pest stresses will reduce the efficiency of production of those leaves. If the crop remains the same, the reduction in leaf function will then cause an overcrop situation with low Brix and delayed maturity. We have found in studies here that drought causes reductions in leaf function that can have effects similar to overcropping, but that these effects were more severe if the crop was heavy. *Thus, it is important to maintain good leaf function so that the supply/demand balance established early in the season remains in balance throughout the season, especially in heavy-cropping vines.* This means good pest management and fertilization practices as well as site selection, floor management, and/or irrigation to insure adequate water.

INTERACTIONS OF MECHANIZATION AND THE BASES OF YIELD

The advent of mechanization of viticulture has required a re-thinking of many viticultural practices and their reasons. Many of the rules-of-thumb and relationships developed for normally pruned vines do not hold for hedged or minimally pruned vines. Perhaps severe pruning did not develop for quality reasons as much as for ease of harvest reasons. Although well supported many years ago by the work of Winkler and Shaulis, the concept of light or minimal pruning of grapevines in a modern vineyard has been difficult for some to accept since it contradicts

some traditional practices. It was assumed that: (1) minimally pruned vines would overcrop so heavily that fruit maturity would always be extremely poor, (2) yields would be very erratic and (3) canopies would be so dense that heavy shading of the basal fruiting zones would lead to poor fruit quality and difficult disease control. Initial observations on cropping of normally pruned vines left unpruned for a year supported some of these fears. The large clusters that develop in the buds of normally-pruned vines cause great overcrops in the first year without pruning. It required more years without pruning to see the new equilibrium that develops.

Potential physiological advantages of minimally pruned vines, especially the early canopy development giving more potential productivity, are beginning to be better understood. Minimal pruned vines capture more sunlight per acre over the season than conventionally pruned vines trained to the Hudson River Umbrella (HRU) system due to the earlier canopy development (Fig. 2). Even though the leaves of

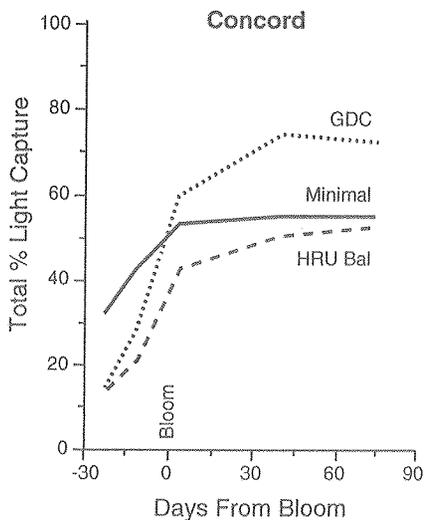


Fig. 2. Seasonal trends of light capture per acre of mature Concord vines in three systems: balance pruned HRU, minimal pruned HRU and GDC. Between bud break and harvest the total light capture was 42%, 49% and 56% for balance pruned, minimal pruned and GDC respectively.

Canopy characteristics, such as density and appearance, have not been the nightmare envisioned by many. Due to the development of so many shoots at the same time, each individual shoot does not develop as much as in normally pruned vines, each leaf tends to be much smaller than normal, fewer laterals develop, and the many short shoots appear to put less total weight into the canes. Additionally, the short, light shoots in minimal pruned vines tend to remain more erect and give a canopy that can be more porous than normally pruned vines with long, heavy shoots of very large leaves that can cause many shading problems.

minimal pruned vines tend to be older as a group than leaves of other systems, we have found good seasonal leaf photosynthesis rates on minimal pruned Concord vines here in New York. Similar results have been found in Australia with Rieslings. The severity of feared overcropping was also greatly overestimated since: (1) the supply was increased due to increased leaf area duration and sunlight capture and (2) the crop sizes were not as large as expected due to the much smaller cluster sizes and berry numbers per cluster. With some thinning, good maturity was found even with larger than normal crops. An additional advantage is that minimally pruned vines have many small berries that have the high skin-to-volume ratio that leads to strong character in the must. This appears to be the case in Australia where many strongly characteristic Chardonnay wines are produced from minimally pruned vineyards.

