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Effect of different levels of phosphorus and sulphur on growth and yield of cowpea (*Vigna sinensis*) Cv. Pusa Phalguni

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Abstract
The experiment "Effect of different levels of phosphorous and sulphur on growth and yield of Cow pea (*Vigna sinensis*) Pusa Phalguni was conducted at the instruction a cum Research farm Department of Horticulture, Collage of Agriculture during kharif season 2012-2013. The experiment was laid out in factorial Randomized Design with three levels each of phosphorus and sulphur consisting nine treatment combination replicated thrice. The treatment comprising of levels of phosphorus *viz*. P_1:40 kg P_2O_5/ ha,P_2:50 kg P_2O5/ha,P_3:60 kg P_2O_5/ha and three levels of sulphur *viz*. S_0:0 kg S / ha,S_1: 20 kg S/ha,S_2:40 kg S/ha and P_1:60 kg P2O5/ha produced better growth number of branches, (13.56), number of functional leaves (17.10) Leaf area (17.55 dm^2) and yield green pod (5o.51q) per hacter of cow pea under study.

Keywords: Cow pea, *Vigna sinensis*, horticulture, phosphorus

Introduction
Cowpea is commercially growth throughout in india for its long pod green as vegetable for its seed as pulse for its foliage and fodder The nutrient available to plant particularly nitrogen and phosphorus are important constitution of protein and phospholipids, phosphorus not only enhance the root growth but also promotes early plant maturity Mullin *et al*., (1996) [3] phosphorus does not increase seed yield but also nodulation. Kuradikari *et al*., (1973) [2] reported that an increase of about 5%seed protein content of cowpea as a result of phosphorus application. Phosphorus is a vital element in all biological system and is limiting factor in enhancing the productivity of legumes. Its availability in tropical soils are less due to fixation by various soil reaction. Phosphorus does not only increase yield but also nodulation. Sulphur is a fourth major nutrient after nitrogen phosphorus and potassium Phosphorus all though not required in large quantities, critical to cowpea yield because of its multiple effect on plant nutrition (Muleba and Ezmumah, (1985) [4] Legume and oilseed crops have been found respond to sulphur application in soil because of deficiency in Availed sulphur Dev and kumar (1982) [1]. Because of relatively higher protein content in seed and straw cowpea requirs high amount of sulphur than other legume crops.

Materials and Methods
The experiment on effect of different levels of phosphorus and sulphur on yield of Cowpea. (*Vigna sinensis*) Pusa Phalguni was conducted at the instruction a cum Research farm Department of Horticulture, Collage of Agriculture, Latur during kharif season 2012-2013. The experiment was laid out in factorial randomized design with three levels each of phosphorus and sulphur consisting nine treatment combination replicated thrice. The treatment comprising of levels of phosphorus *viz*. P_1:40 kg P_2O_5/ ha,P_2:50 kg P_2O_5/ha,P_3:60 kg P_2O_5/ha and three levels of sulphur *viz*. S_0:0 kg S / ha,S_1: 20 kg S/ha,S_2:40 kg S/ha. The recommended N and K each of 50 kg per hacter. Whereas the P and S was applied through urea and Diaammonium phosphate (DAP), phosphorus through DAP, potash through Mutrate of potash and sulphur through Gypsum. The cultural and other operation carried out during experimentation.

The crop was protected from insect and diseases by spraying pesticides, inecticides fungicides as and when required. The observation were recorded at 15 dayes interval.

Results and Discussion

Results presented in table in Table 1and 2 revelved that the different levels of fertigation had a significant influences on height of plant, number of leaves, leaf area and yield

Plant Height

The plant height at 60 DAS was not influenced significantly due to different levels of phosphorous while the maximum height of plant was recorded by the application of 60 kg P_2O_5 ha^{-1} (42.07cm). The different levels of sulphur the maximum value of plant height (43.60 cm)) was recorded by application of 40 kg S ha^1 Intraction effect of phosphorus and Sulphur on plant height was not found significant. The increasing plant height under phosphorus treatment might be due to role of phosphorus in casuing rapid cell division and cell elongation in the meristematic region of the plant similar results were also recorded by Sharma and Jat (2003) [7].

