Madras agric. J. 68 (6): 355-359, June 1981

Influence of Soil Moisture Regimes and N Levels on the Aavailability of Potassium in Soils.

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The influence of soil moisture regimes, doses of added N and their interaction on the available K content of soils was investigated under pot and field conditions in red and black soils of Tamil Nadu with ragi (finger millet) Co. 10 as test crop. Available K Content of soils was not influenced by the soil moisture regimes. A decrease in the available K content of soils was associated with an increase in the quantum of added N. A decrease in the available K content resulted with the maturity of the crop. Black soils contained greater available K than the red soils.

Moisture potential of the soil plays a significant role in the K nutrition of plants. Mass flow and diffusion, the processes responsible for the transport of K from various soil regimes towards plant root depend on the moisture content of the soil. Nitrogen, the growth element has direct and indirect influence on the nutrition of other elements by the crop plants, Hence, in order to obtain a precise knowledge on the influence of soil moisture regimes and N levels on the availability of potassium in soils, investigations were carried out at Tamil Nadu AgriculturalUniversity, Coimbatore with ragi variety Co. 10 as test crop.

MATERIAL AND METHODS

Two pot experiments and a field investigation were conducted during 1974-75. The experimental soils were neutral in pH. The initial available K content of red and black soils in experiment I were 135 and 285 ppm respectively and the initial available K content of soils of experiments II and III was 148 ppm.

Experiment I. A pot experiment was coducted under glass house conditions with red and black soils. The treatments consisted of four levels of N viz., 0(NO), 45(N1), 90 (N2) and 135 (N3) kg/N/ha as ammonium sulphate with a constant dose of 45 kg/ha each of P_2O_5 and K_2O as super phosphate and muriate of potash respectively. The five levels of soil moisture tried were, maintaining the soil moisture at 100 (M1), 75 (M2) and 50 per cent (M3) field capacity, irrigating to field capacity whenever the surface layer dried up (M4) corresponding to farmers practice and at the appearance of first perceptible symptoms of wilting (M5) with three replications. Ten kg. of soil was taken in glazed porcelain pots. Twenty one days old seedlings were transplanted at the rate of 5 hills per pot with 2 seedlings in each hill. After giving life irrigation moisture. regimes were established as per the programme and the same were maintained throughout

Forms a part of Ph. D thesis submitted by the First author under the guidance of the second author to the Tamil Nadu Agricultural University.

the cropping period by weighing the pots daily and adding calculated quantity of water to replenish the moisture loss. Soil samples collected at pre-planting, tillering. flowering and pots-harvest stages were analysed for their available K content using a Flame photometer (Stanford and English 1949)

Experiment II. The second pot experiment was conducted with the soil collected from the University, Campus. The moisture treatments consisted of irrigating to field capacity at 20 (M1). 40(M2). 60(M3), 80(M4) and 100 per cent (M5) available soil moisture depletion. Each treatment was replicated thrice, Soil moisture content between field capacity and 15 atmospheric pressure was taken as available soil moisture. Field capacity was estimated as per the method of Dastane (1967) and the moisture content at 15 atmospheric pressure was determined with a pressure membrane apparatus. Moisture levels were maintained by weighing the pots daily. Soil samples collected at pre-planting, flowering and post-harvest stages were analysed for their available K content.

Experiment III. A field experiment in a split plot design with moisture levels as main plot treatments and N levels as sub plot treatments was conducted during 1975 at the millet breeding station of the University farm The treatments were the same as under experiment II. There were replications with 20 plots of 5.0 x 1.5 m in each. Seedlings were planted giving a spacing of 15cm on either side and after giving the life irrigation moisture regimes were maintained by gravimetric method. Required quantity of water to bring the soil moisture content to field capacity was applied by regulating the flow through a 'V' notch. The available K content of soils was estimated periodically as in Experiment II.

