CORRELATION EFFECT OF ORGANIC AND INORGANIC FERTILIZER MATERIAL FOR ENHANCING THE YIELD OF SEED COTTON UNDER SEMI ARID AREAS.

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ABSTRACT

The experiment was carried out to investigate the vegetative and reproductive response of cotton (Gossypium hirsutum L.) as influenced by various levels of organic (FYM & Poultry litter) and inorganic fertilizer, sown in well-prepared soil in field conditions during 2006. The experiments were laid out according to randomized complete block design with eight levels of organic and inorganic fertilizers in three replications. The observations were carried out at A.R.F Karor, District Layyah. The data were collected on the growth and yield parameters like germination count/ m^2, plant height (cm), numbers of bolls/ plant, average boll weight (gm/boll) and yield (Kg/ha). To find out the best level of fertilizer, T_2 is the best level where applied NPK was @ 114-57-62 and give high yield 3159Kg/ha and is followed by T_5, T_6 with smaller difference in yield than T_1 with the application of FYM and poultry litter with different doses of NPK.

KEYWORDS: Gossypium hirsutum.

INTRODUCTION

Cotton (Gossypium hirsutum L.) is a major cash crop grown in the plains of Punjab and Sindh. It is grown on an area of 3.12 million hectares and earns 60 percent of total foreign exchange earnings (Ravanker et al., 2000). In the recent years, there has been tremendous increase in seed cotton yield due to greater use of fertilizers, irrigation and insecticides (Ravanker et al., 2000). Fertilizers occupy pivotal position in raising seed cotton yield. Experiments have shown that an optimal yield could only be produced with balanced application of all major nutrients in soil Streetor et al. 1984. The research conducted in the Punjab showed that nitrogen was the first and phosphorus the second limiting factor. Cotton crop did not respond to potassium fertilization and its supply seemed as sufficient to fulfill cotton needs for optimum growth and yield (Ahmad,1998). The mineralogical analysis of 20 soil series representing country's most important agricultural land showed that mica is the dominant mineral which indicates sufficient total as well as exchangeable potassium in soil (Bajwa, 1987).

The experiments conducted in the Punjab showed that cotton absorbed a large quantity of potassium indicating that it was more than both nitrogen and phosphorus. Cotton crop removed about 118 kg of nitrogen, 15 kg of phosphorus and 150 kg of potassium per hectare Anonymous (1997). The amount of potassium removed by cotton crop in India was almost similar to that reported in the Punjab (Brar et al.,1987). The trend of potassium removal by cotton crop indicates its heavy drain from Pakistan's soils. The exploitation of soils is likely to lead to severe depletion of potassium, which would eventually limit the efficiency of other nutrients. Similarly, potassium depleted mica will fix potassium ions so considerable quantity of this nutrient would be required to overcome fixation before it is made available to plants (Singh et al.,1999).

During the last two decades, cotton production scenario has considerably changed. There is heavy drain of nutrients due to more demand by early-maturing and high yielding cotton varieties at certain growth stages. Various researchers (Malik et al.,1984; Attri et al.,1985) reported that cotton crop could benefit from higher doses of potassium fertilizers when applied at different times after sowing. This may be attributed to equilibrium between various forms of potassium and degree of potassium fixation in soil (Bailgar et al., 1990). Data regarding cotton response higher doses and time of potassium application are not available. The present studies were undertaken to determine

the best time of potassium application to cotton crop in sandy loam soil in an arid environment.

Nitrogen is a major limiting nutrient for crop production .It can be applied through chemical or biological means but chemical fertilizer is expensive (45).To get optimum crop yield of cotton, biological means need to be explored for acquiring nitrogen for plant growth nitrogen increase the vegetative growth of cotton.

Plants with the ability to perform well (higher dry matter or economic yield) with low or limited amounts of P are considered to be more efficient than plants that do not perform well with the same amount of P in the growth medium (Clark and Duncan,1991).Such variations in P-utilization by crops have also been reported to occur intra-specifically (Fohse *et al*., 1988; Clark and Duncan, 1991; Caradus et al., 1995; Yan et al., 1995; Vegh et al., 1997). An efficient variety responds to a nutrient stress by altering its metabolism to enhance availability of the limiting element in the growth medium. For example, plants of efficient varieties exposed to P deficiency have a tendency to maintain higher root/shoot ratios compared to their plants growing under normal conditions as a result of preferential partitioning of carbohydrates towards root (Cakmak et al.,1994). However, the occurrence of variety-specific differences concerning nutrient uptake, nutrient content and nutrient utilization can not be readily explained by analysis of any single factor (Burauel et al.,1990). According to (Saric 1987) it is question of morphological and anatomical factors as well as physiological processes.

Previous research has shown that "P-efficiency traits" are heritable traits and could be used to improve germplasm for P-nutrition (Clark and Duncan, 1991). Therefore, exploitation of intra-specific variations for P-nutrition of crops will not only help in categorizing the existing genetic material into nutrient into nutrient efficient or inefficient , responsive or non-responsive , but will also provide data base for future breeding ventures.

