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INTER RELATIONSHIP BETWEEN DIFFERENT PHOSPHORUS FRACTION IN A CROPPING SEQUENCE TREATED WITH DIFFERENT PHOSPHORUS SOURCES.

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ABSTRACT

The inter relationship between different fractions of phosphorus was studied in the soils of a cropping sequence (Fingermillet - Maize - Blackgram) treated with different phosphorus sources. The available P (Olsen's P) is positively related with Saloid-P and A1- P. The positive relationship of Fe-P with available P existed in the first two crops vanished in the third crop. The RS-P is not dependent on the available P. Over a period of time Ca-P is also having positive relationship with available P and A1-P.

It has been observed that normally more than one form of P play a significant role in P nutrition of a crop. Potential advantage of P management on a cropping sequence allows the distribution of P among the component crops according to their responsiveness to different forms of P. With this in view, a study was undertaken to find out the inter-relationship betwen different P fractions and crops in a cropping sequence treated with different P sources.

MATERIALS AND METHODS

A field experiment was carried out to evaluate different sources of P for cereal based cropping sequence of fingermillet - maize - blackgram at Tamil Nadu Agricultural University Farm, Coimbatore. The experiment was laid out in F RBD design with three replications. The nutrient status of the clay loam soil (Typic ustropept) was low, low and high for N,P, and K, respectively with a pH of 8.02. The experiment involved 16 treatments with five sources of P viz. single superphosphate, rockphosphate,2/3 rock phosphate + 1/3 single super phosphate, rock phosphate + Phospho bacterium (*Bacillus megaterium*) and Diammonium phosphate and three levels of P viz. 30, 60 and 90 kg P_2O_5 ha^{-1} along with an absolute control. Phosphatic fertilizers were applied only to fingermillet to study it's direct effect, residual effect on the succeeding crop of maize and second residual effect on the third crop of blackgram. To

Table 1. Correlation matrix between different P fractions - Fingermillet.

Variable	Saloid - P	Al - P	Fe - P	RS - P	Ca - P	Avail.P_1	Avail.P_2
	X_1	X_2	X_3	X_4	X_5	X_6	X_7
X_1	-	0.280	0.052	0.114	0.171	0.365*	0.672**
X_2		-	-0.087	0.150	-0.105	0.004	0.329*
X_3			-	-0.151	0.523**	0.091	0.214
X_4				-	-0.006	-0.175	0.218
X_5					-	0.040	0.251
X_6						-	0.216
X_7							-

* Significant at 5% probability level **Significant at 1% probability level

Avail. P_1 : Available P at tillering stage Avail. P_2 : Available P at flowering stage

Table 2. Correlation matrix between different P fractions - Maize.

Variable	Saloid - P	Al - P	Fe - P	RS - P	Ca - P	Avail. P_1	Avail. P_2
	X_1	X_2	X_3	X_4	X_5	X_6	X_7
First residual effect							
X_1	-	0.492**	0.320*	0.206	0.146	0.317*	0.480**
X_2		-	0.437**	0.231	0.135	0.508**	0.555**
X_3			-	0.207	0.185	0.217	0.284
X_4				-	0.256	0.339*	0.216
X_5					-	0.333*	0.214
X_6						-	0.829**
X_7							-
Direct effect							
X_1	-	0.107	0.167	0.298	0.390*	0.661**	0.657**
X_2		-	0.181	0.089	0.152	0.282	0.283
X_3			-	-0.068	-0.040	0.216	0.242
X_4				-	0.276	0.062	0.216
X_5					-	0.317*	0.258
X_6							0.827*
X_7							-
Cumulative effect							
X_1	-	0.626**	0.305	0.369*	0.232	0.668**	0.674**
X_2		-	0.493**	0.180	0.319*	0.667**	0.595**
X_3			-	0.263	0.318*	0.471**	0.320*
X_4				-	0.370*	0.304	0.226
X_5					-	0.400**	0.304
X_6						-	0.871**
X_7							-

* Significant at 5% probability level **Significant at 1% probability level

Avail. P_1 : Available P at knee high stage Avail. P_2 : Available P at tasseling stage

maize only to study its direct effect and first residual effect on blackgram, and also to both fingermillet and maize to study the cumulative addition of P in maize and cumulative residual effect on the third crop of blackgram. The residual crop blackgram (Co 5) was raised in the same undisturbed plots without adding any fertilizers. The N was added uniformly in the form of urea to all the treatments for fingermillet and maize crop and no K was added since the soil contained sufficient amounts of available K. The inorgantic P fractions were determined by the modified procedure of Chang and Jackson as described by Peterson and Corey, 1966.

RESULTS AND DISCUSSION

The correlation matrix on the inter-relationship between different phosphorus fraction are given in the Table 1 for fingermillet, Table 2 for maize and Table 3 for blackgram.

Available P and other P fractions

The Olsen's P with Saloid-P and A1-P were positively related indicating the greater role of Saloid-P and A1-P in determining the P availability in the soils of the first crop of fingermillet in the cropping sequence whereas Sharma *et al* . 1979 observed a close relationship of A1-P and Fe-P with Olsen's P.

In the post harvest soils of maize the Olsen's P was found to be positively correlated with individual P fractions. This indicated the beneficial effect of added phosphatic fertilizers as stated by Anjaneyalu and Omanwar (1979).

The available P in the soil samples of blackgram, viz, the third crop inthe sequence was found to be related to the Saloid-P and A1- P fractions in determining the available P status of the soil. In the second residual effect and first residual effect where P sources were added only to

Table 3. Correlation matrix between different P fractions - blackgram.