New Considerations

The increased potential productivity due to increased seasonal sunlight capture and photosynthesis comes with an increased water use requirement. In a current study on interactions of pruning regime and irrigation of established Concords in Fredonia, we have found in the dry 1991 season that, compared to the conventionally pruned vines, the faster early season canopy development of minimal pruned vines led to more rapid soil water use, earlier stress on the vines, earlier reductions in berry development, and greater impact of drought or, conversely, irrigation. This may not be important in irrigated areas, but in non-irrigated regions irrigation may need to be considered in order to obtain maximum benefit of minimal pruning. Additionally, the larger crops and higher total growth in minimal pruned vines may require re-evaluation of nutritional needs.

CONCLUSIONS

Although it maybe an odd result, it appears that modern mechanization has allowed viticulturists to come back to the concepts of Winkler and to grow the vine in a much more natural way that requires much less fighting with the vine and a better utilization of the inherent nature of the grapevine to produce a large crop of quality grapes. ■

The author acknowledges the many contributions to this work by colleagues N.J. Shaulis, R.M. Pool, R. Dunst, J. Kamas and A. Fendinger, and acknowledges the support of the NY Wine & Grape Foundation, the NY Grape Production Research Fund, and the Kaplan Viticulture Fund.

ANNOUNCEMENTS

UPCOMING EVENTS

The 45th ANNUAL FINGER LAKES GRAPE GROWERS' CONVENTION meets March 5 at Keuka College, Keuka Park, NY. For registration information, contact Dave Peterson, Regional Grape Specialist, Yates County Co-operative

Extension, 110 Court Street, Penn Yan, NY 14527. Phone: (315)-536-3381; fax: (315)-536-5145.

The 23rd ANNUAL NEW YORK WINE INDUSTRY WORKSHOP will meet in conjunction with the 1994 ANNUAL MEETING & SEMINARS OF THE NEW YORK WINE & GRAPE FOUNDATION on 23–25 March 1994, Jordan Hall, New York State Agricultural Experiment Station, Cornell University, Geneva, NY. The *Wine Industry Workshop* on March 23 and 24 will focus on *fermentation quality*. Speakers will discuss the microbiology of juices, wine fermentation, malolactic fermentation, and wine storage. Speakers include: Dr. Ralph Kunkee, Professor Emeritus, Department of Enology and Viticulture, University of California Davis; Dr. Paul Monk, Wine-Yeast Specialist, Lallemend, Australia; Mr. Erik Olsen, Microbiologist and Assistant Winemaker, Chateau Ste. Michelle; and Drs. Thomas Henick-Kling and William Edinger, Wine Research Program, Department of Food Science & Technology, Cornell University. Discussion will emphasize spontaneous versus inoculated fermentations, preparation and use of yeast and bacterial starter cultures, impact of selected yeast and bacterial starter cultures on wine flavor, microbial spoilage in juice and wine, nitrogen deficiency of musts, and management of *Brettanomyces* yeast. The presentations include tastings of selected samples of wine. To register for the Wine Industry workshop, contact Dr. Thomas Henick-Kling, Department of Food Science & Technology, New York State Agricultural Experiment Station, Cornell University, Geneva, NY 14456. Phone: 315/787-2277; fax: 315/787-2397.

The Annual Meeting of the New York Wine & Grape Foundation takes place on March 24 & 25, also at Jordan Hall, New York State Agricultural Experiment Station, Geneva. Topics will include seminars on: Total Quality Management, Employee Selection, Retail Sales Training, New Legislation, Export Opportunities, and other subjects. Willie Taaffe of Taaffe Management Group will present principles and strategies of the Foundation's "Total Quality Focus" program. Lynda Paulson, President of Napa-based Success Strategies, will discuss strategies for hiring the right people and techniques for training them to maximize sales. There will be panel discussions on comprehensive legislation passed in 1993 and the prospects for 1994 and beyond, and also on export opportunities associated with the Foundation's coordinated program. To register for the meetings and seminars of the New York Wine & Grape Foundation, contact Ms. Karyl Hammond, New York Wine & Grape Foundation, 350 Elm Street, Penn Yan NY 14527. Phone: 315/536-7442; fax: 315/536-0719.

The TABLE GRAPE PRODUCTION INTERNATIONAL SYMPOSIUM will take place 28–29 June, in Anaheim, CA. Contact: Dr. Nick Dokoozlian, University of California, Kearney Agricultural Center, 9240 South Riverbend, Parlier, CA 93648.

The AMERICAN SOCIETY FOR ENOLOGY AND VITICULTURE holds its 45th annual meeting on 30 June–2 July in Anaheim, California. For program

materials and registration information contact: ASEV, P.O. Box 1855, Davis, CA 95617. Phone: 916-753-3142.

