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Determining the yield response and nutrients build-up of different cowpea mutants under different soil forms

Potchefstroom, South Africa

Abstract

Cowpea (*Vigna unguiculata*) is often referred to as the poor man's meat as it is a significant source of protein, minerals, and vitamins for the rural poor who have limited access to protein from animal sources such as meat and fish. Mineral deficiencies are common in South Africa and have become part of the "hidden hunger" causing serious constraints to human health. Improving the nutritional quality of cowpea is therefore important to alleviate micronutrient deficiency. The cowpea plant is a drought-tolerant food crop, well adapted to a diverse range of climate and soil types, and widely cultivated throughout the tropics and subtropics of Africa, Latin America, and Southeast Asia, as well as in the United States. In Africa, cowpea is mainly cultivated in West and Central Africa, with an annual production of 3 million tons. Cowpea is one of the mostly grown leguminous crops worldwide that is used for food and fodder. In South Africa, the production is mainly by small holder farmers. Due to its ability fix nitrogen and high nutritional quality, it serves as a potential crop for inclusion in small holder farming systems. In African soils, the most yield limiting factor in agriculture is the plant's availability of nutrients. The main objectives of the research project is to: determine the yield response of cowpea cultivars under soil forms in Taung; Potchefstroom and Mahikeng, determine the nutrients build up of different cowpea cultivars under different soil forms, evaluate the adaptation of Namibian cowpea mutant lines in drylands of the North-West Province and to establish farmer preferred cowpea mutants in various localities of the North West Province.

Introduction

In South Africa, cereal based foods are mostly supplemented with mineral elements such as Iron (Fe), Zinc (Zn),Manganese (Mn), and Selenium (Se) in order to alleviate micronutrient deficiency in children and pregnant women. Hence, there is need for crops with improved protein, vitamins and mineral composition to combat hunger and malnutrition in the country. It was also reported that most of the smallholder farmers in the country are highly dependent on cowpea leaves, immature pods and grain to meet their mineral and protein requirements as protein from meat is expensive. Cowpea is traditionally important as an affordable source of protein and minerals and of cash income in Sub-Saharan Africa, especially for small-holder farmers who have limited options for food and cash crops. The development and deployment of cowpea varieties with improved nutrition and quality that meet the needs of farmers and consumers are required in order to enhance cowpea consumption and production. There is also a gap on the nutrients build-up of different cowpea cultivars on the soil as well as on different soil forms under different climatic conditions. Vitamin A and Zn deficiencies are common in South Africa and have become part of the 'hidden hunger', causing serious constraints to human health. Unbalanced growth and body weight are some the most common nutritional disorders caused by malnutrition. There is need to increase yield of plant varieties with improved vitamins, minerals and protein content to circumvent the existing number of malnutrition cases in Sub-Saharan Africa. Nutritionally enhanced plant varieties provide considerable amounts of bio-available nutrients useful to alleviate nutrient deficiency among rural and urban populations. Plant derived mineral and protein nutrition is the cheapest alternative to circumvent malnutrition that is prevalent in Sub-Saharan-Africa. The aim of this study is to determine the yield response and nutrient build up of different Namibian cowpea cultivars under different soil forms (Hutton in Taung and Bainsvlei in Mafikeng and Potchefstroom) under different climatic conditions. Increase in yield will lead to increase in food security.

Main objectives

To evaluate the yield response of Namibian cowpea cultivars under Hutton and Bainsvlei soil forms.

To determine the build-up of soil nutrients under cowpea production .

To evaluate the adaptation of Namibian cowpea mutant lines in drylands of North-West Province.

Other objective

To establish Farmer preferred cowpea mutants in various localities of South Africa

Materials and methods

Thirty mutant lines will be evaluated in the field in three locations i.e. Taung, Potchefstroom and Mahikeng. The experiments will be laid out in a randomised complete block design repeated three times in each location. The same randomization will be used in the three locations. The plot size will be two rows of four meters length with intra and inter- raw spacing of 100 and 45 centimetres respectively. The experiments will be conducted for two growing seasons (2022/2021 and 2021/2022).

Data Collection : Soil samples will be collected before planting and three times during the planting season from a depth of 0 -30 cm and 30-60 cm. The samples will be stored in plastic bags. Air dried ground and sieved to remove all materials bigger than 2mmin diameter before laboratory analysis. The following will be measured: available phosphorus, particle size, pH, calcium, magnesium, sodium and potassium.

Data will be analysed using Analysis Of Variance (ANOVA) Thirty mutant lines including three South African cowpea checks will be planted in farmers' fields in three sites in the North West Province (Taung, Potchefstroom, Mahikeng),. The trials will include farmer's local variety for comparison. Twenty farmer's will select the best line against their local variety based on yield and agronomic traits such as biomass yield, pod form, pod and grain yield, growth habit, seed size and seed colour. The data will be analysed using SPSS statistical software.

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