Variable	Saloid - P X_1	Al - P X_2	Fe - P X_3	RS - P X_4	Ca - P X_5	Avail. P_1 X_6	Avail. P_2 X_7
Second residual effect							
X_1	-	0.344	0.290	0.181	0.218	0.490**	0.458**
X_2		-	0.345*	0.377*	0.054	0.262	0.180
X_3			-	0.182	0.152	0.400**	0.498**
X_4				-	0.425**	0.256	0.223
X_5					-	0.111	0.121
X_6						-	0.708**
X_7							-
First residual effect							
X_1		0.059	0.369*	0.301	0.174	0.331*	0.331*
X_2		-	0.089	0.264	0.201	0.365*	0.374*
X_3			-	0.319*	0.217	0.311*	0.425**
X_4				-	-0.004	0.257	0.223
X_5					-	0.323*	0.362*
X_6						-	0.681**
X_7							-
Cumulative effect							
X_1	-	0.109	0.025	-0.023	0.182	-0.027	-0.063
X_2		-	0.435**	0.308*	0.104	0.064	0.050
X_3			-	0.126	-0.108	-0.135	-0.135
X_4				-	-0.143	0.086	0.043
X_5					-	-0.015	-0.016
X_6						-	0.090
X_7							-

* Significant at 5% probability level **Significant at 1% probability level

Avail. P_1 : Available P at flowering stage Avail. P_2 : Available P at proforming stage

fingermillet and maize respectively, the positive relationship between Olsen's P and Fe-P was also observed. Thia my be due to the interaction of legume root exudate in solubillising the insoluble Fe-P fraction. Singhania and Goswami (1979) also reported that available P was correlated with Fe-P besides A1-P fractions.

Saloid-P and other P fractions

The Saloid-P fracion is closely linked and positively correlated with the available P fraction. The Saloid-P fraction contributed effectively to the available P fraction of the cropping system which could be attributable to the interaction of the colloidal matrix of the soil involved in the physical adsorption of added P through fertilizers.

A1-P and other P fractions

As a whole, the A1-P was found to be conditioned by the available P fraction in the soil of fingermillet, maize and blackgram implying that the A1-P fraction besides saloid-P also contributed to the available P. However in a few cases, the relationship between A1-P and Fe-P also showed significant relationship. But this occured only after a prolonged incubation of added P in the soil which is in accordance with the findings of Dhillon and Dev (1986).

Fe-P and other P fraction

Up to the harvest stage of the second crop of maize, the inter- relationship between Fe-P and A1-P could be noticed. With the advancement in the period of incubation, the relationship vanished perhaps due to interaction and possible adsorption and precipitation. An important effect deserving mention in most cases, the Fe-P was not related to the available P. This perhaps due to the P fixed by Fe tend to become more insoluable and non available whereas Keter and Ahn (1986) reported Fe-P as the most important source of available P.

Rs-P and other P fractions

Rs-P fraction was found to be not related to any of the P fractions with the first crop. However in the maize crop, the first residual effect showed a positive relationship between Rs-P and available P and the cumulative effect recorded significant correlation values between Rs-P and A1-P and also Ca-P fractions. This was found to hold good with the second reidual effect of blackgram as well. These results suggested that the Rs-P is not dependant on available P as a general rule and showed the other fractions like A1-P and Ca-P and even Saloid-P in certain cases increased. There occured a concomitant increase in the Rs-P as well. It may be mentioned that the A1-P and Ca-P are the other fractions that resulted from the liquidation of Rs-P and obviously such relationship between Rs-P and A1-P and Ca-P fractions could be expected.

Ca-P and other P fractions

With fingermillet crop, a positive correlation between Ca-P and Fe- P was observed. Any increase in soluable phosphate ion which tend to form $CaPO_4$ also bring about enhanced Fe-P fraction. However the long period of incubation transformed the above picture and positive relationship between Ca-P and available P and A1-P could be recognised. This indicates that over a period of time, the Ca-P also contribute to the available P pool of the soil. The fact that Ca-P. available P relationship existed even under the third crop of blackgram provide evidence for the continued beneficial effect of Ca-p fraction in favourably influencing the available P status of the soil.

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ASSOCIATION OF CHARACTERS AND PATH COEFFICIENT ANALYSIS IN UPLAND COTTON (*G. hirsutum*, L).

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ABSTRACT

The present study consisted of 13 genotypes of *G. hirsutum* cottons. Wide range of variability for no.of bolls/plant, seed cotton yield/plant, mean fibre length, seed index, bundle strength, micronaire value and ginning out-turn was observed, offering ample scope for improvement in those characters. High heritability coupled with high genetic advance was manifested by seed index, indicating additive gene action. High heritability and moderate genetic advance estimates for mean fibre length, bundle strength and lint index suggests that variability is partly under non-additive gene control.

Any improvement brought forth in field crops can be quantified in terms of increase in yield. Yield is a complex character, mainly dependent on many genetically controlled quantitative characters as well as environment. The nature and association of such characters with yield and among themselves plays vital role in choosing superior genotypes. It also depends upon the magnitude of genetic variability present in the genetic stock for the maximum improvement of yield. Heritability and genetic advance serves as a tool to the breeder in determining the direction and magnitude of selection.

MATERIALS AND METHODS

The experimental material consisted of thirteen genotypes of *G. hirsutum* cotton that are being