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Potassium Forms in Relation with K Uptake Studies in Soils of Different Cropping Systems in Kurnool District

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ABSTRACT

An investigation was carried out during the year 2015 -16 to study and determine the role of potassium forms in relation with K uptake studies in soils of different cropping systems in Kurnool district. Existence of different forms of potassium in the investigated soils have the following order :fixed K > non-exchangeable K >available K> exchangeable K >water soluble K. All forms of potassium were highest in maize-maize cropping system and lowest in groundnut-groundnut cropping system. The plant parameters i.e dry matter, K content and K uptake of maize crop were highest in Srinagaram village of maize-maize cropping system and lowest in Balapalapalli village of groundnut –groundnut cropping system. The maximum and positive correlation of plant parameters was found with non-exchangeable K .

Key words: *Potassium forms, Maize, Dry matter, K content and K uptake.*

INTRODUCTION

Potassium is one of major and essential plant nutrient has instrumental role in plant nutrition and physiology. In soils potassium exhibits in different forms *viz.*, water-soluble, exchangeable, and non-exchangeable and lattice-K. These forms of potassium are in quasi equilibrium and any depletion in a given form is likely to shift the equilibrium in the direction to replace it[12]. Dynamic equilibrium reactions occurring between the different forms of K have a profound effect on K nutrition. The direction of rate of these reactions determines the fate of applied K and release of non exchangeable K[16]. Despite of wide variation in available K status and in the circumstances where its application is negligible even in deficient soils plants are not showing any response to the applied potassium. Which was ascribed due to the progressive release of potassium from non-exchangeable forms in the soil[9].For a critical appraisal of potassium supplying capacity of soils knowledge on different forms of potassium and conditions controlling the availability are essential. To quantify the role of each form in potassium supplying power estimated by conducting pot culture study using maize as test crop. The role of each form may vary from crop to crop and soil to soil, mainly due to existence of variation in agro climatic zones and nature of soil minerals supplying the nutrient.

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The information exclusively on soils under different cropping systems is scanty. Keeping this in view, the present investigation was carried out to determine the role of potassium forms in relation with K uptake studies in soils of different cropping systems of in Kurnool district.

MATERIAL AND METHODS

The study was undertaken in the Department of Soil Science and Agricultural chemistry, Agricultural College, Mahanandi during the period of 2015-16. Representative surface soil (0-15 cm) 60 soil samples in bulk were collected from 5 cropping systems (black and red soils viz. rice-rice, rice-maize/mustard, maize-maize, fallow-bengalgram, groundnut-groundnut). Soil samples were extracted with neutral normal ammonium acetate for K status. Based on K content selected 30 soil samples for K studies. The soil samples collected were air dried and passed through 2mm sieve. Each sample was then sub-sampled, by quartering and finally a representative soil sample was preserved in a polythene bag for laboratory analysis .The selected soils were analyzed for their initial soil properties and potassium release characteristics. The particle size analysis was carried out by Bouyoucous hydrometer method[10]. The pH and EC were determined in 1:2 soils: water suspension using pH meter and EC meter[5]. The free $CaCO_3$ content was determined as per procedure given by Piper[10].The texture of the soils ranged from sandy loam to clay *i.e.* belongs to moderately coarse to fine texture. The pH of the soils ranged from 6.9 to 8.4 and soils were neutral to slightly alkaline. EC ranging from 0.10 to 0.69 d S $m^{-1}$with a mean value of 0.27 dS m^{-1}. Soils are found to be non-calcareous. Water soluble potassium was determined in 1:5 soil : water extract, after 5 minutes shaking[8]. Available potassium was determined by neutral normal ammonium acetate extract (1:5 soil water extractant) , after 5 minutes of shaking as described by Jackson[5]. The exchangeable potassium was obtained as a difference of the available and water soluble potassium. The fixed form of potassium was determined by boiling with 1 N HNO_3 (1:10 soil : acid ratio) for 10 minutes[22].The non-exchangeable potassium was obtained by deducting the available potassium from fixed potassium contents. A pot culture experiment had conducted by using 5 Kg each of the 2.0 mm sieved soil of different cropping system were taken in earthen pots and P-3396 maize hybrid used as test crop. A common recommended dose of nitrogen and phosphorous applied to all the treatments as per recommended dose 250:60:60 Kg ha^{-1} N $P_2O_5$and K respectively. The maize seedlings @ three per pot sown in each pot. Two plants will be removed at 10 DAS and incorporated in same pot then only one plant maintained in each pot. The crop harvested at 60 DAS. Plant samples collected at 60 DAS were processed and analyzed for K content in the triacid digest with the composition of HNO_3: $HClO_4$: H_2SO_4 (9:4:1) was determined by using flame photometer[10].The dry matter and K content were determined. The potassium uptake was calculated using the following formula and expressed in g pot^{-1}.

