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Research Article

Differential Response of French Bean Varieties to NPK Fertilization with or without Farm Yard Manure in an Alfisol

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Abstract: Differential response of six varieties of French bean to two levels (F1 and F2) of fertilizer (N,P and K) with or without Farm Yard Manure **(**FYM) was studied in a pot culture experiment using an alfisols. Highly significant differences were observed among the varieties' of French bean with respect to N,P and K uptake at all the stages of crop growth. Higher uptake rates of nitrogen and potassium were positively correlated with higher yields. The uptake rates of all the nutrients increased with time. The effect of FYM application on nutrient availability resulted in higher uptake rates in case of nitrogen and potassium at F_2 level that at F_1 level. Significant differences in fresh pod yield were observed among the different varieties of French bean. The varieties, Arka Komal and IIHR-909 recorded higher yield at both F1 and F2 level. The variety tweed wonder recorded lower yield both at F1 and F2 level. At both fertilizer levels with or without FYM it was found that the variety Arka Komal recorded highest pod yield showing that varieties have unique genetic properties that regulate their response to utilization of nutrients.
Keywords: Farm Yard Manure **(**FYM), Alfisol, French bean, Fertilities.

INTRODUCTION

In corporation of nutrient use efficiency into existing cultivars is necessary if advances in crop yields are to be realized given the decreased supplies of fertilizer elements. The present day use of fertilizers are dictated by economic concerns due to steep increase in cost of petroleum and energy costs. As the vegetable cultivation is very intensive it consumes major share of fertilizers.

French bean (*Phaseolus vulgaris L.*) is an important short duration leguminous pod vegetable grown all over the world. The pods are rich in protein, calcium and iron. Differential responses of French bean varieties to N and P fertilization. Haag *et al.*, [1] suggests that varieties of French bean have unique genetic properties in utilization of nutrients. Application of Farm Yard Manure (FYM) plays a vital role in making available the required nutrients for crop growth. Hence an attempt was made to evaluate the responses of French bean varieties to optimum and low fertility levels with or without FYM

MATERIALS AND METHODS

A pot culture study was conducted to assess the utilization efficiency of different varieties of French bean. The experiment was carried out in the green house of College of Agriculture, U.A.S., GKVK, Bangalore, during Kharif season of 1996. The experiment was laid out in a randomized block design with 12 treatments and three replications. Six varieties (V1 to V6) of French bean selected for the study among them Arka Komal and contender which were released and notified varieties served as standards checks (control). The remaining four varieties viz., IIHR-220, IIHR-909, Tweed Wonder and Pant Anupama were pre-relased varieties presently undergoing multi locational trials for their performance all over the country. The fertilizer levels imposed were:

F1 – 100% recommended dose of NPK(@ 62.5 kg N:100KgP_2O_5:75 kg K_2O/ha) without FYM.

F2 – 50% recommended dose of NPK (@ 31.25 kg N: 50 Kg P_2O_5 : 37.5 kg K_2O/ha) + FYM @ 25 tonnes/ha.)

Two plants^{-1} plot were maintained, adequate irrigation was given to maintain the pots at field capacity. Nitrogen was applied at two split doses whereas P and K was applied as basal dose. Recommended plant protection measures were adopted to control pests and diseases. Both soil, plant & samples were collected at three stages of crop growth viz., 20th , 40th 64th day of crop growth. Fresh pods were harvested twice.

RESULTS AND DISCUSSION

Uptake of NPK

The data regarding uptake of NPK nutrients is presented in Table -1 . At all the three stages of crop-growth significant differences were observed in the uptake rates. At 20 days, the variety tweed wonder recorded the highest nitrogen uptake at F2 level. On the other hand at 40 days, Arka Komal recorded the highest nitrogen uptake at F2 level. The variety contender recorded higher uptake of N at 64 days. The 'P' uptake varied significantly among the varieties. Higher uptake was noticed in IIHR-909 and tweed wonder varieties, whereas contender recorded lower uptake. Higher K uptake was recorded by the variety IIHR-220 and Arka Komal, on the other hand lower uptake was observed in the varieties contender and pant Anupama, The varieties Arka Komal and IIHR – 909 which recorded higher fresh pod yields also recorded higher uptake rates of N and K. Thus the uptake rates of nitrogen and potassium was positively correlated with pod yield. Uptake rates in case of nitrogen and phosphrous were on par with the rates observed in French beans [2]. The uptake rates increased with time. The uptake rates in case of nitrogen and potassium in general were higher in F2 level than at F1 level treatments, which was due to addition of FYM at F2 level, this could have enhanced the availability of nitrogen and thus the plant was able to take up more nitrogen. Similar trend was noticed in the studies[3]. The 'P' uptake values at F2 level were in general on par with the values at F1even though only 50% P was available at F2 level. Similar results were observed[4], where in application of manures and N fertilizers increased NH_4-N , NO_3-N and Olsen-P in soil. Combination of fertilizers with manures was better than fertilizer or manure alone.

