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Effects on Plant Species Composition of Glyphosate Application in a Plantain System after Secondary Forest Clearing

STEFAN HAUSER¹, SERAPHIN NGOUMBE¹, BERNARD ALOYS NKONGMENECK²

¹*International Institute of Tropical Agriculture, Humid Forest Eco-regional Center, Cameroon*

²*University of Yaounde, Plant Biology, Cameroon*

Abstract

Weed control is a major challenge in African smallholder agriculture. In long-term crops, particularly those planted at low densities, such as plantain (*Musa spp.* group ABB) weed control is virtually absent and has received little research attention. Plantain is dominantly grown after slash and burn of old secondary forest, where little weed growth occurs in the first year. Declining availability of such land and increasing pressure of invasive weeds requires changing plantain management. Plantain is the most important food cash crop in Cameroon and large parts of the Congo basin. This study evaluates how herbicide use affects the species composition in a plantain field established in young secondary forest.

Plant species were determined in plantain plots and sub-plots were either slashed or treated once or twice with 6l ha⁻¹ Round-up®. Species' survival was determined at 10, 20, and 30 days after treatment (DAT). The forest around the site, sampled as a control had 154 species. At 14 months after planting 171 species were identified in plots to be slashed and 182 species in plots to be treated with herbicide. Survival at 30 DAT, following single herbicide application ranged from 13 to 25%. When treated twice, survival was 32% ($p < 0.001$ compared to single treatment). Slashing caused the disappearance of 12 species (equivalent to 97% survival). About 100 DAT, 170 and 139 species were identified in slashed and sprayed plots, respectively, representing 99.4 and 76% of the initial number of species. When herbicide was used at 17 months after planting, species numbers increased by about 20% over the following 5 months, when treated once and when treated twice. Weeds were classified by their response to herbicide into highly susceptible: died within 10 DAT, 40 spp., 25–26%; susceptible: died within 10–30 DAT, 53 spp., 32–35%; tolerant: showed symptoms but recovered, 54 spp., 32–35%; resistant: showed no symptoms, 8 spp., 4–6%. All tolerant and resistant species were members of the forest plant community. No typical cropping phase weed was tolerant or resistant. Glyphosate use may retain species communities similar to those found in forests.

Keywords: Glyphosate, plantain, Round-up, secondary forest, species community, survival, weeds