

Mini Review

Chemical composition of green foliage biomass of three agroforestry shrub species grown in Bale Zone, Southeast Ethiopia

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The main objective of any agroforestry system is the use of foliage/pruning biomasses as source of nutrients for crop production. Foliage biomass sourced from woody component shows considerable quality variation among species. Hence, better productive agroforestry land use remains on the identification and use of the desirable species foliage biomass perceiving higher quality. Study was designed to examine the quality of three agroforestry shrub species foliage biomass based on macronutrient and common chemical quality index composition. The studied species were *Cajanus cajan*, *Sesbania sesban* and *Flemingia macrophylla*. To do so fully mature green foliage with petioles was collected from all crown parts of mother plants. The collected foliage biomass was analyzed for their macronutrient (N, P, K, Ca, Mg, C) and quality indices (Cellulose, Hemicellulose, Lignin, LCI and poly-phenol) compositions. Results from statistical analyses showed a significant ($p < 0.05$) variations among species except for poly-phenol. In this respect the composition ranged from 2.13 to 2.74% for N, 0.33 to 1.28% for P, 0.4 to 1.04% for K, 0.3 to 1.72% for Ca, 0.21 to 0.24% for Mg, 45.08 to 47.25% for C, 13.7 to 23.6% for hemicellulose, 1.85 to 14.53% for cellulose, 7.71 to 22.3% for lignin, 0.33 to 0.38% for LCI, 0.6 to 0.86% for poly-phenol, 0.1 to 0.74% for tannin, 13.29 to 17.15% for crude protein and 16.44 to 22.43% for C/N ratios. The observed variation may be due to the species inherent physiological ability in the rate of nutrient uptake from soil. In the study foliage biomass sourced from *S. sesban* was identified as highly suitable species with regard to crop nutrient supply followed by *C. cajan* and *F. macrophylla* respectively.

Keywords: *Cajanus cajan*, *Flemingia macrophylla*, *Sesbania sesban*, Quality indices, Nutrient

BACKGROUND AND JUSTIFICATION

Population growth, natural resource degradation and the concomitant need to increase food production are the major challenges in the mid and low altitude areas of Bale. In order to meet the requirements of an increasing population natural resources have been exploited at an alarming rate. A notable example is the devastation of *Combretum-terminalia* woodland and fragmentation of *Harennna forest* of Berbere and Dello Menna districts, respectively. Due to this, the area is experiencing a decrease in overall agricultural land productivity being the

decline of soil fertility as the fundamental problem. The integration of tree/shrub into agricultural landscape has long been suggested as an alternative approach to solve soil fertility problem (Madalcho and Tefera, 2016). The common mechanism in which tree/shrub species enrich soil fertility is via addition of their biomasses mainly prunings (foliage) and also roots.

Foliage of tree/shrub species are classified into high quality, intermediate-high quality, intermediate-low quality and low quality (Palm *et al.* 2001). According to the Authors high quality green biomass contains N > 2.5%, lignin < 15% and polyphenol < 4%; intermediate-high quality green biomass contains N > 2.5%, lignin > 15% or polyphenol > 4%; intermediate-low quality green biomass

