



Evaluation of plantain varieties on yield parameters in Murang'a County, Kenya

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Abstract

Plantains are commonly grown in the coastal region of Kenya. However their demand in urban areas particularly in Nairobi has been increasing thus triggering demand for suitable varieties by farmers in medium altitude zone. The objective of this study was therefore to evaluate the performance of various plantain varieties in a medium altitude zone of Murang'a, Kenya. Consequently, three plantain varieties locally known as "Mkono wa Tembo", "Bokoboko" and "Kampala" sourced with others from Kilifi, Busia, Kisii, Nyeri and Tharaka Nithi Counties were evaluated at KALRO HRI (1450m a.s.l) which is located in Muranga County. The design used was Randomised Complete Block (RCBD) with three replicates. Data on bunch weight, fingers per bunch, finger length and finger thickness were collected at full maturity stage. "Mkono wa Tembo" variety had significantly ($P=0.0006$) higher mean bunch weight (43kg) than Kampala (24.5kg) and Bokoboko (16.6kg). Similarly, "Mkono wa Tembo" variety had significantly more fingers per bunch (119) than "Kampala" (85) and "Bokoboko" (59). For finger length, "Mkono wa Tembo" variety had significantly ($P=0.0027$) longer fingers (25.9 cm) compared to "Bokoboko" (20.1) but almost same size with "Kampala" (25.8 cm). On the other hand "Bokoboko" variety had significantly thicker fingers (17.8cm) than "Mkono wa Tembo" (13.0cm) and Kampala (13.6cm). "Mkono wa Tembo" therefore outperformed other varieties in all parameters considered apart from finger thickness which indicates its superior adaptability in this zone. Consumers normally prefer varieties with long and thin fingers thus "Mkono wa Tembo" and "Kampala" would go very well with consumers. In conclusion, "Mkono wa Tembo" variety was the most promising variety followed by "Kampala" variety for production in medium altitude zone of Murang'a. The two are therefore recommended for promotion in this zone.

Keywords: *plantain; adaptation; yield; variety*

Received: 28/10/21

Accepted: 13/12/21

Cite as: *Njuguna et al., (2022) Evaluation of plantain varieties on yield parameters in Murang'a County, Kenya. East African Journal of Science, Technology and Innovation 3(Special Issue).*

Published: 16/02/22

Introduction

Plantains belong to Musaceae, the banana family of plants, and they are closely related to the common banana. Believed to be native to Southeast Asia, plantains are grown in tropical regions around the world and used in a variety of cuisines. Plantains account for 85 % of bananas

grown globally (Auguityn and Zeidan, 2020). In Africa plantains are a major source of food (Lescot and Ganry, 2010). Unripe plantains are green to yellow, difficult to peel, and the fruit is hard with a starchy flavor (Meseidy, 2020). They are usually larger and tougher than bananas, with much

thicker skin. In addition they are starchy, tough and not very sweet. They require cooking or roasting as they are not very palatable to eat raw. They are nutritious food, rich in vitamins, fibre, potassium and antioxidants (Kathy, 2020)

In Kenya, information on production levels of plantains is very scarce, however bananas in general are important horticultural crops in terms of area and income generation. It is estimated that 63,299 hectares of land are under banana which is about 2 % of the total arable land producing a total of 1,288,588 tons (HCD, 2017). The crop is predominantly grown by small scale farmers who have an average banana holding of 0.3 hectares making up to 13 % of the total farm area. Bananas are fast growing with high biomass yield and fruit all-year round which puts them above other crops as a food and income security crop. Besides being a staple food for rural as well as urban populations, banana is an important source of income for small scale subsistence farmers. The continuous availability of harvestable bunches from a banana stool is especially important to these farmers because it contributes to the year round food and income security. For plantains, they can thrive in most parts of the country especially in Tharaka Nithi, Meru, Nyeri, Kisii, Muranga, Embu, Nyamira, and Kirinyaga Counties (Karamura *et al.*, 2006). However production is still low despite their increasing demand in the urban markets. The main challenge to increased production is lack of suitable varieties for medium altitude zone and unavailability of planting materials. The objective of this study was therefore to evaluate the performance of various plantain varieties in medium altitude zone of Muranga County

Materials and Methods

Six plantain varieties locally known as “Gikono”, “Kabuu”, “Mkono wa Tembo”, “Bokoboko”, “Kampala”, and “Mujuu” were collected from various parts of the country in 2018 as follows: low altitude zone of Kilifi (30m a.s.l), low-medium altitude zone of Tharaka Nithi (600m a.s.l) and medium altitude zone of Busia, Nyeri, and Kisii (1200m a.s.l) and planted at Kenya Agricultural and Livestock Research Organization, Horticultural Research Institute (1450m a.s.l) which is located in Muranga

