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RESEARCH PAPER

Effect of different phosphorus levels on growth, fodder yield and economics of various cowpea genotypes under Kymore plateau and Satpura hills zone of Madhya Pradesh

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Abstract : The field experiment was conducted at fodder research farm, JNKVV, Jabalpur, Madhya Pradesh during *Kharif* season of 2008-09 to study the cowpea genotype (UPC-626, UPC-628, UPC-629, UPC-4200, Bundel lobia-1 and UPC-9202) to varied levels of phosphorus (40, 60 and 80 kg P_2O_5 /ha). The experiment was laid out in Factorial Randomized Design with three replications. The two year pooled data revealed that the among the different genotype UPC-629 recorded highest green forage yield (253.9q/ha), dry matter yield (46.2q/ha), crude fibre yield (5.9 q/ha), net monetary returns (19224 Rs/ha) and B:C ratio (2.70). The application of 80 kg P_2O_5 /ha recorded significantly highest Green Forage Yield (244.8q/ha), dry matter yield (45.6q/ha), crude fiber yield (6.1 q/ha), net monetary returns (18132 Rs/ha) and B:C ratio (2.61).

Key Words : Cowpea fodder genotypes, Phosphorus levels, Green fodder yield, Crude protein yield

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INTRODUCTION

India is basically agriculture country where farming is oriented towards mixed farming and livestock rearing is an integral part. In our country, nearly 70 per cent population resides in village and account for 15 per cent of the world's population with only 2 per cent of the world's geographical area. This is an indicative of tremendous pressure of animal population on the limited land resources (Hazara, 1983). Consequently, the productivity of the livestock is very low in almost all the states and it is a matter of great concern. The fodder production of the country is not sufficient to meet out the requirement of growing livestock population and the forage offered to animal are mostly poor in quality. Thus increasing acreage under forage crops to increase the fodder production is not looking possible, because the availability of land capita is descending

Cowpea is grown throughout the year except to season with extreme low temperature almost in all of the country. It is grown for various purposes such as vegetable crop, forage crop, grain legume crop and erosion resisting crop as cover crop. It provides palatable, notorious and balanced feed to milch animals. Cowpea is a leguminous crop having high potential to fix atmospheric nitrogen in soil. Next to nitrogen phosphorus is yield limiting nutrient. Being the leguminous crop it responds more to phosphoric nutrient than nitrogen and potassium. Thus, it is utmost needed to find out the suitable genotype along with optimum dose of phosphorus for the production of fodder yield.

MATERIAL AND METHODS

The present investigation was carried out at research farm of JNKVV, Jabalpur. The experiment was conducted in factorial randomized design with three replications. There were 18 treatments, consisted of six cowpea genotype (UPC-626, UPC-628, UPC-629, UPC-4200, Bundel lobia-1 and UPC-9202) to varied levels of phosphorus (40, 60 and 80

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kg P_2O_5 ha) and three phosphorus levels (40, 60 and 80 kg P_2O_5 /ha). The soil of experimental field was clay loam in texture, neutral (7.2) in reaction with low organic carbon (0.44%) and normal electrical conductivity(0.34 dS/m) and analyzing low in available N (228 kg/ha), medium in available P_2O_5 (16.2 kg/ha) and available K_2O (297 kg/ha) contents. The uniform dose 20 kg nitrogen + 20 kg K_2O/ha was applied at time of sowing from the urea and muriate of potash, respectively . Phosphorus was applied as per treatments at the time of sowing using single super phosphate. The green fodder yield and growth parameters, *viz*., vein length, number of nodules per plant, leaf area index and leaf- stem ratio (L : S ratio) were recorded at the time of 50% flowering. The crude protein yield was calculated by a factor of 6.25 formula suggested by Mehrez and Zrasko (1977).

RESULTS AND DISCUSSION

The results of the present study have been presented and discussed under the following headings:

Growth parameters:

Genotypes were significantly influenced by phosphorus levels with respect to green fodder, dry matter, crude protein yield, vein length and number of nodules per plant. Among the different genotype of cowpea the UPC-629 recorded higher vine length (163.9 cm), L:S ratio (1.17), leaf area index (8.35), number of nodules per plant (112.92), fresh weight of nodules per plant (3.45 g) and dry wt. of nodules per plant (1.77 g) (Table 2). The application of 80 kg of phosphorus recorded the highest leaf area index (9.39), number of nodules per plant (109.23), fresh weight of nodules per plant (3.28 g) and dry wt. of nodules per plant (1.64 g). Akter *et al*. (1998) emphasized that application of phosphorus significantly increased the nodulation (number and weight of nodules/plant) in plant.

