African Crop Science Journal, Vol. 12. No. 3, pp. 201-204, 2004
Printed in Uganda. All rights reserved
ISSN 1021-9730/2004 $ 4.00

EVALUATION OF SOUTH AFRICAN BRED CULTIVARS OF SWEETPOTATO UNDER BOTSWANA CONDITIONS

I. BOK, M. MOAMOGWE, M. MOLATLHEGI, M. HUNYEPA and I. RAMOGOTSI
Department of Agricultural Research, Private Bag 0033, Gaborone, Botswana

ABSTRACT

Sweetpotato (*Ipomoea batatas*) is widely produced and consumed in Botswana. Identifying cultivars adaptable to the local climatic conditions may stimulate production and give producers and consumers a variety of tuber quality attributes to choose from. Since the country has no capacity to breed its own cultivars, a trial involving fifteen South Africa bred cultivars was conducted at Sebele to assess their adaptability. The experimental mean yield of 11.9 t ha^{-1} was lower than in South Africa but compared favourably with the yield achieved in previous trials using other cultivars. Cultivar 'A59' gave the highest yield of 24.5 t ha^{-1}, while 'Astrid' recorded the lowest (5.5 t ha^{-1}). An increase in tuber number per plant was accompanied by a general decline in tuber weight with '1989-17-1' producing the largest tubers weighing 443g while 'Blesbok' was the most prolific cultivar with each plant producing on average 6 tuberous roots. The bulk of the produce was of acceptable quality with 'Astrid', recording the lowest yield was one of the cultivars with the highest marketable portion.

Key Words: *Ipomea batatas*, South Africa, weevils, yellow-orange fleshed

RÉSUMÉ

La patate douce (*Ipomea batatas)* est largement produite et consommée au Botwana. L'identification des variétés adaptées aux conditions climatiques locales peut stimuler la production et donner aux producteurs et aux consommateurs une un choix dans une gamme des qualités des tubercules. Comme le pays n'a pas de capacité de produire ses propres variétés, un essai impliquant quinze variété Sud-Africaine était conduite à Sebele pour évaluer leur adaptabilité. Un rendement expérimental moyen obtenu de 11.9 t ha^{-1} était faible comparé au rendement en Afrique du sud mais était comparable au rendement obtenu des essais précédents avec d'autres variétés. La variété A59 donna le rendement le plus élévé de 24.5t ha^{-1}, alors que Astrid enregistra le plus faible rendement de 5.5 t ha^{-1}. Une augmentation du nombre des tubercules par plante était généralement accompagnée du déclin en poids des tubercules avec 1989-17-1 produisant le plus grand poids en tubercule de 443 g alors que Blesbok était la vaiété la plus prolifique avec une production moyenne de 6 tubercules par plante. The bulk de la production était de qualité acceptable avec Astrid même si son rendement était le plus faible, elle était la variété la plus vendable.

Mots Clés: *Ipomea batatas*, Afrique du sud, charançons, jaune orange graissé

INTRODUCTION

Sweetpotato (*Ipomoea batatas)* is widely grown in Botswana, although produced by small scale farmers. It is produced under rain-fed condition primarily for home consumption, and irrigation for commercial purpose. This crop is particularly important in the Central and North-East districts of Botswana (Mlenga *et al.*, 1997). As is common with other crops, local producers are not able to meet the demand for this crop in the country, hence, considerable quantities of tubers are

imported from South Africa and Zimbabwe (Horticulture Section Annual report, 2002/3). Low production of the crop in the country has been attributed to, among others, the frequent drought experienced in the country and unavailability of planting materials at the beginning of the growing season. Although lack of adaptable varieties is not cited as a limiting factor to production, there is need to evaluate different cultivars of sweetpotato in the country to identify suitable ones for production. Identifying cultivars that are adaptable to the local climatic condition may stimulate production of this crop. The need to satisfy different sectors of the society and particularly to provide the vital nutrients in the diet of those suffering from numerous ailments, calls for the provision of alternative (cheap) source of these elements. In view of this, the inclusion of the yellow and orange-fleshed cultivars in the evaluation is a step in the right direction in combating malnutrition among those with limited resources. The objective of this study was to assess the performance of sweetpotato cultivars bred in South Africa for suitability under Botswana conditions.