County, Central Kenya for conservation and preliminary evaluation. Consequently, it was found that out of the six varieties, three of them “Mkono wa Tembo”, “Bokoboko” and “Kampala” were promising and therefore were subjected to further evaluation at the institute. The experimental design used was Randomized Complete Block (RCBD) with three replicates. Each plot consisted of three plants which were all used for data collection. Data on bunch weight (kg), fingers per bunch, finger length (cm) and finger thickness (cm) of the 3rd hand at the thickest point were collected at full maturity stage. These data were subjected to ANOVA using GLM procedure of SAS version 8 programme. Means were separated using the Student-Newmann-Keul (SNK) test at 5 % level of significance

Results

Figure 1 shows bunch weight (kg) of three plantain varieties at full maturity. “Mkono wa Tembo” variety had significantly ($P= 0.0006$) higher mean weight (43kg) than “Kampala” (24.5kg) and “Bokoboko” (16.6kg)

The effect of variety on number of fingers of three plantain varieties is shown in Figure 2. “Mkono wa Tembo” variety had significantly more fingers per bunch (119) compared to “Kampala” (85) and “Bokoboko” (59)

The relationship between number of finger per bunch and bunch weight is shown in Figure 3. The higher the number of fingers per bunch the higher the bunch weight. “Mkono wa Tembo” had the highest number of fingers per bunch as well as the heaviest bunch followed by “Kampala” and finally “Bokoboko”

The effect of variety on finger length and thickness are shown in Table 1. “Mkono wa Tembo” variety had significantly ($P=0.0027$) longer fingers (25.9 cm) compared to “Bokoboko” (20.1) but almost same mean length with “Kampala” (25.8 cm). On the other hand “Bokoboko” had significantly thicker fingers (17.8cm) than “Mkono wa Tembo” (13.0cm) and “Kampala” (13.6cm).

The relationship between finger length and finger thickness is shown in Figure 4. The longer the finger the slender it was. “Bokoboko” had the

thickest and shortest fingers while “Mkono wa Tembo” had the most slender fingers but the longest