$$\text{Nutrient uptake (g pot}^{-1}) = \frac{\text{Nutrient content (\%)} \times \text{Dry matter production (g pot}^{-1})}{100}$$

RESULTS AND DISCUSSION

The different forms of potassium *viz.*, water soluble, exchangeable, available, non-exchangeable and fixed forms of potassium were determined in different cropping systems and the data was presented in table1.Mean water soluble form of potassium was highest in rice-mustard/maize cropping system (17mgkg^{-1}) followed by maize-maize cropping system (15mgkg^{-1}), rice-rice cropping system(13mgkg^{-1})fallow Bengal gram system

(9mgkg^{-1}) and lowest in groundnut-groundnut cropping system (7mgkg^{-1}).

Mean available form of potassium was highest in maize-maize cropping system (357mgkg^{-1}) followed by fallow bengal gram cropping system (292mgkg^{-1}), rice-mustard/maize cropping system (269mgkg^{-1}) rice-rice cropping system (181 mgkg^{-1}) and lowest in groundnut-groundnut cropping system (152mgkg^{-1}). Mean exchangeable form of potassium was highest in maize-maize cropping system (342mgkg^{-1}) followed by fallow bengal gram system(283mg kg^{-1}),rice-mustard/maize cropping system(253 mgkg^{-1}), rice-rice cropping system(168mgkg^{-1}) and lowest in groundnut-groundnut cropping system(145mgkg^{-1}).

Mean non-exchangeable form of potassium was highest in maize-maize cropping system(429mgkg^{-1}) followed by fallow bengal gram cropping system (347 mg kg^{-1}), rice-mustard/maize cropping system(322 mg kg^{-1}) ,rice-rice cropping system (237mg kg^{-1}), lowest in groundnut-groundnut cropping system (206 mg kg^{-1}).Mean fixed form of potassium was highest in maize-maize cropping system (770mgkg^{-1}) followed by fallow bengalgram system (639mgkg^{-1}),rice-mustard/maize cropping system(534 mgkg^{-1}),rice-rice cropping system(416 mg kg^{-1}) and lowest in groundnut-groundnut cropping system (358mgkg^{-1}).

All forms of potassium were highest in maize-maize cropping system and lowest in groundnut-groundnut cropping system(Table 1) due to fertilizer management practices. High levels of fertilizers applied in maize-maize cropping system compared to groundnut-groundnut cropping system. Low levels of water soluble and exchangeable forms of potassium were found in all soils of different cropping systems might be due to continuous cropping without addition of potassium or inadequate amount of applied potassium[13].

Potassium study by pot culture:

Dry matter production (g pot^{-1}) at 60 DAS as influenced by K levels

The data presented in table 2 indicated that mean dry matter production was significantly increased with increase in each level of potassium i.e., from 26.77 g pot^{-1} at 0 kg K_2O ha^{-1} to 48.77 g pot^{-1} at 90 kg K_2O ha^{-1}.The abundant increase over control to 30 kg K_2O ha^{-1} was observed and the increase was gradual with each increasing level of K fertilizer from 30 to 90 kg K_2O ha^{-1}. The increase in dry matter content at 90 kg K_2O ha^{-1}over control was 45 percent. The mean dry matter production of different villages ranged from 24.96 g pot^{-1} in Balapalapalli village to 56.34 g pot^{-1} in Srinagaram village, which have lowest and highest native soil K fertility respectively. Interaction effect on both K levels and soil K status was also significant. The results ranged from 9.63 g pot^{-1} in Balapalapalli village with native fertility to 64.48 g pot^{-1} at 90 kg K_2O ha^{-1} in Srinagaram village. The increase in dry matter with increasing levels of K application were reported by Srinivasa Rao and Takkar[18], in sorghum crop, Rakesh Kumar *et al.*[11], and Asif iqbal *et al.*[1], in maize crop.

