Effect of Pre-Harvest Fertilization of Cassava, (*Manihot esculenta* Crantz.) Prior to Cutting for Planting Material, on Subsequent Establishment and Root Yield.

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Abstract

While the prefertilization of cassava planting material six weeks prior to cutting had no effect on the final number of cuttings which emerged from a horizontal planting depth of 10 cms, it significantly reduced the time taken to reach 90% of final emergence from 28.3 to 18.4 days. Fresh root yield 233 days after planting was significantly increased from 14.7 to 17.5 tones ha^{-1} by this preharvest fertilization treatment.

Introduction

The effect of soil temperature on the sprouting and emergence of cassava stem cuttings from a horizontal planting has been discussed by Keating and Evenson (1979). During the course of this work, it was noticed that stem cuttings taken from cassava plants grown under higher fertilizer regimes sprouted and emerged faster than cuttings taken from plants grown under lower nutrient levels. Little published information is available on the effects of nutritional status of cassava stem cuttings on early growth. Hunt *et al.* (1977), in their recent review of cassava physiology state that growth during the initial phase of regeneration from a hardwood stem cutting, is dependent on the reserves in the cutting. In this regard, Williams (1972) has shown that cuttings lose weight for 2-4 weeks after planting, before photosynthesis starts to make a positive contribution. However, in neither case was any mention made of the effects of the nutrient status of the cutting, on these early growth stages.

Nutrient status of sugarcane setts has been shown to exert a strong influence on sprouting and early growth (Van Dillewyn, 1952). Preharvest fertilization of sugarcane in the field prior to cutting for planting material has been shown to increase the rate of sprouting and emergence (Arceneaux, 1948). In some instances, such preharvest fertilization treatments have resulted in increased yields of cane and sugar (Beauchamp and Lazo, 1937; Mathur, 1950). Other pretreatments of sugarcane setts after cutting, but prior to planting, such as soaking in a range of nutrient solutions (Anon, 1933; Clements, 1940; Clements and Akamine, 1940), have been shown to improve sprouting and and emergence rates and in some cases, yield.

In the light of these results for sugarcane and the observed effects of nutritional status on early growth of cassava setts in the laboratory, field work was initiated to evaluate the effect of preharvest fertilization of cassava plants prior to cutting for planting material, as a means of improving crop establishment.

Materials and Methods

The experiment was conducted at the University Experiment Station, Redland Bay (lat 27°37'S long, 153°17'E) on a krasnozem soil. A uniform 24 month old stand of the cassava cultivar M Aus 7 was selected as planting material. This material had not received any fertilizer for at least 12 months. Six weeks prior to cutting for planting material, half of these plants were topdressed with N, P, K,and S at the rate of 75, 125, 150 and 60 kg ha^{-1} respectively. Nitrogen and phosphorus were supplied as monoammoniumphosphate (MAP) while potassium and sulphur were added as potassium sulphate. No fertilizer was supplied to the remaining plants. Irrigation was supplied as required.

Six weeks after the preharvest fertilization treatments were imposed, uniform stem cuttings, 25 cm long, 2-3 cms in diameter and with a minimum of 4 nodes were cut from both treatments and planted horizontally at a depth of 10 cms and at a 1 x 1 m spacing. Plots were irrigated until emergence and kept weed free. Each treatment (i.e., with preharvest fertilization or without preharvest fertilization) was replicated four times in a randomized complete block design. Approximately, weekly observations of percent emergence were based on 28 plants per replicate with a 4 plant sample per replicate being taken at harvest after 233 days growth. Fresh weight of tops, roots (i.e., storage roots and swollen stem cutting) were taken along with plant height, stem number, tuber number and storage root specific gravity as an estimate of starch percent. Plant tops and roots were dried for 14 days at 65°C. In the same field immediately adjacent to the above experiment an identical design was planted, but this time, a banded fertilizer dressing of ammonium nitrate, single superphosphate and potassium sulphate (50 kg N ha^{-1}; 125 kg P ha^{-1} and 100 kg K ha^{-1}) was incorporated at planting, 10 cms from the stem cuttings. This field had previously been used for experimental work with various grain legumes and the residual fertility was such that no response, in terms of percentage emergence, rate of emergence or total root dry matter yields was recorded for this fertilizer application at planting. Hence, both parts of the experiment will be considered together (i.e., eight replicates of two treatments – preharvest fertilization or no preharvest fertilization).

Results

Complete emergence was recorded for both preharvest fertilized and control groups of stem cuttings. However, emergence was faster and more uniform for those cuttings receiving the preharvest fertilization treatment (Figure 1). Percentage emergence was significantly higher ($P < 0.05$) for the preharvest fertilized group of cuttings at 13, 19 and 26 days after planting while there was no significant difference at 34 and 42 days. The time taken to reach both 50 and 90% emergence, estimated from Figure 1, was significantly ($P < 0.01$) less for the prefertilized cuttings, the difference being 2.7 and 9.9 days respectively (Table 1).

