

**CHARACTERIZATION AND EVALUATION OF LOCAL COWPEA  
ACCESSIONS AND THEIR RESPONSE TO ORGANIC AND INORGANIC  
NITROGEN FERTILIZERS IN COASTAL KENYA**

**BY**

**FRANCIS KANGETHE MUNIU**

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## DECLARATION

I declare that, this is my original work and has not been submitted for an award of a degree in any other University.

Francis Kang'ethe Muniu..... Date..... 9/11/2017.....

This thesis is submitted with our approval as the University Supervisors

1. Prof. M. Jesang Hutchinson  
Department of Plant Science and Crop Protection  
University of Nairobi

Signature..... Date..... 9/11/2017.....

2. Dr. Jane Ambuko  
Department of Plant Science and Crop Protection  
University of Nairobi

Signature..... Date..... 9/11/2017.....

## ABSTRACT

Cowpea is among the most popular indigenous African leafy vegetables grown and consumed as grain and leaf by poor small scale farmers in coastal Kenya. The major constraints in cowpeas production include unavailability of morphological and genetic characterization data and lack of technical packages along the value chain. The objectives of this study included: to collect and characterize vegetable cowpea accessions in coastal Kenya, to assess the leaf yield of the accessions and to determine response of select accessions to organic manure and inorganic nitrogen fertilizer application. Twenty eight cowpeas accessions collected from Kilifi and Mombasa counties in Coastal Lowland 3 and 4 ecological zones were evaluated at Kenya Agricultural Research and Livestock Organization (KALRO), Mtwapa. The design of the experiment was randomized complete block design with three replications. Morphological characterization was carried out using International Board of Plant Genetic Resources descriptors. Principle component analyses was conducted on the qualitative and quantitative characters. Cluster analysis was performed using agglomerative hierarchical clustering. The effect of four concentrations of cattle manure (0, 7.8, 15.6 and 23.3 tons/ha) and inorganic nitrogen (Calcium ammonium nitrate) application (0, 178, 416 and 555 kg/ha) on growth and fresh and dry leaf weights from one and serial harvests of four local vegetable cowpea accessions, was studied over two seasons. The experiment was laid in RCBD with three replications and treatments arranged in a factorial manner. Data was analyzed using GenStat Statistical package and means were compared using LSD at 5% level of significance ( $P=0.05$ ). The 28 accessions had sub-globose leaf shape, coriaceous leaf texture and were glabrescent. Twenty six had V-mark on leaflets, while two had none. The leaf colour ranged from dark green to pale green. Seventeen accessions had no twining tendency, two had intermediate and nine had slight twining

tendency. The accessions flowered between 36 and 52 days after planting. The mean number of nodes was between 8-10 nodes per plant. The variety Mnyenze madamada had the highest fresh weight yield while highest dry leaf yield was recorded in variety Katsetse. Ward's method and Euclidian distance produced three clusters. PCA reduced the original set of twenty one variables to five Principal components (PCs), indicating approximately 81.10% of the entire genetic variation in five PCs. Incorporation on of cattle manure and inorganic nitrogen fertilizer CAN had positive influence on leaf dry and leaf yields. The best yields of 27.4 tons/ha were achieved in accession Usimpe mtu mdogo with application of CAN fertilizer at rate of 555kg/ha. Incorporation of 15.6 tons of manure in the soil resulted in best leaf yields of 23.6 tons/ha in Usimpe mtu mdogo. The yields were higher in second season. Dry weights of multiple harvests followed a similar trend Calcium ammonium nitrate was more effective compared to cattle manure during the dry season compared to the wet season, when cattle manure significantly increased yields ( $P > .05$ ). The four select local cowpea accessions responded positively to the application of organic and inorganic fertilizers over seasons, and therefore, have the capacity to address food security and income generation challenges in ASAL and marginal parts of Kenya such as Kilifi County.