PROCEEDINGS

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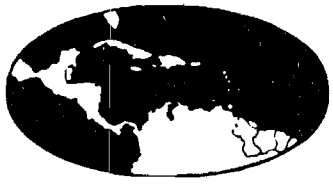

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SOME SPACING EXPERIMENTS WITH SWEET POTATOES IN BARBADOS

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ABSTRACT

Each year about 1,500 to 2,000 acres of sweet potatoes are grown in Barbados as a crop in rotation with sugar cane. Yields range from 1 1/2 to 6 tons per acre. This is regarded as poor to moderate. It is felt that the traditional system of planting sweet potatoes is mainly responsible for such low yields.

Research work on variety testing, fertilizer and population density studies has been done.

It appears from work done between 1960-65 that yields can mainly be improved by increasing plant populations and by improved varieties.

The yields from some 10 local varieties and 5 introduced varieties were tested and results indicate that the local varieties, with one exception, are superior in yields and quality.

With plant spacings of 12", 18", 24" and 30" on 5' banks, the 12" spacing gave the highest yields, but still better yields were obtained with 27" to 36" banks.

INTRODUCTION

At present in Barbados a total of some 3,000 acres of sweet potatoes are grown annually with an average yield of 3.5 tons per acre. This total acreage is divided approximately into two equal plantings viz. a short crop or spring potatoes grown between October and March. The average yield of the former is 3 tons per acre or 3 to 4 pounds per hole; while that of the fall potatoes are 4.2 tons per acre or 5 to 6 pounds per hole.

The above yields are obtained by planting the crop on the banks between the cane holes at three slips to the hole, and 5 x 6 sq. ft. between holes. Recently 5 ft. furrows have been used and the crop planted 3 - 5 ft. along the bank with 1 to 2 slips per hole. No fertilizers or irrigation is applied and there is normally no insect control. Varieties such as Cookstand, Egg Cove, Caroline Lea, 6207, B5 are widely used and to a lesser extent 6210, B44, C9, C26. Recently six varieties were introduce from U.W.I., Trinidad, (049, C104, T25, T67, K4, M23) and results indicate that some of these varieties will yield well.

A brief review of the work done since 1900 shows that during 1900 to 1910 much variety testing was done, but most of these varieties have now been eliminated due to poor yields. Many varieties were ruined by Scarabee infestation (cryptorynchus batatae)[1] (Euscepes batatae)[2]. Variety testing continued through the nineteen twenties and nineteen thirties and some varieties such as B5, B44 were finally selected. (These varieties are still used today). Storage experiments were done about 1936 using the crate and clamp methods, the latter being more successful and a period of 3 to 4 months of storage was recorded.

It was not until 1940-45 that manurial work in sweet potatoes was started. Trials with 2 cwt. S/A per acre and 3/4, 1 1/2 and 3 cwt. M/P per acre were done. Experiments were carried out on both crops on the black soils of Barbados. There was no significant increase in yield and Blackburn[3] suggests that "the absence of any response was mainly due to the poor physical structure of the soil." A further trial using V.G.M. (2:1:1) at 4 cwt. per acre was carried out in the dry season, ensuring that the soil was given a good tilth. There was a significant response and Blackburn concluded "these results support the opinion that soil conditions often limit root crop production in Barbados".

During 1955[4], a trial using cane-holes and furrows suggested that furrows are more efficient in the high rainfall areas. Another trial using cane-holes and three slips to the hole (with populations of 5,226 and 10,452 plants per acre) gave no significant difference in yield but the former gave larger potatoes. Another fertilizer trial showed that an application of 2 cwts. of S/A was significant.

Recent work on fertilizers, maturity trials, and trials involving different types of planting material and types of cultivation have not given any significant differences in yields. This has suggested attention to population density.

RESULTS

Spacing experiments have been limited. In 1962[5] experiments were carried out on 4' furrows at populations of 4,356 to 14,520; these experiments suggested that the higher population gave better yields, but the yields did not rise to the expected and required economic level of five to ten tons per acre. This may have been due to the varieties used, C9 and B44 which are not among the highest yielders in the island. A complete mixture was used but showed no significant results. Gooding[6] has got no significant response from fertilizers.

At waterford Research Station four varieties were compared at four different populations over a 21-week period. These varietal populations and yields are set out in Table 1.

These populations were obtained by using a 4 1/2' bank and spacing of 12", 18", 24", and 30" along the bank. From such a trial, yields of 4.6 tons were obtained at 9,500 plants per acre. Using another variety, 6207, Gooding obtained a similar yield at the same population. During this experiment no L.A.I. were taken but there was not a complete ground cover. The fact that no maximum point was obtained seems to indicate that a much higher population can be tolerated only if yields increase proportionately.

