
**FACULTY OF AGRICULTURE AND ANIMAL SCIENCES
DEPARTMENT OF CROP PRODUCTION AND MANAGEMENT**

**DETERMINATION OF THE EFFECT OF FARM-MADE BIO
INOCULANT ON OCCURRENCE OF SOIL-BORNE MICROBES
AND PERFORMANCE OF SOYBEANS UNDER SCREEN-HOUSE
CONDITIONS IN SOROTI DISTRICT**

BY

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**RESEARCH REPORT SUBMITTED TO THE DEPARTMENT OF
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DECLARATION

I, Omoding Shadrach Justine hereby declare that the work presented in this report is my own except where acknowledged, and it has never been presented by anyone else to any institution for any award of the same.

SIGN.....*Justine*..... DATE.....*20th 11/2023*.....

APPROVAL

This is to certify that this report by Omoding Shadrach Justine was compiled and documented under my supervision and it is ready to be submitted to Busitema University with the approval of:



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DEDICATION

I dedicate my work to my family and friends, especially my dad and mum Mr. Aterar Justine and Mrs. Apia Christine, that may this work bring happiness in all our lives and be a bench mark for the kick start of our success in Jesus' name. Amen.

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TABLE OF CONTENTS

Contents	
DECLARATION	i
APPROVAL	ii
DEDICATION	iii
ACKNOWLEDGEMENT	iv
TABLE OF CONTENTS	v
LIST OF ABBREVIATIONS	vii
LIST OF TABLES AND FIGURES	viii
List of tables	viii
List of figures	viii
CHAPTER ONE	1
1.0 INTRODUCTION	1
1.1 Background	1
1.2 Problem statement	2
1.3 Justification	3
1.4 Main objective	4
1.4.1 Specific objectives	4
1.4.2 Hypothesis	4
1.7 Significance of the study	4
1.8 Scope of the study	4
CHAPTER TWO	5
2.0 LITERATURE REVIEW	5
2.1 Bio inoculants and their benefits	5
2.2 Use of bio inoculants on soybean	6
2.3 Relative abundance of soil microbes	6
2.4 Factors affecting the distribution of microbes in soil	7
CHAPTER THREE	9
3.0 METHODOLOGY	9
3.1 Study location	9
3.2 Study materials	9
3.2.1 Farm made bio inoculant	9

3.2.2 Rhizobia bio-fertilizer	9
3.2.3 Planting pot	9
3.2.4 Soybean seeds	9
3.3 Research design and experimental layout	10
3.5 Preparation of the farm-made bio inoculant.....	10
3.6 Establishment and management of experiments.....	10
3.6.1 Preparation of the growth media (soils in the pots)	10
3.6.2 Inoculation with the farm made bio inoculants	10
3.6.3 Planting.....	10
3.7 Data collection	11
3.7.1 Objective one: Determination of relative abundance of microbes in soils amended with farm-made bio inoculants	11
3.7.2 Analysis of the soil samples	11
3.7.3 Estimation of the Bacteria and Fungi colony forming units	11
3.7.4 Objective two: Assessment of the effect of farm-made bio inoculants on the growth and yield of soybean	12
3.7.5 Estimation of Dry pod weight and Grain yield per hectare	12
3.8 Data analysis and interpretation	12
CHAPTER FOUR	13
4.0 RESULTS.....	13
4.1 Estimation of the Relative abundance of microbes in soils amended with the farm-made bio inoculant	13
4.2 Ascertaining the growth and yield response of soy bean grown in soils amended with farm-made bio inoculants under screen house conditions	16
CHAPTER FIVE	17
5.0 DISCUSSION.....	17
CHAPTER SIX.....	20
6.0 CONCLUSIONS AND RECOMMENDATIONS	20
6.1 CONCLUSIONS	20
5.2 RECOMMENDATION	20
REFERENCES	xi
APPENDICES	xiv

LIST OF ABBREVIATIONS

AEI-Agro-ecological intensification

ANOVA-Analysis of variance

DPW-Dry pod weight

⁰C-Degree Celsius CFU-Colony

forming units

e.g.-For example

IAA-Indole acetic acid

LSD-Least Significant Difference

NA-Nutrient agar

NaSARRI-National Semi-Arid Resources Research Institute

PDA-Potato dextrose agar

PGPB-Plant Growth Promoting Bacteria

Sn-Season

QS-Quorum sensing

LIST OF TABLES AND FIGURES

List of tables

Table 1: Showing means of Bacteria, Fungi colony counts and summary of the ANOVA

Table 2: Table 2. Showing Means of all the parameters assessed and summary of the ANOVA

