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The 2002 Grape Growing Season: Lessons for the 21st Century

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2002 brought serious problems for Michigan's grape farmers; if in the future we are to avoid those factors under our control which contributed to the problem (all obviously are not under our control), we must learn and profit from the lessons of our 2002 experience.

From time-to-time our response to seemingly unrelated events provide a basis for superior insights. The 2002 growing season, in my view, provided such an opportunity. In assessing this or any other complex problem it is useful to define the situation as simply as is possible while accurately expressing the problem and the conditions that influenced it. It is equally useful to eliminate unrelated phenomena so that the issue can be critically examined without distraction. Once accomplished, a complex problem may be sub-divided into its component parts and each part weighed as to its relative contribution to the problem. This is a rational approach to problem solving and this was applied to our assessment of the 2002 growing-season so that we could learn what contributed to the production challenges we experienced.

The Situation in 2002.

The spring of 2002 followed a 2001 season characterized by severely reduced crop levels per acre due to undesirable weather conditions during bloom, pollination and fruit set. In the spring of 2002, we followed the annual ritual of holding our collective breaths as early warm weather in March and April hastened bud burst. 2002 was a year when our worst concerns proved valid as early forcing of primary buds (in some cases secondary buds forced at nearly the same time) resulted in frost susceptible shoots that were killed by spring freeze episodes on April 22-23 and then again on May 20-21. These episodes and the poor crop of 2001 were the

ingredients of the experience we had at the beginning of the 2002 growing season.

Coming into the 2002 season many producers of Concord and Niagara grapes were under economic stress. The small Michigan crop in 2001 meant that finances were tight. There was reason for optimism, however, since the growing conditions in 2001 plus the low crop for that season had resulted in outstanding conditions for bud fruitfulness and excellent vine carbohydrate status as indicated by the heavy, dense, dark periderm canes we retained at pruning. In addition, many farmers retained 10-15% more nodes than the usual 90-100 for Concord and Niagara.

So, it was like a whip across the face on a cold January day when the first reports about the severity of the spring freezes and resulting bud losses began to come in. It seemed that each subsequent report was worse than its predecessor. The result was, understandably, a rapidly developed sense of despair on the part of farmers and a near funeral atmosphere on the part of producers and those working closely with the industry. To offer any positive thought was to be branded as "non-caring" or "insensitive". The consistent message given was "zero" crop.

The seriousness of the situation mobilized available resources as farmers sought input from extension, industry field staff and research leaders as to their options. At a meeting (May 7) called at SWMREC ~ 150 farmers attended. In addition to Dr. T. Zabadal, Superintendent at SWMREC, were Drs. R. Perry, Chairperson of the Department of Horticulture and A. Schilder of MSU's Department of Plant Pathology, field men from National Grape Cooperative, Ms. Leah Clearwater, Viticulturist from the Program of Viticulture and Enology also attended. Teaching responsibilities in the new Program of Viticulture and Enology prevented my attendance.

In early May it was the view of the Viticulture Research Program in the Department of Horticulture that the "zero" crop prediction was premature. It could well have been "zero", but we were still in the pre-bloom stage of growth, there were no carefully collected data on bud mortality and that made it too early to make the judgment. The anger that greeted Ms. Clearwater when she suggested that point of view made it clear that view was not popular.

The earliness of the season, the previous season's favorable weather and low crop, plus the experience with the 1976 Michigan crop (explanation to follow) were among the considerations that Ms. Clearwater and I discussed prior to her participation in the May 7 meeting at SWMREC. I cautioned her against taking a firm position on crop status, but strongly suggested that it was too early to predict 2002 crop level. To help producers find real numbers on bud survival, we developed a vineyard evaluation sheet and a protocol for its use in assessing their situation across different vineyard sites. It seemed clear then, as it does today, that nobody had a better insight into the crop potential of her/his vineyard than the producer. We passed out over 150 sheets for the evaluation and noted that we would provide input on potential crop if the data were sent to us. Of the 150+ sheets dispersed we received 2 requests for input.

Of greater interest to farmers was an attempt to get specific recommendations on whether to spray. The specific question most often asked was, "should I spray my 'zero' crop vineyard." Dr. Schilder accurately noted that the potential for differences across the grape production region made such a "blanket" recommendation unwise. This point was made again later in a jointly written article, by Drs. Schilder and Isaccs. Such a blanket response concerning spray application was bound to be wrong. It could be potentially inadequate at one end of the crop spectrum and a waste of time and money at the other.

