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(Thesis Title)
EFFECTS OF FERTILIZER APPLICATION AND PINCHING ON THE YIELD OF GRAIN AMARANTH (*Amaranthus hypochondriacus*)

Thesis Abstract

Inadequate food and imbalanced nutrients are major causes of human malnutrition for the poor, sick, children, elderly and People Living with HIV/AIDS (PLWAS) who are the most vulnerable. These groups have high protein requirements but are unable to access adequate amounts from animal sources due to high cost. Therefore, there is need to explore cheap plant foods with comparable protein quality and quantity as animal protein foods such as grain amaranth (*Amaranthus hypochondriacus*). The current level of production is quite low (0.25 – 1 t ha-1) as compared to the potential of 3 t ha-1. This study investigated the effects of combined organic and inorganic fertilizer, fertilizer pelleting and pinching on the growth and yield of grain amaranth. The study was carried out at the Maseno University demonstration farm during the short rains in 2010 and the long rains in 2011 in two experiments which were laid out as Randomized complete block design (RCBD) with split plot arrangement and replicated three times. For fertilizer and pinching experiment study, the main plots were pinching at different times and the subplots were the different inorganic and organic fertilizer combinations, while in pelleting study, the main plots were pelleting and the subplots were three different levels of manure and inorganic fertilizer combinations. The data collected was on days to 50 % germination, days to 50 % flowering, days to 50 % maturity, average plant height, stem width, number of leaves, height of flower head, canopy, plants dry matter weight, grain yield and 1000 seed weight. The data were subjected to Analysis of Variance and significant means separated by the least significant difference at P<5%. A regression of yield and growth parameters was done to determine the factor with the greatest influence on yield. To assess the effect of organic and inorganic fertilizer combination and fertilizer pelleting on the soil and plant tissues nutrient status during growth and development of

	amaranth, soil and leaf samples were taken at seedling, flowering and at harvesting growth stages and analyzed for nitrogen (N), phosphorous (P) and potassium (K) .The soil and leaf nutrient data was subjected to regression analysis. Regression analysis was used to observe the influence of the nutrient levels in the soil and leaves on the crop yields. Pinching at 28 days after planting was the best practice for increased stem width, number of flowering stems, canopy, number of leaves and yield. Fertilizer combination of 75 % organic N and 25 % inorganic N had the highest grain yield of 1.185 ha^{-1}while fertilizer combination of 25 % organic and 75 % inorganic recorded the lowest grain yield of 0.665 t ha-1both in 2010 and 2011. Stepwise multiple regressions of the factors with yield showed plant height to have the highest influence on yields. All the pellet fertilizer treatments had better growth parameters, higher dry matter weight, 1000 seed weight and grain yield than the control. In 2011, pellet fertilizer treatment with 75 % organic N and 25 % inorganic N had mean grain yield of 743 kg ha^{-1}, while non- pellet fertilizer of the same treatment had mean grain yield of 533 kg ha^{-1}. In the same season pellet fertilizer treatment with 25 % organic N and 75 % inorganic N had mean grain yield of 413 kg ha^{-1} while the non-pellet fertilizer of the same treatment had mean grain yield of 231 kg ha^{-1}(Least Significant Difference = 141.3). The regression models were statistically significant at P<5% in estimating the linear dependency of; % N in leaves on % N in the soil at both seedling and flowering stages, yield on the level of potassium in the soil and in the leaves at both seedling and flowering stages. The regression models using fertilizer pellets showed positive correlation between % N levels in the leaves and % N levels in the soil at flowering stage representing a normal curve. The regression models positively related P levels in the soil and yield at seedling stage which is normally the case. The study recommends the use of a mixture of 6.75 kg ha^{-1} organic manure and 22 kg ha^{-1} inorganic N to ensure prolonged source of nutrients to the plant and to enhance yield. Coating of fertilizers containing high leachable nutrients or pelleting with manure is also recommended.