Table 3: Time frame for the major experimental activities done

List of figures

Figure 1: Fungi inoculum on Potato dextrose agar plates

Figure 2: Bacteria inoculum on nutrient agar plates

Figure 3: Bacterial colony counts for soil samples collected before and after inoculation

Figure 4: Making of the bio inoculant

Figure 5: Plastic bag used for potting

Figure 6: Working with the laminar hood

Figure 7: PDA plate magnified on a LED colony counter

Figure 8: Agar plates with fully grown inoculum

ABSTRACT

Bio inoculants play an important role in agriculture as plant growth promoters and improvers of soil fertility. However, little information is known about dynamics of new farm-made bio inoculants and how they affect soil microbes and soil nutrient response of plants. Here, in a screen house experiment involving a complete randomized design with three replications and three treatments that is Rhizobia bio-fertilizer, farm made bio inoculant and the control, we analyzed the effect of use of a farm-made bio inoculant on the soil microbial colony counts, growth and yield performance of Soybean. We found out that Treatments with Rhizobia biofertilizer and the farm-made bio inoculant recorded a significant increase ($P < 0.01$) in the soil microbial colony counts, growth and yield performance of Soybean from the different parameters studied, which might partly be attributed to inoculation that led to increased microbial populations whose ability to produce IAA, assimilate and acquire essential nutrients enhanced plant growth and yield. Notably, soils amended with the Rhizobia bio-fertilizer had the highest significant increase in the bacteria colony counts (32,656,667cfu/ml) followed by the farm-made bio inoculant (30,769,167cfu/ml) and the control (16,082,500cfu/ml). This was the same for the yield performance of Soybeans, where plants treated with the rhizobia bio-fertilizer had the highest grain yield (1635kg/ha), followed by those treated with the far-made bio inoculant (140kg/ha) and then the control (942kg/ha), a trend which was reflected in all the seasons. These findings provide a crucial role of soil microbial populations in the soil fertility and plant performance. Hence, recommendation emphasized the need to do soil testing to ascertain the different soil factors would affect the relative abundance of the soil microbes even before the bio inoculant is applied. A recommendation was also made to increase on the number and specific times of applying the farm made bio inoculant and also formulate the farm-made bio inoculant while ensuring microbes with a better symbiotic relationship with the plant are present in it.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Soybean [*Glycine max* (L.) Merr.] is a grain legume crop of great potential in Sub-Saharan Africa. It is an excellent source of protein and oil (approximately 40% protein and 20% oil content) for human food and animal feed (Clever *et al.*, 2020). In Uganda and some other parts of Sub-Saharan Africa, soybean is increasingly becoming a popular food and cash crop, this is evidenced by the rapid increase in number of industries involved in processing soybean in the region for food in the last decade (Tukamuhabwa and Obua, 2015). Despite the importance of soybean in Uganda, its production is very low in some parts of the country probably due to limited soil fertility and other factors (Mirriam *et al.*, 2023). Soybean is a legume plant suited to soils with a relatively high clay content, it is sensitive to soil acidity, requires reliable rainfall, particularly from flowering to pod maturity and in order for soybean to grow well, the following 14 essential nutrients i.e. nitrogen (N), phosphorus (P), potassium (K), sulfur (S), calcium (Ca), magnesium (Mg), zinc (Zn), manganese (Mn), copper (Cu), iron (Fe), boron (B), chloride (Cl), nickel (Ni) and molybdenum (Mo) must be supplied in their correct quantities (Tukamuhabwa and Obua, 2015). However, most of these resources are in their unavailable form and each year only a little part of them is released through biological activity and chemical processes, thus to increase crop yield per unit area, largely chemical fertilizers are used (Iraj Zarei, 2012). This approach is solely directed toward maximizing grain yield, without regard to long-term impacts on the soil resource, yet that is crucial for sustainable production (Sabry, 2015).

There has been a lot of information published on disadvantages of continued use of synthetic fertilizers which feed the plants rather than replenishing the soil, and their eventual harm to the environment and human health (Chandini *et al.*, 2019). In fact, being too dependent on these harsh chemicals especially Nitrogen can be a bad thing, this is because soil bacteria convert excess nitrates into nitrite ions, which, if ingested, get into the bloodstream where they attach to hemoglobin molecules, reducing their ability to carry oxygen and starving the body of oxygen and leached nitrates in drinking water used for infant formula can cause potentially fatal bluebaby syndrome, and can cause serious health problems for adults and children alike (Sabry, 2015).

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