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BUSITEMA UNIVERSITY, ARAPAI CAMPUS

FACULTY OF AGRICULTURE AND ANIMAL SCIENCES

DEPARTMENT OF CROP PRODUCTION AND MANAGEMENT

ANALYSIS OF CRUDE PROTEIN, PHENOLIC AND FLAVONOID CONTENT OF COWPEA GENOTYPES.

BY

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SUPERSVISOR: DR OPIO PETER (PhD.)

RESEARCH REPORT SUBMITTED TO THE DEPARTMENT OF CROP PRODUCTION AND MANAAGMENT IN PARTIAL FULFULIMENT OF THE REQUIREMENTS FOR THE AWARD OF DEGREE IN BACHELOR OF SCIENCE IN AGRICULTURE AT BUSITEMA UNIVERSITY

March 2024

APPROVAL

This special project report has been submitted for examination consideration with my approval as the university supervisor.

..19/03/2024......................... ..19/03/2024

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DECRALATION

I **NAMATAKA BRENDA** declare that the research report is mine and is worked out of my efforts and it has never been submitted to any academic institution for awarding.

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DECRALATION

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DEDICATION

With great thanks I dedicate this book to my lovely dad Namolo Stephen who has been able to help me through all my struggles. He has been a great support and an icon in all my studies. In addition, I dedicate this report to my sponsors, the government of Uganda which has been able to handle my university dues until completion. In a special way, I really dedicate it to my biological parents Mr. woniala Domasco and Mrs. woniala ketty wanyenze including my siblings not forgetting my precious and lovely daughter Buhule lucky, my siblings Winnie, Caroline, Ben, and Endrine that have always supported me in different areas of my study.

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LIST OF ACRONYM

ANOVA	Analysis of Variance
BSA	Bachelor of Science in Agriculture
FAO	Food and Agricultural Organisation
LSD	Least Significant Difference
MaRCCI	Makerere Regional Center of Crop Improvement
AOAC	Association of official analytical chemists
Kg	kilogram
SSA	Sub Saharan Africa.
NaSARRI	National Semi Arid Regional Research Institute
LSD	Least Significant Difference
$Kgha^{-1}$	kilogram per hectare
IITA	International Institute for Tropical Agriculture
CV%	Percentage Co-efficient Variance
CV	coefficient variation
TPC	total phenolic content
TFC	total flavonoid content
CE	Catechin Equivalents
GAE	Gallic Acid Equivalents
DW	Dry Weight
Mg	milligram

ABSTRACT

Cowpea is an important but underutilized legume crop, which is contributing to food and nutritional security in Sub Sahara Africa. Cowpea plays a critical role where it is a major source of dietary protein that nutritionally complements staple low-protein cereal and tuber crops. Therefore this research aimed at comparing the ten cowpea genotypes in terms of crude protein, phenolic content and total flavonoid content. These genotypes were obtained from Makerere Regional Center of Crop Improvement (MaRCCI) and were planted using alpha lattice design in busitema university arapai campus, soroti district. Proximate and bioactive compounds of different genotypes of cowpea grains were determined using standard AOAC methods. Crude protein was analyzed using the kjeldahl method from Gulu university laboratory whereas total phenolic contents and flavonoid content was prepared in arapai laboratory and analyzed from National Semi Arid Resources Research Institute (NaSARRI) in Serere district. The bioactive compounds where analyzed considering two seasons as well as the first season for crude protein content. The crude protein content was found in the range of 20.94% to 22.31% with a mean of 21.17%. However, genotypes AYIYI, NAROCOWPEA 5(cream) and Par18*LGC070/68(deep red) was observed with higher crude protein compared to others Meanwhile, genotype Par18*LGC070/42(deep red) observed the least crude protein content of 20.94%. in terms of bioactive compounds, The TPC of the genotypes for the seasons ranged from 10.06 mgGAE/100gDW to 24.64mgGAE/100gDW for season one and 8.62 to 24.06 mgGAE/100gDW for season two respectively. High phenolic compounds where recorded in cowpea with colored seed coats i.e. Par47*LGC074/18(brown) and Par18*LGC070/68(deep red) with 24.64 and 24.06mgGAE/100gDW respectively for first and second season. NAROCOWPEA 5(cream) and Par18*LGC070/52(brown) were observed with 8.62 and 10.06 mgGAE/100gDW respectively as the lowest. Total (%) ash was found more in Par18*LGC070/52 with 3.797% and the lowest in Par47*LGC074/30 genotype with 3.180%. Basing of the nutritive value, genotypes with more crude protein and bioactive compound were recommended and more improvement to be done by breeders to increase the protein to 30 % since varieties with higher protein can be crossed basing on other researches made.

Key words: cowpea, crude protein, total phenolic content, total flavonoid content.

CHAPTER ONE

1.0 INTRODUCTION

1.1 The background

Cowpea (Vigna unguiculata L. Walp) is a diploid with 2n = 22 and a genome size of about 620 million base pairs (Boukar et al., 2019), it is a centuries-old human crop, which originated in Africa and spread throughout Latin America and Southeast Asia. The crop flourishes well in areas where the minimal and maximal temperatures range between 18.2ºC and 27.6ºC, respectively, during the growing season (Sariah, 2010). Cowpea has a great nutritional value as it has high amounts of proteins and minerals, as well as chemical compounds, such as the phenolic compounds and flavonoids, which contributes to the prevention of diseases.(Santos et al., 2021) (Prakash & Gupta, 2011).

According to FAO, 2021, the total world production of cowpeas in 2019 was 8.9 million metric tons representing 2.7-folds increase since 2000. Nigeria (40.2%), Niger (26.8%), and Burkina Faso (7.3%) contributed 74.3% of total cowpea production (Affrifah et al., 2022) .In malnutrition prone regions of sub-Saharan Africa (SSA) countries, cowpea has become a strategic dry land legume crop for addressing food insecurity and malnutrition (Mekonnen et al., 2022).

In Uganda, cowpea is the fourth most widely grown legume crop after common bean, groundnut and soy bean and is intensively cultivated in the northern and eastern regions of the country (Mwale et al., 2017). The average daily protein intake is estimated at 37.7 g per person day but it is much lower in eastern and northern drier areas (Ddamulira et al., 2015). For instance, in semi-arid parts of Uganda where other protein rich crops like beans and soybean cannot be grown, cowpea can be an equally nutritious substitute (Ddamulira et al., 2015). Like soybean, cowpea is nutritious with 23% protein in dry seeds, which could meet the increasing consumer demand for health (Weng et al., 2019a).

The percentage of the national population at risk for low zinc intake ranges from 68 to 95% in South and Southeast Asia, Africa, and the Eastern Mediterranean regions, and globally nearly half of the world's population is at risk for low zinc intake (Pereira et al.,2014). In addition to that, the level of micronutrient malnutrition is very alarming among one-half of the world's population, particularly children, women of reproductive age, and pregnant and lactating women in developing countries

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