

EVALUATION OF TWO DIFFERENT TYPES OF PLANTING MATERIAL FOR SWEET POTATO PRODUCTION

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ABSTRACT

The use of planting material of the highest quality is essential for the achievement of a successful sweet potato production system. A trial was conducted at the Gladstone Road Agricultural Centre to evaluate two different types of planting material for sweet potato production. Yield performances of plants generated from two-week-old rooted two-node cuttings were compared with plants obtained from freshly cut 60 cm (24 in) vine lengths. The varieties 'Antigua' and 'Six Weeks' were used in this experiment. The sweet potato plants established in the field using rooted plantlets resulted in a higher number of marketable tubers and higher marketable tuber weights than plants generated from fresh unrooted vine cuttings.

Introduction:

Sweet potato (*Ipomoea batatas* (L) Lam.) is perhaps the most important of the root and tuber crops grown in The Bahamas. Over the past few years there has been a significant amount of interest in the cultivation of this crop by local farmers throughout the islands. One of the major constraints to sweet potato production, however, is the availability of good quality planting material. The agronomic practices of farmers also contribute to the inferior quality of material utilised in their production system. Farmers generally use long lengths of vine as planting material for sweet potato production, which is obtained from established fields. This method uses quite a lot of plant material that, if taken from older portions of the sweet potato vine, may be a potential source for insect pests and diseases. Repeated use of vines as planting material has been shown to promote increased weevil infestation in sweet potato tubers (Ray *et al*, 1983). Very few of the local farmers use planting material that has been sprouted prior to establishment in the field. Increased production and utilisation of this crop will require the participation of farmers in propagation techniques that provide an abundance of quality planting material. By introducing new technologies and improved production practices, the yield potential of this crop can be further enhanced. In an effort to improve sweet potato production, the Department of Agriculture has implemented a multiplication and distribution programme designed to improve the quality of planting material within the local production system. The material is delivered to the farmers as two-week-old rooted two-node cuttings. If planting material is cut into two-node segments and allowed to develop roots in a shaded area or nursery, more plants can be generated from that same amount of material. A small trial was established to determine whether there was any difference in using fresh

unrooted vines of about two feet in length versus two-node rooted cuttings of approximately four inches in length.

Objectives:

The objective of this study was to determine the best type of planting material for sweet potato production. Comparison was based on the total number of tubers, number of marketable tubers, total tuber weight and marketable tuber weight.

Materials and Methods:

The study was carried out at the Gladstone Road Agricultural Centre, New Providence, from April to October 2010. Two different types of planting material were examined in this experiment: rooted cuttings (Plate 1) and freshly cut unrooted vines (Plate 2). Two node cuttings of sweet potato were rooted in polystyrene trays containing a potting mixture (Pro-Mix[®]). The plantlets were propagated under shade and were kept well watered until they produced a well-developed root system and at least two fully expanded leaves. After two weeks of growth, the plants were transplanted directly to field plots. At the same time, fresh vine cuttings of approximately two feet in length were cut from stock plant material in the field and planted directly to the experimental plots. The two white fleshed sweet potato varieties used in this evaluation were ‘Antigua’ and ‘Six Weeks’.



Plate 1. Rooted planting material



Plate 2. Unrooted vine cutting

The 2 x 2 factorial experiment was laid out in a completely randomised design, using the two sweet potato varieties in two different treatments, replicated three times. The plants were established on ridges 1.5 m apart, with 0.6 m spacing between plants within the rows. Each plot consisted of 10 plants.

The usual cultural practices were observed, to ensure that an even stand of plants was established in the field plots. The mean monthly maximum and minimum temperatures for the trial period were 33.8°C (92.8°F) and 21.8°C (71.2°F), respectively. The total rainfall for the period was 1017.8 mm (40.1 in). Mean monthly sunshine duration for the period was 8.8 h. Weather data on sunshine duration, maximum and minimum temperatures and rainfall for the period under study was obtained from the Meteorological Department.

After six months of growth, four plants were randomly sampled from each of the three plots containing the two varieties of the two different types of planting material. For each treatment, the total number of tubers, total weight of tubers, number of marketable tubers and weight of marketable tubers were recorded.

Statistical Analyses:

All experimental results were analysed using Instat+™. Instat is an interactive statistical package, copyright © 1999-2005, Statistical Services Centre, University of Reading, UK. All rights reserved.

Results:

Analysis of variance (Table 1) for the sweet potato trial indicated significant differences between the two treatments for number of marketable tubers and weight of marketable tubers, at a 0.1% and 1.0 % level of confidence, respectively. There were no significant differences among varieties for any of the yield responses. No significant interaction was established between variety and type of planting material for any of the responses measured.

Table 1. Analysis of variance (ANOVA) for total number of tubers, number of marketable tubers, total tuber weights and weight of marketable tubers among two sweet potato varieties planted using two types of planting material. Std Err is for each treatment mean. Error mean square has 47. df. *, ** and *** denote statistical significance at 5, 1 and 0.1% level of confidence, respectively. NS indicates differences between means not significant.

