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INTRODUCTION

Mung bean (*Vigna radiata*) is one of the most significant crop in Asia, but it contains anti-nutrient components in the form of phytate, which reduce the bioavailability of mineral [1]. Some processing techniques, especially sprouting have been proven to reduce anti-nutrient components, and increase the quality of mung bean. Sprouting process also produce phenolic components and vitamins; especially ascorbic acid [2]. The use of NIRS within 700–2500 nm interval has been reported to be able to classify mung bean sprout based on sprouting time for quality purpose [3]. However, complex aqueous system of mung bean sprout suggests that water matrix coordinates plays a key role at molecular level [4]. The usage of aquaphotomics is suitable due to the sample preparation from the conventional techniques. **The objective of this study was to understand the possibility of rapid quality check and observation of sprouting process through NIRS and aquaphotomics, and test the potential of NIRS and aquaphotomics to build a correlative model for the quality evaluation and ascorbic acid determination in low concentration.**

MATERIALS & METHODS

The bean was sprouted for 120 h and sampling was done in 6 h interval. The sprouting was done on cellulose paper in an incubator of constant temperature. Water content was determined by AOAC method, pH and conductivity based on benchtop instrument, and ascorbic acid content based on direct redox titration with iodine solution. NIRS measurement was done using DLP NIRScanNano instrument (Texas Instrument, Dallas, Texas, United States) in transmission mode using quartz cuvette of 1 mm path length. NIRS scanning was done in triplicate with three consecutive scans. Grown sprout was crushed, mixed with water (1:2 ratio), and filtered, creating the bean sprout extract used for NIRS scanning. Result from conventional analytical techniques were analyzed using descriptive statistics and one-way ANOVA followed by pair-wise comparison (Duncan). The spectral data was analyzed using chemometrics methods (PCA and LDA), and regression model was built using PLSR technique and 6-fold cross validation.



Figure 1. Germinated Mung Bean Sprout from 0-120 h

RESULTS

The aquagram showed a trend of strong bound water formation during germination (Figure 2a.), and its comparison with the ascorbic acid standard (Figure 2b.). PLSR model was made from the spectral data of bean sprout extract, and predicted quality parameters (water content, germination time, and ascorbic acid content). The ascorbic acid content was analyzed for independent prediction of sample with unknown concentration of ascorbic acid. The prediction result was then compared with conventional technique (Figure 2d.)

CONCLUSION

The results showed reliability for mung bean sprout quality evaluation, where it prominently predicted quality parameters. PLSR regression showed high accuracies and low error. Aquagrams showed similar trend of initial weaker bonded water molecules, then forming of stronger bound water (1513 nm) was observed after prolonged sprouting and high ascorbic acid content. This indicated potential of ascorbic acid detection in complex food matrixes with low concentration.

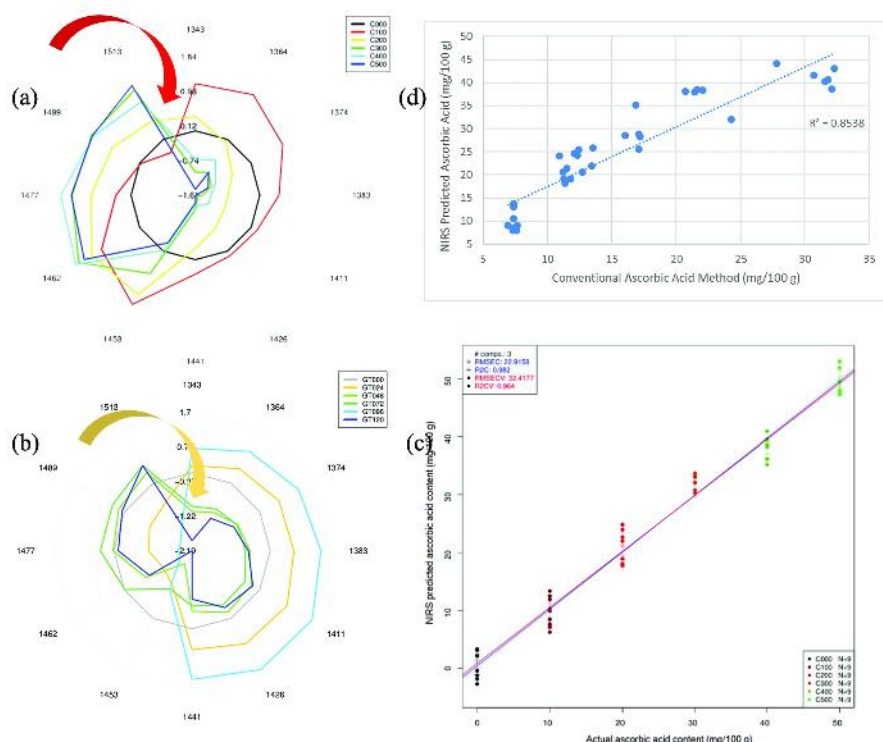


Figure 2. Aquagram (1300–1600 nm) and PLSR plot, after Savitzky-Golay smoothing (SG) and standard normal variate (SNV) pretreatment of the spectra: (a) Aquagram plot of sprouted mung bean sprout with 24-hour interval; (b) Aquagram plot of ascorbic acid (0–500 mg/100 g); (c) Regression of ascorbic acid prediction; (d) Ascorbic acid content plot of NIR predicted values against conventional technique result.

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