MATERIALS AND METHODS

Cuttings of fifteen (15) cultivars of sweetpotato from South Africa were planted at Sebele research site on the 20th December 2001. Although 'Blesbok' was also bred in South Africa, it was used as a control because it is one of the cultivars recommended for local production, based on its performance in previous trials. Cut vines of these cultivars of about 40 cm, were used as planting materials. They were planted on ridges spaced 75 cm apart. Plots in all the trials were subjected to the same treatment with respect to fertiliser, irrigation, weeding, and other cultural operations. A basal dressing of 2:3:2 compound fertiliser at a rate of 500 kg ha^{-1} was applied to the field prior to planting, and an additional application of 150 kg ha^{-1} ammonium sulphate done by banding along the ridges at six weeks after planting.

Treatments were laid out in a complete randomised block design with three replications. The trial was terminated on the 21st May 2002 when the crop was harvested and data on storage root yield and tuberous roots number recorded. Other yield characteristics were estimated from these parameters. The data were subjected to ANOVA using a SAS programme and LSD was used to separate the treatment means (Steel *et al.*, 1997).

RESULTS AND DISCUSION

Data for yield and its components are presented in Table 1. The storage root yield for the trial was 11.9 t ha^{-1}. Cultivar 'A59' gave the highest yield of 24.5 t ha^{-1}, but was not significantly different from that of 'A56' with 16.6 t ha^{-1}. The lowest yield was recorded in 'Astrid', although was statistically similar to a number of other cultivars including '1994-11-3' whose mean yield was 13.5 t ha^{-1}. The yield of the cultivars was very low compared to their performance in South Africa, where they produced marketable tubers in excess of 40 t ha^{-1} (Laurie, 2003, Agricultural Research Council, South Afrrica. Pers. comm.). Reasons to explain why such a big difference in performance remain unclear but climatic factors may be responsible, particularly temperature at the time of planting. The trial was planted late in the season and by the time the crop approached maturity, low temperatures were already in occurrence, hence, this may have reduced tuber growth to some extent. The damage caused by sweetpotato weevils (*Cylus puncticollis*) on tubers are also partly responsible for the reduction in marketable yield. The yields obtained from different cultivars were, however, more than the previous years; the latter was 6 t ha^{-1} (DAR Annual Report, 2001) indicating that the cultivars used are superior with respect to yield. The performance of the cultivars was more influenced by the tuberous root number than by tuber weight as evidenced by a decrease in yield accompanied by a general decline in the former (Fig. 1). The performance of, 'A59', 'A2' and '1997-18-1', which are yellow and orange-fleshed cultivars, is impressive and shows that they can be successfully included in the production programme of farmers.

Mean tuber weight for the trial was 252 g with cultivar '1989-17-1' producing the heaviest storage roots (443 g). There was no significant relationship between tuber weight and total yield but cultivars with larger tubers had a tendency to produce fewer storage roots and *vice-versa* (Fig. 2). Cultivars 'A59' and 'A2' were the most prolific,

producing a mean of nine tuberous roots per plant. The high yield observed for the superior cultivars was attributed to the high number of tubers they produced.

The lowest incidence of pest damage was recorded for '1994-18-1', where none of the tubers was rendered unmarketable as a result of sweetpotato weevil infestation. The bulk of the storage roots (54%) for 'Censa' was lost due to weevil damage, suggesting that this cultivar is prone to the weevil attack. Two-thirds of the total produce was of acceptable tuber quality and size. The unmarketable portion mainly being attributable to weevil damage.

CONCLUSION

Cultivar 'A59' is superior in yield overall of 24.5 t ha^{-1}. An increase in storage root number is accompanied by a general decline in tuber weight

TABLE I. Performance of sweetpotato cultivars evaluated at Sebele Research Station

Cultivar	Yield (t ha^{-1})	Tuber weight (g)	Tuber number	Marketable portion (%)	Pest dam aged portion (%)
A59	24.5a	279bcd	5ab	64ab	30abcd
A56	16.6ab	337abc	3bcd	73ab	21bcd
A2	15.5bc	169de	5ab	78a	9cd
Blesbok	15.3bc	168de	6a	78a	7d
1997-18-1	15.0bc	177de	5ab	82a	0d
1994-11-3	13.5bcd	172de	5ab	42b	45ab
1990-4-2	13.3bcd	194cde	4abc	83a	7d
Censa	11.9bcd	268bcde	3bcd	42b	54a
1994-8-1	11.7bcd	366ab	2cd	71ab	25abcd
1994-5-1	10.4bcd	369ab	2cd	56ab	40abc
1997-9-2	9.2bcd	213cde	3bcd	55ab	27abcd
1989-17-1	8.9bcd	443a	1d	65ab	27abcd
89-23-1	7.8cd	222cde	2cd	54ab	41ab
Tanzania	5.6d	129e	3bcd	68ab	25abcd
Astrid	5.5d	276bcd	1d	83a	14bcd
Mean	11.9	256	3	66	24.9
CV	44.5	29.2	42.6	25.9	64

