SCD Probiotics®

Case Study Summary – Effects of SCD Bio Ag® on Soil Microbial Activity, Biomass and Enzymatic Activity in Field Study

Agriculture – field application (CSS-012-16)

Industry: Agriculture
Application: Soil amendment with SCD Bio Ag®
Product: SCD Bio Ag

Highlight

- SCD Bio Ag application improves soil quality indicators such as soil fungal communities, rhizobia, dehydrogenase, b-glucosaminidase and fluorescein diacetate hydrolase

Introduction

Intensive use of agrochemicals over the past few decades has resulted in negative impacts on the environment and soil health, including soil microbial diversity. Therefore, there is a need to use alternative management such as probiotics, which build soil health by promoting soil microbial diversity and enzymatic activity. To combat the detrimental effects that agrochemicals have on soil microbial diversity, a soil health facility agreed to participate in a study that would test the effects of the probiotic solution SCD Bio Ag on their farm. Soil testing was done to see the effects on soil when using the probiotic solution, SCD Bio Ag.

Rhizobia are soil bacteria that fix nitrogen inside the root nodules of legumes. The addition of nitrogen to soil through fertilizers causes both soil health and ecological concerns, making the presence of Rhizobia in soil a vital objective.

Microbial biomass (bacteria and fungi) is a measure of the mass of the living component of soil organic matter. The microbial biomass in the decomposed plant, animal residue, and soil organic matter released lower levels of carbon dioxide and enhanced plant-available nutrients.

Soil enzymes increase the reaction rate at which plant residues decompose and release plant available nutrients. The enzymes such as hydrolase and glucosidase facilitate the breakdown of organic matter.

The objective of the study was to evaluate the role of SCD Bio Ag in promoting soil quality by evaluating its effects on soil microbial biomass, microbial community structure, and soil enzymatic activities.

Methodology

The soil used in the study site was Armstrong loam and included twelve 3 m x 8 m plots with four treatments in a randomized block design. There were split applications of probiotics. The treatments included a non-treated control (2400 mL/ha), treatment #1 (Trt 1; 144 mL/ha probiotic solution with 2256 mL/ha of water), treatment #2 (Trt 2; 216 mL/ha probiotic solution with 2184 mL/ha of water), and treatment #3 (Trt 3; 288 mL/ha of probiotic solution with 2112 mL/ha water). The application of SCD Bio Ag was 0, 60, 90 and 120 L/ha per year. After applications, soil microbial biomass, and community structures were analyzed using phospholipid fatty acid analysis. Standard soil enzyme assays assessed microbial activity.

Results

After examining the results, there were significant differences for total fungi and saprophytic fungi biomass. The Rhizobia levels in the soil bacteria in treatment #3 (Trt3) showed a tremendous increase during the study after the first split application (Trt3: 98.05 ng g-1 and Control: 18.72 ng g-1) (Fig. 1). Protozoa were higher in Trt3 (81 ng g-1) than the control (36.61 ng g-1). The significant differences were observed on soil enzymatic activity as β-glucosidase (5.19 µg), and FDA hydrolase (8270 µg) activities were higher in Trt3 than the control (respectively 4.63 µg and 5137 µg). Total microbial biomass had a strong positive correlation with total fungi, saprophytic fungi, rhizobia and protozoa biomass in Trt3. There was also a 20% increase in fungi to bacteria ratio within 9 months in Trt3. Trt3 contained the highest amount of SCD Bio Ag in the mixture, suggesting a direct correlation between the increase of soil quality and SCD Bio Ag's live microorganisms.

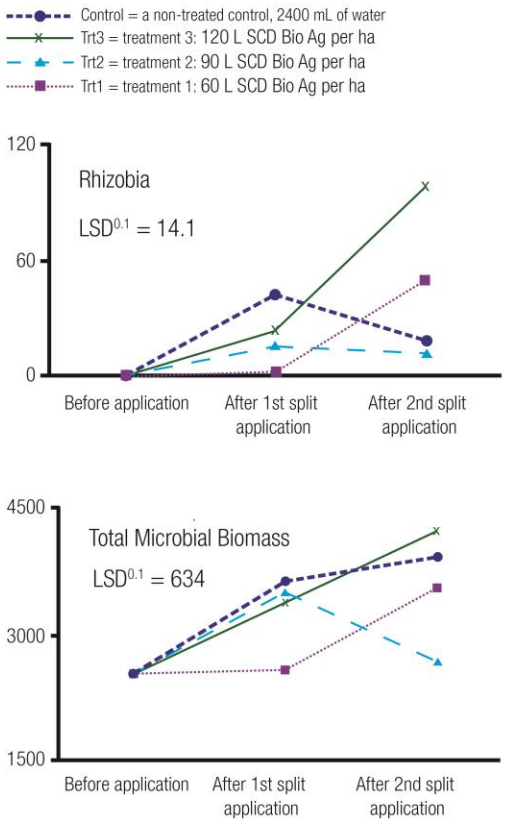

Fig. 1: Rhizobia and total microbial biomass (ng g-1) before the application of SCD Bio Ag, after the first split application of SCD Bio Ag and after the second split application of SCD Bio Ag.

Conclusions

The field study results suggest that the concentration of probiotics (Trt3; 120 L ha-1 year-1) positively affected soil fungal communities including both AMF and saprophytic fungi. Results also indicated a strong positive correlation of DHA and FDA hydrolytic activity with all and various microbial groups, respectively. There were strong positive findings between β -glucosaminidase and all microbial groups.

More soil biological parameters can be included in future studies to further quantify the effects of probiotics on other soil biological parameters such as microbial biomass C, selected enzyme assays, and other soil quality indicators that may be more responsive to effects of probiotics.