

Application of Near-Infrared Spectroscopy for the Assessment of Maturity Stages of Mazafati Date Fruits

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Summary

Near-Infrared (NIR) spectroscopy technique and a supervised pattern recognition method were used to classify Mazafati date fruit according to four main maturity stages (Kimri, Khalal, Rutab and Tamr). Spectral acquisitions were carried using a fast, non-scanning spectrometer in the range of 900-1700 nm and interactance mode. Hierarchical cluster analysis was first carried out to explore the degree of spectral similarities between the four maturity stages. Classification was performed using soft independent modelling of class analogy (SIMCA) by performing a principal component analysis (PCA) for each maturity stage. The results showed that 75% and 85% of samples in Kimri and Rutab stages were respectively classified correctly while 100% samples in both Khalal and Tamr stages were correctly recognized. NIR spectroscopy combined with SIMCA appeared to be a good method for the classification of maturity stages of date fruits.

Key word: near-infrared spectroscopy, date fruit, classification, hierarchical cluster analysis, simca, maturity stages.

Introduction

Date fruit (*Phoenix dactylifera*) is one of the most important and oldest agricultural productions in Middle East countries which has been cultivated and used as food for more than 6000 years (Sahari et al., 2007). With production of 1,000,000 tons of date fruit and exportation of 143,351 tons in 2006, Iran is one of the largest producers of dates in the world. Even today, in spite of the dramatic socioeconomic changes in Iran, many people, especially in southern regions of Iran, earn their livelihood from trading of date fruit. There are about 400 different varieties of date fruit in Iran, however, the Mazafati variety is the most famous and delicious one and is usually considered as a soft or wet variety (FAOSTAT, 2006).

Some date fruits ripen early in the season, whilst others are not mature until the end of the season (August/September), and during the maturity, physical and chemical properties of date fruits change considerably (Dowson, 1982). Because of single-pass harvesting method of date fruits, the harvesting has to include the date fruits in all ripening period which consist of four distinct stages named Kimri, Khalal or Kharak, Rutab and Tamr, respectively (Sahari et al., 2007, Imad et al., 1995, Al-Shahib & Marshall, 2003). In the first stage, the fruits are green with the highest moisture content and acidity and the lowest sugar