

Effect of Planting Method on Sweet Potato Vine Dry Matter Yield

N. Ondabu
KARI- Lanet, P.O. Box 3840,
Nakuru

R. Kenana
KARI- Lanet, P.O. Box 3840,
Nakuru

J. Mwangi
KARI- Lanet, P.O. Box 3840, Nakuru

K.R.G. Irungu
KARI- Lanet, P.O. Box 3840,
Nakuru

K. Changwony
KARI-Perkera Research
Centre, P.O. Box 32 Marigat

J.K. Kitilit
Department of Animal Science and
Management, University of Eldoret,
P.O. Box 1125, Eldoret Email-
k2kitilit@yahoo.com

B. Mugo
KARI-Muguka Research
Centre, P.O. Box 30148,
Nairobi

Abstract

Sweet potato (*Ipomea batatas* (L) Lam) is a tropical crop mainly used for human consumption and animal feed. A farmer survey in Nakuru District revealed that sweet potato vines are potential ruminant feed. Although these vines are protein rich, there is a limited production technology to promote adoption and upscaling. The objective of this study was to develop the best planting method for fodder sweet potato. Sweet potato cultivar Wagabolige which has high pest and disease resistance was planted in KARI-Lanet. Four planting methods commonly used by farmers which included ridge, flat, valley and mound were evaluated to determine their effect on herbage yield. The experimental design used was randomized complete block design (RCBD) with three Replicates. The experiment was conducted thrice in three seasons. The valley treatment significantly ($P < 0.01$) out yielded all the other three planting methods with 13.1kg of dry matter (DM) per plot whereas mound had the lowest yield of 10.2 kg. There were highly significant ($P < 0.01$) differences between flat and ridge, but there was no significant ($P > 0.05$) difference between valley and flat treatments. There were highly significant ($P < 0.01$) differences on DM yield between seasons of harvest. The yields for the first harvest were highest with 14.5 kg DM compared to subsequent harvest with 9.9 kg DM. These results demonstrate the seasonal influence on DM yield in sweet potato vines. This information should be disseminated to farmers to stimulate the production of more herbage (vines) for their livestock.

Key words: Planting Method, Sweet Potato

INTRODUCTION

The sweet potato (*Ipomea batatas* (L) Lam) is a tropical crop whose tubers are used for human and animal consumption. Traditionally, sweet potato has been grown exclusively for the purpose of tuber production, for human consumption and the forage (vines) are fed to livestock, as a by-product. The vine production however has been considered as waste after tuber harvest. Several studies have reported on dry matter production and distribution in sweet potato (Karachi, 1982a). Attempts were further made (Karachi 1982b) to broadly classify Kenyan materials into dual purpose, tuber and vine producing types based on vine: tuber ratio. Recent work carried out at KARI-Lanet (Ondabu *et al.*, 2004) selected and evaluated several vine producing types among them Wagaborige, Marooko and K158. These types have good dry matter DM 18% content and are high in nutritive value. This work was carried out to provide farmers in the region with high nutritive fodder which can improve milk production for sale. The vine types have a potential in integrating crops and livestock production. The main constraint of sweet potato vine production as livestock feed is low dry matter and the fact that there is no production packages to increase yield. However, the crude protein (CP) is fairly high up to 18 - 22% and therefore vines can be used as protein supplements.

The cultivation methods of sweet potatoes in Kenya are widely varied according to region and individuals. The methods mainly used are flat, mound and ridge plantings. These methods have not been validated to establish suitability on vine herbage production. The objective of the current study was to evaluate the effects of four planting methods on DM yield of vines.

MATERIALS AND METHODS

The experiment was conducted at KARI-Lanet, Nakuru district south of the Rift Valley. In this area the rainfall is 800mm per annum, the altitude is 1920m above seas level and soil type is deep loam. The average maximum and minimum temperatures are 26°C and 10°C respectively. Land preparation was done using tractor by ploughing with a disc plough and harrowing (done twice) to a fine till to avoid weeding during vine establishment in 2005. Cultivar Wagabolige which has shown high vine production, tolerance to prolonged drought and maybe harvested for five years was used (Ondabu *et al.* 2004). This sweet potato cultivar has high vine tuber ratio, good weed suppression, improves soil organic matter and has not shown any incidences of disease infection or pest infestations.

The experimental design was Randomized complete block design (RCBD). The plot size was 5x3m. The spacing of the cuttings was maintained at 60 cm between rows and 30cm between stations and a population of 84 stables was maintained in each plot. The distance between blocks was maintained at 1 m. Four planting methods Flat (1), Ridge (2), Valley (3) and Mound (4) were prepared for planting. The planting method was assigned to each block randomly and replicated three times. Planting materials were prepared from a well established stand the cultivar Wagabolige. Cuts of stables of about 30cm were prepared for planting. No fertilizer or manure was used.

