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Influence of Nitrogen and Potash on the Quality of Tapioca Tuber at Different Months of Growth*

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Field experiments conducted over two seasons with varying levels of nitrogen and potash on tapioca varieties indicated that tuber dry matter increased with the age of the crop but heavy rainfall at the time of harvest caused a reduction. The starch content ot the tuber in both Burma and H. 165 varieties increased upto ninth month beyond which the increase was not appreciable. Variety Coimbatore local registered higher crude fibre content followed by Burma and H. 165. Nitrogen application had significantly increased the crude fibre and HCN content of tuber Potash had no effect on crude fibre but reduced HCN ccntent. With the maturity of the tuber, the fibre content decreased. The hybrid H. 165 registered higher HCN content followed by Coimbatore local and Burma. At the time 0f harvest lowest HCN content was recorded in all the three varieties,

Tapioca is an important crop used for staple food and as livestock feed. It is harvested over a range of growth periods based on the visual symptoms such as falling of large number of leaves from the plant, cracking of soil surrounding the root portion etc. Tubers are consumed as vegetable and also used for the extraction of starch. Harvesting of immatured and over matured tuber. adversely affect the quality of tuber. The changes taking place on the quality tuber such as dry matter, starch, crude fibre and HCN content during different months of growth period and the influence of N and K fertilizer were investigated and reported.

MATERIAL AND METHODS

Two field experiments were conducted during January to November in 1975 and 1976 seasons in a sandy loam red soil in the Farm of Tamil Nadu Agricultural University, Coimbatore. In the first experiment three tapioca varieties viz. Coimbatore local, Burma and H. 165 were tried while in the second only Burma and H. 165 were tested. The levels of N were O (NO), 75 (N1), 150 (N2) in the first experiment and O (NO), 50 (N1), 100 (N2), 150 (N3) kg N/ha in the second experiment. The levels of potash were O (KO), 150 (K1), 300 K2) in the first experiment and O (KO), 100 (K1), 200 (K2), 300 (K3) Kg K_2O/ha in the second experiment. In both the experiments a common dose of 75 kg P_2O_5 /ha was applied uniformly to all the plots as superphosphate. The entire quantity of N and half of K_2O were applied as basal and the remaining half of K_2O at sixtieth day after planting.

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Nitrogen and potash were applied in the form of urea and muriate of potash respectively.

The first experiment was laid out in a 3^8 confounded factorial design while for the second experiment split plot design was adopted assigning VxN treatment to the main plot and K levels to the Sub-plot. The gross plot size was 5.25x 6.75m to accommodate 63 plants spaced 75 x 75 cm apart. The setts were planted vertically on the sides of ridges and two shoots were maintaind through out the crop growth. Respresentative tuber samples were collected at monthly intervals from sixth to tenth month age of the crop. The dry matter, starch (McCready *et al*, 1950), HCN (Gilchrist *et al*. 1967 and Indira and Sinha, 1969) and crude fibre (A. O.A. C. 1979) contents of tubers were estimated.

RESULTS AND DISCUSSION

The results of analysis are presented in Table 1. The dry matter content of the fresh peeled tuber is very important as it is having a direct relationship with the starch content of the fresh tapioca tuber Thompson and Wholey, 1972). The tuber dry matter content ranged from 22.3 to 39.0 with an increase with age which was obviously due to increased starch accumulation in the tuber. In the second experiment there was a significant reduction in the dry matter content at tenth month which may be attributed to high soil moisture status caused by high rainfall which coincided with the harvesting time. The total rainfall received during the tenth-month age of the crop were 81 and 185 mm in the first and second experiment respectively. Obigbesan (1977) also pointed out that variation in the dry matter content of tuber between years might be caused by the soil moisture status at the time of harvest. In the second experiment the variety Burma registered significantly higher dry matter content of 31.72 percent than H. 165 (30.56). Similar varietal variation was also well documented (Obigbesan 1977). Potash application failed to influence the dry matter content of the tuber in both the experiment significantly.

There was no difference in the starch content of the three varieties. Nitrogen fertilization reduced the starch content from 75.81 percent in the control to 74.53 percent in 50 kg N/ha. during the growth phase of the tuber in the second experiment. This might be due to the diversion of carbohydrates for the synthesis of protein a non-protein nitrogenous compounds. Potash application was found to increase the starch content of the tuber at different months of growth which was attributed to its role as a cofactor for number of enzyme reactions in carbohydrate metabolism, particularly the polymerization of glucose to starch. (Obigbesan, 1973).

