

Effect of organic matter and phosphorus on growth and yield of soybean (*Glycine max*)

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ABSTRACT

A field experiment was conducted on sandy-loam soil at the Main Research Station, UAS, Hebbal, Bangalore, during 2 summer seasons of 1990 and 1991, to study the response of soybean [*Glycine max* (L.) Merr.] to organic matter (FYM + rice straw in the proportion of 1 : 1 at 0, 5 and 10 tonnes/ha) and phosphorus (37.5 and 56.25 kg P₂O₅/ha). At the peak growth of 60 DAS, the leaf-area index (LAI) was significantly increased from 2.57 in the control to 3.41 and 4.05 with 5 and 10 tonnes/ha of organic matter. Similarly, grain yield increased significantly from 20.7 to 23.0 and 26.9 q/ha with increase from 0 to 5 and 10 tonnes/ha organic matter and 22.7 to 24.1 q/ha with 37.5 to 56.25 kg P₂O₅/ha as a result of increased dry-matter production at various growth stages.

Soybean [*Glycine max* (L.) Merr.] is one of the important grain legumes of India which not only helps in maintaining soil fertility but is also a rich source of protein and fats. Its cultivation has become popular in southern parts of Karnataka due to establishment of processing units and high remunerative prices. It is recognised that combined source of organic matter and chemical fertilizers play a key role in modern agriculture in increasing the productivity of crops and sustained management of soil fertility. The present investigation was carried out to study the effect of organic matter and phosphorus on growth and yield of soybean.

MATERIALS AND METHODS

A field experiment was conducted in factorial randomized block design with 3 replications in summer season of 1990 and 1991

at Hebbal main research station of UAS, Bangalore. The treatments consisted of combination of 3 levels of organic matter [farm-yard manure (FYM) + rice straw in the proportion of 1 : 1 @ 0, 5 and 10 tonnes/ha] and 2 levels of P₂O₅ (37.5 and 56.25 kg/ha). The soil was red sandy loam (Alfisols) and available nitrogen 338.6 and 276.4, available P₂O₅ was 50.6 and 48.8 and available K₂O was 120.9 and 294.0 kg/ha in 1990 and 1991 respectively. The soil pH was 6.3 and 6.7 in 1990 and 1991 respectively. Soybean 'Hardee' was sown in rows 30 cm apart. Uniform doses of 25 kg N and K₂O/ha were applied at sowing. The gross plot size was 19.2 m x 12.0 m and net plot size was 14.4 m x 9.6 m. Leaf-area index and dry-matter production were recorded periodically by taking 5 randomly selected plants outside the net plot area.

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Table 1. Total dry-matter production, seed yield and stover yield of soybean as influenced by levels of organic matter and phosphorus

Treatment	Total dry-matter production/ plant (g)* at				Grain yield (q/ha)			Stover yield (q/ha)		
	30 DAS	60 DAS	90 DAS	Harvest	1990	1991	Pooled	1990	1991	Pooled
<i>Organic matter (tonnes/ha)</i>										
0	1.52	7.84	24.78	28.87	21.94	18.27	20.67	25.93	24.19	25.06
5	1.69	9.44	31.94	35.17	23.81	22.19	23.00	29.68	26.08	27.89
10	1.87	10.70	43.07	41.53	27.13	26.74	26.94	31.96	26.46	29.21
CD (P = 0.05)	0.10	0.60	1.48	2.08	2.31	0.88	1.16	2.44	NS	1.42
<i>Phosphorus (kg/ha)</i>										
37.50	1.64	8.90	31.30	33.57	23.68	21.69	22.69	28.42	25.52	26.97
56.25	1.75	9.75	35.20	36.82	24.90	23.33	24.12	29.96	25.63	27.79
CD (P = 0.05)	0.08	0.49	1.21	1.70	NS	0.72	0.95	NS	NS	NS

* Pooled data of 2 years

RESULTS AND DISCUSSION

Effect of organic matter

The LAI increased significantly as the levels of organic matter increased from control (0.71 at 30 DAS, 2.57 at 60 DAS and 2.25 at 90 DAS) to 5 tonnes (0.79 at 30 DAS, 3.41 at 60 DAS and 2.78 at 90 DAS) and 10 tonnes (0.89 at 30 DAS, 4.05 at 60 DAS and 3.08 at 90 DAS) (Fig. 1).

