USING MULTISPECTRAL IMAGES TO ASSESS BIOACTIVE COMPOUNDS IN SORGHUM

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ABSTRACT

In recent years, there has been a growing interest in using sorghum for human consumption, mainly due to the demand for healthier, gluten-free foods with greater nutritional value. In addition, sorghum is a source of bioactive compounds with antioxidant, immunomodulatory, anti-inflammatory, antimicrobial and anticancer properties. The chemical characteristics of bioactive compounds become critical for human nutrition purposes, which influence their bioavailability and differ among sorghum genotypes. With this objective, multispectral images were acquired for the grains of 80 diverse sorghum inbred lines. Individual seeds from each line were subject to image analysis at 19 wavelengths in a VideometerLab 4® equipment. The bioactive compounds evaluated were anthocyanins, total phenolics, antioxidant activity and tannins. The average spectrum from each image was related to the levels of each chemically quantified bioactive compound. The construction of the multivariate models for predictive bioactive compounds in sorghum grain was based on multivariate analyses using Principal Component Analysis (PCA), selection of variables by Random Forest (RF) and regression analysis by Partial Least Squares (PLS). The five selected wavelengths via RF that best explained the phenotypic variation in the bioactive compounds were used in the construction of a PLS model for each bioactive compound. For the prediction of bioactive compounds from sorghum grains, the PLS models developed obtained the performance (Root Mean Square Error of Prediction) RMSEP= 0.027 mg luteolinidin equivalents. g^{-1} and R_p^2= 0.90 (anthocyanins), RMSEP= 1.50 gallic acid equivalents (GAE).g^{-1} and R_p^2= 0.87 (total phenolics), RMSEP= 33.55 µmol Trolox (TE.g^{-1}) and R_p^2= 0.82 (antioxidant activity) and RMSEP= 4.46 mg catechin equivalents (CE.g^{-1}) and R_p^2= 0.76 (tannins). In conclusion, multispectral imaging associated with chemometrics can be applied to classify lines based on

the content of bioactive compounds in sorghum grains, helping in the early selection of genotypes in breeding programs.

Keywords: *Sorghum bicolor*; Genetic Breeding; Multispectral image.

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