EFFECTS OF GENOTYPE AND SOIL FERTILITY INPUTS ON YIELD AND NUTRITIONAL CONTENTS OF FINGER MILLET (*Eleusine coracana* (L.) *Gaertn.*) FOR ADAPTABILITY IN EASTERN KENYA

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DECLARATION

I declare that this Thesis is my original work and has not been presented for any award of a degree in any other university.

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ABSTRACT

Finger millet has been proposed to be adapted as an option to mitigate climate change against drought in arid and semi-arid lands. On-farm trials were conducted at Katangi and Katoloni divisions in Machakos County. In the first objective, twenty finger millet genotypes from different sources, six local genotypes, six from International Crop Research Institute for Semi-Arid Tropical (ICRISAT) and eight from Kenya Agricultural Research Institute (KARI) were screened for, better yields and yield parameters under different soil fertility regimes in Eastern Kenya. The experiment was laid out in a randomized complete block design (RCBD) in a split-plot arrangement replicated thrice. Finger millet genotypes were the main plot while the three soil fertility regimes (synthetic fertilizer, manure and control) as the sub-plot. Genotypes were evaluated for; chlorophyll contents, days to 50% flowering, biomass contents, plant height, yield and yield components. In the second objective, variation of nutritional and anti-nutritional contents of finger millet genotypes namely; Ateso, Gulu-E, KNE-479, KNE-1034, FMV-1 and Nyaikuro was determined. Through specific chemical analysis procedures, mineral contents, proximately composition and anti-nutritional factors were determined and correlated.

Chlorophyll content was significantly high (p<0.05) in finger millet planted under synthetic fertilizer treatment, followed by manure and lowest in control treatment. Similarly, at Katangi, application of synthetic fertilizer led to increased biomass content followed by organic manure whereas control had the least.

Finger millet genotypes at Katangi matured earlier by attaining 50% flowering within 72.9 days compared to those at Katoloni that took 90.2 days. Genotype KNE-689, KNE-479 and FMV-1 matured early than the rest. However, all the finger millet genotypes did not show
any variation in biomass contents at both sites. A high number of fingers per panicle were observed in synthetic fertilizer treated finger millet genotypes Okhale-1, P-283 and Oreuro; the lowest number was observed in genotype KNE-479 and FMV-1 at Katoloni. Under manure treatment, genotypes Aran, KNE-689 and P-283 had the highest numbers of fingers per panicle while genotypes KNE-814 and FMV-1 had the least. In control treatment, high numbers of fingers were observed in genotypes KNE-741, U-15 and wimbee. In comparison, genotype KNE-479 and Oreuro had the lowest. At Katangi, use of synthetic fertilizer and manure led to significant increase in yield in all genotypes compared to control. Significantly (P<0.05) high yields were observed in genotypes P-283, Aran, Gulu-E and Ateso while Nanjala Brown, KNE-479 and Oreuro had low yields at Katoloni, in contrast high yields were observed in synthetic fertilizer followed by manure treated finger millet at Katangi. At Katoloni, genotypes, P-283, Nanjala Brown, Emarage and MS had higher 100-seed mass whereas genotypes KNE-1034, KNE-814 and KNE-689 weighed least.

There were no significant (p>0.05) differences in calcium (Ca), iron (Fe) and zinc (Zn) contents among the genotypes. An inverse relationship among genotypes between fat contents and crude protein was observed. Genotypes Ateso and Gulu-E had the highest crude fat contents while KNE-479 had the lowest. In contrast, genotypes KNE-479 and Nyaikuro had the highest while genotypes Gulu-E and Ateso had low crude protein. Genotype Ateso followed by FMV-1 and Nyaikuro had high isoleusine, leusine, methionine, threonine and cysteine amino acid contents. High levels of phenylalanine were observed in genotypes Nyaikuro and Ateso. Ateso had the highest P-hydroxybenzoic, sinapic and syringic acids, while Nyaikuro had high ferulic and vanillic acids. Except for genotype KNE-479 with highest sinapic acid contents, the ICRISAT developed genotypes had the lowest anti-nutritional contents. Anti-nutrients tannins, vanillic acid and ferulic acid were negatively
correlated to Fe and Zn contents. Therefore when selecting finger millet for Fe and Zn the levels of anti-nutritional contents need to be considered. It’s also important to factor in the inverse relationship between crude protein and crude fat since proteins are high in low yielding genotypes and vise-versa.