control recorded 950 kg.ha^{-1} of pod yield. This might be due to competition of weeds for essential resources like moisture, light and nutrients since this had higher number of weeds as compared to other treatments (Rethinam *et al.* 1976). This resulted in the less number of matured pods plant^{-1} under this treatment. Yield reduction in pod was observed when the field is kept weed infested after 15 days of sowing and the yield reduction was maximum when the field is kept weed infested upto 45 days after sowing. The results revealed that a weed-free condition from 15 to 45 days after sowing is essential for getting maximum pod yield in groundnut.

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Madras agric. J.78 (9-12) Sep-Dec-1991

https://doi.org/10.29321/MAJ.10.A01887

EFFECT OF MOISTURE REGIMES AND NITROGEN ON NPK UPTAKE AND YIELD OF FINGER MILLET

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ABSTRACT

Experiments were conducted for two seasons (*rabi*, 1985-1986 and *Kharif* 1986) on clay loam soils to study the effect of moisture regimes and N levels on NPK uptake and yield of finger millet (*Eleusine coracana* L. Gaertn.) In general, the uptake of N increased linearly from tillering and highest at maturity. Irrigating the crop at 0.6 IW/CPE ratio throughout the crop period increased the uptake of NPK leading to highest grain yield. Among the levels of N, uptake of N, P and K was highest at 80 kg.ha^{-1} in both the seasons.

KEYWORDS : Finger Millet, Moisture Regimes, NPK uptake, Nitrogen Levels.

The availability of plant nutrients and the response to the applied fertilizers depend on the quantity of irrigation water and frequency of irrigation (Singh 1972). Nutrients and soil moisture regimes interact, leading to higher uptake of nutrients and hence higher yields. Addition of N increased the uptake of NPK by finger millet (Ramaswamy and Subramaniam 1978). Although the effects of either moisture or N stress on finger millet have been the subject of many studies, relatively little information concerning the interaction effects of these stresses on nutrient uptake and yield when imposed in combination is available.

MATERIALS AND METHODS

Field experiments were conducted during *rabi*, 1985-1986 and *kharif*, 1986 to study the effect of moisture regimes and levels of N on NPK (elemental forms) uptake and yield of finger millet (Co 11). The soil was clay loam (44.7% coarse sand, 15.5% fine sand, 8.0% silt and 31.8% clay) with medium moisture retentive capacity (27.6% field capacity and 13.5% permanent wilting on oven dry basis), low in available N (220 $kg.ha^{-1}$), medium in available P (14 $kg.ha^{-1}$) and high in available K (750 $kg.ha^{-1}$). The soil was moderately alkaline (pH 8.3) in reaction.

The crop growth period was divided into transplanting to panicle initiation (stage 1), PIS to flowering (stage 2) and flowering to maturity (stage 3). Five moisture regimes viz., irrigation at IW/CPE ratio of 0.6 throughout (M_1); irrigations at 0.3, 0.6 and 0.6 IW/CPE ratio, (M_2); 0.3, 0.6 and 0.9 IW/CPE (M_3); 0.6, 0.3 and 0.9 IW/CPE (M_4) and 0.3, 0.9 and 0.6 IW/CPE (M_5) during the stage 1,2 and 3 respectively and six N levels (0,40,80,120,160 and 200 $kg.ha^{-1}$) were tested in split plot design with three replications. The depth of irrigation water applied was 5 cm. Twenty day old finger millet seedlings were transplanted with a spacing of 15 x 15 cm using two seedlings $hill^{-1}$

The total uptake of N at four stages of crop growth, P and K at harvest only were worked out by multiplying the total dry matter (TDM) with the N content in the plant and expressed in $kg.ha^{-1}$. Samples were analysed for NPK separately as per treatment from all the three replications and statistically analysed.

RESULTS AND DISCUSSION

In general, the uptake of N increased linearly from tillering and highest at maturity. N uptake (Table 1) by the plant at tillering, PIS, flowering and maturity was high under higher moisture regime (M_1) in both the seasons. The favourable influence of moisture regimes on N uptake was observed whenever the yield increases were associated with higher moisture levels.

Application of N had a marked influence on the N uptake which increased progressively with the successive increments of N application only upto 80 $kg.ha^{-1}$ and 120 $kg.ha^{-1}$ in *rabi* and *kharif*, respectively. Increased N application might have improved vegetative growth, foraging capacity and the photosynthetic rate, thus resulting in higher grain yields. Higher grain resulted in more N uptake.

