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FACULTY OF AGRICULTURE AND ANIMAL SCIENCES

DEPARTMENT OF CROP PRODUCTION AND MANAGEMENT

EVALUATION OF F_2 SEGREGATING SORGHUM POPULATION FOR EARLINESS AND YIELD PERFORMANCE

BY

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A RESEARCH REPORT SUBMITTED TO THE DEPARTMENT OF CROP PRODUCTION AND MANAGEMENT IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF A BACHELOR OF SCIENCE IN AGRICULTURE AT BUSITEMA UNIVERSITY

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DECLARATION

I, **DONGO HAMISI**, do hereby declare that this special project report is my original work and has never been submitted to any other University for the award of an academic qualification. I present it without any reservations for examination considerations.

NAME: **DONGO HAMISI**

SIGN:.....

DATE: 07th/03/2024.

APPROVAL

This report has been submitted with my approval as the appointed academic supervisor.

DR: LUBADDE GEOFREY

SIGN:.....

DATE:.....13/03/24

Department of Crop Production and Management.

DEDICATION

This report is dedicated to the almighty ALLAH for the gift of life and good health with which I have been able to accomplish this research project, to my lovely father Sheikh. Yusuf Munyana and Mother Hajjat. Razia Nalumansi. I also whole heartedly dedicate this thesis to my beloved friends, brothers and sisters for their abundant support and love and lastly to the person reading this report, thanks for giving in your time and May the almighty ALLAH bless you.

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ACRONYMS

FAO:…….. Food Agricultural Organization

FAO:……... Food and Agriculture Organization

ITCZ:……... Inter Tropical Convergence Zone

MAAIF:…… Ministry of Agriculture Animal Industry and Fisheries

Mm:…….. Milli meter

NaSSARI:……. National Semi Arid Resources Research Institute

NC:…… North Carolina

NGOs:……. Non-Government Organizations

SDGs:……. Sustainable Development Goals

SOV:…….. Source of Variation

SSA:…… Sub-Saharan Africa

UBOS:…… Uganda Bureau of Statistics

UNDP:…… United Nations Development Program

ZARDI:…… Zonal Agricultural Research Development Institute

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ABSTRACT

Sorghum is the third most vital cereal crop worldwide in terms of production and area of coverage after maize and rice occupying up to 420,000ha of arable land. Sorghum satisfies the majority of the essential nutritional requirements for humans since it's a very nutritious food which also support a strong immune system. Sorghum is, nevertheless, farmed in Uganda using rain-fed agricultural techniques that need little to no capital expenditures. Majority of the sorghum cultivars are landraces, which have a poor yield roughly 500 kg ha^{-1} at the farm level and are vulnerable to disease, pests, drought, and birds. One of the most significant of these limitations is the low yields in the majority of Uganda's sorghum-growing regions, which contribute to food insecurity, low earnings, and hunger in the farming communities. Therefore the main objective of this study was to identify sorghum genotypes with high yielding background and early maturing for breeding to meet the needs of the farmers. The experiment was carried out in Soroti, Serere and Lira districts in Uganda. With a mean grain yield of 2837 kg ha-1 across all sorghum populations, genotypes SSGA109xSSGA114 (3768 kg ha-1) and SSGA101XSSGA1013 (3753 kg ha-1) had the highest grain yields, with a moderately high 100 grain weight of 2.889g, 3g, and 2.889g, respectively. However, genotype SSGA112 had the lowest grain yield (707 kg ha-1) and was followed by genotype SSGA113, which had a grain yield of 1936 kg ha^{-1}. With genotype SSGA112 exhibiting delayed days to flowering at 96.78 days and SSGA111 with 81.22 days to 50% flowering, the majority of sorghum genotypes flowered late. The earliest genotypes to flower were SSGA107XSSGA111, maturing at 62.44 days, and SSGA108 (62.56 days). Nonetheless, this study found significant correlations between grain yield and other agronomic variables, and there was a positive relationship between yield and other yield components, such as 100 grain weight, panicle length, and panicle width.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Globally, Sorghum (Sorghum bicolor (L.) Moench) is the fifth most important cereal crop in terms of production and area of coverage after wheat, rice, maize and barley (Lubadde et al., 2019). In Africa, it is ranked the second most important cereal crop after maize and the third in Eastern Africa after maize and finger millet. In Uganda, sorghum is the third most widely grown cereal crop after maize and rice (Andiku et al., 2020) where it occupies up to 420, 000 ha of arable land (UBOS, 2020). The crop originated from Africa, in the region bordering Sudan and Ethiopia between 5000 and 7000 years ago. Sorghum was then distributed along the trade and shipping route around the African continent and through the middle East to India at least 3000 years ago (Mamudu, 2017).

Nutritionally, it contains high levels of antioxidants and nutrients and is gluten free (Scandinavica et al., 2021). It belongs to the family Poaceae or Gramineae (Grass family); genus, Sorghum, and species bicolor, with 2n = 2x = 20 chromosomes and has a C4 photosynthetic pathway (Studies & Africa, 2019). However, despite the importance of sorghum in both local and global context, it is commonly grown under rain fed conditions with very little or no capital inputs (Tesfamichael et al., 2013) and therefore low yields are attained by the farmers. The grain yield of sorghum is low not only due to biotic and abiotic stresses, but also socio-economic factors such as farmers' choice of locally available genotypes for planting. One of the most important constraints identified as a causative factor to low yield is the use of poor quality planting materials in most sorghum growing areas (Olupot, 2011).

In order to boost sorghum production in Africa, sorghum grain quality, yield, and resilience to biotic and abiotic challenges must be improved on high yielding backgrounds, primarily through hybrid breeding (Akinwale *et al*., 2014). This provides information on gene effects in controlling inheritance of traits of interest and helps in selecting the parents to be included in cultivar improvement or hybridization programs (Maiga et al., 2021). The aim of this study was to evaluate

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