Research Article

Growth, Yield and Protein Production of Urdbean as Influenced by Phosphorus, PSB and Pressmud

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Abstract

An experiment was conducted during the summer season (*zaid*) of 2005 at Student Instructional Farm of Narendra Deva University of Agriculture & Technology, Kumarganj, Faizabad (U.P.). Three phosphorus levels (20, 40 & 60 kg ha^{-1}) with and without PSB or pressmud (5 t ha^{-1}) were tested in a field investigation on no. of plants per meter, plant height, no. of branches per plant and yield of urdbean. The crop responded favourably to phosphorus and pressmud (PM) /PSB. Significantly improvement in plant height and no. of branches per plant was recorded in application of 60 kg P_2O_5 along with pressmud 5 t ha^{-1}. Treatment 60 kg P_2O_5+ 5 t ha^{-1}pressmud gave significantly higher grain yield over all other treatments but remained at par with 60 kg P_2O_5 alone or with PSB inoculation.

Keywords: Urdbean, Growth attributes, yield, phosphorus, PSB and pressmud

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Introduction

There is a growing concern among the scientific community, environmentalists and policy makers about the safe disposal of the large amounts of organic wastes produced worldwide. Urbanization, industrialization, increasing food demand for rising human population, intensive use of relatively easily available and inexpensive chemical fertilizers and economic pressure are adding to the production and accumulation of large amounts of organic wastes [1]. The yield potential of varieties of crops can be obtained only with optimal nutrient supply and other input managements. Pulse crops play a significant role in food production of India. Among the major pulses, urdbean (*Vigna mungo* L. Hepper) ranks second after pigeonpea. Legumes such as urdbean belongs to family leguminasae, is becoming an important crop in North India, to meet the food and protein demand of our growing population. Urdbean is usually a short duration crop and reported to improve soil fertility through symbiotic fixation of atmospheric di-nitrogen (N_2). The low productivity of urdbean in the country may be ascribed to many reasons, however cultivation on marginal lands, inadequate and imbalanced fertilization.

Phosphorus is an essential plant nutrient for legumes as it is directly involved in various metabolic activities of plants. The optimum supply of phosphorus to the plant stimulates root development and growth, thereby helps establish seedling quickly and also hastens maturity as well as improves the quality of crop produce. In view of escalating prices of chemical fertilizers, there is a need of alternative sources of phosphorus, especially biofertilizers (PSB), to supplement the nutrient supply through chemical fertilizers, as biofertilizers are cheaper, pollution free and renewable. Pressmud (PM) is one of the cheapest sources of organic fertilizer which is a byproduct of sugarcane industry. Crop productivity can be increased by the application of chemical, organic and biological fertilizers [2].

Keeping this in view, an experiment was conducted to study the effect of phosphorus, PSB and pressmud on growth, yield and protein production of urdbean.

Materials and Methods

A field experiment was conducted during summer season of 2005 at Student Instructional Farm of Narendra Deva University of Agriculture & Technology, Kumarganj, Faizabad (U.P.). The experimental site falls under subtropical zone in Indo-Gangetic plains having alluvial calcareous soil and lies between 24.4°–26.56° north latitude and 82.12°–83.98° east longitude. The soil was silty loam having organic carbon 0.45%, available N 262.0 kg ha^{-1}, available P_2O_5 19.65 kg ha^{-1} and available K_2O 272.80 kg ha^{-1} with pH 8.1. The experiment was conducted in randomized block design and replicated thrice. The twelve treatments consisting of control without P (T_1), 20 kg P_2O_5 ha^{-1} (T_2), 40 kg P_2O_5 ha^{-1} (T_3), 60 kg P_2O_5 ha^{-1} (T_4), PSB alone (T_5), 20 kg P_2O_5 ha^{-1} + PSB (T_6), 40 kg P_2O_5 ha^{-1} + PSB (T_7), 60 kg P_2O_5 ha^{-1} + PSB (T_8), pressmud (PM) alone 5 t ha^{-1} (T_9), 20 kg P_2O_5 ha^{-1} + 5 t PM (T_{10}), 40 kg P_2O_5 ha^{-1} + 5 t PM

(T_{11}) and 60 kg P_2O_5 ha^{-1} + 5 t PM (T_{12}). A uniform dose of 20 kg N and 40 kg K_2O ha^{-1} was applied in all the treatments. Pressmud was incorporated in soil and PSB was used for inoculating the seed as treatment @ 25 g kg^{-1} seed. Variety 'T-9' of urdbean was sown in the last week of March. Other inputs-cum-operations were followed as per recommendations and need of the crop. Data on no. of plants per meter, plant height, no. of branches per plant and yield were recorded in urdbean at the time of harvest.

Results and Discussion

Number of plants per meter

Data regarding no. of plants per meter are presented in **Table 1**. Data showed that various levels of phosphorus alone and with phosphorus solubilizing material or pressmud did not reflect the no. of plants per meter significantly. Treatment P_{60} + PSB and P_{60} + pressmud were found slightly superior over the control and rest of the treatments. This may because of homogenous germination of seeds sown in the plots. These results are also in accordance with the results obtained [3].