Moisture regimes did not distinctly influence the uptake of P and K at harvest in both the seasons (Table 1). The P uptake was markedly increased upto 40 $kg.ha^{-1}$ N and 160 $kg.ha^{-1}$ N in *rabi* and *kharif* seasons, respectively. This enhanced P uptake was associated with increased grain yield due to N application. The K uptake increased with increase in rates of N application only upto 80 $kg.ha^{-1}$ in rabi and 120 $kg.ha^{-1}$ N in *kharif*. Since the K supply of the soil was nonlimiting and successive increments of N additions were accompanied by yield increases, the uptake of K by the crop also increased with higher levels of N.

Table 1. N, P and K uptake by finger millet at different stages and grain yield (K) as influenced by moisture and N

Moisture regimes N levels	N uptake (kg.ha^{-1})								Uptake (kg.ha^{-1})				Grain yield (kg.ha^{-1})	
	Tillering		PIS		Flowering		Maturity		P		K			
	R	K	R	K	R	K	R	K	R	K	R	K	R	K
M_1	60.0	32.4	84.0	35.7	178.8	164.3	242.6	248.3	50.3	49.6	201.8	207.1	4602	4613
M_2	36.2	29.9	65.5	34.5	125.2	106.3	168.5	165.1	52.6	53.6	208.6	188.0	3685	3911
M_3	44.3	26.6	74.8	33.8	154.0	132.1	192.6	195.8	50.0	48.1	195.9	176.5	4411	4456
M_4	51.7	30.8	81.5	36.9	166.4	97.2	210.0	160.3	45.9	48.6	188.7	185.0	3490	3541
M_5	31.4	27.2	58.9	29.6	104.8	136.9	178.2	199.5	51.9	52.5	205.6	174.3	4011	4077
CD (5%)	8.5	2.3	3.2	1.2	46.8	7.8	37	3.7	Ns	NS	NS	NS	215	141
N_0	19.3	13.3	34.4	18.5	63.7	52.8	85.8	80.2	39.9	38.0	142.7	103.0	2861	3096
N_{40}	42.0	29.6	67.4	30.7	130.3	113.2	179.8	171.1	46.4	45.0	189.5	155.5	3618	3677
N_{80}	48.8	29.9	78.7	32.9	150.4	139.6	215.0	209.2	49.3	49.3	203.5	186.3	4352	4371
N_{120}	48.4	34.2	82.4	38.7	168.4	149.2	231.0	227.1	52.8	53.9	226.6	218.2	4426	4444
N_{160}	54.9	35.1	86.2	42.4	175.9	153.8	244.8	234.2	56.0	56.1	222.5	230.1	4492	4583
N_{200}	55.0	34.3	88.1	42.0	178.5	155.0	233.8	231.4	56.2	58.3	219.6	224.5	4490	4548
CD (5%)	8.6	1.8	9.7	1.8	63.6	8.6	53	5.4	8.0	3.2	25.0	14.0	542	188

R = R.abi K = Kharif NS = Not Significant

Table 2. N uptake by finger millet at flowering during *kharif*, 1986 due to interaction of moisture and N

Treatments	N Uptake kg.ha^{-1}					
	N_0	N_{40}	N_{80}	N_{120}	N_{160}	N_{200}
M_1	64.5	167.3	185.8	183.7	190.0	194.3
M_2	31.6	88.8	111.8	136.7	132.9	130.0
M_3	47.9	87.8	151.8	156.8	171.3	170.7
M_4	53.2	90.4	97.0	111:8	114.1	116.7
M_5	66.8	131.6	151.8	160.0	154.1	156.7

N at M CD (5%) = 19.0 M at N CD (5%) = 17.0

The interaction effect (Table 2) of moisture and N at flowering stage indicate that at higher moisture regime, the response of N was limited at 80 kg.ha^{-1}. But under stress or lower moisture regime (M_4), the N response was observed upto 120 kg.ha^{-1}. This indicated that under moisture stress conditions, higher level of N application increased the N uptake by the crop. The moisture regimes did not influence the N uptake by crop in the absence of N application. However, the effect of moisture was marked in increasing the N uptake at higher levels of N.

Higher grain yield of finger millet under adequate moisture regime (M_1) and high rates of N application (80 and 120 kg.ha^{-1} N) can be attributed to higher uptake of NPK by the crop. The study clearly indicated the need for maintenance of optimum available moisture in active root zone depth for realising high grain yields at higher rates of N application.

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