The EASTERN SECTION, AMERICAN SOCIETY FOR ENOLOGY AND VITICULTURE holds its annual meeting on July 13–15, at the Holiday Inn, Middleburg Heights, Ohio (Cleveland Area). Information to be presented includes various aspects of viticulture, chemistry, microbiology and technology of wine making, and marketing and economics. Also featured is the "Regional Wine Showcase", a trade show, and a banquet. For information contact: Dave Peterson, Secretary ASEV/ES, Finger Lakes Grape Program, 110 Court Street, Penn Yan, NY 14527. Phone: (315)-536-3381; fax: (315)-536-5145.

A PINOT GRIS/PINOT BLANC SEMINAR will be held on 13 July, in conjunction with the above meeting of the ASEV/ES at the Holiday Inn, Middleburg Heights, Ohio. This seminar will have experts from the main Pinot gris/Pinot blanc regions from Europe, from the West Coast, a review of Eastern U.S. Pinot gris, and a presentation of the Pinot gris research by Ohio State University. There will also be a discussion of the viticultural, enological, historical and social aspects. A post-meeting tour of Ohio wineries is planned. For registration contact: Don Splittstoesser, New York State Agricultural Experiment Station, Geneva, NY 14456. Phone: 315-787-2275; fax: 315-787-2397. For further program information contact: Roland Riesen, OARDC, Department of Horticulture, Wooster, OH 44691. Phone: 216-263-3814; fax: 216-263-3685.

RECENTLY PUBLISHED INFORMATION ON GRAPEVINES

Grape Variety Bulletins Now Available

Two new publications on grape varieties have recently been released as Co-operative Extension Bulletins by Cornell University. These booklets give information on noteworthy varieties that can be recommended for cool-climate viticultural areas, with emphasis on New York. These bulletins will be listed, with other publications on grapes, in the newly revised "Cornell Cooperative Extension Catalog", which will be available from county extension offices by early March. Or contact: Media Services Resource Center, Cornell University, 7 Business and Technology Park, Ithaca, NY 14850. Phone: 607-255-2080. The two new bulletins are:

Information Bulletin 233. Wine and Juice Grape Varieties for Cool Climates, by B.I. Reisch, R.M. Pool, D.V. Peterson, M. Martens, and T. Henick-Kling. \$4.75.

Information Bulletin 234. Table Grape Varieties for Cool Climates, by B.I. Reisch, D.V. Peterson, R.M. Pool, and M. Martens. \$3.50. (Continued on back cover)

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.;** and, the J.M. Kaplan Vineyard Research Program.

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RECENTLY PUBLISHED INFORMATION ON GRAPEVINES

The Proceedings of the Second N.J. Shaulis Grape Symposium: *Pruning Mechanization and Crop Control*, July 1993, can be purchased for \$10.00, payable to: NY State Agricultural Exp. Stn. Contact: Ms. Gemma Osborne, Department of Horticultural Sciences, New York State Agricultural Experiment Station, Geneva, NY 14456. Phone: 315-787-2228; fax: 315-787-2216.

The Proceedings of the 22nd New York Wine Industry Workshop, Geneva, NY, 1993. \$10.00, payable to: NY State Agricultural Exp. Stn. Contact: Dr. Thomas Henick-Kling, Dept. Food Science & Technology, NYSAES, Geneva, NY 14456. Phone: 315-787-2277; fax: 315-787-2397.

The Proceedings of the ASEV/ES Workshop, 15 July 1992. *Wine Aroma Defects*. \$15.00, payable to: ASEV/ES. Contact: ASEV/ES, C/O Dr. Donald Splittstoesser, Dept. Food Science & Technology, NYSAES, Geneva, NY 14456. Phone: 315-787-2275; fax: 315-787-2397.

Several publications have recently been announced for sale by the American Society for Enology and Viticulture. Contact the society for prices or further information on the

publications given below. ASEV, P.O. Box 1855, Davis, CA 95616. Phone: 916-753-3142; fax: 916-753-3318. Selected publications are:

Handbook of Grapevine Certification and Clean Stock Programs in North America. (1994).

Cover Crops: A Practical Tool for Vineyard Management (1993).

Rootstock Seminar: A Worldwide Perspective (1992).

Vineyard Pest Management: Alternatives for the Future (1992).

Alternative Rootstock Update (1991).

Proceedings of the International Symposium on Nitrogen in Grapes and Wine (1991).