

Abstract

Butternut (*Cucurbita moschata*) is an important tropical fruit vegetable grown worldwide for household food security and nutrition. Butternut is widely gaining acceptance because of its nutritional value, early maturity, long shelf-life and its adaptability to a wide range of climatic conditions and farming systems. Furthermore, it is a multipurpose vegetable crop, making the crop a good alternative source of nutrition to the low income and vulnerable population. Currently its demand outweighs its supply due to low production attributed to several production constraints including poor agronomic practices such as suboptimal application of fertilizers, few female flowers, lack of appropriate pinching practices aimed at improving the number of female flowers and pests and diseases. This study aimed at determining the effect of fertilizer application and pinching on the growth, yield and post-harvest quality of butternut. The study was conducted in two trials between 2019 and 2020, i.e., Chuka University Horticultural demonstration field (Trial I) and a farmer's field within Karingani ward in the outskirts of the University (Trial II). A 2×3×5 factorial experiment laid down in Randomised Complete Block Design was used. The treatments included fertilizers at five levels (0, 5 and 10 tonnes/ha of poultry manure, 100 and 200 Kg/ha of NPK 17:17:17), pinching at 3 levels (0, 4th node and 6th node) and two butternut varieties (Waltham and Atlas F1). Data was collected on the number of branches per plant, number of leaves per plant, number of flowers, vine length, leaf area, fruit yield, fruit mineral nutrients (Ca, Mg, Mn, Cu, Fe and P) content, fruit firmness and total soluble solids. Data obtained was subjected to analysis of variance using the SAS software version 9.4 and the significantly different means were separated using the Least Significant Difference at 5% probability level. There was significant effect of each factor and their combined effect (treatments; $p < 0.05$) on most of the studied variables and at different growth stages. Application of poultry manure at 10 tonnes/ha resulted to higher number of branches, leaves and flowers, longer vines, bigger leaf area, higher total soluble solids (TSS), firmer fruits, higher fruit mineral elements and fruit yield compared to NPK fertilizer and the control (no application of fertilizer). Pinching at 4th node produced a higher number of branches and leaves and flowers larger leaf area, higher TSS and fruit mineral elements, firmer fruits and higher fruit yield compared to pinching at 6th node and no pinching. The two butternut varieties performed significantly different ($p = 0.0001$), with an average fruit yield of 8.12 and 16.85 tonnes/ha for Waltham and Atlas F1 in Trial I and II, respectively. In regard to treatment effect, treatment V2P4M2 gave the highest butternut fruit yield of 30.98 tonnes/ha and 31.40 tonnes/ha in Trial I and Trial II, while treatment V1P00 gave the lowest butternut fruit yield of 1.29 tonnes/ha and 1.60 tonnes/ha in trial I and trial II, respectively. This study also aimed at optimising the input variables using Box-Behnken design (BBD), which revealed that the optimal level of 33 Kg/ha (Waltham) and 505 Kg/ha (Atlas F1) of NPK, and 7635 Kg/ha (Waltham) and 8102 Kg/ha (Atlas F1) poultry manure and pinching 3rd node will lead to optimal butternut fruit yield. The study demonstrated that BBD can serve as an inexpensive tool in optimization of the butternut fruit production. This study showed that appropriate agronomic practices can greatly improve butternut fruit yield. The study revealed that application of poultry manure can improve fruit quality and thus help improve nutrition. The study recommends application of 10 tonnes/ha of poultry manure and pinching at 4th node for sustainable butternut production. The study also recommends further field studies to validate the BBD predicted findings.