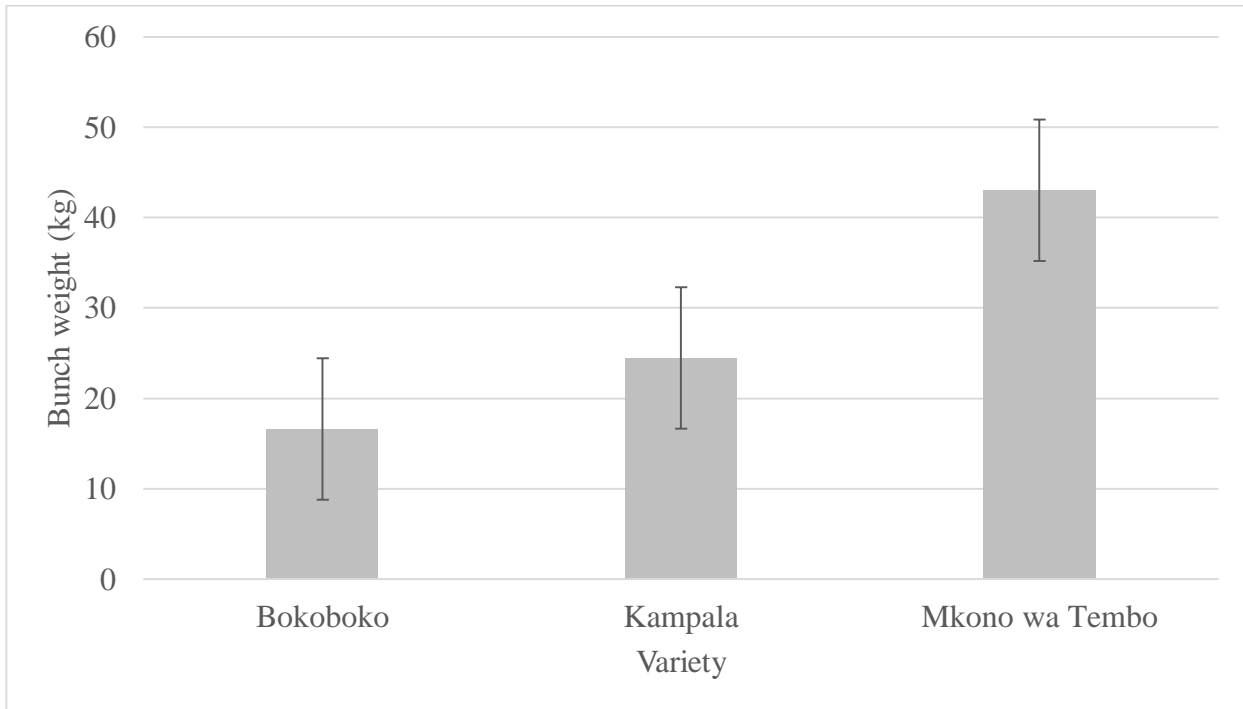


Figure 1. Mean bunch weight (kg) of three plantain varieties at full maturity

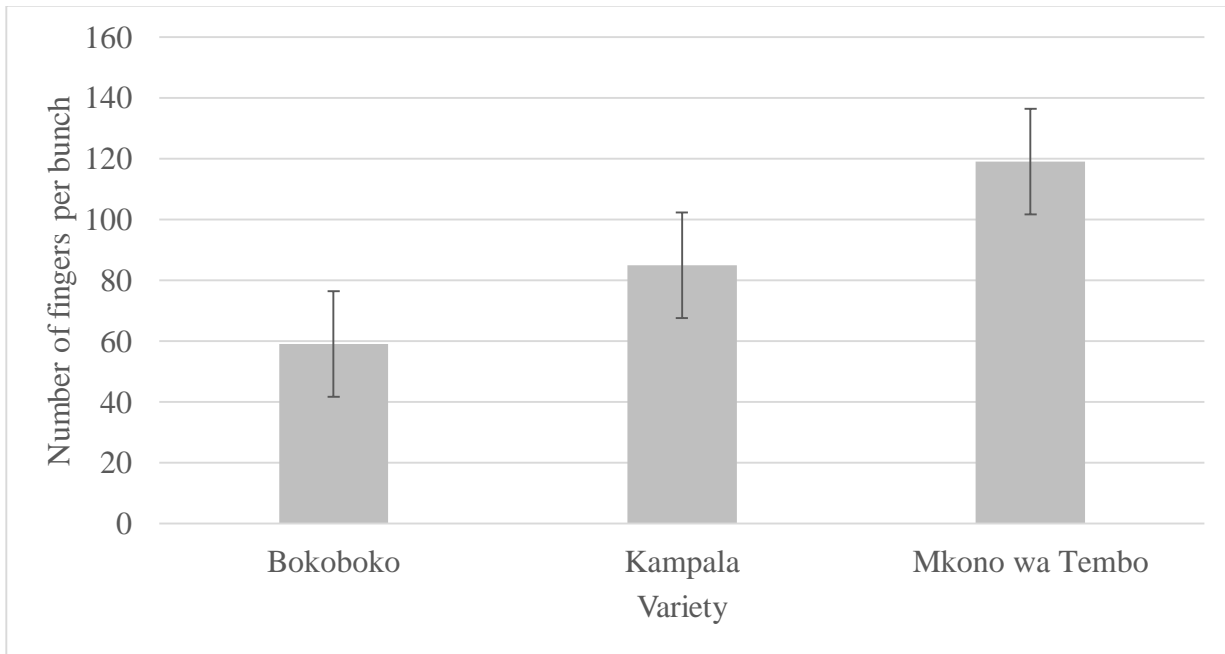


Figure 2. Mean number of fingers per bunch of three plantain varieties at full maturity

