Waters
Lab Highlights
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WATERS™ NEW COLUMN FOR FRUIT JUICE ANALYSIS

"A meal without wine is like a day without sunshine" - so says the old Italian proverb. To ensure a cloud-free atmosphere, the California wine industry established the California Wine Grape Inspection Program. Through most of the program's history growers and vintners relied on tedious and subjective hand sorting methods to establish the quality of an incoming lot of grapes. With the introduction of mechanical harvesting hand sorting became impossible since the grapes are removed from their stems and are partially crushed, and a different (and more objective) method was sought. After considerable study, the program found that HPLC offered an accurate and reproducible method for determining the defect level in wine grapes, thereby protecting the interests of both grower and vintner in establishing the price paid for the crop and assuring the consumer of a sound product. This is one of the first examples of HPLC being used to determine the price of an agricultural commodity.

Defects in wine grapes are produced by undesirable microorganisms (molds, yeasts, and bacteria), and may be detected by measuring their metabolites. One particular mold found in cooler growing areas, such as the Napa Valley, produces appreciable quantities of glycerol. The so-called sour bunch rot in warmer areas such as the San Joaquin Valley produces acetic acid in addition to glycerol. Premature yeast fermentation will produce ethanol. Accordingly, it is necessary to analyze for these three substances in the presence of the large quantity of sugars (> 20%) found in grape juice, and the sulfur dioxide added as a preservative. Furthermore, the analysis must be complete in five minutes.

The defect analysis is best carried out on a cation exchange resin in the hydrogen form, a so-called "organic acid" column. Because of the need for speed and the limitations of competitors' resin technology, others have been limited to use of a 10 cm column, with resolution of the components of interest often poorer than desired.

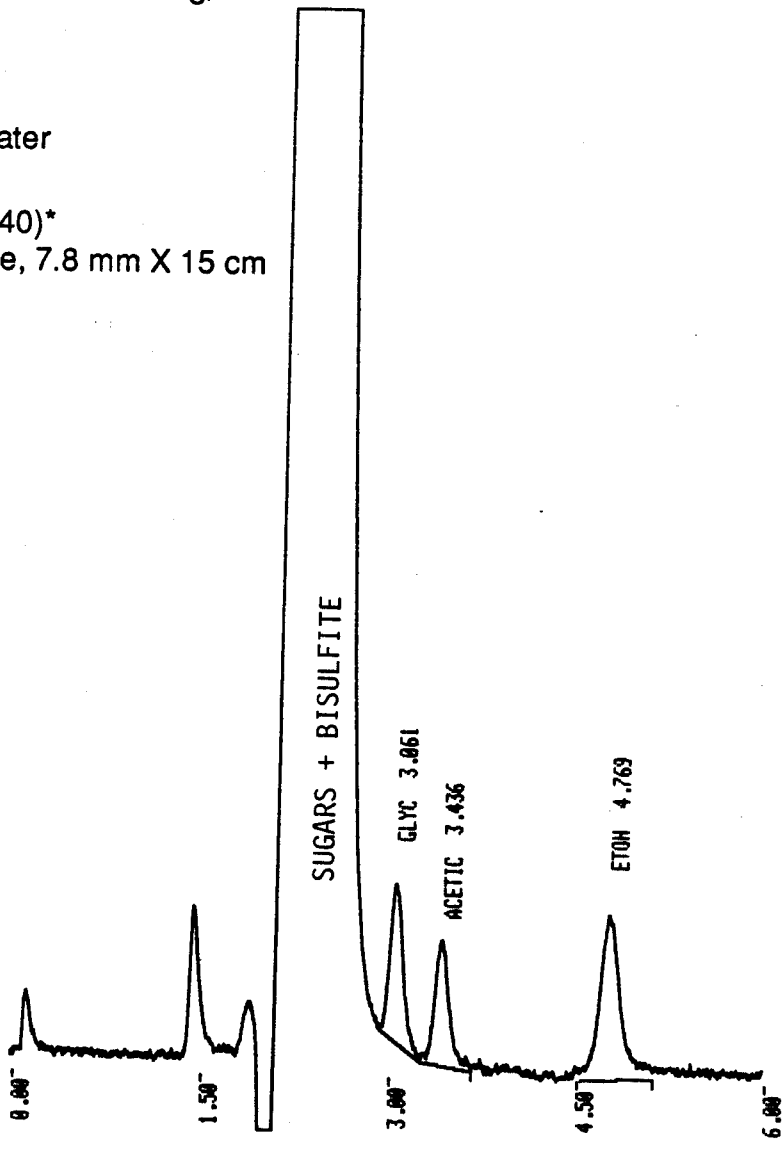
To meet the stringent demands of this analysis, Waters has introduced the Waters™ FAST Fruit Juice Column. Packed with a new, highly durable resin material, this 15 cm column offers superior resolution with no sacrifice of analysis time. Figure 1 shows a typical chromatogram of standards.

MILLIPORE
Waters Chromatography Division
34 Maple St. / Milford, MA 01757 / 617-478-2000
Craig Dorschel

FIGURE 1

Sample: Glucose 10%,
Fructose 10%,
Glycerol 500 ppm
Acetic Acid 500 ppm
Ethanol 1000 ppm
Sulfur Dioxide 1000 ppm (as $NaHSO_3$)

Injection Vol.: 20 µL
Flow: 1.5 mL/min.
Column Temp.: 55° C
Mobile Phase: 0.05% H_3PO_4 in water
Pressure: 700 psi
Attenuation: 64X (M401), 64X (M740)*
Column: Waters™ FAST Fruit Juice, 7.8 mm X 15 cm



Note that while sulfur dioxide (bisulfite) is present, no peak is seen. Under the conditions of the analysis, this peak is underneath the sugars (large off-scale peak) and thus does not interfere with any of the peaks of interest. This application also shows the power and convenience of the M740 Data Module - the baselines are perfectly drawn to compensate for the very small amount of tailing of the sugars.

Let us raise our glasses, then, and offer a toast to the California wine industry and to the success of this pioneering use of LC.

* "effective attenuation" 4X on M401