

Executive Summary

The Impact of Methoxy pyrazine on Aroma and Flavor of Bordeaux Style Red Wines Produced in Cool Climates

TITLE: Reducing the Impact of Methoxy pyrazine on Aroma and Flavor of Bordeaux Style Red Wines Produced in Cool Climates.

CURRENT YEAR: 2002-2003 **YEAR INITIATED:** 2000

PERSONNEL: G. Stanley Howell, Principal Investigator
Randy Beaudry , Flavor Chemist
Daniel Wampfler, Enology Graduate Student

PROGRESS TO DATE: Since the last report was submitted to the Michigan Grape and Wine Industry Council regarding the project on the reduction of methoxy pyrazine, much progress has been made. Mr. Daniel Wampfler has been diligently working on a detection and quantification method and has recently had a breakthrough proving successful. The procedure is relatively simple to perform and requires a similar amount of time to complete as the previous method of Solid Phase Microextraction, while allowing for the lower detection limits of that in wine (1-50ng/L). The newly implemented protocol requires that an internal standard (80ng/L deuterated IBMP) be added to a sample of wine (~150 mL), and then the wine sample be distilled in a common enological laboratory apparatus known as a Cash Still, typically used to measure the volatile acidity and alcoholic strength of wine. After distillation is complete the distillate is passed through a small amount of strong acid cation exchange resin. Methoxy pyrazine is slightly basic and it is adsorbed on the resin bed. Sodium hydroxide, a strong base is then passed through the column to strip all of the methoxy pyrazine off the column and into a collection vial. Methylene chloride an organic solvent is then used to perform a liquid-liquid extraction, transferring the methoxy pyrazine from the aqueous phase into the organic phase. The organic phase containing the methoxy pyrazine is then concentrated further by the evaporation of all but a few microliters. The sample may then be injected directly into the GC-Mass Spec for analysis. The addition of a deuterated internal standard allows for the quantification of the actual concentration of methoxy pyrazine while also accounting for any loss of target compound throughout the sample preparation and analysis procedures.

POSSIBLE APPLICATIONS: At the onset of harvest, the detection and quantification method will be streamlined to the point that samples will be able to be prepped and analyzed at a relatively rapid rate, allowing for the monitoring of methoxy pyrazine levels in product at any stage, such as juice, during fermentation, and on throughout the aging and maturation of finished wines. Because of the ability to analyze a wide range of sample types, many research trials, some already set in place, can be set up. Examples of vineyard trials are: training systems, crop load, leaf area, canopy management and trellis system. Enological experiments may consist of malolactic bacteria strains, yeast choice, thermovinification trials, oak powder/chip additions, and barrel aging trials. It is not a simple task to set up all of these trials and is impossible to perform them simultaneously, however berry samples can be frozen and analyzed at a later date than when harvested. Similarly, wine samples can be gathered and stored in a cellar to be taken out and analyzed without the threat of large variations in methoxy pyrazine concentrations.

ATTACHED CHROMATOGRAM:

Included in this report is a recent wine sample that was spiked with 1 part per billion methoxypyrazine. This concentration in the sample is higher than the concentrations commonly found in wine (average of 15ng/L or 1 Sppt) however, after further analysis and calculations of peak area, common methoxypyrazine concentrations of that in wine can be detected with the procedure and analytical equipment employed. The peak that has been highlighted in yellow represents the methoxypyrazine molecule.

PLANNED TRIALS FOR 2002 VINTAGE:

Berry samples of Cabernet Franc grapevines will be taken beginning at veraison and then every two weeks thereafter to be analyzed for methoxypyrazine levels throughout this time period. When the grapes have been determined to be ripe for the production of wine, a lot of grapes will be chosen as to provide enough material for the production of 30 gallons of wine. A yeast trial will then be set up to determine if yeast choice plays a role on the concentrations of methoxypyrazine throughout fermentation. Several commercially available yeast strains will be chosen and wines will be inoculated. In addition to the wine being analyzed by GC-Mass Spec, a tasting panel will be trained specifically for sensitivity to methoxypyrazine and all wines will be organoleptically evaluated with results being compared to analytical lab data.

Our commitment to the Council and the industry is strong and we are making progress towards the reduction of methoxypyrazine in cool climate wines. We plan to seek funding from the Council and the Viticultural Consortium in the next funding cycles.