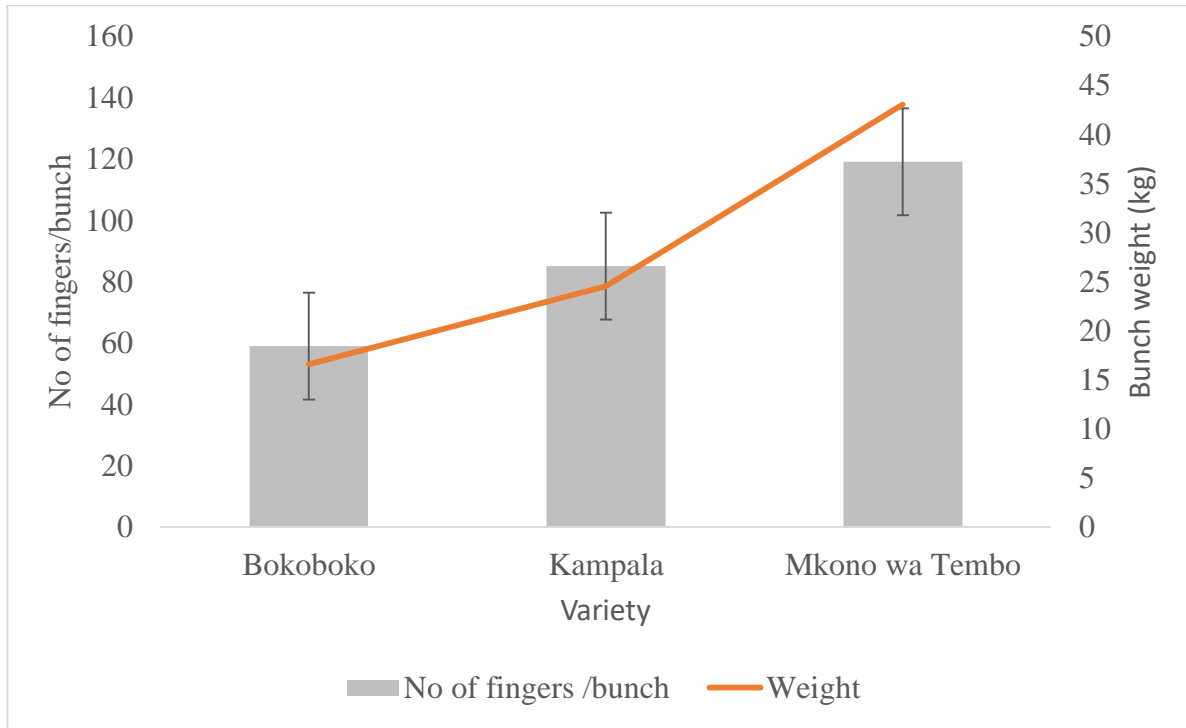


Figure 3. Relationship between No of fingers per bunch and bunch weight of three plantain varieties

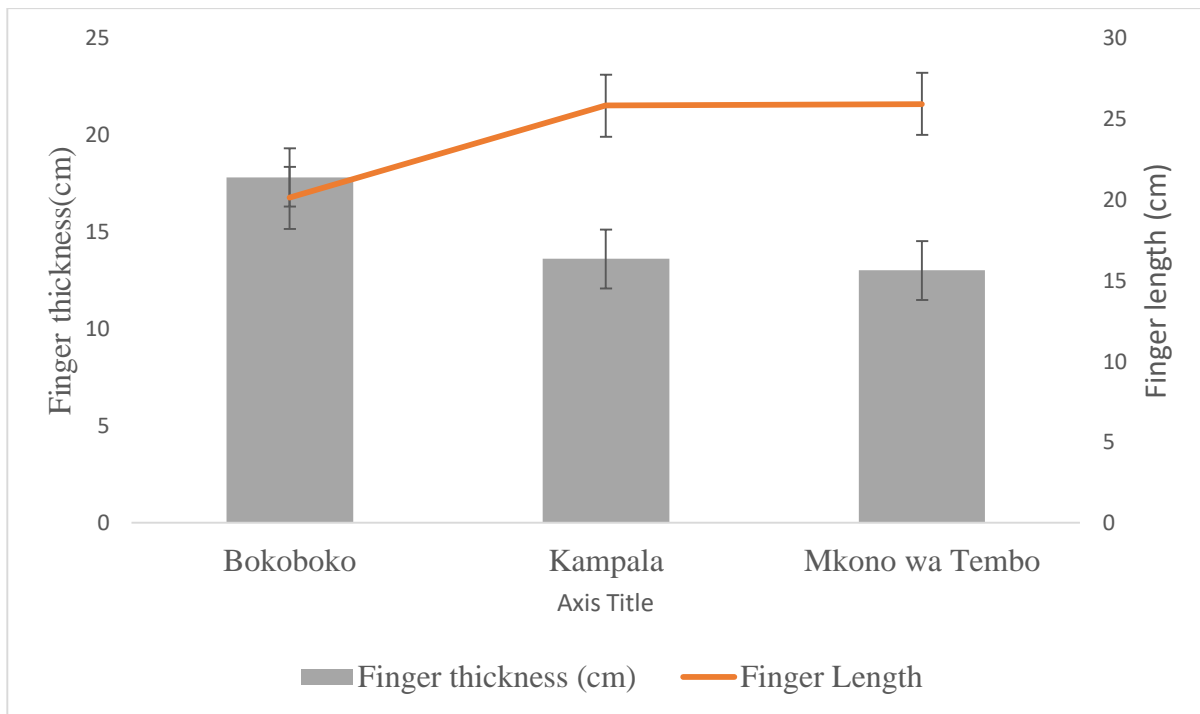


Figure 4. Relationship between finger length and finger thickness for three plantain varieties

Table 1: Mean finger length and thickness (3rd hand of a bunch) for three plantain varieties at full maturity

