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EFFECT OF N AND K FERTILIZATION ON Fe, Zn, Mn and Cu NUTRITION OF CASSAVA (*MANIHOT ESCULENTA CARNTZ*) VARIETIES

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Cassava varieties, Burma and H. 165 were raised in a sandy loam soil under four levels of N aud K. Micronutrient contents of tuber, stem and leaf were estimated in a ten month old crop. The results indicated that the concentration of all the micronutrients in tuber, stem and leaf were not appreciably influenced by N and K fertilization. Leaf registered higher content of all the micronutrients except Zn. In tuber the concentration of Fe, Mn and Cu was the lowest and Zn was maximum. The variety H.165 had higher requirement of all the four micronutrients than Burma. Nitrogen and Potash fertilization had significantly increased the uptake of all the micronutrients. One hectare of tapioca crop yielding 33, 29 and 8 t/ha of tuber, stem and leaf respectively on fresh weight basis was found to remove 2.76 Kg Fe, 805 g Zn, 456 g Mn and 144 g Cu. The distribution of these nutriets in the plant indicated that more than fifty per cent of Zn had mobilised to the tuber while the stem retained a major po.tion of the absorbed Fe, Mn and Cu.

Cassava (*Manihot esculenta* crantz) is reported to be a heavy feeder on soil nutrients particularly major nutrients but information on the micronutrient content of tuber, stem and leaf and their uptake values is lacking. Hence, a study on the nutrient removal under the influence of major nutrients particularly N and K was felt necessary to establish the quantity of each micronutrient removed from the soil. This will also enable growers to replenish the nutrients removed and to maintain soil fertility and yield.

MATLRIALS AND METHODS

Two field trials were conducted in a sandy loam soil. Available micronutrient status of the soils selected for field experiment were 1.3, 1.1, 43.2 and 3.0 ppm of Iron (Fe), Zinc (Zn) manganese (Mn) and Copper (Cu) respectively. The pH and Ec (1:2 soil water suspension) were 7.6 and 0.2 mmhos / cm. Four levels of N (0, 50, 100 and 150 kg/ha) and four levels of K_2O (0, 100, 200 and 300kg/ha) were tried on two Cassava varieties viz., Burma and H.165. Nitrogen and Potash were applied in the form of urea and muriate of potash. A uniform dose of 75 kg P_2O_5 was applied to all the plots as superphosphate. After the maturity of tuber at the end of ten months, the plant was pulled out, separated into tuber, stem and leaf,

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Table 1. Iron and Zinc uptake in tuber, stem and leaf

	Iron (g/ha)				Zinc (g/ha)			
	Tuber	Stem	leaf	Total	Tuber	Stem	leaf	Total
V_1	851	907	721	2479	519	205	58	782
V_2	757	1170	1049	2976	528	299	02	929
S. E.	27	31	32	62	15	8	3	22
C. D. at 5%	83	94	98	—	—	—	8	68
N_0	739	802	759	2300	449	199	65	713
N_1	922	1139	659	2720	626	265	75	966
N_2	822	1042	1041	2905	517	241	80	338
N_3	734	1170	1081	2985	499	303	101	903
S. E.	39	44	46	88	22	12	4	32
C. D. at 5%	117	133	139	268	67	36	11	96
K_0	731	1028	865	2624	458	244	77	779
K_1	826	947	875	2648	533	237	76	846
K_2	828	1069	933	2830	539	265	87	891
K_3	831	1109	868	2808	561	281	83	905
S. E.	32	30	46	63	15	11	4	19
C. D. at 5%	—	91	—	178	43	—	—	58

washed thoroughly, and rinsed with deionised water. The samples were dried in a forced air circulation oven and powdered. All the four micronutrients (Fe, Mn, Zn and Cu) were determined in the triple acid extract using Atomic Absorption Spectrophotometer.

RESULTS AND DISCUSSION

The data on the influence of N and K fertilization on the content and uptake of micronutrient nutrient are presented in tables 1-3.

