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Development of comprehensive calibration models for pulp traits by near infrared spectroscopy (NIRS) for pure species and hybrids of *Corymbia* and *Eucalyptus*

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Corymbia hybrid has emerged as a complimentary pulpwood in India along with *Eucalyptus camaldulensis* and eucalypt hybrids for enhancing the profitability of the industry and the income of farmers. Near infrared spectroscopy (NIRS) offers a rapid non-destructive method for estimating wood and pulp traits of short rotation trees. Development of NIR calibration models in *Corymbia* is essential for quick selection and rapid advancement of pulp wood traits. A study was carried out to develop a combined calibration curve for pure *E. camaldulensis* and *Corymbia* species and their interspecific hybrids. Wood samples were extracted from four-year-old 300 trees of *Corymbia torelliana* (CT), *C. citriodora* (CC), *C. variegata* (CV) and *E. camaldulensis* (EC) and their interspecific hybrids from progeny evaluation trials at three different locations in south India. The wood logs and powdered core samples were analyzed for kraft pulp yield (KPY), lignin and S/G ratio by wet chemistry and NIRS method. The KPY values of CC and CV ranged from 44 to 52%, whereas CT, a maternal parent in CT x CC|CV hybrids, had a narrow range of 38-46.5%. However, the interspecific hybrids of CT x CC|CV exhibited a range with higher values from 48.5 to 50.5%, indicating a narrow scope for predicting hybrids from that of parent's standard calibration curves. The estimated values in pure species of *Corymbia* for lignin content ranged from 22.7 to 29.2 % and 1.9 to 3.1 for S/G ratio, while in hybrids it was 25.6 to 29.4 for lignin. The correlation coefficients for cross-validation of KPY in CC, CV, CT and their hybrids were 0.8, 0.81, 0.89 and 0.72, respectively, and root mean square errors (RMS) were 0.8, 0.55, 0.73 and 0.31, respectively. When CC and CV samples were pooled to generate a common prediction model, the correlation coefficients were 0.8 for KPY, 0.75 for lignin and 0.83 for S/G ratio, with RMS of 0.68 for both KPY and lignin, and 0.12 for S/G ratio. *Corymbia* hybrids were evaluated with 99% accuracy using a combined prediction model of pure *Corymbia* species and hybrids. The method was validated with 80 samples of pure species and hybrids with a RMS of less than 1.0. We also attempted in developing a combined prediction model for different species of *Corymbia*, *Eucalyptus*, and their hybrids with minimum prediction errors.

Keywords: kraft pulp yield, lignin, S/G ratio, NIRS, prediction model