Prior to the meeting, the Viticulture and Enology Program Team had met and discussed the situation and decided to get detailed field assessment of the bud-loss status of all vineyard research plots, most of which are in SW Michigan. Those data provided a basis for cautious optimism. While we do not select sites of only average quality for research efforts, the data collected suggested that Concord primary bud losses were highly variable based on site and ranged from a high of 56% to a low of 0%. Secondary bud loss was only 20% at the most severely damaged site (2-sites in Berrien Co., 1-in Van Buren Co. and 1-in Ingham Co.). Total bud counts were nearly 5500, so there was sufficient sample size. Niagara data indicated that they were slightly less damaged with a loss of 51%. Loss of secondary buds was greater on Niagara than the greatest on Concord with highest levels at 39%.

Data Value?

What was the value of such data? The location and variety variability made it very clear that assessment of crop potential could only be determined on a

site-by-site and a variety-by-variety basis. We shared this data with processor field men and subsequently agreed with the view that such optimistic numbers could be misconstrued as a general, industry-wide prediction. There was also the concern that such data could potentially undermine future efforts to gain Federal Disaster Assistance. I still believed, however, that their greatest value was as an incentive to get producers to more carefully assess their individual vineyard site's status. I also retained the nagging thought that there was greater potential production than the "zero" crop being suggested.

The 1976 Experience.

Part of that nagging feeling flowed from the experience of the 1976 season. Conditions were almost identical to that of 2002 and dire predictions of very minimal crop were presented. When the crop was in we had more than twice the projected tonnage. Another set of factors also influenced the judgment that there was potentially more crop - the 2001 growing-season. The low crop and superior season weather were noted above, but the reasoning was not explained. Low crop in 2001 meant excellent carbohydrate status during the critical period of flower cluster and floret initiation. The good, warm temperatures during the months of July and August also favored the initiation of more flower clusters per shoot and more flowers per flower cluster. In short, I thought it quite possible that we might see an additional cluster on strong shoots and more flowers on all clusters. Given good weather during bloom and fruit set we had data from other years suggesting that both within cluster and within vine compensation was possible, resulting in more and larger berries on a cluster than would occur under common conditions of full bud number. Still, all this was pre-bloom. We had only to look at the 2001 season to see how quickly good circumstances could go bad. But, it was too early to call "zero" crop.

2002 and "Zero" Crop.

The 2002 season is now history and it is well known that there was indeed a crop considerably larger than the "zero" predicted in early May. Some who predicted "zero" crop have expressed surprise at the crop's size. We were not. We had been in vineyards all summer and estimated by mid-July that we had a ~40% crop. I also knew that we had a lot of *Phomopsis* in the Niagara. It is now known that nearly 1000 tons of Niagara grapes were rejected due to inadequate protections for grape berry moth (GBM) and related pest problems on cluster rot. Less quantifiable is the loss of Concord and especially Niagara to pre-harvest drop resulting from *Phomopsis*. That

loss was made worse by the drop in front of the harvester as the vines were shaken. Both losses were preventable given adequate programs of protective sprays; the sprays were not applied based on the initial mistaken assumption that there was "zero" crop or the crop was insufficient to warrant protection.

Lessons?

So, those were the 2002 experiences. What are we to make of them? What were the lessons to be gained? If crop-reducing spring freeze episodes are so infrequent, how can a collective wisdom be established with long-term memory? That is a challenge, but not one that is insurmountable.

2002 experiences resulted in a number of expressions of frustration. Some expressions suggested that extension and industry leadership was ineffective in its responsibility to guide grape producers. Other expressions suggested that grape farmers were unwilling to apply the inputs and suggestions made by extension and industry field men. In the end there were hundreds of tons of grapes lost unnecessarily in a year when every ton of grapes was most strongly desired by the processor, every producer needed the cash flow and the fruit was nicely ripe based on fruit composition values in our plots.

A Time- Line.

One method of dealing with the 2002 type experience is to look at it via a time-line approach; what did we know, when did we have the opportunity to be knowledgeable, and what could we have done with the information. This guide should be relevant to any future year when spring environmental conditions threaten production.

First. Do an Assessment of Bud Survival.

There was a critical need for individual vineyard assessments of the amount of bud kill sustained resulting from the two spring freeze episodes. Given the magnitude of the task, that could have been done by only one organization – the individual vineyard owner, operator and/or their employees.

Second. Maintain Objectivity.