Iron content of leaf was much higher than that of stem and tuber. An average crop of tapioca yielding 33 t/ha of tuber was found to remove 2.76 kg of iron (Table 3). It was observed that nearly 43.8 per cent of the total Fe absorbed was retained in the stem and the remaining equally distributed between leaf and tuber. Accumulation of higher proportion of Fe in stem was also noted by Kanapathy (1974). The lower concentration of Fe in leaf might be partly due to its nature of relative immobility (Devlin, 1969). The results presented above indicate that the variety H.165 which recorded higher dry matter prodution had accounted for greater Fe uptake than the other variety, Burma. Iron uptake by cassava increased

with increasing rates of N and K application (Table 1).

Tuber contained higher concentration of Zn than stem and leaf. Zinc content in leaf was higher than the critical level of 20 ppm proposed by Mortvedt *et al.* (1972) for most of the crops. Total uptake of Zn was 0.81 kg/ha. Of the total Zn absorbed, 59 per cent was retained in tuber itself. Thus the amount of Zn removed by tuber is of great importance. Nitrogen fertilization had significantly enhanced Zn uptake in tuber, stem and leaf.

Manganese content of tuber, stem and leaf was 4.5, 30.5 and 93 ppm respectively. Thus leaf had the highest Mn content as in the case of Fe. Kanapathy (1974) also recorded higher Mn content in tapioca leaf. The total Mn uptake was found to be 456 g/ha. The distribution of the total Mn among different parts of the plant indicated that tuber accounted for 12.3 percent and the remaining being almost equally distributed between stem and leaf, thus revealing lesser mobilization of Mn to tuber Between the varieties studied, H.165 removed more of Mn from the soil than Burma (Table2). Nitrogen fertilization had significantly increased the Mn uptake in stem, leaf and total Mn uptake, while K had positive influence only on stem and

Table 2. Manganese and copper uptake in tuber, stem and leaf.

	Manganese (g/ha)				Copper (g/ha)			
	Tuber	Stem	Leaf	Total	Tuber	Stem	Leaf	Total
V_1	67	155	151	373	52.8	73.1	24.3	150.2
V_2	58	203	218	479	48.3	97.1	40.7	186.0
S. E.	4	5	4	8	1.9	3.6	1.3	4.7
C. D. at 5%	—	16	13	24	—	11.1	3.8	14.2
N_0	52	141	153	346	39.2	66.1	27.9	133.2
N_1	64	193	178	435	54.5	91.0	32.4	177.9
N_2	67	178	191	436	56.5	81.6	32.4	170.5
N_3	63	205	217	485	51.9	101.7	37.2	190.8
S. E.	6	7	6	11	2.7	5.2	1.8	6 6
C. D. at 5%	—	22	19	34	8.1	15.7	5.4	20 1
K_0	55	176	173	404	40.3	81.2	31.1	152.6
K_1	65	162	176	403	51.4	71.3	31.2	163.9
K_2	63	187	196	446	54.0	92.0	33.5	179.5
K_3	62	191	197	450	56.4	86.0	34.1	176.5
S. E.	4	5	8	15	1.8	3.4	1.5	4.4
C. D. at 5%	4—	14	–	42	5.2	—	—	12.5

Table 3. Micronutrient content, uptake and distribution in tapioca

	Content (ppm)			Uptake (g/ha)			Percentage distribution			
	Tuber	Stem	Leaf	Tuber	Stem	Leaf	Total	Tuber	Stem	Leaf
Fe	69	159	390	768	1207	782	2757	27.8	43.8	28.4
Zn	42	35	34	476	261	68	803	59.0	32.6	8.4
Mn	4.5	30.5	83	54	213	189	456	12.0	46.7	41.3
Cu	5.5	10.3	12.7	45	73	26	144	31.3	51.0	17.7

total Mn uptake. Jackson and Carter (1976) also found that in potato N and K fertilization had increased Mn uptake.

Copper content in tuber, stem and leaf was far less than any other micronutrient studied. The mean total uptake of 144 g/ha was found to be distributed as 31, 51 and 17 per cent in tuber, stem and leaf respectively. Variety H.165 had registered the highest total Cu uptake followed by Burma. Nitrogen and potash application increased Cu uptake in tuber, stem, leaf and total uptake.

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