Variety	Finger Length	Finger thickness
Bokoboko	20.13b	17.8a
Kampala	25.8a	13.6b
Mkono wa Tembo	25.9a	13.0b
CV	6.10	6.26
P-value	0.0027	0.0032

Discussion

The results of this study show that “Mkono wa Tembo” variety had the highest bunch weight of the three varieties evaluated. Bunch weight is a critical yield parameter because large scale traders use it when buying plantains from farmers and when selling the same to medium and small scale traders as well as consumers. Consequently, “Mkono wa Tembo” would be the most preferred variety by farmers because it would fetch a higher price for them compared to “Kampala” and “Bokoboko”. “Bokoboko” on the other hand would fetch the lowest price per bunch all other factors held constant. Bunch weight depends on genetic factor as well as plant nutrition and other orchard management practices. According to Batte *et al.*, (2021), the average genetic gains for bunch weight is 1.4%. Nyine *et al.*, 2017 on the other hand reported that yield traits accounted for 31–35% of principal component variation under low and high input field management conditions. The other major factor influencing bunch size is the ability of a variety to adapt to a particular agro ecological zone. There are varieties which are more tolerant to hot or cold condition than others and this determines their performance in different zones. It is important to note that “Mkono wa Tembe” had been sourced from coastal area which is quite humid and hot yet it adapted very well to medium altitude zone which is generally cooler and less humid. This is an indication of its superior adaptability capacity.

Number of fingers is a major factor when marketing bananas in Kenya. Small traders normally sell bananas per finger basis thus the more the fingers per bunch the higher the returns. Even for those traders who sell per bunch weight, the more the fingers the higher the weight of the bunch as shown in Figure 3. This concurs with the findings of Batte *et al.*, 2021 that fruit length, circumference and number of hands had direct positive effect on the bunch weight. According to Ortiz (2006) most of the bunch and fruit traits were positively and significantly associated. “Mkono wa Tembo” would therefore be the most preferred by the traders because of these positive attributes since it outperformed other varieties in all parameters considered apart from the finger thickness. Consumers normally prefer varieties with slender but long fingers. In a study carried out in Cameroon, it was found that consumers have specific requirements regarding the type (cultivar) of plantain they buy (Dury *et al.*, 2002). Thus it is necessary to select varieties with the desired attributes like “Mkono wa Tembo”.

Conclusion

In conclusion, “Mkono wa Tembo” was the most promising variety followed by “Kampala” in medium altitude zone of Murang’a County. “Bokoboko” was the least promising

Recommendation

Variety “Mkono wa Tembo” and “Kampala” are recommended for promotion in medium altitude zone of Muranga County. However, there is need

to evaluate more varieties in order to increase plantain genetic diversity in this zone

Acknowledgement

The authors are grateful to Government of Kenya through National Research Fund for providing

funds used in this study. Appreciations also go to the Director General, Kenya Agricultural and Livestock Research Organization and Institute Director, Horticultural Research Institute for facilitating this study. We also acknowledge farmers who provided plantain varieties for the study

References

- Augustyn A & Zeidan A (2020) Plantain fruit and plant <https://www.Britannica.com>
- Batte M., Swennen R., Uwimana B., Akech V., Brown A., Geleta M. & Ortiz R. (2021) Traits that define yield and genetic gain in East African highland banana breeding. *Euphytica* 217:193
- Dury S., Bricas N., Tchango-Tchango J., Temple L & Bikoi N (2002). The determinants of Urban plantain consumption in Cameroon. *Elsevier* Vol 13, Issue 2 Page 81-88
- Horticulture Crop Directorate (2017). Horticulture Validated Report 2015-2016
- Nyine M., Uwimana B., Swennen R., Batte M., Brown A. & Christelova P. (2017). Trait variation and genetic diversity in a banana genomic selection training population. *PLoS One.*, 12(6)
- Ortiz R (2006) Genetic & phenotypic correlations in plantain-banana euploid hybrids. *Plant breeding* 116 (5)487-491
- International Network for the Improvement of Banana and Plantain (2002). *Infomusa: The International magazine on banana and plantain.* 52 p. 695
- Karamura, D., Njuguna, J. & Nyamongo, D (2006). Kenya Musa Expedition Report
- Kathy (2020). What are the health benefits of plantains? <https://www.medicalnewstoday.com>
- Lescot T & Ganry J (2010). Plantain (*musa* spp.) Cultivation in Africa: a brief summary of Developments over the previous two decades. *ActaHortic* 2010 879, 49
- Meseidy R. (2020). Plantain 101: here is everything you need to know. <https://www.thepioneerwoman.com>