

INFLUENCE OF STAGES OF HARVEST ON THE YIELD AND QUALITY OF CASSAVA (*Manihot esculenta* CRANTZ)

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In a field experiment, cassava (*Manihot esculenta* Crantz) varieties M.4 and H.2304 were trial harvested at 6 to 12 months after planting (MAP). Fresh tuber yield was not significantly different between harvest stages of 6th to 9th MAP. Though there was increase in yield beyond the 10th month, there was increase in fibre content of tubers and deterioration in cooking quality. Contents of starch, fibre and HCN were higher and dry matter percentage lower in H. 2304 than M. 4. The HCN content, though increased up to 8 MAP, it was within the safe limit of 100 μ/g .

Cassava (*Manihot esculenta* Crantz) is a perennial root crop raised as an annual and harvested at eight to twenty four months after planting. In Kerala, the State where the area under cassava is the largest in India, the crop is harvested within eight to twelve months of the planting. An early harvest of the crop often leads to reduced tuber yields. Delayed harvest results in the development of woody and fibrous tubers. A reduction in starch content also follows (Ingram and Humphries, 1972). The optimum time of harvest of cassava will be the stage at which maximum tuber yield of desirable quality is obtained. This stage may vary with varietal and ecological factors. The optimum stage of harvest of a variety in different agro-climatic zones can be judged only through phased harvesting trials. The objective of this investigation was to find out the optimum stage of harvest of cassava cv. M. 4 and H. 2304 (Sree Sahya.)

MATERIAL AND METHODS

Two separate experiments were conducted from 1978 to 1981 to

achieve the objectives defined. The first trial was conducted with a single variety, M 4, at Coconut Research Station, Nileswar during 1978-79. The yield and quality of the tubers were studied by harvesting the crop at four different stages of harvest viz. 7, 8, 9 and 10 months after planting. Based on the results of the first trial, a more detailed experiment was conducted with two varieties viz. M. 4 and H. 2304 and seven stages of harvest, viz. 6, 7, 8, 9, 10, 11 and 12 months after planting. These two varieties selected are popular in Kerala, the former known for its excellent cooking quality and the latter for its high yield. This trial was conducted at College of Horticulture, Vellanikkara during 1980 and was repeated during 1981. Both the trials were laid out in R. B. D. with a plot size of 5.4 m x 5.4 m. The net plot size was 3.6 m x 3.6 m. The first trial was replicated six times and the second trial three times. The cropping season was from May to May and the crop was grown under rainfed conditions. A manurial dose of 12.5 t/ha of farm-yard manure and 75 kg each of nitrogen

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phosphate and potash per hectare was given.

At the time of harvest apart from tuber yield, the quality characters like starch, sugar, crude fibre (A. O. A. C. 1965) and HCN content (Indira and Sinha, 1969) of the tubers were determined. The cooking quality was assessed by serving the cooked tubers to a taste panel consisting of ten persons and the overall taste was assessed as excellent, good, satisfactory, poor (Jellinck, 1964). During first year of the trial, specific gravity of the tubers was taken as the yardstick for its starch and dry matter contents (Wholey and Booth, 1979). During 1980 and 1981, the dry matter percentage of both tuber and top portion were estimated separately and harvest index was worked out.

RESULTS AND DISCUSSION

The result of the first trial conducted at Niléswar showed that the number of tubers per plant and the tuber yield obtained at different stages of harvest were not significantly different (Data not presented). Similarly the specific gravity values of the tubers recorded at the four stages of harvest were on par. It was concluded that the variety M. 4 could be harvested even at the early stage of seven MAP.

The results of the second trial conducted at Vellanikkara (Trichur) are given in Table. The superiority in yielding ability of the hybrid variety H. 2304 was evident from the results. On an average, the yield recorded in H. 2304 was forty per cent more than that of M. 4. During 1980, the

yield obtained at different stages of harvest was significantly different in both the varieties. The yield obtained at ten MAP was superior to that recorded at six and eight MAP. The result of the trial conducted in 1981 showed that the tuber yield was not significantly different between stages of harvest. The trend of results was, however, almost the same as that of the previous year. Pooled analysis of the data of the last two years showed that the tuber yield obtained at 11 months stage of harvest was significantly higher. There was no significant difference between the yields obtained at six to nine MAP. The maximum tuber yield of 23.3 t/ha was obtained at 11 MAP. The sharp decline in yield recorded at 12 MAP is attributable to the resurgence of the vegetative growth after summer on receipt of premonsoon showers.

