In-situ quantification of sugar content in intact green bean pods by Near Infrared Spectroscopy

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A non-destructive methodology based on portable Near Infrared Reflectance Spectroscopy (NIRS) has been evaluated for pre-harvest and on-site quantify moisture, fructose and soluble sugars in bean pods, with the objective of helping agro-food producers to evaluate the optimal harvest strategy to obtain the best quality product. 144 green pod samples were scanned on intact mode using a Handheld NIRS PhazirTM (Polycromix, wavelength range 1595-2395nm). The potential of the proposed methodology combined with chemometric strategies was validated by comparison with the laboratory traditional methods. Chemometric analysis was performed using Partial Least Squares (PLS) regression with internal cross-validation for several combinations of pre-treatments: 1st and 2nd derivatives and Standard Normal Variate (SNV) or Multiplicative Scatter Correction (MSC) to minimize scatter effects (Unscrambler v. 10.1 software). Good prediction statistics were achieved for the moisture content of bean pods (R2v = 0.70; SEP = 1.51 %), fructose (R2v = 0.79; SEP = 18.02 mg g-1) and soluble sugars (R2v = 0.71; SEP = 30.98 mg g-1). In addition, no significate differences (p > 0.05) were found when comparing reference with predicted mean values in each parameter. Those results demonstrate that NIRS is a suitable alternative technology which can be on-vine implemented by producers and food processers to optimal harvest bean pods attending their moisture and sugar content.

**Keywords:** on-site analysis, portable sensor, NIRS, green bean

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