Weeds were controlled during the establishment of the vines. Vines were harvested, at 150 days interval. Harvesting was done using sickles at 0 cm stable height. The vines were weighed and sub-samples taken for dry matter (DM) determination. This was done as described by Association of Official Analytical Chemists (AOAC, 1990). The sampling was repeated for three seasons including November short rains 2005, February dry season 2006 and May long rain season 2006.

The data collected was analyzed statistically using genstat statistical software version Release 4.23DE (2003). Effect of planting method, season and interaction between method and season were tested.

RESULTS AND DISCUSSION

During the experiment period rainfall was below the normal, which is usually above 800mm. Planting methods affected yields and showed significant difference ($P<0.01$) between treatments. There were significant differences of dry matter produced for flat and ridge compared to valley planting method. Planting in the valley had the highest herbage yield of 13.1 kg DM/plot whilst the mound method had the lowest herbage of yield of 10.2kg DM/plot. When season of harvesting were compared, the first season had the highest yield of 13.1 kg DM while the second season had the lowest 9.9 kg DM. Harvest season treatment interaction had no significant difference. According to Synider *et al.* (1992) cutting interval had no effect on yield. Synider *et al.* (1992 reported that vine production require continuous growing without rotation for a period of 5 years. In this study there were no significant difference observed for dry matter content (Table 2) between season and DM yield in variety Wakabolige. Crude protein content was not analyzed because a previous study confirmed the CP content of this variety to be 18.4%. During the experimental period the climatic conditions that prevailed are shown in Table 1.

Table 1. Average rainfall, maximum and minimum temperatures during the experiment period

Season	Temperatures	Maximum	Minimum	Average rainfall in mm	Remarks
Short rains		25.04	6.08	71.70	Fairly dry
Sept-November		25.04	6.08	71.70	Fairly dry
Dry season					
Dec-February		29.55	8.50	20.80	Very dry
Long rains					
March – May		22.35	8.61	115.50	Fairly wet

Table 2. Dry Matter yield among treatment and season of harvest

Harvest/season	1	2	3	Lsd
DM (kg)	14.5 ^a	12.1	9.9 ^b	
DM%	13.7	10.1b	12.7	3.8
-				
Planting Method	1	2	3	4
DM (Kg)	11.4 ^b	12.8	11.8 ^b	12.3
DM (%)	13.1 ^a	13.2	10.2 ^c	13.1 1.1

Rows with different superscripts are significantly different (P<0.01)

Key: planting methods 1-Flat, 2- Ridge, 3- Valley, 4 - Mound

Work done earlier by Ontiti *et al.*, (2002) showed that planting methods do not affect DM yield on three sweet potato varieties at KARI-Lanet. According to agricultural compendium (1989), sweet potatoes can be grown in various soil types from swamp to sandy loam, fertile, well-drained soils, non-saline, non-alkaline and PH 5-8. Therefore different methods can be used to grow sweet potatoes in different soils. In swampy or waterlogged soils it requires drainage, therefore ridges and mounds could be suitable for growing vine types. In deep loam soils, valley and flat methods could be suitable. In these experiments, valley methods out-yielded all other methods. The soils in the experiment area were deep loam making the method of choice to be valley planting method. Additionally, vine production requires continuous growing without rotation for a period of 5 years. This is advantageous in the total yield per unit area. Research on sweet potato vines has been given low priority. As preliminary research has shown, potential exists for the research on sweet potato vine agronomy. This will increase nutritive feed for livestock production and thus increase farm level income through reduced cost of production.

CONCLUSION

It is concluded from this work that valley planting method had higher DM yield of herbage on cultivar Wagabolige. It is recommended that this study should be expanded to cover dual purpose varieties to determine the effects on tuber yields across seasons.

ACKNOWLEDGEMENTS

The authors greatly acknowledge the Director Kenya Agricultural Research Institute (KARI) for funding the study, Centre Director KARI – Lanet for facilitating and supporting the study, Mr. Philip Ndolo senior research Officer for identifying and providing cultivar Wagabolige. We are also indebted to farmers in Bahati Division of Nakuru District for the interest they have shown in the cultivar.

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BIO-DATA

Naftal Ombogo Ondabu, is a senior Research scientist at the Kenya Agricultural Research Institute-Lanet. He holds a Bsc (Agriculture), Msc (Plant breeding) and a PhD (plant breeding and genetics) of University of Eldoret. Dr Ondabu has interest in the Molecular genetics and the development of Forage for Livestock development. In this regard, he developed and released a number of sweet potato and Macadamia varieties for use by Kenya Farmer. He has also written and won a number of competitive grants, participated in scientific conferences and published widely from his own work.