In both the varieties, dry matter percentage of the tuber was significantly less when the crop was retained in the field for more than 10 months. The hydrocyanic acid (HCN) content was significantly higher in H. 2304 as compared to M. 4. For the hybrid variety, the HCN content varied from 28 to 72 μ /g of fresh tuber, whereas that for M. 4 was only 10 to 19 μ /g of fresh tuber. In both the cultivars, the HCN content in the tubers, though increased with age upto 8 months was within the safe limit of 100 μ /g.

The crude fibre content, in general, was high in the cultivar H. 2304. There was sharp increase in crude fibre content of tubers when the

Tuber yield, harvest index and quality characteristics of cassava tuber.

Varieties	Fresh weight of tubers (t/ha)			Harvest index (%)	Quality of tuber			
	Year		Pooled		Crude fibre (%)		Starch (%)	Sugar (%)
	1980	1981			M 4	H. 2304		
M. 4	16.9	16.9	16.9	54.8	1.58	—	63.1	0.24
H. 2304	21.1	22.8	22.0	62.1	—	1.88	67.1	0.25
C.D. (0.05)	2.8	2.6	0.7	5.1	0.15		1.9	N.S.
SEm±	0.96	0.89	0.5	1.8	0.053		0.6	0.007
Stages of Harvest (MAP*)								
6	14.8	22.9	18.9	60.8	1.06	1.66	64.9	0.25
7	19.8	18.6	19.2	57.0	1.51	1.64	67.8	0.25
8	14.0	19.7	16.9	62.5	1.50	1.63	64.9	0.24
9	17.3	17.9	17.6	62.5	1.43	1.63	64.3	0.27
10	22.4	19.7	21.1	55.5	1.42	1.63	67.0	0.27
11	24.3	22.3	23.3	56.7	1.75	2.59	65.1	0.23
12	20.5	17.9	19.2	54.2	2.40	2.39	61.9	0.21
C.D. (0.05)	5.2	N.S.	2.5	N.S.	0.4		3.5	N.S.
SEm±	1.8	1.7	0.9	3.3	0.13		1.2	0.013

*Months after planting.

N.S. Not significant.

crop was retained in the field for more than ten months. The cooking quality as assessed by the taste panel showed that the tubers harvested after ten months stage were of poor quality. This may mainly be due to the accumulation of fibre and high percentage of moisture in the tubers. This is an undesirable character for the use of tubers even for industrial purpose. Therefore it is evident that both the cultivars must be harvested within ten months after planting for getting the maximum advantage.

The hybrid variety was superior in starch content. The sugar content was not significantly different in these

varieties. The starch percentage of tuber decreased after 11 months stage.

The harvest index was higher for H.2304. Between stages it was on par. The data indicate that 54-63% of the photosynthates are stored in the edible tuberous root from sixth month onwards.

As the yield of the tubers obtained at six to nine MAP was on par with that of 10 MAP and as the quality of tubers was impaired when retained in the field for more than ten months, it is concluded that these varieties can be harvested 6-7 months after planting without significant reduction in yield.

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Madras Agric. J. 71 (7) 450-454. July 1984.

EFFECT OF ZINC AND MAGNESIUM APPLICATIONS ON THE AVAILABILITY OF NATIVE CALCIUM TO WINTER MAIZE IN CALCAREOUS SOIL

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Addition of Zn significantly increased the dry matter yield of maize roots, stem, leaf sheath and leaf blade whereas Mg decreased their yields. In no Zn treatment, the application of Mg at 60 ppm reduced the total dry matter yield to 35% and in presence of 5 ppm Zn the magnitude of reduction was only 12%. The depressing effect of Mg on the concentration of Ca was much higher as compared to Zn. Incorporation of Mg reduced the uptake of Ca in roots to 62% and in aerial organ to 76% which revealed an inhibited translocation of Ca from root to shoot. Application of Zn reduced the soil available Ca to 27% whereas Mg reduced it to 39% showing thereby the higher depressing effect of Mg on the availability of Ca as compared to the effect of Zn.

Widespread deficiency of Zn has been noticed on several crops being grown in calcareous soils of North Bihar (Sakal and Singh, 1979). Winter maize is relatively more susceptible to Zn deficiency than the spring and monsoon ones. In some pockets

of calcareous belt incipient Mg deficiency on maize has also been observed. Zinc and Mg application is advocated to mitigate this problem. But their effects on the availability of Ca to maize in such highly calcareous soil are not clearly under-

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