K content as influenced by K levels

The data presented in the table 3 indicated that graded levels of K application increased the K concentrations from 2.30 percent in control to 3.50 percent at 90 kg K_2O ha^{-1}. The increase in K content at 90 kg K_2O ha^{-1}over control was 34 percent. The increased K content with graded levels of potassium application was also reported by Srinivasa Rao and Takkar[18], in sorghum crop, Rakesh Kumar *et al.*[11], and Asif iqbal*et al.*[1], in maize crop.

The mean K content of different villages ranged from 2.48 percent in Balapalapalli village to 3.94 percent in Srinagaram village, which have lowest and highest native K soil fertility respectively .Interaction effect of graded levels of potassium and K status were also significant. The results ranged from 1.35 per cent in Balapalapalli village with native K fertility (control) to 4.45 per cent in Srinagaram village at 90 kg K_2O ha^{-1}.Percent increase in K content at 90 kg K_2O ha^{-1} over control in Srinagaram soils was 21 percent where as in Balapalapalli soils was 59 percent. It indicates that soils having high initial K status show less response than soils having low initial K status.

These results clearly indicated that even though, soils are having high initial K status external application is needed especially in high K requirement crops. Similar reports were given by Srinivasa Rao and Takkar[18] and Srinivasa Rao, *et al*.[19].

K uptake by rice crop as influenced by K levels and soil K status

The data presented in the table 4 indicated that mean K uptake was significantly increased with increase in each level of potassium and the values ranged from 0.64 g pot^{-1} to 1.72 g pot^{-1} for 0 to 90 kg K_2O ha^{-1} respectively. The response observed at 90 kg K_2O ha^{-1} was 60 percent over control. Mean K uptake of different villages ranged from 0.70 g pot^{-1} in Balapalapalli soils to 2.25 g pot^{-1} in Srinagaram village soils. Which have lowest and highest native K soil fertility respectively. The K uptake ranged from 0.13 g pot^{-1} in soils of Balapalapalli with native K soil fertility to 2.87 g pot^{-1} in Srinagaram village at 90 kg K_2O ha^{-1}.

Correlation coefficients (r) among the forms of potassium

The data was presented in the table 5 gives the inter correlation between different forms of potassium. All the forms are positively correlated with each other. Available form showed maximum positive correlation with all the forms where as water soluble form correlated to a less extent. Non exchangeable K had positive relationship with all other K fraction indicating that there was exists an equilibrium between different forms of K and a depletion of one form is replenished by the other forms of potassium[6,4]. The data obtained in the present investigation indicated that equilibrium exists among different forms of potassium. Due to dynamic equilibrium, depletion in a given K-form is likely to shift the equilibrium in the direction to replenish it. This is conformity with the findings of Ramamoorthy and Velayutham[12], Das *et al*.[3]. and Siva prasad*et al*.[20],

Correlation co-efficient (r) between different forms and plant parameters

The data presented in the table 6 gives the correlation coefficient values between different forms of K with plant parameters i.e dry matter, K content and K uptake of maize crop. The data revealed that the correlation coefficient with water soluble K and plant parameters was lowest. The maximum and positive and significant correlation of plant parameters was found with fixed K. This indicates that a significant proportion of plant needs of K is met from non-exchangeable fraction of soil K. Exchangeable K and non-exchangeable K ion there by significantly adopted and contributed a sustained proportion of plant uptake. Thus, it could be concluded that fixed K should be taken into consideration while giving fertilizer recommendation. These results are in conformity with the findings of Bansal *et al*.[2], Srinivasa Rao *et al*.[21]. Sawarkar*et al*.[14], also reported that total K and lattice K should be taken into consideration while giving fertilizer recommendation for increasing the yield of soybean-wheat cropping systems.

The water soluble K was dominant fraction in the initial stages while exchangeable and non-exchangeable K contributes more in the later stages of the plant[15]. Under intensive cultivation, readily available and exchangeable K is removed by crops. This is followed by further release of exchangeable K from non-exchangeable K form. Dynamic equilibrium is affected when applied K is either taken up by plants or leached into lower soil horizons or converted into unavailable form. Under this situation, non-exchangeable K plays an important role by releasing K in to exchangeable and solution forms[17]. Similar reports were made by Jimenez and Parra[7]. They estimated that about 80 per cent of K extracted by nine wheat crops from soil came from the non-exchangeable K pool. Hence HNO_3 soluble K provides an estimate of long term K supply to crops by releasing non-exchangeable K in the investigated soils.