RESULTS AND DISCUSSION

The details regarding the available K content of the experimental soils are presented in Tables 1 and 2. In all the three experiments various soil moisture regimes did not influence the available K content of soils. Though alternate cycles of wetting and drying were found to enhance the K fixing power of soils (Ramanathan *et al.* 1974) non significant influence of soil moisture on the available K status of soils were reported by Augustine Selvaseelan *et al* (1973). In the present investigation the soils had very high initial available K concentration and as such there was no measurable changes in the available K status of soils due to variations in irrigation levels. Reduced K availability as reported by earlier workers could be due to restricted K diffusion, a phenomenon well manifested under conditions of low available K status, Mengal and Braunschweig (1972) recommended the application of higher doses of K to counterbalance the negative influence of higher pF on K diffusion. This implies that the available K concentration in the soil remains unaffected due to soil moisture variation when the K supplying power of soils is non-limiting. Thus the present finding is in agreement with the earlier reports that in a soil with abundant K supplying power soil moisture regimes had no significant effect on the available K content of soils.

Unlike in the case of soil moisture regimes, levels of applied N had a significant effect on the available N content of soils. Maximum K availabiliry was under No treatments and the minimum under the highest rates of applied N. This was possible due to the influence of applied N on yield components and associated characters. The total drymatter yield and total K uptake were maximum in all the three experiments under the highest dose of applied N. Since the K uptake was maximum under the highest levels of added N, the available K content of soil was minimum under higher N treatment.

Irrespective of the type of soils studied, doses of added N and soil moisture regimes maintained, there was a progressive decrease in the available K status of soil with the age of the crop. This was due to the increased K removal from the soil by the crop uptake and consequent depletion in the soil.

In experiment I, red and black soils exhibited significant differences in their available K contents, where as in black soil contained significantly higher available K than red soils. The higher available K content of black soil might be due to the higher initial available K content of that soil.

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TABLE 1 Available K status of soils (ppm)- Experiment 1

Treatment/		*Pre-planting* Black soil	Red soil	*Tillering* Black soil	Red soil	*Flowering* Black soil	Red soil	*Post-harvest* Black soil	Red Soil
M1	N0	315	155	220	130	260	118	190	130
	N1	325	140	255	110	213	70	180	78
	N2	310	155	250	30	220	48	155	55
	N3	305	165	240	100	195	33	150	50
M2	N0	300	160	275	113	245	118	185	110
	N1	310	150	268	70	235	78	195	88
	N2	300	160	230	73	190	43	195	63
	N3	360	160	230	65	170	33	160	58
M3	N0	315	150	250	110	240	100	195	110
	N1	305	165	245	100	213	63	180	85
	N2	300	160	240	85	185	48	155	75
	N3	285	150	245	73	178	40	140	65
M4	N0	300	160	275	125	255	125	170	118
	N1	310	155	275	110	225	78	155	85
	N2	305	160	268	100	190	70	140	65
	N3	300	150	250	105	220	63	135	60
M5	N0	325	155	275	118	245	120	175	110
	N1	310	160	260	105	225	78	170	113
	N2	315	150	240	100	220	65	150	75
	N3	305	155	220	85	170	43	135	58

	SE	CD
N levels	1.97	6.07
Stages	1.97	6.07
Soils	1.39	4.29

TABLE. 2 Available K status of soils (ppm)

Treatment		Experiment I			Experiment II	
	Pre planting	Flowering	Post-harvest- (Mean values)	Pre-Planting	Flowering	Post-harvest (Mean values)
N0	270	140	125	303	153	152
M1 N1	270	120	110	288	158	143
N2	295	100	90	297	153	133
N3	258	100	90	290	152	118
N0	225	140	130	323	157	140
M2 N1	235	125	120	293	155	130
N2	230	115	115	293	145	123
N3	250	100	95	280	138	120
N0	270	135	125	277	147	118
M3 N1	260	115	105	282	132	107
N2	250	125	108	267	137	113
N3	270	125	113	292	140	103
N0	235	150	135	292	160	145
M4 N1	250	115	100	293	147	140
N2	295	105	103	280	153	140
N3	225	125	125	303	155	135
N0	250	150	125	275	153	145
M5 N1	225	150	140	292	160	140
N2	230	140	130	275	168	127
N3	250	125	125	272	158	150

	SE	CD	SE	CD
N levels	—	—	2.44	6.83
Stages	3.54	10.35	2.11	5.91