

DEVELOPMENT OF A MICHIGAN FRUIT BRANDY INDUSTRY

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And Cherry Research Committee)

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ABSTRACT

The development of a fruit brandy industry in Michigan is the subject of the research and development program. Fruit brandy, which is widely available in Europe, is virtually unknown in Michigan and the U.S. The objectives of the program are to establish the correct conditions for fermentation and distillation to be used with Michigan fruit for brandy production. To ensure that the research is relevant to industrial needs, a Michigan Fruit Brandy Industry Advisory Board has been formed including members from Michigan commodity groups and the first group of wineries entering brandy production.

PROBLEM STATEMENT

Michigan's plant agriculture industry is one of the most productive and diverse industries in the U.S. Unfortunately, the fruit production segment of the industry is a victim of its own success. Improvements in production techniques have made surpluses in most major crops a common occurrence. These surpluses have created significant downward pressure on prices.

In addition to surpluses, many fruit crops have defects that result in reduced value and in the most extreme cases no market at all. Some typical examples of defects include:

- i. Tart cherries- late season cherries are soft and difficult to pit.
- ii. Apples- cosmetic defects and small size often reduce market value.
- iii. Plums- difficulty in pitting of ripe fruit.
- iv. Pears- over population leads to small fruit size.
- v. Peaches- ripe fruit is difficult to process and small size is unacceptable.
- vi. Grapes- improperly pressed fruit leads to poor juice yield.

An alternative use of fruit that is widely practiced in Europe, yet is virtually unknown in the U.S., is the production of fruit brandy. In principle, any fruit can be used, but the six listed above are generally the most popular. Unlike regular brandy like cognac, the fruit brandies are produced by fermentation of whole fruit, not juice. The use of the whole fruit obviates the need to remove pits or seeds. Furthermore, since the fruit is ground or crushed prior to fermentation, size defects are of no consequence. Over ripe fruit is of particular utility since it contains higher sugar levels than earlier season fruit, which leads to higher alcohol yields. An additional aspect of a Michigan fruit brandy industry is a change in State law that allows existing wineries to enter fruit brandy production by acquiring an inexpensive (\$100 annual) license. Given the various factors listed, it is the objective of the proposed program to develop the technology for production and simultaneously develop an industry wide promotion plan for Michigan fruit brandy.

SPECIFIC OBJECTIVES

1. To develop appropriate fruit selection protocols.
2. To develop appropriate fermentation conditions.
3. To develop distillation procedures.
4. To develop a quantitative, consistent measure of product quality.
5. To develop new products based on distilled spirits.
6. To develop industry wide marketing strategies.

SPECIFIC METHODS AND DESCRIPTION OF APPROACH**Organizational Approach**

Michigan Fruit Branch Industry Advisory Board. In order to ensure that the proposed research program addresses the needs of Michigan industry, an industrial advisory board has been formed. The following representatives from the major fruit commodity groups and Michigan wineries that will start brandy production serve on the Board:

Cherry Marketing Institute- Phil Korson
 Michigan Apple Committee- Mark Arney
 Michigan Grape and Wine Industry Council- Linda Jones
 Michigan Plum Advisory Board- Perry DeKryger
 St. Julian Winery- Chas Catheman
 Chateau Chantal- Mark Johnson
 Blackstar Farms- Donald Coe

MSU Distillation Facility. A fruit fermentation and distillation facility has been established at MSU. The facility has a ten liter experimental still and a 150 liter production scale still. In addition, HPLC and gas chromatography are available for product evaluation and quality control. The Bureau of Alcohol, Tobacco, and Firearms has granted an experimental distillation permit to MSU.

PROGRESS ON SPECIFIC OBJECTIVES

To develop appropriate fruit selection protocols. A critical element of any brandy production process is the quality of the starting material. We have tested the use of frozen fruit for cherries, pears, and plums for brandy production. It is our conclusion that while frozen fruit can be used, it does not have the same level of flavor and aroma as fresh fruit. This result is consistent with European practice. Therefore, we do not in general recommend the use of frozen fruit for production of the highest quality spirits. We will not study this issue in the upcoming year's proposed research.

To develop appropriate fermentation conditions. We have used champagne yeasts for production of brandy with excellent results. These yeasts exhibit high speed of fermentation to avoid contamination, fermentation to dryness to ensure highest yield, and require minimal other nutrients for successful fermentation. Control of the generation of off flavors such as acetaldehyde or fusel oils, which are negative flavor components is generally accomplished by temperature control of the fermentation. Our results indicate

that temperature less than 70 F should be used. These temperatures require cooling during fermentation.

Distillation procedures. Batch distillation is used in the production of brandy. The procedure is to collect the three fractions from the still called the heads, hearts, and tails. The heads contain off flavors and unwanted compounds, but also contain positive aroma contributions. Therefore, it is always desired to make this fraction as small as possible. The hearts comprise the product. The tails contain fusel oils, which are very negative flavor components. It is proposed to develop fast gas chromatography to be used as a real time process monitor. By using real time measurements, the distiller will know precisely when to make cuts. Furthermore, the initial quality of a batch will be known. This quality attribute will allow the distiller to know whether the product can be used as a brandy or whether it should be blended.

Quantitative, Consistent Measure of Product Quality. Unlike wines, brandies do not have vintages. A critical element for success is the development of consistent products. It is proposed to develop a chromatographic database for evaluation of products. The approach will be to establish a calibration for the nearly four hundred possible compounds found in brandies. A specific brandy will be analyzed to determine the presence of each compound. This quantitative measure will be compared to expert taste panels to establish which compounds result in positive or negative flavor attributes. Ultimately, this approach will permit a figure or merit, or grade, to be established for each brandy analyzed. It is not the goal, or even desirable, for every brandy to be identical, but this approach will emphasize reproducibility and to ensure negative flavor compounds are avoided.

New Products Based on Distilled Spirits. It is recognized that consumer acceptance of clear fruit brandies, eau-de-vie, will not be immediate. While markets are developed for eau-de-vie, other, more easily marketed products will be developed. The two product categories to be developed are fortified wines and infusions/ liqueurs. Fruits are generally low in sugar and result in wines of low alcohol content. An alternative approach is to produce a fortified wine that is made by partial fermentation of juice followed by addition of high proof alcohol. In the present case, brandy would be the alcohol used to fortify. This combination results in a port wine. Other possibilities are sherries or desert wines. A second product line includes infusions and liqueurs. These products will be produced by using brandy as a base. For an infusion the fruit is soaked in the brandy to extract flavors and colors. Liqueurs, on the hand, permit color, flavor, and sugar to be added. In all cases, products will be developed with close industrial interaction.