Table 1: Different forms of Potassium in cropping systems of studied soils (mg kg^{-1} soil)

S.No	Village Name	Cropping system	Water soluble K	Available K	Exchangeable K	Non-Exchangeable K	Fixed K
1	RARS,Nandyal rice	R-R	12	225	213	345	570
2	Battaluru	R-R	12	190	178	196	387
3	Nallagatla	R-R	16	183	167	260	428
4	Kaminenipalli	R-R	11	82	71	128	210
5	Yerragudidinna	R-R	10	130	120	139	270
6	M.C. farm ,rice	R-R	17	279	262	356	635
	Mean		**13**	**181**	**168**	**237**	**416**
7	Srinagaram	M-M	22	779	757	807	1586
8	Tamadapalli	M-M	15	338	323	392	730
9	Velpanuru	M-M	14	355	341	497	852
10	Mahanandi	M-M	13	215	202	237	416
11	Nallakalva	M-M	09	131	122	199	331
12	M.C.farm, maize	M-M	20	326	306	377	703
	Mean		**15**	**357**	**342**	**429**	**770**
13	Kanala	R-MU	9	246	237	364	364
14	Bhemunipadu	R-MU	13	131	118	137	268
15	Rythunagaram	R-MU	21	357	336	401	758
16	Bollavaram	R-MA	11	371	360	448	820
17	Ayyavarikoduru	R-MA	18	206	188	222	328
18	Gajulapalli	R-MA	28	305	277	363	668
	Mean		**17**	**269**	**253**	**322**	**534**
19	RARS,NandyalBengalgram	FB	08	261	253	362	623
20	Venkateswarwpuram	FB	11	362	351	491	853
21	Neravada	FB	6	210	204	242	453
22	Balapanuru	FB	10	326	316	353	680
23	Kouluru	FB	13	475	462	484	960
24	Boyirevula	FB	6	117	112	150	267
	Mean		**9**	**292**	**283**	**347**	**639**
25	M.C.farm,groundnut	GN-GN	8	201	193	220	421
26	Shankarapalli	GN-GN	10	203	193	232	436
27	Muddaram	GN-GN	6	71	65	117	189
28	Balapuram	GN-GN	7	301	294	440	741
29	Balapalapalli	GN-GN	8	57.5	49.5	110	166
30	Yembavi	GN-GN	5	81	76	117	193
	Mean		**7**	**152**	**145**	**206**	**358**

R-R: rice-rice, M-M: maize-maize, R-MU: rice-mustard, R-MA: rice-maize, FB: fallow-bengal gram and GN-GN: groundnut-groundnut

Table 2: Dry matter production (g pot^{-1}) as influenced by graded levels of potassium

S.NO	Village Name	K Levels (kg K_2O ha^{-1})				MEAN
		0 (T1)	30 (T2)	60 (T3)	90 (T4)	
1	RARS,Nandyal	28.91	39.86	46.60	52.48	**41.96**
2	Battaluru	27.86	38.53	45.48	50.68	**40.63**
3	Nallagatla	25.98	35.19	42.16	46.53	**37.46**
4	Kaminenipalli	11.74	23.68	33.48	40.66	**27.39**
5	Yerragudidinna	23.99	33.66	40.66	45.47	**35.94**
6	M.C. farm	32.07	39.71	47.15	51.37	**42.57**
7	Srinagaram	44.26	55.66	60.96	64.48	**56.34**
8	Tamadapalli	34.89	42.62	49.22	53.67	**45.10**
9	Velpanuru	35.98	43.56	49.47	53.57	**45.64**
10	Mahanandi	25.05	33.67	40.60	45.87	**36.29**
11	Nallakalva	21.76	33.65	40.75	45.4	**35.39**
12	M.C.farm	33.35	41.47	47.56	52.47	**43.71**
13	Kanala	26.77	36.76	43.59	49.19	**39.07**
14	Bhemunipadu	18.37	31.56	38.55	44.37	**33.21**
15	Rythunagaram	33.36	41.55	47.48	52.68	**43.76**