MATERIAL AND METHODS

Experiments were conducted at Adaptive Research Farm Karor during Kharif 2006. Trials were comprised on eight treatments viz, T_0=control (no fertilizer) T_1 departmental recommendation 114 – 57 – 6_2 kg NPK per hectare, T_2 = FYM @ 25 tons per hectare T_3 = poultry litter @ 6 tons per hectare T_4 = FYM @25 Tons + 50% of the departmental recommendation T_1, T5 = FYM @ 25 tons per hectare +25% of the departmental recommendation T1, T_6 = poultry litter @ 6 tons ha^{-1} + 50% of the Deptt Recommendation ,T_1 , T_7 poultry litter @ 6 tons ha^{-1} +25% of the Deptt. Recommendations, T_1.

All the FYM, poultry litter and PK was applied at sowing and nitrogen was applied in two split doses.

The experiment was sown in randomized complete block design with three replication. Cotton variety CIM –496 was sown within first fortnight of May. The plot size was 6x10 meter having 75cm row to row and 20cm plant to plant distance. Plant production measures were adopted accordingly. Yeild parameters =germination, plant height, No. bolls were recorded. Seed cotton yield data were recording in two picking.

Data were analyzed statistically.

RESULTS AND DISCUSSIONS

The experiment was carried out to study the vegetative and reproductive response of cotton (*Gossypium hirsutum* L.) as influenced by various levels of organic and inorganic fertilizers, sown in well-prepared soil in field conditions on May, 2006. The experiment was laid out according to randomized complete block design with eight levels of organic and inorganic fertilizers and three replications. The observations were carried out at ARF Farm Karor, Adaptive Research Farm Karor, District Layyah, during the4 year 2006.The data were collected on the growth and yield parameters like germination count/m^2, plant height (cm), average boll weight CM/boll and yield per hectare.

The results obtained are as under;

Germination count/m^2:

Data pertaining to germination count/m2

were collected and subjected to statistical analysis revealed non-significant results regarding germination count/m2 and is presented in table 1. It means application of different levels organic and inorganic fertilizers showed no effect on the concerned parameter.

Plant Height:

Data concerning plant height were collected and analyzed statistically showed significant results regarding plant height and is presented in table 2 as analysis of variance.

Comparative study of the means showed that maximum plant height (43.53 cm) was achieved in T_1 where NPK was applied @ 114 -57-62 kg hectare^{-1} followed by T_4 (40.53 cm), T_6 (38 cm), T_5 (35.93 cm) as compare to control where least plant height (19.60 cm) was reported.

Table1: Analysis of variance of Germination count/m^2

Source of Variation	DF	SS	MS	F-value	Prob.
Replication	2	6.333	3.167	4.9259	0.0240
Fertilizer Levels	7	10.625	1.518	2.3611ns	0.0812
Error	14	9.000	0.643		
Total	23	25.958			

ns = non-significant

Comparison of mean values:

Sr. No.	Treatments	R_1	R_2	R_3	Mean
1	T0 = Control	8	9	10	9.00
2	T1 = NPK @ 114-57-62 Kg/ha	10	11	11	10.66
3	T2 = FYM @ 25 Tons / ha	9	10	11	10.00
4	T3 = Poultry litter @ 6 tons/ha	8	10	9	9.00
5	T4 = FYM @ 25 tons / ha + 50% of T1	10	8	10	9.33
6	T5 = FYM @ 25 tons /ha + 25% of T1	9	10	10	9.66
7	T6 = Poultry litter @ 6 tons / ha + 50% of T2	9	10	10	9.66
8	T7 = Poultry litter @ 6 tons / ha + 25% of T1	8	7	10	8.33

Table2: Analysis of variance of average plant height

Source of Variation	DF	SS	MS	F-value	Prob.
Replication	2	30.280	15.140	6.0468	0.0128
Fertilizer Levels	7	1129.067	161.295	64.4199**	0.0000
Error	14	35.053	2.504		
Total	23	1194.40			

** = *Highly Significant (1% level of significance)*

Number of bolls:

Data regarding number of balls were collected and subjected to statistical analysis showed non-significant results for the concerned parameter and is presented in table 3. It means application of different levels of organic and inorganic fertilizers showed no effect on the number of bolls.

Average boll weight:

Data related to average boll weight were collected and analyzed statistically revealed significant results regarding concerned parameter and is presented in table 4 as analysis of variance.

Study of comparison of mean values of average boll weight showed that maximum

average boll weight (3.4) was found in T_1 where NPK was applied @ 114 -57-62 kg hectare^{-1} followed by T_4 (3.23), T_5 (3.15) statistically at par with T_1 (3.15) as compare to control where least average boll weight (2.82) was reported.

Yield:

Data regarding yield were collected and analyzed statistically revealed significant results regarding concerned parameter and is presented in table 5 as analysis of variance. Comparative study of mean values of yield showed that maximum yield (2939 Kg/ha) was found in T_1 where NPK was applied @ 114 -57-62 kg hectare^{-1} which is statistically at par with T_4 (2857 Kg/ha), T_5 (2700 Kg/ha) (3.15) while least yield (1090 Kg/ha) was reported in control where no fertilizer application was given.