Fresh pod yield

Fresh pod yield were found to be different significantly among the different varieties at both the fertilizer levels. The data is presented in Table 2. Highest total fresh pod yields were recorded by the varieties Arka Komal (F1 level) and IIHR-909 (F2 level), on the other hand the variety tweed wonder recorded the lowest pod yield both at F1 and F2 levels.

In total fresh pod yield of Arka Komal recorded higher values both at F1 and F2 level than other varieties. On the other hand the variety tweed wonder recorded the lowest pod yield both at F1 and F2 levels. It was observed from the data that at F2 level with 50% NPK and FYM, the variety Arka Komal performed better and produced second highest pod yield. It was observed from the results that the efficient varieties like Arka Komal and IIHR-909 have produced almost equal yields both at higher (F1) and lower (F2) fertility conditions. Similar results were observed in French bean by Haag *et al.,* [1] among 124 genotypes under low and high fertility conditions.

Thus it was observed that lot of diversity was present among the varieties of French bean in nutrient use efficiency. It can be inferred from the study that the genotypes of French bean have unique genetic properties that regulate their responses in utilization of available nutrients. The other is the importance of FYM in soil fertility thus making available more nutrients for crop growth.

Table 1 .Effect of fertilizer levels with or without FYM on nitrogen , phosphorus and potassium uptake (mg pot^{-1}) by different varieties of French bean

Treatments	Varieties	Nitrogen uptake			Phosphorus uptake			Potassium uptake		
		20 days	40 days	64 days	20 days	40 days	64 days	20 days	40 days	64 days
100% NPK (F1)										
T1	Arka Komal	40	203	369	1.87	10.37	17.71	76	393	672
T2	IIHR-220	55	265	338	2.61	12.68	16.99	96	467	597
T3	IIHR-909	54	218	332	3.69	15.05	22.94	81	342	521
T4	Tweed Wonder	29	203	345	2.39	23.13	39.354	45	284	584
T5	Pant Anupama	33	191	394	1.27	7.51	15.46	47	381	578
T6	Contender	32	259	391	1.13	9.13	13.77	44	354	534
50% NPK + FYM(F2)										
T7	Arka Komal	55	339	519	1.27	7.86	12.02	76	464	610
T8	IIHR-220	43	230	447	1.43	9.46	14.71	47	308	479
T9	IIHR-909	54	285	446	1.08	5.66	9.65	61	322	549
T10	Tweed Wonder	58	286	285	1.51	8.10	10.69	64	357	442
T11	Pant Anupama	29	319	563	1.67	6.67	11.75	47	299	526
T12	Contender	57	335	429	1.78	8.99	9.41	75	378	471
S.Em.		1.20	0.94	0.70	0.16	0.20	0.27	0.71	0.90	0.66
CD at 5%		3.52	2.77	2.06	0.46	0.60	0.80	2.09	2.64	1.94

Table 2 : Effect of fertilizer levels with or without FYM on fresh pod yield (gm pot^{-1}) of different French bean varieties

Treatments	Varieties	Fresh pod yield		
		I Harvest	II Harvest	Total
	100% NPK (F1)			
T1	Arka Komal	148.34	84.81	233.16
T2	IIHR-220	37.49	74.76	112.25
T3	IIHR-909	107.49	34.07	141.56
T4	Tweed Wonder	10.15	85.17	95.32
T5	Pant Anupama	94.50	63.03	157.53
T6	Contender	91.55	60.77	152.32
	50% NPK + FYM(F2)			
T7	Arka Komal	100.41	81.24	181.65
T8	IIHR-220	61.34	65.46	126.80
T9	IIHR-909	134.50	43.72	178.22
T10	Tweed Wonder	13.26	68.65	81.91
T11	Pant Anupama	77.73	44.58	122.30
T12	Contender	54.48	41.91	96.40
S.Em.		17.21	10.13	17.27
CD at 5%		6.51	3.07	6.37

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