University of Hohenheim

Institute of Plant Production and Agroecology

in the Tropics and Subtropics

Department of Agroecology

Professor Dr. J. Sauerborn

Influence of fertilization and crop history on soil properties and microbial societies and its' relation to population density of *Striga hermonthica* (Del.) Benth., in the Kati district of Mali

Diplomarbeit

submitted by

Sebastian Bökle from Waldenbuch

Stuttgat, Hohenheim

Oktober 2011

Funded by the Eiselen Foundation Ulm and

BMZ of the Federal Republic of Germany

ABSTRACT:

The parasitic flowering plant *Striga hermonthica* (Del.) Benth. causes enormous yield losses particularly in cereal crops in the semi arid tropics, mainly in Sub-Saharan Africa and Asia where cereals provide the main resource for human nutrition. Beneath several control methods organic fertilization and soil organic matter itself, have controlling effects on *Striga*. The present research study investigates interactions between field history, fertilization, soil organic carbon, microbial abundance and *Striga* incidence in the region around Sindala in Mali. For soil sampling and analysis fields with high and low organic fertilization and different emergence of striga were chosen. Soil was analyzed for phospholipid fatty acids (PLFA), dissolved organic carbon (DOC), microbial biomass C and N and further relevant parameters like pH, N_{total}, NO_3^-, NH_4^+, P, K, CEC, C_{org} and exchangeable bases Ca and K. Total, intact and dead *Striga* seed amounts were investigated. Simple regression analysis for total N, available P, exchangeable Ca and microbial C yielded significant negative interactions with *Striga* seed bank densities. With *Striga* seed bank densities as target variable, multiple regressions yielded highest significance for P, K, Ca and CEC followed by increasing bacterial amounts in microbial community, living soil organisms, represented by total PLFA concentration and a signature PLFA for Gram-positive bacteria (i15:0). P and CEC had negative slopes for multiple regressions, indicating repressing impacts on *Striga* incidence, K and the PLFA i15:0 had positive slopes indicating *Striga* assisting impact. Nutrient balance of the soil had more impact on *Striga* incidence than microbial abundance. Nevertheless bacteria have high potential to intervene in *Striga* germination stimulation.

Keywords: *Striga*, PLFA, organic matter, microbial communities, control method, nutrient balance