However, not all the direct effects could bring about positive and significant association with yield. Only the positive direct effect of LW, SW, TPP and LSR resulted in such association. Similarly, none of the characters with negative direct effect such as LL could bring in changes in otherwise positive association with yield except the LPP.

The indirect effect of LW, SW and LSR was much more pronounced in the association of TPP and LPP with GFY. Based on the information on phenotypic and genotypic correlations and direct and indirect effects of various characters on GFY, preference may be given to LW, SW, LSR and TPP in the selection programme to isolate superior genotypes.

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NUTRIENT UPTAKE AND QUALITY CHARACTERS AS INFLUENCED BY LEVELS OF P, ENRICHED FYM AND PHOSPHOBACTERIA IN SOYBEAN

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ABSTRACT

Field experiments were conducted to study the effect of P levels, enriched FYM and phosphobacteria on nutrient uptake and quality characters in soybean. Application of 100 per cent recommended dose of inorganic P_2O_5 as enriched FYM (80 kg/ha) along with seed and soil inoculation of phosphobacteria significantly influenced the nutrient uptake and quality characters in soybean.

KEY WORDS : Soybean, P levels, enriched FYM, nutrient uptake, quality characters

Soybean (*Glycine max* (L.) Merrill) is an important leguminous crop with high protein content. The crop requires adequate amount of phosphorus for better growth and yield. Phosphorus is one of the essential plant nutrients and it is applied through various sources like inorganic P, enriched farmyard manure (EFYM) and biofertilizers. Information on the effect of P enriched FYM and phosphobacteria on nutrient uptake and quality characters of soybean is limited and needs to be investigated.

MATERIALS AND METHODS

Field experiments were conducted at the Annamalai University experimental farm, Annamalai Nagar during January - April 1996 and July - October 1996. The experiments were laid out in randomised block design replicated three. There were 14 treatment combinations involving 100 per cent inorganic P_2O_5 alone and its combinaiton with EFYM and phosphobacteria as well as 75 per cent inorganic P_2O_5 in combination with EFYM and phosphobacteria tested on soybean cultivar Co 1. The soil of the experimental field was clayloam with pH of 8.1. It was low in available N, medium in available P_2O_5 and high in available K_2O. A fertilizer schedule of 20 : 80 : 40 kg of N, P_2O_5 and K_2O ha^{-1} respectively was followed. P and phosphobacteria were applied as per treatment schedule. All the fertilizers were applied basally.

RESULTS AND DISCUSSION

Nutrients uptake

Among the various treatments tested (Table 1), application of 100 per cent inorganic P_2O_5 (80 kg/ha) as EFYM along with seed and soil inoculation of phosphobacteria registered higher nutrient uptake in both the seasons. The increased nutrient uptake might be due to greater availability of nutrients through organic, inorganic and biological sources by enhancing the cambial activity of root hairs, root proliferation and cell development in the root surface areas resulting in higher dry matter production (DMP) and plant growth. Application of 75 per cent inorganic P_2O_5 (60kg/ha) along with seed inoculation of phosphobacteria registered the least uptake of nutrients in both the seasons. This was due to lesser availability of nutrients through reduced supply of P without enrichment along with individual application of phosphobacteria (seed alone) resulting in reduced plant growth. The present results are in line with the reports of Nimje and Jagdish Seth (1988) in soybean and Wahab and Kadiresan (1995) in sesamum.

Quality character

Application of 100 per cent inorganic P_2O_5 as EFYM along with seed and soil inoculation of phosphobacteria recorded higher protein and oil content of soybean seed in both the seasons (Table 2). This might be due to the favourable effect of applied P levels through single superphosphate on N transformation and in the accumulation and metabolism of carbohydrates in plants. Among the treatments tested, 75 per cent inorganic P_2O_5 along with seed inoculation of phosphobacteria recorded the least protein and oil content of soybean seed in both the seasons. This might be due to the reduced supply and availability of P to the crop. The present results are in line with the reports of Rajput *et al.*,

Table 1. Nutrient uptake in soybean (kg/ha)