Number of branches

The highest number of branches (13.50) recorded with the application of phosphorus at 60 kg h^{-1} and was found at par with 50 kg P_2O_5 ha^{-1} The different levels of sulphur the significantly highest number of branches (13.56) per plant was observed with 40kg S h^{-1} at 60 DAS and was found at par with 20 kg S ha^{-1}. Intraction effect on number of branches per plant were not significant found. This may be probably due to the cumulative effect of phosphorus on the process of cell division, balanced nutrition and increased availability of phosporus. The result are close conformity with Yadav and Yadav (2011) [9].

Number of leaves: At 60 DAS application of 60 kg P_2O_5 ha^{-1} produced significantly highest number of functional leaves. (17.30) per plant over 40kg S h^{-1}. The different levels of sulphur at 60 DAS application of 40kg S $h^{-1}$was recorded maximum number of branches per plant (17.10). The intraction effect between different levels of phosphorus and sulphur in mean number of leaves per plant was not found significant at 60 DAS. The might to due to phosphorus involved in the cell division, cell elongation. The results of the present study were in conformity with recorded by Owolade *et al*. (2003) [5]

Leaf area: Significantly highest leaf area per plant (21.55dm^2) per plant was observed due to application of 40 kgS h^{-1}. Interaction effect was found non significan

Days to initiation of flowering: Significantly minimum dayes (42.78days) to first flowering recorded by treatment 50 and60 kr phosphorus per hectar. The significantly early flowering (42.33 days) was reecoded when cowpea crpo was fertilizer with 20 kg Sper hectar was found stastically at par with 40kg per hectar Intraction effect found significant.

Green pod yield per plot and hectar: The maximum green pod yield per plot and pre hector was influenced significantly due to different levels of phosphorus. The maximum pod yield per plot (6.38kg) and per hector (50.61q) was produced with the application of 60 kg P_2O_5 $ha^{-1.}$ The application of 40 kg S per hector was produced higher green pod yoeld per plot (6.5kg) and per hectar (52.22q). Which was found superior over without application of sulphur per hector.

The application of 40 kgS h^{-1} was produced higher green pod yield per plot (6.5 kg) and per hectar (52.51 q) was found superior over without application of sulphur pper hectar. The higher green pod yield was recorde with higher level of phosphorus may be due to higher dose of phosphorus may be due to higher reproductive growth similar finding were reported by Rehman *et al*. (2007) [6] Subhramanian *et al*. (1977) [8].

Table 1: Effect of different levels of phosphorus and sulphur on growth charectars of cowpea

Treatment	Plant height (cm)	Number of branches	Number of leaves	Leaf area (dm^2)	Days to initiation of flowering
Phosphorus levels (P)					
P_1	39.84	11.64	14.76	17.01	43.11
P_2	41.40	13.16	16.54	20.26	42.78
P_3	42.07	13.50	17.30	22.55	42.78
SE+_	1.25	0.41	0.57	0.76	0.31
CD at 5%	NS	1.33	1.73	2.31	NS
Sulphur Levels (S)					
S_1	39.38	11.92	14.84	17.88	43.89
S_2	40.33	12.82	16.66	20.29	42.33
S_3	43.60	13.56	17.10	21.65	42.44
SE+_	1.25	0.41	0.57	0.76	0.31
CD at 5%	NS	1.33	1,73	2.31	0.95
Interaction effect					
SE+_	2.18	0.17	1.00	1.33	0.55
CD at 5%	NS	NS	NS	NS	1.65

Table 2: Effect of different levels of phosphorus and sulphur and yield of cowpea

Treatment	Green pod yield per plot	Green pod yield per hectre
Phosphorus levels (P)		
P_1	5.51	43.74
P_2	6.23	49.43
P_3	6.38	50.51
SE+_	0.22	1.74
CD at 5%	0.66	5.24
Sulphur Levels (S)		
S_1	5.39	42.75
S_2	6.15	48.82
S_3	6.58	52.22
SE+_	0.22	1.74
CD at 5%	0.66	5.24
Interaction effect		
SE+_	0.38	3.03
CD at 5%	NS	NS

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