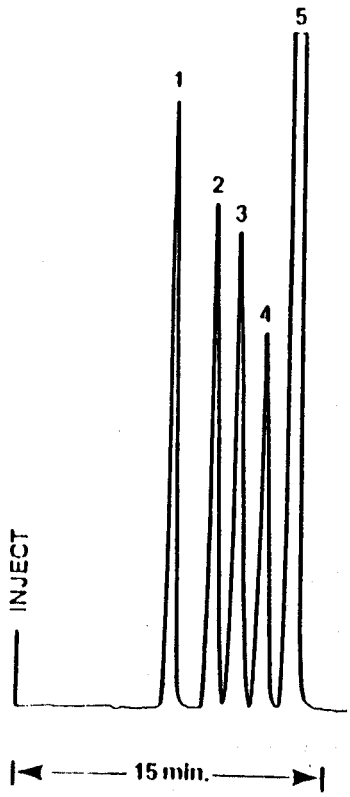
Waters
Lab Highlights
An Internal Communication of Applications and Techniques
LAH 0065 10/82
Doc # M1000
AN/FA,/QC,PM/CH/SG

ANALYSIS OF WINES UTILIZING A SUGAR ANALYZER

The separation and quantitation of carbohydrates and their fermentation products are important to modern wine chemists to monitor the fermentation process and its results. Of major importance are the reducing sugars, glucose and fructose, as well as the fermentation product, ethanol, and by-product, glycerol. In juice from grapes, a knowledge of sugar content is useful as it is indicative of the maturity of the grapes which, in turn, dictates proper harvesting time. During fermentation, the ratios of sugars to alcohols can yield information concerning the degree to which a must has been fermented and, therefore, the best point at which to terminate fermentation. The Sugar Analyzer I containing the Sugar-PAK™ I column may be used in all stages of wine production to yield rapid, informative and reproducible results. When ethanol is to be quantitated, it has been demonstrated that a column temperature of 90°C (recommended for sugars) tends to yield lower than actual results due to the volatility of this component at this temperature. More accurate ethanol results can be achieved when this column is operated at 70-75°C. Figure 1 shows a 15-minute separation of sugar standards with glycerol and ethanol. Figures 2 and 3 represent a "dry" white wine and a "fortified" red wine respectively. Figure 4 is included to show the excellent precision of this instrument over ten consecutive analyses.

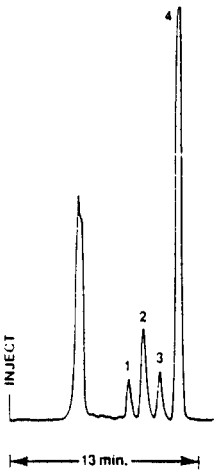


Sugar Standards

INJ. VOL.:	20 µl
COLUMN:	Sugar-PAK I
TEMPERATURE:	75°C
MOBILE PHASE:	H_2O
FLOW RATE:	0.5 ml/min.
DETECTOR:	Model 401 Differential Refractometer, 16X

1. Sucrose 0.5%
2. Glucose 0.5%
3. Fructose 0.5%
4. Glycerol 0.5%
5. Ethanol 5.0%

FIGURE 1

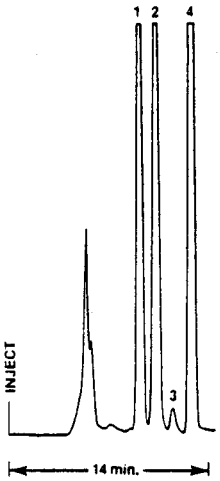


Sugars in Wine
Johannisberg Riesling of California

SAMPLE:	White Wine diluted to 20%
INJ. VOL.:	20 µl
COLUMN:	Sugar-PAK I
TEMPERATURE:	75°C
MOBILE PHASE:	H_2O
FLOW RATE:	0.5 ml/min.
DETECTOR:	Model 401 Differential Refractometer, 16X

1. Glucose 0.39%
2. Fructose 1.16%
3. Glycerol 0.64%
4. Ethanol 12.2%

FIGURE 2



Sugars in Wine
Port Wine

SAMPLE:	Port Wine diluted to 20%
INJ. VOL.:	20 µl
COLUMN:	Sugar-PAK I
TEMPERATURE:	75°C
MOBILE PHASE:	H_2O
FLOW RATE:	0.5 ml/min.
DETECTOR:	Model 401 Differential Refractometer, 16X

1. Glucose 5.0%
2. Fructose 5.8%
3. Glycerol 0.25%
4. Ethanol 18.6%

FIGURE 3

PRECISION

Column: Sugar Pak™ 1 Temperature: 70 C
Detector: RI at X32 Injection: 10 µl

	Glucose %	Fructose %	Alcohol %
1.	10.93	11.45	10.92
2.	10.88	11.41	10.89
3.	10.95	11.42	10.89
4.	10.92	11.39	10.92
5.	10.91	11.40	10.90
6.	10.90	11.43	10.93
7.	10.97	11.44	10.87
8.	10.97	11.50	10.96
9.	10.97	11.43	10.90
10.	11.06	11.50	10.97
	10.946	11.437	10.915
Average $\bar{X}$	10.95	11.44	10.92
Range	10.88 to 11.06	11.39 to 11.50	10.87 to 10.97
Standard Deviation	0.05	0.04	0.03
% RSD	0.46	0.35	0.27

FIGURE 4

John Morawski