Table 1 effect of phosphorus, PSB and Pressmud on growth attributes of Urdbean

Treatment	No. of Plants per Meter	Plant height (cm)	No. of Branches per Plant
T_1– Control	10.05	34.50	19.53
T_2- 20 Kg P_2O_5 ha^{-1}(P_{20})	10.30	39.61	19.98
T_3- 40 Kg P_2O_5 ha^{-1} (P_{40})	10.72	42.59	20.83
T_4- 60 Kg P_2O_5 ha^{-1} (P_{60})	11.21	44.15	21.88
T_5-PSB alone	10.11	35.25	19.66
T_6- 20 Kg P_2O_5 ha^{-1} + PSB	10.43	41.24	20.17
T_7- 40 Kg P_2O_5 ha^{-1} + PSB	10.87	43.38	21.17
T_8- 60 Kg P_2O_5 ha^{-1} + PSB	11.40	45.20	22.29
T_9- Pressmud alone (PM) [5 t ha^{-1}]	10.19	35.67	19.80
T_{10}- 20 Kg P_2O_5 ha^{-1} + 5 t pressmud ha^{-1}	10.57	41.99	20.51
T_{11}- 40 Kg P_2O_5 ha^{-1} + 5 t pressmud ha^{-1}	11.03	43.51	21.51
T_{12}- 60 Kg P_2O_5 ha^{-1} + 5 t pressmud ha^{-1}	11.52	45.48	22.73
S Em ±	0.389	1.490	0.750
C.D. (0.05)	NS	4.395	2.229

Plant height (cm)

Data in respect of plant height are presented in Table 1. Various treatments affected the height of plants significantly having maximum height with 60 kg P_2O_5 + 5 t ha^{-1} pressmud and minimum in control plots. Increasing levels of phosphorus either alone or incombination with pressmud or PSB improved the plant height significantly but the quantum of increase in plant height found to be more with PM when compared with PSB inoculation. This may be attributed to the higher availability of nutrients and sufficient nodulation which ultimately enhanced the height of plants. These results are very close to the findings [4].

Number of branches per plant

Data pertaining to the no. of branches per plant are presented in Table 1. The no. of branches per plant were maximum with P_{60} + PM followed by P_{60} + PSB and P_{60} and significantly superior over the control. This might be because of more availability of phosphorus which resulted sufficient formation of photosynthates which promotes the metabolic activities, accelerates cell division and formation of merismetic tissues. Reported improved branching pattern in green gram with application of PM and PSB along with recommended dose of fertilizers [5].

Grain and Stover Yield (q ha^{-1})

Data in respect of grain and stover yield are presented in **Table 2**.Grain yield of urdbean increased with increasing levels of phosphorus upto 60 kg P_2O_5 ha^{-1} but difference in yield between 40 kg P_2O_5 and 60 kg P_2O_5 was not upto the level of significance. Inoculation of PSB did not improve the grain yield significantly while incorporation of pressmud enhanced the yield significantly at 20 kg P_2O_5 ha^{-1} having 12.6% additional yield. Among phosphorus solubilizing materials, pressmud was found to be slightly superior over PSB. The highest increase in economic (grain)

yield with 60 kg P_2O_5 ha^{-1} + pressmud might be because of association with enhancement in yield attributing characters such as pods per plant and grains per pod. Results reported in black gram [6]. Similar trend was observed for stover yield.

Table 2 Effect of phosphorus, PSB and pressmud on yield and protein production of urdbean

Treatment	Yield of Urdbean (q ha^{-1})		Protein Production (kg ha^{-1})
	Grain	Stover	
T_1– Control	7.10	15.19	142.21
T_2- 20 Kg P_2O_5 ha^{-1}(P_{20})	10.03	20.22	222.77
T_3- 40 Kg P_2O_5 ha^{-1} (P_{40})	11.62	22.53	268.54
T_4- 60 Kg P_2O_5 ha^{-1} (P_{60})	12.45	23.67	292.82
T_5-PSB alone	7.85	16.41	173.72
T_6- 20 Kg P_2O_5 ha^{-1} + PSB	10.90	21.85	250.48
T_7- 40 Kg P_2O_5 ha^{-1} + PSB	12.04	23.19	283.30
T_8- 60 Kg P_2O_5 ha^{-1} + PSB	13.01	24.59	312.37
T_9- Pressmud alone (PM) [5 t ha^{-1}]	8.07	16.62	178.99
T_{10}- 20 Kg P_2O_5 ha^{-1} + 5 t pressmud ha^{-1}	11.30	22.48	264.87
T_{11}- 40 Kg P_2O_5 ha^{-1} + 5 t pressmud ha^{-1}	12.11	23.23	290.51
T_{12}- 60 Kg P_2O_5 ha^{-1} + 5 t pressmud ha^{-1}	13.16	24.74	322.29
S Em ±	0.35	0.72	-
C.D. (0.05)	1.03	2.11	-

Protein Production (kg ha^{-1})

Data on protein production of urdbean are summarized in Table 2. Production of protein under higher doses of phosphorus with PM and PSB found more as compared to their lower doses. Production of protein was highest with P_{60} + PM closely followed by P_{60}+ PSB and P_{60}.This may be due to the fact that the adequate supply of phosphorus under this treatment. These results are in agreement with those obtained [7, 8].

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