Fodder yield :

Cowpea genotype UPC 629 recorded significantly higher green fodder yield (253.9 q/ha), dry matter yield (46.2 q/ha), crude protein yield (43.9 q/ha), followed by UPC 626 (241.9, 42.9 and 5.5 q/ha, respectively). However, the genotype bundle lobia-1 recoded lowest green fodder yield (158.6 q/ha), dry matter yield (28.2 q/ha) and crude protein yield (3.7 q/ha) (Table 1). Purushotam *et al*. (2001) also reported the suitable genotype for better fodder yield of cowpea. The different phosphorus levels data revealed that the increased dose of phosphorus 60 and 80 kg per hectare results increased green fodder, dry matter and crude protein yield. The application of 80 kg of phosphorus per hectare recorded significantly higher green fodder yield (244.8 q/ha), dry matter yield (45.6 q/ha) and crude protein yield (6.1 q/ha) however the lower dose of phosphorus 40 kg per hectare recorded lower green fodder yield (190.3 q/ha), dry matter yield (32.8q/ha) and crude protein yield (3.7 q/ha). Sharma and Jat (2003) also reported that the application of 40 kg of P_2O_5/ha gave significantly higher seed yield of cow pea. The cowpea genotype UPC-629 recorded higher green fodder yield with 80 kg of phosphorus fertilizer application (Baboo and Mishra, 2001).

Table 1 : Green fodder, dry matter and crude protein yield (q/ha) of cowpea under different treatments

Treatments	Green fodder yield (q/ha)	Dry matter yield (q/ha)	Crude protein yield (q/ha)
Variety			
UPC-626	241.9	42.9	5.5
UPC-628	238.8	43.5	5.4
UPC-629	253.9	46.2	5.9
UPC-4200	193.5	35.2	4.5
Bundel lobia-1	158.6	28.2	3.7
UPC-9202	216.9	39.3	4.9
S.E.±	3.6	0.6	0.1
C.D. (P=0.05)	10.6	1.9	0.3
P level (kg/ha)			
P_{40}	190.3	32.8	3.7
P_{60}	216.7	39.3	4.1
P_{80}	244.8	45.6	6.1
S.E.±	2.5	0.5	0.1
C.D. (P=0.05)	7.3	1.3	0.1
Interaction Entry x P levels			
S.E.±	6.3	1.1	0.1
C.D. (P=0.05)	17.9	3.3	0.4
CV	15.0	8.1	5.1

Table 2 : Growth parameters and economics of cowpea under different treatments

Treatments	Vine length (cm)	L:S ratio	LAI	No of nodules/plant	Fresh wt. of nodules/plant	Dry wt. of nodules/plant	GMR Rs/ha	NMR Rs/ha	B:C ratio
Variety									
UPC-626	117.3	0.83	8.26	103.55	3.18	1.68	29028	17784	2.58
UPC-628	132.8	0.77	8.17	102.36	3.05	1.62	28656	17412	2.54
UPC-629	163.9	1.17	8.35	112.92	3.45	1.77	30468	19224	2.70
UPC-4200	105.1	0.71	7.85	93.35	2.16	1.01	23220	11976	2.06
Bundel lobia-1	80.0	0.66	7.68	87.54	2.03	0.98	19032	7788	1.69
UPC-9202	130.5	0.76	8.07	95.63	2.24	1.02	26028	14784	2.31
S.E.±	3.9	0.02	0.11	2.06	0.08	0.05			
C.D. (P=0.05)	1.2	0.06	0.30	6.00	0.24	0.15			
P level (kg/ha)									
P_{40}	126.3	0.81	5.98	85.99	1.80	0.91	22836	11592	2.03
P_{60}	121.4	0.90	8.81	102.44	2.96	1.48	26004	14760	2.31
P_{80}	117.1	0.73	9.39	109.23	3.28	1.64	29376	18132	2.61
S.E.±	2.8	0.01	0.09	1.83	0.06	0.04	-	-	-
C.D. (P=0.05)	7.9	0.04	0.28	5.63	0.19	0.13	-	-	-
S.E.±	6.8	0.04	0.08						
Interaction entry x P levels									
C.D. (P=0.05)	19.4	0.10	0.25						
CV	9.6	7.7	1.25						

Economics :

The UPC 629 genotype recoded highest gross monetary returns (Rs 30468/ha), net monetary returns (Rs. 19224/ ha) and benefit : cost (2.70) ratio followed by UPC 626 (Rs. 29028, 17784/ha and 2.58, respectively). The application of 80 kg of phosphorus per hectare recoded highest gross monetary returns (Rs 29376/ha), net monetary returns (Rs 18132/ha) and benefit : cost (2.61) followed by 60 and 40 kg of phosphorus per hectare (Table 2). Shekara *et al*. (2010) also recorded the application of 80 kg P_2O_5/ha recorded significantly higher net monetary returns (Rs. 27115/ha).

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