NB: Means within a column followed by the same letter are not significantly different at P<0.05

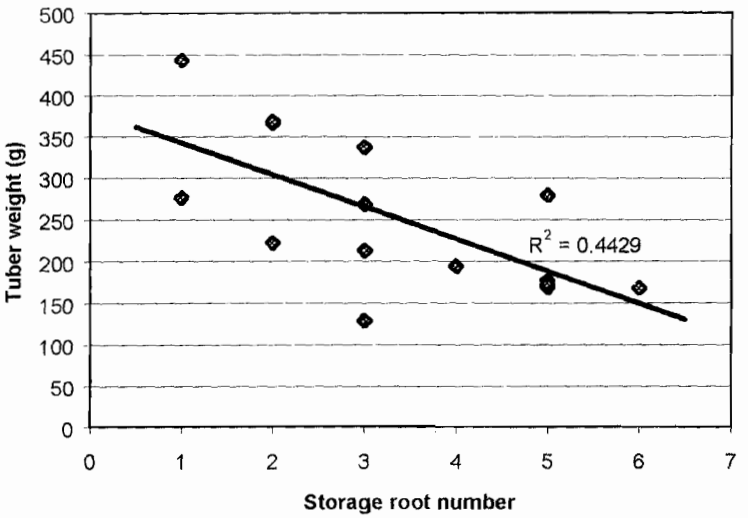

Figure 1. Relationship between sweetpotato tuber weight and number of storage root number formed.

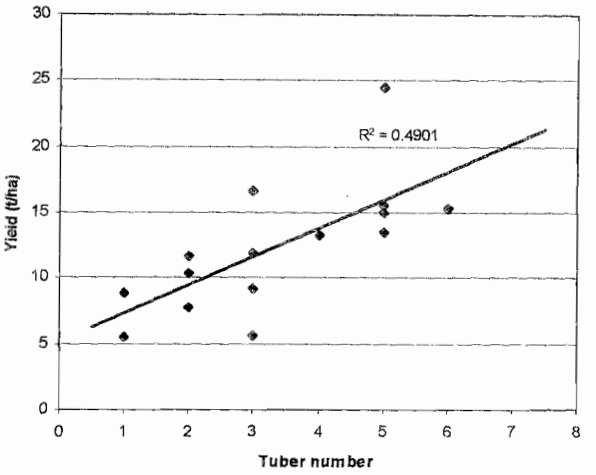

Figure 2. Influence of number of tubers formed on the yield of cultivars of sweetpotato.

but yield was more influenced by tuber number than by the former. The bulk of the produce was of acceptable quality with 'Astrid', though recording the lowest yield was one the cultivars with the highest marketable portion. Yellow and orange-fleshed cultivars can be grown successfully at Sebele and surrounding areas as a cheap source of carbohydrates and β-carotene in the diet. Management practices, particularly the control of sweetpotato weevils, should, however, be improved to realise the full potential of the cultivars. Further investigations should be carried out with a wider scope of parameters, including such aspects as palatability, and drought tolerance, among others.

ACKNOWLEDGEMENTS

The authors are grateful to the Southern African Root Crops Research Network (SARRNET) and Botswana Government for their financial support. The Agricultural Research Council of South Africa is acknowledged for providing planting materials.

REFERENCES

Department of Agricultural Research. 2001. Annual Report for the Crop Research Division. Ministry of Agriculture. Botswana.

Horticulture Section Annual Report. Department of Crop Production. Ministry of Agriculture. Botswana.

Mlenga, W. S., Tsheboeng, K. and Madisa, M. 1997. Cassava and Sweetpotato baseline study in Botswana. Ministry of Agriculture. Botswana.

Steel, R.G.D., Torrie, J.H. and Dickey, D.A. 1997. Principles and Procedures of Statistics: A Biometrical Approach. Third Edition, McGraw-Hill Book Company Inc., New York, USA. 666pp.