

Hyperspectral Estimation of Leaf Chlorophyll Content in Moso Bamboo (*Phyllostachys pubescens*) Forests

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Abstract: Chlorophyll content at leaf level is an important variable because of its fundamental role in photosynthesis and in-plant health status. Now a day's several studies have focused on evaluating different vegetation indices in their sensitivity to vegetation biophysical parameters. This study was conducted to evaluate the performance of hyperspectral vegetation indices (VIs) in chlorophyll content estimation based on the surface spectral reflectance in Moso bamboo species. In order to realize the estimation of leaf chlorophyll content nine VIs: normalized difference vegetation index (NDVI₆₇₀), NDVI₇₀₅, modified simple ratio (MSR₆₇₀), MSR₇₀₅, green Chlorophyll Index (CI_{green}), MERIS Terrestrial Chlorophyll Index (MTCI), modified chlorophyll absorption reflectance Index/optimized soil-adjusted vegetation index (MCARI/OSAVI), transformed chlorophyll absorption ratio index/optimized soil-adjusted vegetation index (TCARI/ OSAVI) and modified soil adjusted vegetation index (MSAVI) was used. Using portable Chlorophyll Meter SPAD-502 a total of 225 spectra samples, and 450 leaf samples for biochemical analysis were collected. PROSPECT model was used for sensitivity analysis among the indices. Results indicated that from all indices except NDVI₆₇₀, MSR₆₇₀, and MSAVI the rest of indices were significantly correlated with chlorophyll content at P<0.01 and 0.05 levels. NDVI₇₀₅ was the best index which showed a better linear correlation with leaf chlorophyll content by the largest r^2 of 0.514 values. MTCI seemed to be comparatively less related to leaf chlorophyll content with r^2 of 0.223. Regarding to sensitivity study NDVI₇₀₅ and CI_{green} indices showed higher sensitivity level for leaf chlorophyll content than others. This finding indicated that as the modified NDVI₇₀₅ index was a good estimator of chlorophyll content; it had a better correlation and sensitivity level which help us to develop a model for leaf chlorophyll content estimations.

Keywords: Hyperspectral; Leaf Chlorophyll Content; Spectral reflectance; Vegetation Indices.