

## NUTRIENT UPTAKE OF FINGER MILLET AS INFLUENCED BY INTERCROPS, BORDER CROPS AND N FERTILIZATION

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### ABSTRACT

Five crops sorghum, sunflower, lady's finger, onion and cluster beans were tried both as intercrops and border crops in finger millet with three levels of N (70, 90 and 110 kg/ha). N, P and K uptake by finger millet was affected markedly by the intercrops than the border crops. Sunflower as an intercrop competed for nutrient with finger millet to a greater extent followed by sorghum and the influence of onion and clusterbeans was minimum. Finger millet-sorghum combination removed maximum N and sunflower association depleted more of P and K. Increased N application was found to increase the uptake of nutrients.

**KEY WORDS:** Finger Millet, Inter-crop, Border crop.

Several cropping systems have been identified that make better use of available resources and result in very substantial increase in yields. Increased productivity is associated with an increased uptake of nutrients besides moisture and light. In an improved cropping system, with a close, spaced crop like finger millet as base crop, the component crops may exert competition for nutrient and ultimately affect the production through reduced nutrient uptake. A study was conducted to find out the removal pattern of some of the intercropping and border cropping systems with finger millet (*Eleusine coracana* Gaertn.)

### MATERIALS AND METHODS

The experiment was conducted at the Tamil Nadu Agricultural University, Coimbatore during summer, 1978 under irrigated conditions. The soil of the experimental plot was well drained, sandy clay loam with pH 8.7 and EC of 0.4 m.mhos/cm. The soil was low in available N (221.3 kg/ha), medium in P (15.6 kg/ha) and high in K (427.7 kg/ha). Finger millet (var.Co 11) as base crop was tried both under intercropping and border-cropping systems. Five crops viz., sorghum (Co.22), sunflower (EC.101495), Lady's finger (Pusa Sawani), onion (Co.2) and clusterbeans (local) were tried both as intercrops and border-

TABLE 1. Uptake of N, P and K by Finger Millet and associated crops (kg/ha)

Treatments	N Uptake-FM			P Uptake-FM			K Uptake-FM			Uptake of I/B			Total biomass yield (kg/ha)	Grain yield (kg/ha)	Production of FM (kg/ha)
	T	F	M	T	F	M	T	F	M	N	P	K			
FM+Sorghum (I)	50.0	99.4	125.1	10.4	15.5	16.8	76.6	143.6	182.3	41.2	5.9	61.0	13436	4052	
FM+Sunflower (I)	45.3	87.8	117.1	10.0	14.5	15.9	75.1	138.0	166.3	33.0	9.9	109.7	15098	2717	
FM+Lady's finger (I)	62.8	109.5	137.0	10.5	16.6	17.8	78.8	153.7	184.0	8.9	1.9	20.0	12652	4216	
FM+Onion (I)	62.7	111.2	134.3	12.0	16.8	18.4	82.3	158.7	186.8	6.7	0.7	5.7	11734	4259	
FM+Clusterbeans (I)	65.2	108.2	134.7	11.4	16.7	18.2	79.1	154.8	185.0	14.0	3.9	22.0	12921	4341	
FM+Sorghum (B)	64.5	112.7	136.1	12.5	16.8	18.4	80.0	160.8	186.3	27.7	4.7	45.0	13611	4217	
FM+Sunflower (B)	64.3	107.8	135.2	12.5	16.8	18.3	74.1	156.9	184.0	24.0	6.9	89.1	14332	3961	
FM+Lady's finger (B)	66.7	111.4	136.6	12.7	17.0	18.4	80.2	161.8	186.6	6.5	1.1	15.8	12245	4356	
FM+Onion (B)	67.5	110.2	141.4	12.6	16.9	18.6	81.0	164.7	187.7	4.9	0.7	4.1	12010	4501	
FM+Clusterbeans (B)	67.9	109.7	138.6	12.3	17.0	18.6	81.6	165.8	189.0	10.8	2.9	14.4	12687	4484	
Finger millet (Pure)	69.0	112.8	142.7	12.7	17.0	18.8	81.8	164.5	190.8	-	-	-	12009	4566	
N 70	58.1	101.8	129.8	11.2	16.1	17.7	75.0	151.2	182.0	-	-	-	-	4007	
N 90	63.1	107.8	134.7	11.8	16.6	18.1	79.9	159.9	185.2	-	-	-	-	4200	
N 110	66.0	113.0	139.0	12.0	16.8	18.3	82.6	160.1	186.2	-	-	-	-	42	
CD (5%)															
Pure Vs Intercropping	1.3	3.7	2.7	0.5	0.3	0.7	2.9	1.6	1.5	-	-	-	194	242	
Pure Vs Bordercropping	1.3	NS	2.7	NS	NS	NS	2.9	1.6	1.5	-	-	-	194	242	
Between Intercropping	1.7		3.5	0.7	0.4	0.9	3.8	2.1	3.1	-	-	-	252	312	
Between Bordercropping	1.7	NS	3.5	NS	NS	NS	3.8	2.1	3.1	-	-	-	252	321	
N levels	0.8	1.3	1.1	0.2	0.11	0.1	0.8	0.7	0.8	-	-	-	97		