Comparison of mean values: Table No.2

Sr. No.	Treatments	R_1	R_2	R_3	Mean
1	T0 = Control	148.6	152.4	157.2	152.73
2	T1 = NPK @ 114-57-62 Kg/ha	162.6	156.0	172.0	163.53
3	T2 = FYM @ 25 Tons / ha	165.2	166.0	172.8	168.0
4	T3 = Poultry litter @ 6 tons/ha	165.6	158.0	160.0	161.20
5	T4 = FYM @ 25 tons / ha + 50% of T1	174.6	164.4	152.6	163.68
6	T5 = FYM @ 25 tons /ha + 25% of T1	174.6	158.4	161.2	164.73
7	T6 = Poultry litter @ 6 tons / ha + 50% of T1	173.8	160.8	160.0	164.86
8	T7 = Poultry litter @ 6 tons / ha + 25% of T1	165.6	158.8	163.4	162.60

Table3: Analysis of variance of number of bolls

Source of Variation	DF	SS	MS	F-value	Prob.
Replication	2	195.624	97.812	2.3889	0.1281
Fertilizer Levels	7	421.705	60.244	1.4713ns	0.2547
Error	14	573.230	40.945		
Total	23	1190.559			

ns = non-significant

Comparison of mean values:

Sr. No.	Treatments	R_1	R_2	R_3	Mean
1	T0 = Control	20.4	18.6	19.8	19.60 g
2	T1 = NPK @ 114-57-62 Kg/ha	45.2	42.4	43.0	43.53 a
3	T2 = FYM @ 25 Tons / ha	29.6	30.2	30.4	30.07 f
4	T3 = Poultry litter @ 6 tons/ha	35.4	34.8	28.6	32.93 e
5	T4 = FYM @ 25 tons / ha + 50% of T1	41.2	41.4	39.0	40.53 b
6	T5 = FYM @ 25 tons /ha + 25% of T1	39.0	36.0	32.8	35.93 cd
7	T6 = Poultry litter @ 6 tons / ha + 50% of T1	40.0	37.8	36.2	38.00 bc
8	T7 = Poultry litter @ 6 tons / ha + 25% of T1	35.2	34.4	34.2	34.60 dc

LSD Value = 2.771

Table4: Analysis of variance of average boll weight gm/boll

Source of Variation	DF	SS	MS	F-value	Prob.
Replication	2	0.001	0.001	0.1849	
Fertilizer Levels	7	0.571	0.082	20.6755**	0.000
Error	14	0.055	0.004		
Total	23	0.627			

** = *Highly Significant (1% level of significance)*

Comparison of mean values:

Sr. No.	Treatments	R_1	R_2	R_3	Mean
1	T0 = Control	2.90	2.85	2.70	2.817 d
2	T1 = NPK @ 114-57-62 Kg/ha	3.40	3.35	3.45	3.400 a
3	T2 = FYM @ 25 Tons / ha	3.10	3.15	3.20	3.150 bc
4	T3 = Poultry litter @ 6 tons/ha	3.05	3.00	3.15	3.067 c
5	T4 = FYM @ 25 tons / ha + 50% of T1	3.25	3.20	3.25	3.233 b
6	T5 = FYM @ 25 tons /ha + 25% of T1	3.15	3.20	3.10	3.150 bc
7	T6 = Poultry litter @ 6 tons / ha + 50% of T1	3.25	3.15	3.20	3.200 b
8	T7 = Poultry litter @ 6 tons / ha + 25% of T1	3.15	3.20	3.15	3.167 bc

LSD Value = 0.1108

Table5: Analysis of variance of Yield (Kg/ha)

Source of Variation	DF	SS	MS	F-value	Prob.
Replication	2	992143.58	496071.792	14.1122	0.0004
Fertilizer Levels	7	7305780.95	1043682.994	29.6905**	0.0000
Error	14	492128.41	35152.030		
Total	23	8790052.95			

** = *Highly Significant (1% level of significance)*

Comparison of mean values:

Sr. No.	Treatments	R_1	R_2	R_3	Mean
1	T0 = Control	1052	1132	1085	1090 e
2	T1 = NPK @ 114-57-62 Kg/ha	3032	2637	3148	2939 a
3	T2 = FYM @ 25 Tons / ha	2226	1996	2303	2175 d
4	T3 = Poultry litter @ 6 tons/ha	2035	1966	2495	2165 d
5	T4 = FYM @ 25 tons / ha + 50% of T1	2736	2764	3071	2857 ab
6	T5 = FYM @ 25 tons /ha + 25% of T1	2303	2495	3301	2700 abc
7	T6 = Poultry litter @ 6 tons / ha + 50% of T1	2437	2303	2991	2577 bc
8	T7 = Poultry litter @ 6 tons / ha + 25% of T1	2342	2149	2802	2431 cd

LSD Value = 328.3

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