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Selection of narrow band reflectance for normalized difference vegetation index (NDVI) calculation to predict rice growth and nitrogen status

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Objectives

This study intended to select narrow band reflectance sensitive to a given crop variable to calculate NDVI for fast and in-time prediction of various rice crop growth and nitrogen (N) status before heading stage.

Materials and Methods

An experiment conducted in Experimental Farm of Seoul National University, Suwon, Korea in 2003 including: four rice varieties (Hwasungbyeo, SNU-SG1, Juanbyeo and Surabyeo) and 10 nitrogen levels (ranging from 0 to 295 kg ha-1). Hyperspectral canopy reflectance (300-1100 nm with 1.55 nm step) and various crop variables such as biomass, LAI, plant N concentration and content were measured at panicle initiation stage and booting stage (52 and 74 DAT, respectively). The best narrow band NDVI for describing each crop variable was selected and then used for crop variable prediction by linear regression.

Results and Discussion

The results showed that reflectances at wavebands ranging from 740 to 900 nm were the most frequently selected for calculation of the best NDVI for nine crop variables. Coefficient of determination (R2) derived from simple linear regression model to predicted nine crop variables using the best narrow band NDVI ranged from 0.47 to 0.83. The higher R2 and the best fit linear regression (Y= aX + b) for the crop variables vs. the best narrow-band NDVI in comparison to the best non-linear regression (Y=aebx) model with broad band NDVI reveals that the best narrow-band NDVI overcame saturation problem of broad band NDVI at high LAI values as reported by Huete (1988), Haboudane et al. (2004).

Key words: *Hyperspectral reflectance, canopy, nitrogen, rice, NDVI, narrow band.*

Key references

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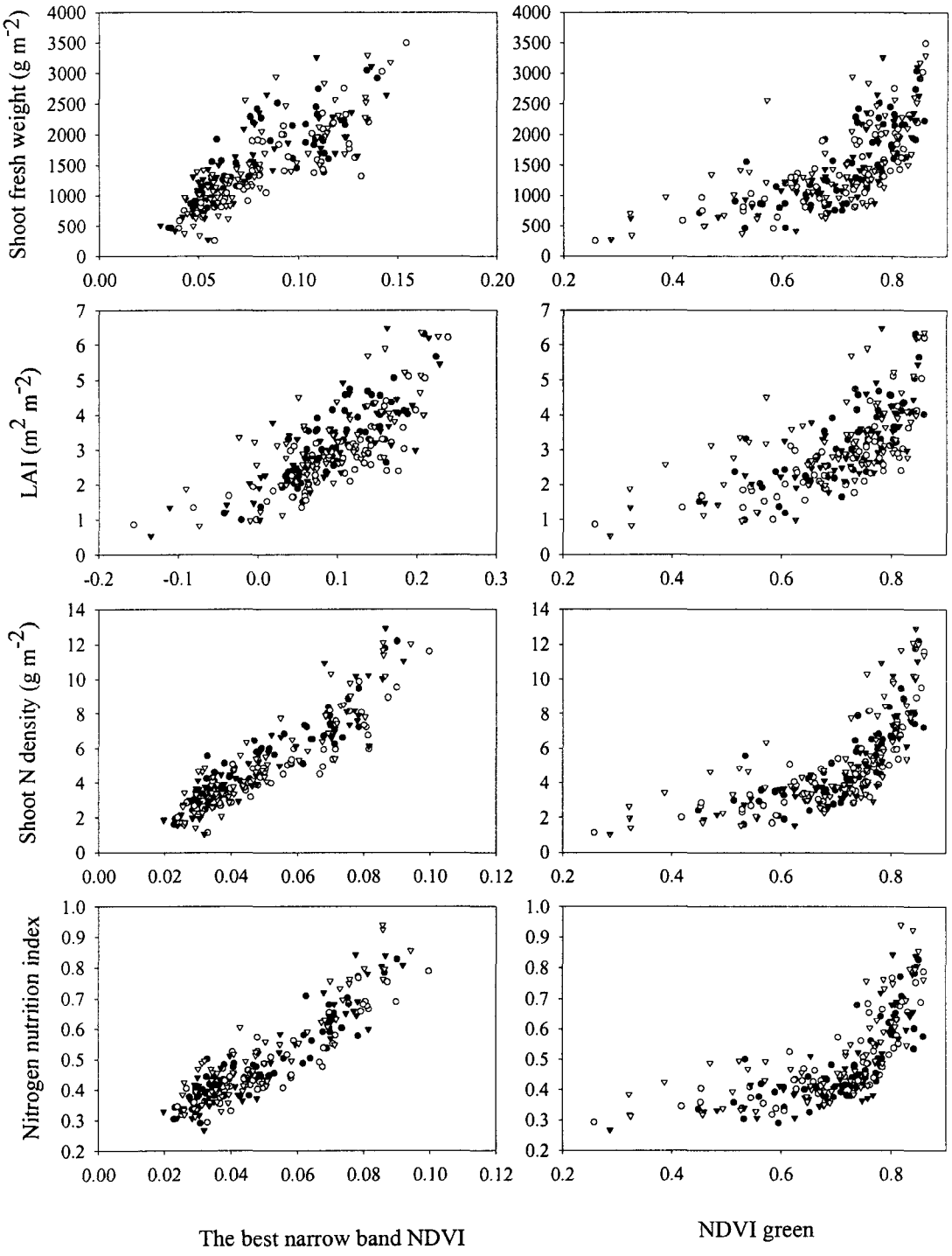

Fig. 1. The regression between NDVI of the best fit and NDVI green with some selected crop variables. Filled circles, open circles, filled triangles, and open triangles present for Hwasungbyeo, SNU-SG1, Juanbyeo, and Surabyeo, respectively.