Source	df	-----Significance levels-----			
		No. of tubers	No. of marketable tubers	Total weight	Weight of marketable tubers
Variety	1	NS	NS	NS	NS
Treatment	1	NS	**	NS	*
Treatment x Variety	1	NS	NS	NS	NS
Error	44				
Std. Err		0.36	0.20	0.09	0.08

The mean values of the yield responses for the two sweet potato varieties derived from two different types of planting material are presented in Table 2. In all cases, the rooted planting material generated higher values than the unrooted planting material. Though, the number of tubers per plant from the rooted planting material was greater than the unrooted planting material for both varieties, the differences were not statistically significant.

Table 2. Mean values of yield responses assessed six months after planting two sweet potato varieties derived from two different types of planting material.

Variety/Type of planting material	No. of tubers per plant	No. of marketable tubers per plant	Total weight per plant	Weight of marketable tubers
Antigua/Rooted	6.5	4.4	1.51	1.45
Antigua/Unrooted	6.1	3.2	1.27	1.10
Six Weeks/Rooted	5.8	3.7	1.60	1.44
Six Weeks/Unrooted	5.0	2.5	1.42	1.05

A comparison of plants generated from rooted plantlets and fresh vine cuttings showed that the rooted plantlets gave a higher number of marketable tubers than the unrooted plantlets (Fig. 1). The variety ‘Six Weeks’ gave the lowest marketable yield from plants generated from unrooted vine cuttings. The variety ‘Antigua’ was observed to be greater than ‘Six Weeks’ for marketable yields, though differences were not significant.

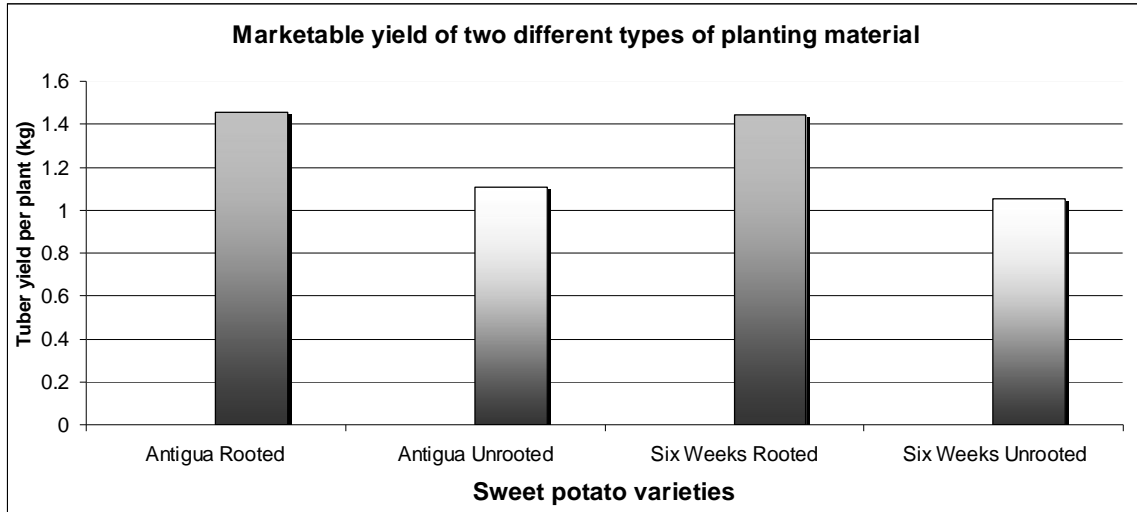


Figure 1. Effect of type of planting material on tuber yield of two sweet potato varieties grown under field conditions at GRAC, 2010.

Discussion:

The results from this study indicate that sweet potato plants established in the field using rooted plantlets resulted in a higher number of marketable tubers than plants generated from fresh unrooted vine cuttings. This corroborates earlier data of Islam *et al.* (2002), who, in a study on sweet potato growth and yield from plug transplants, planted intact or without roots, determined that the overall growth and yield of the plug transplants (as shown in Plate 1) was greater than that of the conventional unrooted cuttings. In another study on the vegetative growth and tuber yields of sweet potato established from micropropagated plantlets and farm-retained vine cuttings, Matimati *et al.* (2005), found that all cultivars investigated yielded higher after micropropagation, compared to conventionally derived planting materials.

The type of planting material determines the number and weight of marketable sweet potato tubers. There was no significant varietal response to tuber yield, though the variety ‘Antigua’ did produce a larger number and weight of marketable tubers than the variety ‘Six Weeks’. This study established the evaluation of rooted two-node cuttings as an alternative method of providing good quality planting material for local Bahamian farmers. Marketable yields for rooted planting material were significantly higher than for the traditional method of unrooted cuttings.

A key objective in any agricultural operation is the recovery of the investment in the shortest time possible. This can be achieved, in part, by producing better quality planting material that has the capacity to establish itself rapidly in the field, and that has the

potential to reach high levels of production within the cropping season. The results of this trial demonstrate the advantages of rooted planting material over traditional unrooted vine cuttings.

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