The preharvest fertilization treatments resulted in no significant differences in the harvest parameters, plant height, stem number, tuber number or tuber specific gravity. However, fresh root weight yields were significantly increased ($P < 0.05$) by approximately 19% from 14.7 ton/ha^{-1} to 17.5 ton/ha^{-1} (Table 2). Dry matter yields were correspondingly increased by the preharvest fertilization treatment, however this increase was not statistically significant in the case of D.M. yield of tops.

Discussion

The improved emergence rate of cassava stem cuttings after preharvest fertilization is similar to the response reported for sugarcane setts (Van Dillewyn, 1952). Such improved early growth rates could have important implications in terms of improved early weed control. Under the favorable crop establishment conditions prevailing in this work, preharvest fertilization had no effect on the final number of cuttings to emerge (100% for both treatments). However, under adverse field conditions, the improved emergence rates of prefertilized cuttings is likely to have a beneficial effect on crop establishment. The small, but significant yield improvement associated with preharvest fertilization warrants further attention being paid to the nutrient status of cassava planting material, even in situations where post planting nutrition is favorable.

Acknowledgements

We are indebted to Mr. A. Haralampou for technical assistance and C.S.R. Ltd. for financial assistance in the conduct of the field work at Redland Bay.

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Stem Cuttings Under Different Preharvest Fertilization Treatments.

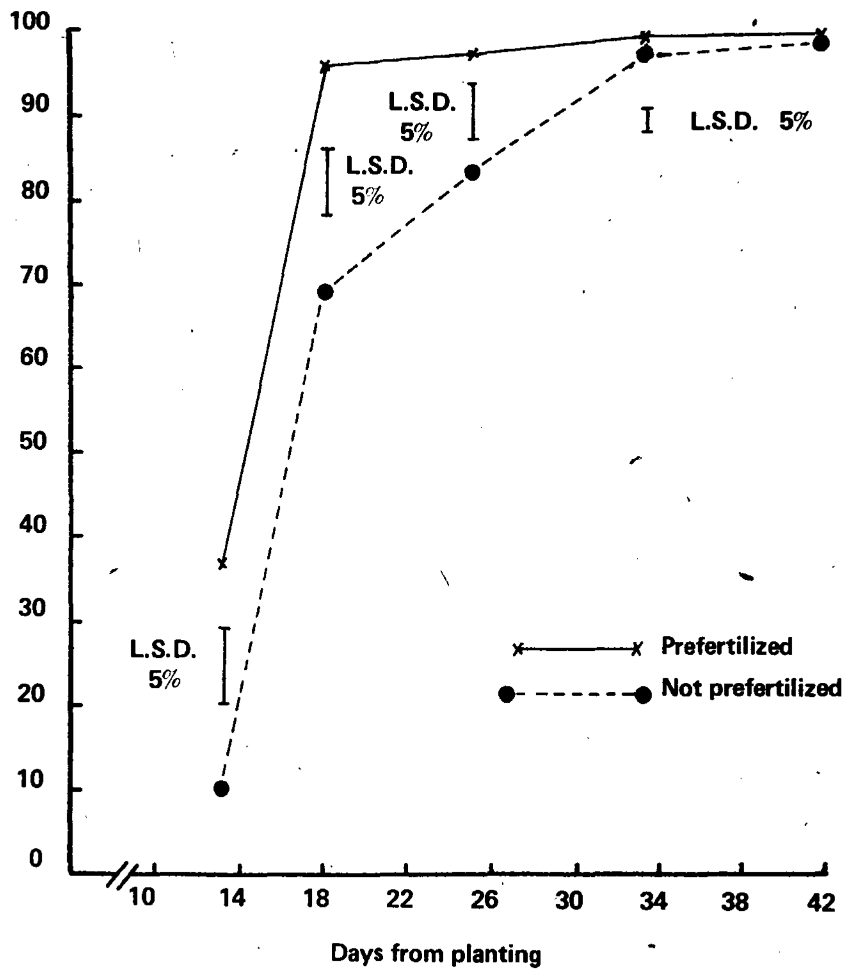

Fig. 1. Cumulative Percentage Emergence Versus Time from Planting for Cassava (M AUS 7)

Table 1. Mean time to 50 and 90% emergence for cassava (M Aus 7) stem cutting under different preharvest fertilization treatments

	Mean Time (days)	
	To 50% Emergence	To 90% Emergence
Preharvest Fertilization	14.2	18.4
No Preharvest Fertilization	16.9	28.3
LSD 1%	0.9	3.5

Table 2. Effect of preharvest fertilization on yield of tops and roots of cassava cultivar M Aus 7 after 233 days growth

	Root F.W. Yield (tonnes F.W. ha^{-1})*	D.M. Yield (ton/ha^{-1})		
		Roots*	Tops	Total*
Preharvest Fertilization	17.5	6.16	2.87	9.03
No Preharvest Fertilization	14.7	5.07	2.31	7.38
LSD 5%	2.6	0.9	n.s.	1.44

* Significant difference at $P < 0.05$

n.s. Not significant at $P < 0.05$