Determination of individual sugars in different varieties of persian grape using Near Infrared spectroscopy

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Glucose, fructose and sucrose being the main sugars that can be found in natural fruit juice. Many instrumental methods, such as GC, LC, electrochemical or spectrometric methods provide information about both the total content of sugars and the specific concentration of each carbohydrate[1].

The simplicity of sample handling and measurement in the near IR(NIR) wavelength region, which allows the use of long pathlength, optical glass cells and optical fibers, makes NIR a good alternative for sugar determination [2].

In the present study, six varieties of persian grapes were harvested at intervals through august to october and analysed for sugars by NIR. The results were processed by principal component regression (PCR) and partial least squares (PLS) analysis.

Sample juice was prepared by squeezing through gauze from crashed grape. This solution was treated by zinc ferrocyanide prior to analysis in order to eliminate colored compounds and all optically active nonsugar substances. For glucose and fructose the most characteristic wavelengths were 1456nm corresponding to the first harmonic O-H stretching and the second at 2062nm corresponding to O-H stretching and deformation; secondary characteristic combination bands were also seen at 2265 nm (O-H and C-C stretching) and at 2240 nm (C-H and C-C stretching). However these spectra were taken over a wavelength range from 1100-2500nm at room temperature of 25-30C.

To test the accuracy of the described procedure, samples of six varieties of grape were analysed by the proposed NIR and a standard method [2].Good agreement were found between these two sets of the results. To perform the recovery studies , samples of grape juices previously analysed by the proposed method, were spiked with known amounts of each individual sugars and then analysed again. Relative standard deviations varied from 1.4 to 1.8% for six independent measurements of individual and total sugar concentration. In the analysis of real and synthetic samples, precise and accurate results were obtained , providing accuracy errors lower than 1.9% in all cases. Average recoveries of 97±4% for total sugar and between 95±5% and 99±2% for single sugars demonstrate the applicability of the methodology developed to the direct analysis of grape Juice.

1.   Chang, S.K.C. Holn, E., Schwarz, J., and Duatr, P.R., Anal.Chem. 67, 127R, 1995.
2.   Hazen, K.H., Amold, M.A. and Small, Appl. Spectros., 48, 477, 1994.