World Academy of Science, Engineering and Technology
International Journal of Bioengineering and Life Sciences
Vol:17, No:10, 2023

Sorghum Grains Grading for Food, Feed, and Fuel Using NIR Spectroscopy

Authors : Irsa Ejaz, Siyang He, Wei Li, Naiyue Hu, Chaochen Tang, Songbo Li, Meng Li, Boubacar Diallo, Guanghui Xie, Kang Yu

Abstract : Background: Near-infrared spectroscopy (NIR) is a non-destructive, fast, and low-cost method to measure the grain quality of different cereals. Previously reported NIR model calibrations using the whole grain spectra had moderate accuracy. Improved predictions are achievable by using the spectra of whole grains, when compared with the use of spectra collected from the flour samples. However, the feasibility for determining the critical biochemicals, related to the classifications for food, feed, and fuel products are not adequately investigated. Objectives: To evaluate the feasibility of using NIRS and the influence of four sample types (whole grains, flours, hulled grain flours, and hull-less grain flours) on the prediction of chemical components to improve the grain sorting efficiency for human food, animal feed, and biofuel. Methods: NIR was applied in this study to determine the eight biochemicals in four types of sorghum samples: hulled grain flours, hull-less grain flours, whole grains, and grain flours. A total of 20 hybrids of sorghum grains were selected from the two locations in China. Followed by NIR spectral and wet-chemically measured biochemical data, partial least squares regression (PLSR) was used to construct the prediction models. Results: The results showed that sorghum grain morphology and sample format affected the prediction of biochemicals. Using NIR data of grain flours generally improved the prediction compared with the use of NIR data of whole grains. In addition, using the spectra of whole grains enabled comparable predictions, which are recommended when a non-destructive and rapid analysis is required. Compared with the hulled grain flours, hull-less grain flours allowed for improved predictions for tannin, cellulose, and hemicellulose using NIR data. Conclusion: The established PLSR models could enable food, feed, and fuel producers to efficiently evaluate a large number of samples by predicting the required biochemical components in sorghum grains without destruction.

Keywords : FT-NIR, sorghum grains, biochemical composition, food, feed, fuel, PLSR
Conference Title : ICPSS 2023 : International Conference on Plant Sciences and Systems
Conference Location : Tokyo, Japan
Conference Dates : October 09-10, 2023