Tropentag, September 16-18, 2026, hybrid conference

"Towards multi-functional agro-ecosystems
promoting climate resilient futures"

Multifunctional cover crops for sustainable intensification: Agronomic performance, weed suppression and soil quality in Cameroon

Lawrence Monah Ndam[1], Joel Rinda Ngemenya[2], Mannette Bame Iya Mbone[3]

[1] *University of Buea, Agronomoic and Applied Molecular Sciences, Cameroon*
[2] *Univewrsity of Buea, Agronomic and Applied Molecular Sciences,*
[3] *Univewrsity of Buea, Agroecology Laboratory,*

Abstract

Sustainable intensification in humid tropical smallholder systems requires technologies that stabilise yields, suppress weeds and regenerate soils, while reducing dependence on synthetic inputs. Against this backdrop, we evaluated the adaptability and multifunctional performance of five herbaceous cover crops—*Mucuna pruriens*, *Cajanus cajan*, *Stylosanthes guianensis*, *Crotalaria juncea* and Crotalaria retusa—in the Mount Cameroon Region, focusing on agronomic traits, weed suppression and soil chemical dynamics. Field experiment established in a Randomised Complete Block Design with five cover crop treatments plus a weedy fallow control. Measurements included nodulation, canopy development, fresh and dry biomass, weed density and biomass, diversity indices, and pre and post season properties (pH, organic matter and carbon, total N, available P, exchangeable K, Ca and Mg). Results revealed that *M. pruriens* exhibited superior nodulation (9.33 ± 0.33 nodules plant ^{1}) and rapid canopy closure (97.2 % ground cover by Week 12), while C. retusa produced the highest dry biomass (5.67 ± 0.40 t ha ^{1}; $p < 0.05$). Across species, cover cropping increased soil pH by about 7.1 % relative to weedy fallow and raised organic matter and organic carbon by 10.7 % and 16.1 %, respectively, with *S. guianensis* and *C. juncea* particularly effective in building soil C stocks. In contrast, available P declined by 25.3 % ($p < 0.001$) and exchangeable Ca, Mg and K decreased significantly ($p < 0.001$), reflecting strong nutrient uptake and possible leaching in high rainfall volcanic soils; notably, *M. pruriens* and C. retusa plots retained comparatively higher cation levels, indicating superior nutrient capture and banking. Weed suppression responses were species specific. *M. pruriens* reduced weed biomass by up to 100 % (ANOVA $p < 0.05$), driven by dense canopy cover and below ground competition, whereas *S. guianensis* was consistently the least effective suppressor, and problem weeds such as Ageratum conyzoides, Eleusine indica and Cyperus rotundus persisted mainly in non *Mucuna* plots. C. retusa and *M. pruriens* offered the most favourable trade offs between high biomass production, weed control and soil quality enhancement. We therefore recommend their combined integration as a complementary cover crop in resilient, low herbicide rotations for the Mount Cameroon Region and analogous humid tropical agro ecosystems.

Keywords: Cover crops, humid tropics, soil fertility, sustainable intensification, weed suppression

Contact Address: Lawrence Monah Ndam, University of Buea, Agronomoic and Applied Molecular Sciences, Molyko P. O Box 63 buea, 237 Buea, Cameroon, e-mail: ndam.lawrence@ubuea.cm