16	Bollavaram	36.06	42.55	48.05	52.6	**44.81**
17	Ayyavarikoduru	23.19	33.80	40.89	45.83	**35.92**
18	Gajulapalli	29.47	38.15	44.63	48.17	**40.10**
19	RARS,Nandyal	28.42	39.50	45.47	50.58	**40.99**
20	Venkateswarwpuram	32.37	41.45	47.55	52.55	**43.48**
21	Neravada	24.99	36.58	43.67	48.81	**38.51**
22	Balapanuru	31.36	40.47	46.56	51.87	**42.56**
23	Kouluru	38.16	45.87	50.93	55.20	**47.54**
24	Boyirevula	14.37	29.36	38.36	44.55	**37.42**
25	M.C.farm	22.84	36.66	43.50	48.66	**37.91**
26	Shankarapalli	24.80	35.85	42.40	47.40	**37.61**
27	Muddaram	10.52	21.54	31.65	38.06	**25.44**
28	Balapuram	28.93	40.36	46.45	52.20	**41.98**
29	Balapalapalli	9.63	21.45	31.46	37.33	**24.96**
30	Yembavi	11.17	24.76	34.80	40.45	**27.79**
Mean		**26.77**	**36.65**	**43.67**	**48.77**	

CD at 5% level of significance

	CD	SE(d)	SE(m)
Factor (A) K levels	**0.71**	**0.35**	**0.25**
Factor (B) villages/soil K status	**2.76**	**1.38**	**0.97**
Factor (A x B)	**3.91**	**1.95**	**1.38**

Table 4 K content (g pot^{-1}) in plant as influenced by graded levels of potassium

S.No	Village Name	K Levels (kg K_2O ha^{-1})				MEAN
		0 (T1)	30 (T2)	60 (T3)	90 (T4)	
1	RARS,Nandyal	2.20	2.43	2.93	3.21	**2.69**
2	Battaluru	2.03	2.27	2.78	3.10	**2.55**
3	Nallagatla	2.08	2.31	2.83	3.08	**2.58**
4	Kaminenipalli	1.45	2.17	2.93	3.20	**2.44**
5	Yerragudidinna	1.95	2.45	2.93	3.20	**2.63**
6	M.C. farm	2.59	2.56	3.06	3.29	**2.88**
7	Srinagaram	3.50	3.75	4.07	4.45	**3.94**
8	Tamadapalli	2.70	2.71	3.21	3.40	**3.01**
9	Velpanuru	3.25	3.40	4.00	4.20	**3.71**
10	Mahanandi	2.35	2.57	3.11	3.20	**2.81**
11	Nallakalva	1.91	2.41	3.20	3.40	**2.73**
12	M.C.farm	2.70	2.61	3.47	3.65	**3.11**
13	Kanala	2.46	2.71	3.46	3.62	**3.06**
14	Bhemunipadu	1.73	2.23	3.00	3.21	**2.54**
15	Rythunagaram	3.21	3.41	3.81	4.06	**3.62**
16	Bollavaram	3.20	3.30	4.10	4.25	**3.71**
17	Ayyavarikoduru	2.03	2.25	3.03	3.26	**2.64**
18	Gajulapalli	2.33	2.61	3.00	3.48	**2.86**
19	RARS,Nandyal	2.35	2.71	3.23	3.46	**2.94**
20	Venkateswarwpuram	2.95	3.45	3.01	3.75	**3.29**
21	Neravada	2.26	2.76	3.22	3.36	**2.90**
22	Balapanuru	2.45	2.66	3.41	3.76	**3.07**
23	Kouluru	2.75	3.02	3.51	3.83	**3.28**
24	Boyirevula	1.71	2.45	3.18	3.47	**2.70**
25	M.C.farm	2.15	2.38	3.06	3.34	**2.73**
26	Shankarapalli	2.24	2.42	2.97	3.21	**2.71**
27	Muddaram	1.41	2.15	2.91	3.35	**2.46**
28	Balapuram	2.40	2.65	3.23	3.58	**2.97**
29	Balapalapalli	1.35	2.11	3.12	3.32	**2.48**
30	Yembavi	1.40	2.17	3.16	3.40	**2.53**
Mean		**2.30**	**2.64**	**3.23**	**3.50**	

CD at 5% level of significance

	CD	SE(d)	SE(m)
Factor (A) K levels	**0.04**	**0.02**	**0.01**
Factor (B) villages/soil K status	**0.18**	**0.09**	**0.06**
Factor (A x B)	**0.26**	**0.13**	**0.09**

Table 4: K uptake (g pot^{-1}) in plant as influenced by graded levels of potassium