FM : Finger millet, I : Intercrop, B : Bordercrop, T : Tillering, F : Flowering, M : Maturity,

crops in finger millet besides a pure crop of the base crop. Three levels of N (70, 90 and 110 kg/ha) were tried, one above and one below the recommended level of 90 kg N/ha. The cropping systems were allotted to the main plots and the N levels to the subplots. The treatments were replicated thrice in a split plot design. A uniform basal dressing of 45 kg each of  $P_2O_5$  and  $K_2O$ /ha was applied just prior to sowing. N was applied in two equal halves, one as basal and the other at 45 days after sowing.

Solid stand of finger millet was direct sown at a spacing of 15 x 15 cm. In intercropping system also the population of the finger millet was maintained as that of solid row under 10-20 x 15 cm paired row system and the intercrops were sown in between two pairs of finger millet rows. In the border cropping systems, finger millet was sown with a uniform row spacing of 15 cm and border crops were sown along the bunds all around the bed. Above ground plant samples of finger millet were collected at tillering (45th day), flowering (60th day) and at harvest (90th day) and associated crops at maturity and analysed for their N, P and K by standard procedures given by Humphries (1956) and Jackson

## RESULTS AND DISCUSSION

The uptake of N, P and K of finger millet at different stages of growth and the intercrops/bordercrops are given in Table. A steep increase in N uptake was observed between maximum tillering and flowering and after that the N uptake slowed down. Decline in photosynthesis and carbohydrate formation in the later stages of plant growth may be the reasons for this (Mehrotra and Lehri, 1967). In the intercropping systems, N absorbed by finger millet was minimum throughout the crop growth period in sunflower combination followed by sorghum. Sunflower and sorghum being crops with extensive root system might have competed with finger millet roots for nutrient by root ramification in the feeding zone as observed by Jensma (1974). The influence of lady's finger was pronounced only after tillering and the other combinations did not affect the N absorption by finger millet very much, indicating the companion nature of clusterbeans and onion. Among the bordercrops, N uptake by finger millet was limited by sunflower and very little effect was offered by the other bordercrops. Since the bordercrops utilised the bund space efficiently and reduc-

the competition with finger millet was restricted. Levels of N had a positive and marked influence on its uptake at all stages and at high levels of N (110 kg/ha), the uptake was maximum. The increased dry matter production keeping with increased N application might be the cause for increased uptake.

The results also indicated that out of the total P uptake, 90 per cent was taken up before flowering and the remaining 10 per cent later. Govindan (1975) observed that finger millet required P in large proportions in early stages for the growth and development of roots. At all stages, pure and border-cropped finger millet absorbed more P than the intercropped finger millet. Sunflower and sorghum combinations under intercropping system reduced the P uptake of finger millet markedly because of the increased dry matter production of sunflower and sorghum by way of competition for nutrients. The effect of other intercrops and bordercrops were not pronounced. Nitrogen significantly influenced the P uptake and maximum uptake was recorded at higher level of N (110 kg/ha).

K uptake also more or less followed the same trend as the

N uptake. Out of the total K uptake, 42 per cent was taken up before tillering, 44 per cent between tillering and flowering and 14 per cent after flowering. Similar pattern of K uptake was reported by Tirupathy and Morachan (1973). Pure crop of finger millet registered increased K uptake than the intercropped or bordercropped finger-millet. Sunflower both as an intercrop and bordercrop and sorghum in the intercropping system reduced the K uptake of finger millet. The effect due to other crops was not pronounced. Increased N levels exerted a positive influence on the K uptake.

The nutrient uptake (N, P and K) of different intercrops/bordercrops revealed that the crops when raised as intercrops removed more of N, P and K when compared to those as bordercrops. Accommodation of more plants per unit area in the intercropping system increased the total dry matter production through competition and consequently the nutrient uptake. Among the crops, sorghum absorbed more N while sunflower has taken more P and K. The uptake was minimum with onion indicating that the nutrient absorption depends on the nature of species entering into the competition.

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GENOTYPE - ENVIRONMENT INTERACTION FOR YIELD COMPONENTS IN PIGEONPEA (*Cajanus cajan* (L.) MILLSP)

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ABSTRACT

None of the six pigeonpea cultivars over three different seasons could be identified for yield stability. However SA 1 and PLS 361/1 were identified for the stability of number of branches, number of pods per plant, number of seeds per pod and 1000-grain weight. The genotype-environment interaction is highly significant for all the yield components except number of seeds per pod. This study also suggests that these two cultivars can be used for crop improvement studies in pigeonpea.

KEY WORDS: G x E Interaction, Pigeonpea, Yield Components

Pigeonpea is considered land pulse crops in Tamil Nadu. to be one of the important dry- Pigeonpea is highly sensitive

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