

Characterization of Ethiopian Coffee Varieties by Near Infrared Spectroscopy

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SUMMARY

Developing rapid and non-destructive ways of authenticating varieties or geographical origins is an important field of current research, mainly for agricultural products. Near infrared reflectance spectroscopy (NIRS) was investigated as a means of discriminating between coffee cultivars from Ethiopia. The study was carried out in 2005, on six Arabica cultivars from progeny plots established in a randomized complete block design with two replicates at the Jimma Agricultural Research Centre, Jimma, Ethiopia. Cherries were selectively harvested at different stages of ripeness: unripe-light green cherry, ripe-red cherry, overripe-dark to reddish brown cherry. Immediately following harvest, cherries were pulped and wet processed, the seeds were sun dried. In this way, 36 samples of green coffee beans were collected. The average moisture content was 10.9%. Three grams of homogenized ground green coffee were analysed, in random order, in diffuse reflectance from 400 nm to 2 500 nm (2 nm steps) using a NIRSystem FOSS 6500 spectrometer. Each analysis was duplicated and the average spectrum was used for calculation. The caffeine, chlorogenic acid, sucrose, trigonelline and fat contents were predicted for each sample using a NIR calibration based on more than 300 spectra and chemical references. An analysis of variance was carried out to test how the two studied factors, variety and maturity, affected the contents of those biochemical constituents. A factorial discriminant analysis based on principal components extracted from spectra led to 86% successful classification of the samples according to the cultivar groups. These results are promising, especially if we consider that certain genotypes are very similar and could be grouped according to their genetic distances. NIRS is a powerful method for checking green coffees. However, these results have to be confirmed by increasing the number of samples, diversifying origins and assessing the ability of the models to predict mixtures of cultivars.

INTRODUCTION

The continuing decline in coffee prices and the deterioration of coffee plantations has led producers to reconsider their production, particularly their choice of Arabica cultivars, with a view to winning new markets (*terroirs*, origins, etc.). In order to guarantee certification for those coffees and a quality premium, reliable and rapid control methods need to be developed. Near infrared reflectance spectroscopy was investigated as a means of discriminating between 6 Ethiopian cultivars from the Jimma Agricultural Research Centre based on their spectral fingerprint.