

## YIELD PERFORMANCE OF FOUR BEETROOT (*Beta vulgaris* L.) VARIETIES COMPARED WITH THE LOCAL VARIETY UNDER OPEN FIELD CONDITIONS IN SEYCHELLES

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### ABSTRACT

Field experiments were conducted from June to September, 2005 and 2006 at the Vegetable Evaluation and Research Station, Anse Boileau, Seychelles to evaluate the yield performance of four beetroot varieties, 'Moronia', 'Lola', 'Crosby' and 'Detroit-243' against the commonly grown variety 'Detroit' under open field conditions. The experiment consisted of five treatments laid out in a randomized complete block design with four replications. The results obtained showed that while variety 'Moronia' was the earliest to maturity, the longest root length and largest root width were produced by variety 'Crosby'. Similarly, the same variety 'Crosby' gave the highest root yield with root yield being 39.7 % and 33.1 % higher than the popular variety 'Detroit' in both years, respectively. Hence the variety 'Crosby' was recommended as a potential replacement for 'Detroit'.

**Keywords:** Beetroot varieties, *Beta vulgaris*, Yield, Field conditions.

### INTRODUCTION

Beetroot (*Beta vulgaris* L.) is a member of the Chenopodiaceae family which includes silver beet, sugar beet and fodder beet (Deuter and Grundy, 2004). They are biennials although they are usually grown as annuals and believed to have originated from Germany (Thompson, 2001). Beetroot produces green tops and a swollen root during its first growing season. It is highly productive and usually free of pests and diseases (Ado, 1999). It is rich in several vitamins, hence is an ideal vegetable for health conscious people (Deuter and Grundy, 2004).

In Seychelles, there is an increasing demand for the cultivation of beetroot to meet the needs of the urban markets. The variety 'Detroit' is popularly grown by farmers. Currently, it is the only variety with an average root yield of 28 t/ha (Ado, 1999). This was considered low when

compared to the yield produced by other varieties grown elsewhere (Burney and Mahmood, 2002).

The study was therefore aimed at evaluating the yield performance of four beetroot varieties compared with the commonly grown variety 'Detroit' with the objective of identifying a variety with higher yield performance to replace the low yielding local variety under open field conditions.

### MATERIALS AND METHODS

The experiments were conducted from June to September, 2005 and 2006 under open field conditions at the Vegetable Evaluation and Research Station Farm located at Anse Boileau, Seychelles which lies between longitude 7° 26' and 7° 53' E and latitude 5° 17' and 5° 26' N with an altitude of 216 m above sea level. The annual precipitation ranges from 250-300 mm.

Four beetroot varieties 'Moronia', 'Lola', 'Crosby' and 'Detroit-243' were evaluated alongside the popular variety 'Detroit' for its yield performance. Varieties 'Moronia', 'Lola' and 'Crosby' originated from Denmark while 'Detroit-243' and the standard variety 'Detroit' were from AVRDC-ARC African region, Tanzania.

The experimental area (87.0 m<sup>2</sup>) which consisted of sandy-loam soil was cleared, rotovated and divided into 20 treatment plots. Each plot had an area of 3.15 m<sup>2</sup>.

Two rows were made in each plot spaced 50 cm apart. Poultry manure at the rate of 1.98 Kg was applied in each row and covered with a thin layer of soil. Three days later, one seed was sown in a hole (3–5 cm depth) along rows, at a spacing of 50 cm X 30 cm, after which they were irrigated immediately using the microsprinkler. Each plot consisted of a total population of 12 plants (38,095 plants per hectare equivalent). The treatments were laid out in a randomized complete block design with four replications.

One week after seed germination, the first application of the fertilizer Nitrophoska (12-12-17) was done at the rate of 558 kg per hectare while the second application was applied two weeks later following recommendation by Ripjma (1991). The fertilizer was applied using the band placement method. Weeding was carried out as the need arose while harvesting was done in mid- September.

Data taken included mean days to maturity, mean root length, mean root width, mean root weight per plant and yield (t/ha). The data were subjected to Analysis of variance (ANOVA) while the Least Significant Difference (LSD) was used to separate treatment means.

## RESULTS AND DISCUSSION

In Table 1, the meteorological information of the trial site at Anse Boileau, Seychelles for the growth period from June to September, 2005 and 2006 is given. The average monthly temperature over the years ranged from 22.2 °C to 30.2 °C. The average relative humidity ranged between 80.1 % and 85.8 %. The maximum temperature and the relative humidity range were considered high for beetroot. Burney and Mahmood (2002) reported that maximum temperature above 30 °C and humidity (more than 75 %) enhance reduction in beetroot yield. Generally, rainfall recorded was low during the crop growth period, while the month of June recorded the highest amount of rainfall and highest number of rainy days.

Total N value in the soil over the years was low (0.03 % and 0.06 %). Similarly, the soil had a medium level of P (6.2 ppm and 7.5 ppm) with a

corresponding low level of K (0.06 % and 0.09 %) for the years 2005 and 2006 respectively. Relatively moderate amounts of exchangeable bases (Ca and Mg) were present in all the soil units. Over the years, organic matter was low (1.2 % and 1.4 %) while the pH in water was near neutral (Table 2). The soil condition, especially the level of organic matter was not conducive for the production of beetroot, however, the pH was suitable.