The pooled data (Table 1) indicated that dry-matter production/plant significantly increased with increase in levels of organic matter at all dates of observation. The grain and stover yields of soybean were significantly highest in 10 tonnes organic matter both in 1990 (27.1 and 31.9 q/ha) and 1991

(26.7 and 26.4 q/ha respectively) and in pooled data (Table 1). There was 17% increase in grain yield, 12% in stover yield in the pooled data with 10 tonnes of organic matter over 5 tonnes of organic matter and 30% in grain and 16% in stover yield over the control. Such an improvement may be attributed to significant increase in LAI and dry-matter accumulation. Similar type of observations were made by Shivashankar and Shantaram (1980) and Ulman (1981).

Effect of phosphorus

Application of 56.25 kg P_2O_5 /ha recorded significantly higher LAI at 60 and 90 DAS (Fig. 1) and dry-matter production than 37.5

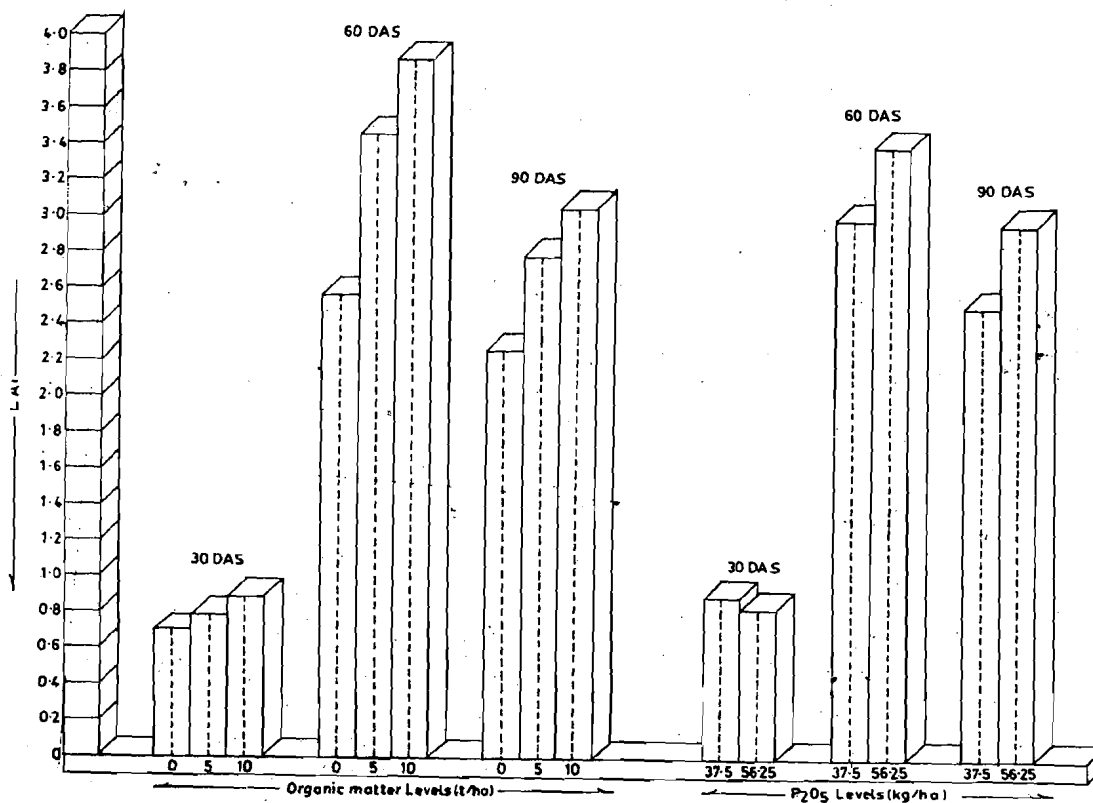


Fig. 1. LAI of soybean as influenced by organic matter and P_2O_5 levels

kg P_2O_5 /ha at all growth stages (Table 1).

Significantly higher grain yield in 1991 (22.2 q/ha) and in pooled data (24.1 q/ha) was recorded in the treatment which received 56.25 kg P_2O_5 /ha. The stover yield, however did not differ significantly in both the years. These results are in conformity with the findings of Vyas *et al.* (1987) and Nimje and Seth (1988). The per cent increase in grain yield was 6.3 with 56.25 kg over 37.5 kg P_2O_5 .

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