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EFFECT OF BIOCHAR ON PERFORMANCE OF IMPROVED MAIZE VARIETIES

BY

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A RESEARCH DISSERTATION SUBMITED TO THE DEPARTMENT OF CROP PRODUCTION AND MANAGEMENT IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF BACHELOR OF SCIENCE IN AGRICULTURE OF BUSITEMA UNIVERSITY

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DECLARATION

I, Makoba Francis declare that this research report, submitted to the Department of Crop Production and Management is my original work, and that to the best of my knowledge, it has never been previously presented to any institution of higher learning for the award of any academic qualification. I hereby affirm that except for references to other people's work, which have been duly cited, this work is a result of my own research.

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DEDICATION

I dearly dedicate this report to my beloved family, Mr. Kooba Justine, Mrs. Wanyenze Esther and my supervisors, Dr. Lubadde Geofrey, Mr David Akodi and their Research Cordinating Team headed by Dr. Opio Peter , who in their tireless efforts sustained me through their providence of both financial and technical advice and thus contributed greatly to the entire research period; not forgetting the committed research coordinator and the entire team, my colleagues for their encouragement and physical and moral support.

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
RCBD	Randomized Complete Block Design
CCRP	Collaborative Crops Research Project
Cm	Centimetre
NaSARRI	National Semi-Arid Resources Research Institute
Kg	Kilogram
Ha	Hectare
IITA	International Institute of Tropical Agriculture
^{0}C	Degree centigrade
SAS	Statistical Analysis System
MAAIF	Ministry of Agriculture Animal Industries and Fisheries
SSA	Sub Saharan Africa
pH	Potential of hydrogen
T/yr.	Tones per year
CV	Coefficient of Variation
FAO	Food and Agricultural Organization

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Abstract:

The current maize production, productivity and quality have stagnated due to several biotic and abiotic factors. Among the abiotic factors, Soil fertility loss has led to drastic yield reduction during maize production. This study therefore sought to determine the effect of biochar on performance of different maize varieties. An experiment was conducted for one season at Arapai campus in a randomized complete block design. Different maize varieties were planted under the same rate of biochar application and without biochar . Data was collected on germination, plant growth in terms of Plant height, leaf number and yield parameters which included the cob weight, and grain weight. The results of the study revealed that biochar had no significant ($p>0.05$) effect on germination of the selected varieties of maize, but leaf numbers were significantly affected with UH5051 (14 leaves) and Bazooka (13 leaves) performing best as also seen in their control (13 leaves and 12 leaves respectively), Longe 5 and Longe 10H, had the least leaf numbers at 12 leaves each and 11 leaves each in control while in plant height, Longe10H (157.6cm) and Bazooka (152.70cm) while in control 151.5 and 147.5cm respectively performed best . In terms of the final grain yield, the study found significant differences in the grain yield of different varieties with significantly the highest grain yield obtained in variety UH5051 and Bazooka with 3804 Kg/Ha and 3733 Kg/Ha under biochar while in control, 2251kg/ha and 2250kg/ha was recorded, this clearly showed how much biochar influenced the yield of these varieties, this was after running a paired T-test analysis. The significantly lowest grain weight was obtained in varieties Longe 10H (2489kg/ha) and Longe 5 (2695kg/ha) as well as control with 2051kg/ha and 2151kg/ha respectively. From the results of this study, it may be concluded that biochar positively affects the growth and yield of maize varieties. The number of leaves, plant height of different varieties were significantly affected by biochar. Meanwhile germination was not significantly affected the biochar. In terms of yield and other yield parameters, cob weights, and grain yields were highest in UH5051 and B but lowest in Longe 5 and this makes varieties UH5051 and Bazooka to be the best for production under application of biochar. Even though biochar had significant effect on the growth and yield of different maize verities, there is need for more studies to be conducted on the different levels of biochar in relation to many varieties to determine how each variety performs under different levels.

CHAPTER ONE

INTRODUCTION

1:1 Background

Maize (*Zea mays* L.) is important in global agri-food systems with production surging in the past couple of decades due to rising demand and a combination of technological advances, yield fluctuation and changes in production area (Erenstein *et al*., 2022). Maize is already the leading cereal in terms of production volume and is set to become the most widely grown and traded crop in the coming decade. It is a versatile multi-purpose crop, primarily used as a feed globally (Epule & Chehbouni, 2022).

According to FAO (2020), global maize production reached 263 million tons by 2021 with the cereals being one of the most highly consumed crops globally. In Africa, the rapidly growing population is exerting a lot of pressure on agricultural resources including maize productivity and harvest area. Maize production and harvest area has increased by 71.35% and 60.12%, respectively in Africa. Regionally, maize is an important food and income security crop that supports livelihood of millions of small-scale farmers in West Africa, Central and East Africa (Epule & Chehbouni, 2022).. It is a major staple, commercial, and export crop in Uganda. It is the leading cereal crop grown in almost all parts of the country (Gourlay *et al*, 2017).

Despite the high demand for maize and its increasing production, Maize production and productivity is still low due to the high dependence on rain-fed subsistence farming in Uganda and other parts of the sub-Saharan Africa (Ekpa *et al*., 2019). Climate change is expected to further reduce the productivity. Pest and diseases have been also a major challenge but the development of pesticides as helped to reduce their adverse effect yields (Islam *et al*., 2018).

Despite a number of interventions put in place to improve maize production and productivity in Uganda such as use of organic and inorganic fertilizers, development and application of pesticides, and breeding for drought tolerance and pest and disease resistance, soil moisture deficiency has remained a challenge especially in the drought prone area of Eastern Uganda.

Through research, effort has been made to increase maize productivity through application of biochar (agricultural waste charcoal) as alternative soil conditioner to maintain soil moisture (Fu

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