

Characterising corn grain using infrared imaging and spectroscopic techniques: a review

T. S. Rathna Priya and A. Manickavasagan

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Abstract

Corn is the largest cultivated grain crop in the world and the need to characterize corn grains based on various quality parameters is becoming essential as the demand for corn is increasing continuously in various end product applications. The conventional methods like visual inspection and analytical techniques involves sample destruction and are either subjective or time-consuming resulting in a growing requirement for the development of non-destructive techniques for a rapid and accurate determination of corn grain constituents and contaminants. This paper reviews the potential of infrared (IR) based imaging and spectroscopic techniques to determine quality parameters of corn grains, and their opportunities to incorporate in the supply chain of corn-based agro-industries. The variety and hardness of corn grains could be efficiently identified through the near infrared (NIR) hyperspectral imaging with accuracies ranging from 80 to 95% and 60 to 85%, respectively. IR imaging techniques determined the oil content of corn grains with standard error ranging between 0.7 and 1.3%. The detection of fungal infestations and mycotoxins in corn grains were widely studied using NIR, short-wave infrared (SWIR) and fluorescence hyperspectral imaging techniques with accuracies ranging from 75 to 98% and 70 to 97%, respectively. These techniques showed a better accuracy for infestations and variety classification (85–90%) and kernel hardness (60–65%) when used in the reflectance operational mode and proved effective for both single and bulk kernel analysis.