In another trial carried out on a different soil type and rainfall area, and with population of 3,000 to 14,000 plants, maximum yields of 7.2 tons were obtained.

From this experiments, it appears that a population of 9,000 to 11,000 plants per acre will give maximum yields. In some areas where rainfall is low, at higher populations water stress may assume great importance. At Jerusalem Research Station on a better soil type and better rainfall distribution, higher yields were obtained at a similar population. It could be also that there was less competition both in leaf area and root room. Each plant at maximum population of 9,680 plants per acre had 4 1/2 sq. ft. of space, but at Waterford, 4 1/2 ft. between banks and 1 ft. between plants must appear more competitive (both in leaf and root room) than the plants at Jerusalem where plants were three feet between banks and eighteen inches apart.

Although it is felt that a 3 ft. bank is beneficial, it must be borne in mind that food crop production in Barbados is made to fit in with the cane crop and not vice versa. As a result, the land is prepared in 5 ft. banks and hence research must consider improving yields with the use of these 5 ft. banks.

Consideration must however be given to food crop production with its own land preparation and cultivation.

Commercial practices will depend to a large extent on the relative importance and economics of the sugar crop and on finding a suitable rotation.

CONCLUSION

Low yields observed in Barbados could be due to:

(a) Rainfall

(b) Low population density

(c) Soil factors and cultivation

(d) Varieties

(e) Little interest in the crop resulting from low market prices

It is felt however that population of 9,000 to 11,000 are adequate under rainfall of 20 to 30 inches during the growing cycle.

Appendix I shows the cost of production. The current price of potatoes in the field is 2 to 4 cents a pound and the yield required to give an economic crop can be deduced.

In addition to agronomic factors, the physiological aspects of crop production are important. In this respect the size and efficiency of the photosynthetic system must be investigated. The former is represented by the leaf area - recorded as Leaf Area Index i.e. Leaf Area/Unit ground cover. The latter as Net assimilation rate. Some work has been done by Spence and Haynes et al[7] in this respect and also by Watson[8] on English Potatoes. The higher yielding varieties were those with higher mean leaf areas. There was however no association of high Net assimilation rate with high yield.

Further research along the following lines is indicated:

(1) Increase plant population density and

a) the effect of moisture on the increase density;

b) the effect of the increase density on the cane crop.

(2) The selection of higher yielding varieties.

(3) The improvement of cultivation methods.

(4) The improvement of storage techniques to even out the seasonal production and improve the economics of the crop.

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TABLE I

WATERFORD RESEARCH STATION

POPULATION	YIELD IN TONS PER ACRE			
	6207	Egg Cove	Caroline Lea	Cookstand
9,680	1.45	2.20	3.43	4.61
6,453	1.73	1.67	3.29	3.63
4,840	1.39	1.80	3.16	2.86
3,872	1.08	1.13	2.60	2.77

TABLE II

JERUSALEM RESEARCH STATION

POPULATION	YIELD IN TONS PER ACRE			
	6207	Egg Cove	Caroline Lea	Cookstand
14,520	3.82	5.08	4.63	6.43
9,680	4.05	6.03	4.63	7.24
7,260	3.87	4.36	4.63	7.02
5,808	3.19	4.32	5.20	6.61

COST OF PRODUCTION PER ACRE IN $.

THROWN-OUT LAND - PLANTING RATE

Cane Hole & Mounds - 3 to 4 slips per hole 5 x 5 sq.ft.
Furrows - 5 ft. furrows - 3 slips at 3 - 5 sq.ft.

Operation	Cane Hole	Furrows
Land Preparation		
Harrow	34.00	34.00
Cane Hole @ 1.36 per hundred	23.69	--
Make up mounds between cane holes 78¢ per hundred	13.58	--
Line field	6.49	6.49
Furrow	--	12.00
Planting		
Dig Holes 10¢ per hundred slips	6.97	6.97
Cutting and planting slips 16¢ per hundred	10.15	10.15
Truck Driver etc.	2.00	2.00
Weeding		
1 woman @ 1.50 weekly for 15 weeks	22.50	22.50
Spraying	5.00	5.00
Harvesting	3.00	3.00
	$127.38	102.11

It is sometimes necessary to plough at $30.00 per acre in addition to harrowing.

SELLING PRICE AND REVENUE YIELD

Selling Rate (in tons)	1	2	3	4	5	6	7
two cents	$44.80	89.60	134.40	179.20	224.00	268.80	313.60
three "	67.20	134.40	201.60	268.80	336.00	403.20	470.40
four "	89.60	179.20	268.80	358.40	448.00	537.60	627.20