In Table 3, the yield performance of four beetroot varieties compared with the regular variety 'Detroit' under open field conditions at Anse Boileau, Seychelles for the year 2005 and 2006 is given. Variety 'Moronia' matured earlier while varieties 'Crosby' and 'Detroit-243' matured late in both years. The time to maturity could be linked to the genetic control of the varieties, thus the difference in the length of time taken to remain at the vegetative phase before roots are initiated and become matured.

Variety 'Crosby' (late maturing) produced the longest root length of 11.58 cm and 12.76 cm and largest root width of 6.02 cm and 7.55 cm in the year 2005 and 2006 respectively. However, its root length and root width were not significantly different at  $p \leq 0.05$  level when compared to a similar late maturing variety 'Detroit-243'. This view supports Yupaworayos (2000), who reported that late maturing varieties produced root with large size. The late maturing varieties could have benefited from the prolonged accumulation of thermal units necessary for sufficient root bulking, thus influencing size.

Variety 'Crosby' produced the largest root weight per plant of 125.50 g and 130.45 g in addition to recording the best yield of 48.65 t/ha and 46.32 t/ha for the year 2005 and 2006 respectively. Its root weight per plant and yield were significantly higher at  $p \leq 0.05$  level than those obtained from other varieties. The benefits derived from the prolonged accumulation of thermal units necessary for sufficient root bulking could have influenced its higher root weight per plant and yield. Thompson (2001), in a similar experiment in Canada, reported that 'Crosby' out-yielded seven other varieties introduced and produced the best yield. Variety 'Crosby' significantly improved yield at  $p \leq 0.05$  level by 39.7 % and 33.1 % for the year 2005 and 2006 respectively compared to that obtained from the popular variety 'Detroit'

Ijoyah, M.O.<sup>1</sup>; Sophie, V.L.<sup>2</sup> and Rakotomavo, H.<sup>3</sup>**Table 1: Meteorological information, Anse Boileau, Seychelles (June-September) 2005, 2006**

Months	Average monthly rainfall (mm)	Average monthly temperature (°C)		Average relative humidity (%)
		Max.	Min.	
<b>2005</b>				
June	15.8(25)*	30.2	23.1	85.8
July	4.2(12)	28.0	22.6	83.6
August	3.9(12)	28.5	22.4	83.5
September	5.1(16)	29.4	23.0	80.1
<b>2006</b>				
June	15.3(24)*	28.3	23.1	83.4
July	4.0(11)	28.4	22.8	80.1
August	3.6(17)	27.5	22.2	81.4
September	3.8(10)	26.6	22.3	81.2

Source: Vegetable Evaluation and Research Meteorological Station, Anse Boileau, Seychelles.

\*Value in parenthesis indicate number of rainy days.

**Table 2. Physico-chemical properties of the soil of experimental site, 2005 and 2006.**

Parameters	Soil analytical data		Method of analysis
	2005	2006	
Organic matter	1.2 %	1.4 %	Walkley-Black method
Nitrogen	0.03 %	0.06 %	Kjeldahl method
P <sub>2</sub> O <sub>5</sub>	6.2 ppm	7.5 ppm	Flame photometric
K	0.06 %	0.09 %	Oxidation method
Ca	1.36 meq/100 g	1.89 meq/100 g	A.A.S
Mg	0.86 meq/100 g	1.00 meq/100 g	A.A.S.
pH(H <sub>2</sub> O)	6.5	6.9	pH meter
pH(CaCl <sub>2</sub> )	5.0	5.4	pH meter

ppm: parts per million

A.A.S.: Atomic Absorption Spectrophotometer

**Table 3. Yield performance of four beetroot varieties compared with the local variety (Detroit) at Anse Boileau, Seychelles for the year 2005 and 2006**

Varieties	Mean number of days to mature (N0)		Mean root length (cm)		Mean root width (cm)		Mean root weight Per plant(g)		Yield (t/ha)	
	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006
Moronia	60.30bc	60.22bcd	6.29bc	7.05bc	3.64bc	4.02bc	91.55bcd	100.20bcd	29.32b	31.00b
Lola	65.42bc	64.80bc	8.58b	8.98b	5.42ab	6.35b	107.08b	112.32bc	37.36b	36.52b
Crosby	75.03a	75.16a	11.58a	12.76a	6.02a	7.55a	125.50a	130.45a	48.65a	46.32a
Detroit-243	75.03a	75.14a	10.76a	11.50a	5.97a	7.50a	110.42b	120.20b	37.40b	35.30b
Detroit	70.01ab	70.04b	7.42bc	6.82bc	5.33b	6.54b	97.31bc	115.13bc	29.43b	28.30b
Means	69.16	69.07	8.93	9.42	5.28	6.39	106.37	115.66	36.43	35.49
LSD(p=0.05)	4.32	4.01	1.15	1.53	0.62	0.53	5.23	6.10	10.43	12.20
Cv(%)	13.31	15.20	10.14	12.03	7.69	9.20	17.66	15.42	19.50	18.23

Means in the same column followed by different letters are significantly different at (p=0.05) using the LSD.

## CONCLUSION

From the results obtained, it can be concluded that for open field conditions, variety 'Crosby' is preferred as a potential replacement for the low yielding local variety 'Detroit'. This is associated with higher root length, root width, root weight per plant and yield respectively. It is therefore recommended that further investigation on the yield performance of the varieties be evaluated across different locations with varied ecology in the Seychelles.

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