The starch content of the tuber was found to increase with age of the crop in both the experiments. However this increase was not appreciable after ninth month. Similar observation was also reported by Ketiku and Oyenuga (1972).

Among the three varieties tested in the first phase of the investigation, Coimbatore local contained higher amount of crude fibre (3.17%) than Burma (3.03%) and H. 165 (2.82%), the last one registering the lowest value in both the experiments. Nitrogen application was found to increase the crude fibre content of the peeled tuber significantly at different months of growth which also decreased gradully from six month to harvest stage. The high percentage of crude fibre observed in the early stages of growth was probably due to relatively greater formation of cell-wall materials to cope with subsequent rapid storage of starch (Ketiku and Oyenuga, 1972). This decreasing trend of crude fibre with time could also possibly be due to root enlargement coupled wirh more starch accumulation (Subramanyan et al, 1955) However, the fibre content at ninth and tenth month remained almost at constant level.

The HCN content was found to vary greatly among varieties. H. 165 consistently registered higher values (35.00 and 35.85 ppm) than the other varieties in both the experiment. Similar genetic variability among tapioca varieties was also observed by earlier workers (Moh and Alan, 1972; Obigbesan, 1977). Nitrogen fertilization had consistently increased the HCN content of tuber throughout the crop growth. Prema *et al* (1975). also recorded similar higher HCN due to N fertilization, lending support to the above observation. During the development of tuber, potash was found to lower the HCN content significantly. Obigbesan (1973) also obtained similar results. The HCN content of the tuber decreased gradually with the age of crop registering the lowest value of 15.87 ppm at tenth month. The results of the present investigation are in accordance with those of Gopal and Sadasivam (1973) and Obigbesan and Fayemi (1976).

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TABLE 1: Quality of Peeled Tapioca Tubes as Inflienced by Fertilizer and Months of Harvest

Treatments	Dry matter (Percentage on oven dry basis)		Starch		Crude fibre		HCN (ppm on fresh wt. basis)	
	1975	1976	1975	1976	1975	1976	1975	1976
Varieties								
Coimbatore (Local)	34.81	–	75.38	–	3.17	–	24.00	–
Burma	33.88	31.72	75.90	75.21	3.03	3.14	20.50	21.74
H. 165	33.41	30.56	75.20	74.66	2.82	2.83	35.00	35 85
S E.	0.23	0.20	0.48	0.22	0.05	0.03	0.40	0.45
C. D. at 5%	0.66	0 62	–	–	0.15	0.09	3.90	1.38
N levels: N_0	34.48	31.24	75.60	75.81	2.87	2.90	22.60	25 96
N_1	34.05	31.47	75.42	74.53	3.03	2.98	28.30	29.41
N_2	33.57	30.96	75.45	74.66	3.14	2.97	28.60	28.78
N_3	–	30.89	–	74.75	3.08	–		31.03
S. E.	0.23	0.29	0.48	0.31	0.05	0.04	1.40	0.64
CD at 5%	0·66	–	–	0.95	0.15	–	3.90	1.96
K_2O levels								
K_0	34.18	31.26	74.29	72.82	3.00	2.88	29.10	30.60
K_1	34.09	31.04	75.65	74.52	3.03	3.13	26.30	28.72
K_2	33.83	31.06	76.60	76.04	2.99	2.95	24.10	27.11
K_3	–	31.20	–	76.38	–	2.97	–	28.46
SE	0.23	0 20	0.48	0.30	0.05	0.06	1.40	0.60
CD at 5%	–	–	1·35	0.86	–	...	3.90	1.72
Month after Planting :								
Sixth	28.26	25.87	69.00	70.72	4.12	4.30	36.90	43.55
Seventh	33.02	27.87	74.13	71.65	3.59	3.42	31.50	37.62
Eighth	34.71	35.39	75.70	74.59	2.90	2.45	26.80	27.36
Ninth	36.77	34.87	78.67	78.16	2.30	2.42	21.50	19.58
Tenth	37.42	31.70	79 94	79.57	2.12	2.31	15.80	15.87
SE	0.30	0.32	0.62	0.35	0.07	0 04	1.80	0.71
CD at 5%	0.85	0.98	1.74	1.04	0.19	0.14	5.10	2.19