S.NO	Village Name	K Levels (kg K_2O ha^{-1})				MEAN
		0 (T1)	30 (T2)	60 (T3)	90 (T4)	
1	RARS,Nandyal	0.64	0.97	1.37	1.68	**1.16**
2	Battaluru	0.57	0.87	1.26	1.57	**1.07**
3	Nallagatla	0.54	0.81	1.19	1.43	**0.99**
4	Kaminenipalli	0.17	0.51	0.98	1.30	**0.74**
5	Yerragudidinna	0.47	0.82	1.19	1.46	**0.98**
6	M.C. farm ,rice	0.83	1.02	1.44	1.69	**1.25**
7	Srinagaram	1.55	2.09	2.48	2.87	**2.25**
8	Tamadapalli	0.94	1.16	1.58	1.82	**1.38**
9	Velpanuru	1.17	1.48	1.98	2.25	**1.72**
10	Mahanandi	0.59	0.87	1.26	1.47	**1.05**
11	Nallakalva	0.42	0.81	1.30	1.54	**1.02**
12	M.C.farm, maize	0.90	1.08	1.65	1.92	**1.39**
13	Kanala	0.66	1.00	1.51	1.78	**1.24**
14	Bhemunipadu	0.32	0.70	1.16	1.42	**0.90**
15	Rythunagaram	1.07	1.42	1.81	2.14	**1.61**
16	Bollavaram	1.15	1.40	1.97	2.24	**1.69**
17	Ayyavarikoduru	0.47	0.76	1.24	1.49	**0.99**
18	Gajulapalli	0.69	1.00	1.34	1.68	**1.17**
19	RARS,Nandyal	0.67	1.07	1.47	1.75	**1.24**
20	Venkateswarwpuram	0.95	1.43	1.43	1.97	**1.45**
21	Neravada	0.56	1.01	1.41	1.64	**1.16**
22	Balapanuru	0.77	1.08	1.59	1.95	**1.35**
23	Kouluru	1.05	1.39	1.79	2.11	**1.58**
24	Boyirevula	0.02	0.72	1.22	1.55	**0.88**
25	M.C.farm	0.49	0.87	1.33	1.63	**1.08**
26	Shankarapalli	0.56	0.87	1.26	1.52	**1.05**
27	Muddaram	0.15	0.46	0.92	1.28	**0.70**
28	Balapuram	0.69	1.07	1.50	1.87	**1.28**
29	Balapalapalli	0.13	0.45	0.98	1.24	**0.70**
30	Yembavi	0.16	0.54	1.10	1.38	**0.79**
Mean		**0.64**	**0.99**	**1.42**	**1.72**	

CD at 5% level of significance

	CD	SE(d)	SE(m)
Factor (A) K levels	**0.035**	**0.017**	**0.026**
Factor (B) villages/soil K status	**0.138**	**0.062**	**0.040**
Factor (A x B)	**0.196**	**0.09**	**0.06**

Table 5: Inter correlation between different forms of potassium

	Water soluble K	**Available K**	**Exchangeable K**	**Non-Exchangeable K**	**Fixed K**
Water soluble K	1.000				
Available K	0.480**	1.000			
Exchangeable K	0.513**	0.990**	1.000		
Non-Exchangeable K	0.483**	0.965**	0.962**	1.000	
Fixed K	0.512**	0.982**	0.981**	0.976**	1.000

Table 6: Correlation co-efficient (r) between different forms of K and plant parameters

	DMY	% K	K uptake
Water soluble K	0.487**	0.391*	0.471**
Available K	0.912**	0.871**	0.956**
Exchangeable K	0.912**	0.870**	0.955**
Non-Exchangeable K	0.904**	0.889**	0.955**
Fixed K	0.913**	0.872**	0.957**

* Significant at 0.05 per cent level

**Significant at 0.01 per cent level

CONCLUSIONS

In the present study existence of different forms of potassium in the investigated soils have the following order fixed K > non-exchangeable K > available K> exchangeable K > water soluble K. All forms of potassium were highest in maize-maize cropping system and lowest in groundnut-groundnut cropping system due to fertilizer management practices. High levels of fertilizers applied in maize-maize cropping system compared groundnut-groundnut cropping system. The plant parameters of maize crop were highest in Srinagaram village of maize-maize cropping system and lowest in Balapalapalli village of groundnut –groundnut cropping system. The maximum and positive correlation of plant parameters were found with non-exchangeable K.This indicated that a significant proportion of plant needs of K was met from non-exchangeable fraction of soil K. Thus, non exchangeable K should be taken into consideration while giving fertilizer recommendation to increase potassium use efficiency.

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