Treatments	Nitrogen Uptake		Phosphorus Uptake		Potassium Uptake	
	Season I	Season II	Season I	Season II	Season I	Season II
100% inorganic P_2O_5 alone (80 Kg ha^{-1})	79.23	77.63	15.82	15.73	74.98	72.87
100% inorganic P_2O_5 as enriched FYM (EFYM)	95.62	92.72	20.30	19.20	86.33	84.35
100% inorganic P_2O_5 + Phosphobacteria seed inoculation	83.70	81.80	17.02	15.76	78.99	76.68
100% inorganic P_2O_5 + Phosphobacteria soil application	86.18	83.78	17.64	16.54	80.83	78.64
100% inorganic P_2O_5 + Phosphobacteria seed and soil application	90.09	86.89	18.67	17.37	83.84	80.01
100% inorganic P_2O_5 as EFYM + Phosphobacteria seed inoculation	98.45	96.15	21.84	20.91	91.44	89.10
100% inorganic P_2O_5 as EFYM + Phosphobacteria soil application	104.27	101.07	24.12	22.82	99.58	96.98
100% inorganic P_2O_5 as EFYM + Phosphobacteria seed and soil application	109.82	106.22	26.98	25.48	105.88	103.76
75% inorganic P_2O_5 + Phosphobacteria seed inoculation	76.55	74.25	14.88	14.79	73.13	71.15
75% inorganic P_2O_5 + Phosphobacteria soil application	80.58	77.48	16.21	15.67	76.76	74.65
75% inorganic P_2O_5 + Phosphobacteria seed and soil application	82.42	78.72	16.56	15.26	77.44	75.16
75% inorganic P_2O_5 as EFYM + Phosphobacteria seed inoculation	93.37	91.07	19.77	18.84	84.73	82.62
75% inorganic P_2O_5 as EFYM + Phosphobacteria soil application	96.71	93.64	21.62	20.42	88.98	86.59
75% inorganic P_2O_5 as EFYM + Phosphobacteria seed and soil application	100.10	96.30	22.02	20.93	93.23	91.04
CD (P=0.05)	4.37	4.23	2.63	2.65	6.28	5.70

Table 2. Quality character of soybean seed

Treatments	Nitrogen Uptake		Phosphorus Uptake	
	Season I	Season II	Season I	Season II
100% inorganic P_2O_5 alone (80 Kg ha^{-1})	41.15	41.13	22.35	22.32
100% inorganic P_2O_5 as enriched FYM (EFYM)	41.40	41.40	22.75	22.73
100% inorganic P_2O_5 + Phosphobacteria seed inoculation	41.25	41.23	22.46	22.46
100% inorganic P_2O_5 + Phosphobacteria soil application	41.29	41.28	22.50	22.51
100% inorganic P_2O_5 + Phosphobacteria seed and soil application	41.33	41.33	22.57	22.56
100% inorganic P_2O_5 as EFYM + Phosphobacteria seed inoculation	41.49	41.48	22.76	22.75
100% inorganic P_2O_5 as EFYM + Phosphobacteria soil application	41.64	41.62	22.80	22.80
100% inorganic P_2O_5 as EFYM + Phosphobacteria seed and soil application	41.88	41.87	22.86	22.85
75% inorganic P_2O_5 + Phosphobacteria seed inoculation	41.09	41.07	22.31	22.30
75% inorganic P_2O_5 + Phosphobacteria soil application	41.18	41.15	22.38	22.37
75% inorganic P_2O_5 + Phosphobacteria seed and soil application	41.22	41.22	22.43	22.40
75% inorganic P_2O_5 as EFYM + Phosphobacteria seed inoculation	41.36	41.32	22.61	22.61
75% inorganic P_2O_5 as EFYM + Phosphobacteria soil application	41.45	41.44	22.67	22.65
75% inorganic P_2O_5 as EFYM + Phosphobacteria seed and soil application	41.56	41.55	22.80	22.80
CD (P=0.05)	0.19	0.17	0.44	0.43

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EFFECT OF SOWING TIME AND MULCHING ON WEED CONTROL IN COTTON-BASED INTERCROPPING SYSTEM IN RAINFED VERTISOLS

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ABSTRACT

Field experiments conducted at the Agricultural Research Station, Kovilpatti during *rabi* seasons of 1993-94 and 1994-95 revealed that intercropping of cotton + black gram at 2:1 ratio reduced the weed density and dry matter. Mulching either with subabul loppings or *bajra* straw @ 6 t/ha recorded significantly lower weed population and the dry matter accumulation than the unmulched control.

KEY WORDS : Cotton, intercropping, mulching, weeds

Intercropping is an important feature of crop production system in India under dryland agriculture. In a slow growing crop like cotton, much of the interspace remains unutilised during early stages of the crop growth. The canopy does not cover the inter row space and as such weeds come up in the unutilised space and compete with cotton crop for the available moisture, nutrients and light. Whereas, under thick canopy the competition of weed is greatly reduced (Donald, 1963). One of the most important advantages of mulching is supression of weeds, thereby reducing the cost of intercultivation in rainfed agriculture. Hence, field experiments were conducted to find out the effect of mulching on weed control in cotton based