While such losses are always painful, it is crucial that all interested persons maintain objectivity. This is most important for industry leaders, extension personnel, processor field men and grape researchers. In some future year there will possibly be a truly "zero" crop year. When that occurs, we must recognize that the situation is bad, but that it is beyond our control. More

likely will be circumstances as in 1976 and 2002 when we know that there are losses, but are ignorant of the level of the loss. Only through the use of rational, objective assessment can that ignorance be dispelled and accurate assessments of crop potential be made. Objectivity is also important as we consider the future potential of Federal Disaster Assistance. We want to avoid the appearance of "crying wolf" until we can say that we see fur and teeth.

Third. Consider the Characteristics of the Previous Growing Season.
Assess last year's weather during the critical period from 2-weeks before bloom until veraison. The 2001 season was a clear indicator of superior potential fruitfulness (yield/node retained) because of the low crop in 2001 and the good, warm season during the pre-bloom to veraison period.

Fourth. Estimate Crop Potential.
Like bud survival, the scope of this evaluation makes it possible for this to be done only by the vineyard manager and/or employees. Such estimates are not accurate to within 1-lb/vine, but can suggest yields within + or – 1.0 T/A. The methods to do this are well defined and the accuracy of such estimates get better as one gets nearer harvest and the vines have fewer and fewer environmental factors limiting potential yield.

We can know potential crop pre-bloom based on previous averages/surviving bud, but poor fruit-set as in 2001 would throw that off. 2-3 weeks post bloom is usually a reasonable time to estimate clusters/shoot and berry set. Dry weather, wind damage, hail, *Phomopsis*, *Botrytis* and an array of other factors can reduce the potential yield, but that is always the case. Dr. R. Pool viticulturist at the Agricultural Experiment Station at Geneva, NY has shown that berries on Concord vines at 1200 growing degree days (GDD) are at 50% of their final weight. Sampling vines at or very near 1200 GDD will provide an indicator of the final crop potential as early as 25 June (in excellent years like 1991 and 1998) but no later than 20 July (in terrible years like 1992). This will not be dead-on, but can serve as a good indicator of crop potential and economic levels of yield. Since these will vary with crop level, this can be assessed in a general by MSU research and extension staff and National Grape Cooperative field men, but nothing can replace on-site assessment by the vineyard manager.

Fifth. Pest Control Sprays.
This is a most difficult issue and I defer to my colleagues Drs. Schilder and Isaacs with regard to any specific suggestions. However, it does seem clear

that some protective sprays must be applied before it is possible to determine crop status. Extension Bulletin E-154, the Fruit Management Guide indicates both pathogen and insect sprays for cutworm, flea beetle, *Phomopsis*, powdery mildew, black rot, and *Botrytis* before bloom. Such protections may be made annually on a good faith basis with no assurance that there will be a crop after fruit-set. GBM sprays typically begin immediately post-bloom and a good program of monitoring is required to determine the specific situation within each vineyard plot. As noted above, by 2-3 weeks post-bloom we can typically determine crop status within broad definition (big, normal, small, non-economic).

Variety Differences.

Some assessment of variety differences seems necessary. Niagara vines appear to be more susceptible to *Phomopsis* than do Concord vines. Reducing early season sprays may be penny-wise and pound foolish, especially when one considers the next year's build-up of disease inoculum. Similarly, maintaining an effective control program is essential for reducing the risk of load rejection.

Evolution in Production Methods.

All the current Integrated Viticulture approaches are aimed at the goal supported by nearly every grape farmer – reduced sprays at levels to achieve acceptable pest control. This idea, revolutionary in the 1970's, is wide-spread today. At the heart of this program's successful application is an active, competent program of vineyard scouting – commonly done by hired consultants. I believe that the 21st Century will see this kind of on-going vineyard assessment expanded to include currently well understood methods of crop prediction and crop adjustment. The economics of both juice and wine grape production will be major pressures pushing such an effort.

The success of Michigan grape producers in the 21st Century will require an evolution in production methods and greater input by educated and trained individuals with understanding of grapevine physiology and the influences that annual weather patterns can have on the expressions of that physiology. Vineyard managers will need such education, or become economically capable of hiring such persons. My view is that this is the only way to achieve and maintain the highest levels of production of fruit at quality levels acceptable to the processor. If we can learn this lesson from the 2002 Michigan grape season, then this horrible experience will have served the long-term good of the industry. Alternatively, we can experience the

validity of the quotation by the philosopher Santayana, "*Those who do not learn from history are doomed to repeat it*". My sincere hope is that it will be the former.