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Effect of Genotypes and Nitrogen Levels on Productivity, Nutrient Uptake and Profitability of Ricebean *Vigna umbellata* (Thunb.) Ohwi and Ohashi

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Abstract

A field study involving ricebean genotypes and nitrogen levels was conducted during *kharif* of 2003 and 2004. Among the genotypes, RBL-6 performed the best with a productivity of 776 kg/ha with net profit of Rs 3,929/ha and N, P and K uptake of 49.1, 6.95 and 29.5 kg/ha, respectively. Application of 40 kg N/ha recorded the maximum seed yield of 889 kg/ha, harvest index of 23.68% and N, P and K uptake of 52.8, 7.15 and 31.16 kg/ha, respectively with net return of Rs 5,124/ha.

Key words : Ricebean, Nitrogen levels, Nutrient uptake, Harvest index, Economics.

The per capita availability of pulse have declined from 60.7 g/day in 1951 to 36.0 g/day in 2000 compared to the minimum requirement of 60 g/day and optimum requirement of 104 g/day (1). In this scenario apart from traditional pulses, emphasis is laid on many other non-traditional pulses like ricebean and maramabean to supplement protein requirement. Ricebean is a multipurpose grain legume gaining popularity in tribal agro-ecosystems of Eastern India, particularly Orissa. In recent years, some high yielding genotypes of ricebean have been released. Optimum nitrogen dose is one of the key factors for higher seed yield in rice bean (2). Hence, the present experiment was conducted to find out the effect of genotypes and nitrogen levels on productivity and profitability of ricebean.

Methods

The experiment involving six ricebean genotypes (V_1=RBL-35, V_2=LRB-355, V_3=LRB-349, V_4=LRB-354, V_5=RBL-6 and V_6=BRB-1) and four nitrogen levels (N_0=0, N_1=20, N_2=40 and N_3=60 kg N/ha) was conducted at Central Research Farm of the Orissa University of Agriculture and Technology, Bhubaneswar during *kharif* of 2003 and 2004. The treatments were fitted in a split-plot design with three replications. The soil of the experimental site was acidic with pH 6.1, available nitrogen 230 kg/ha, available P_2O_5 30.8 kg/ha and available K_2O 180.3 kg/ha. A uniform dose of 40 kg P_2O_5 and 20 kg K_2O/ha along with 50% of required N based on treatments were applied as basal at the time of sowing and rest 50% N at 25 days after sowing. The crop was sown on first week of August in both the years with a spacing of 30 × 10 cm and harvested during first week to second week of November. Intercultural operations were done 25 and 40 days after sowing (DAS). The seed and stover yield of ricebean obtained from the net plot area were recorded after sun drying and expressed as kg/ha. The nutrient uptake was worked out by multiplying the nutrient content in seed and stover with corresponding per hectare treatment yield. The nutrient content was determined by micro-Kjeldhal method for nitrogen, colorimetric method for phosphorus and Flame photometry method for potassium. The net profit was calculated by deducting the cost of cultivation from the gross income in rupees per hectare.

Results and Discussion

Genotype

Ricebean genotypes differed among themselves in productivity. The genotype RBL-6 gave the maximum seed yield of 776 kg/ha which was 3, 10, 14,16 and 20% higher than the variety BRB-1, LRB-349, RBL-35, LRB-354 and LRB-355.

Stover yield is an indicator of vegetative growth.

Table 1. Effect of genotypes and nitrogen levels on productivity, nutrient uptake and net return of ricebean (pooled data of 2 years).

Treatments	Seed yield (kg/ha)	Stover yield (kg/ha)	Harvest index (%)	N-uptake (kg/ha)	P-uptake (kg/ha)	K-uptake (kg/ha)	Net return (Rs/ha)
Variety							
RBL-35	682	2517	21.32	42.3	5.86	25.17	2787
LRB-355	648	2426	21.08	36.8	5.34	23.35	2365
LRB-349	705	2592	21.38	44.6	5.89	26.22	3077
LRB-354	670	2477	21.29	39.4	5.42	24.15	2635
RBL-6	776	2734	22.10	49.1	6.95	29.52	3929
BRB-1	753	2694	21.85	46.5	6.10	26.38	3656
CD (0.05)	26.9	102.6	0.23	2.84	2.14	3.65	–
N-Levels (kg/ha)							
0	464	1739	21.06	24.8	3.72	16.18	340
20	755	2684	21.95	44.3	6.29	27.45	3785
40	889	2865	23.68	52.8	7.15	31.16	5124
60	715	3007	19.21	50.6	6.53	28.40	3055
CD (0.05)	16.2	99.4	0.18	2.57	1.78	3.22	–

The highest stover yield of 2,734 kg/ha was recorded with the variety RBL-6 which was 7.46, 27.7, 40.9, 49.1 and 66.13% higher than the varieties BRB-1, LRB-349, RBL-35, LRB-354 and LRB-355. The RBL-6 also recorded the maximum harvest index of 22.1% among the varieties tested. LRB-355 recorded significantly lowest seed yield of 648 kg/ha stover yield of 2,426 kg/ha with harvest index of 21.08%. Similar variation in grain and stover yield among the rice bean varieties have been reported by Dwivedi (3) and Mandal and Mukherjee (4).

The maximum uptake of total nitrogen, phosphorus and potassium was 52.8, 6.95 and 29.52 kg/ha in genotype RBI-6 followed by BRB-1 with 46.5, 6.10 and 26.38 kg/ha N, P and K, respectively. Among the varieties RBL-6 registered the maximum return of Rs 3,929/ha followed by BRB-1 with net return of Rs 3,565/ha.

Nitrogen Levels

Incresing N levels increased the grain yield significantly up to 40 kg N/ha. Higher level of N significantly decreased the seed yield (Table 1). Maximum grain yield of 889 kg/ha was recorded due to application of 40 kg N/ha followed by application of 20 kg N/ha with seed yield of 755 kg/ha. The control treatment produced the lowest seed yield of 464 kg/ha. Application of successive doses of N i.e. 20, 40 and 60 kg/ha increased the seed yield to the tune of 63.0, 92 and 54% over control, respectively. On the contrary, the stover yield increased significantly up to 60 kg N/ha. The maximum stover yield of 3,007 kg/ha was recorded at 60 kg N/ha followed by that recorded at 40 kg N/ha. This is in conformity with the findings of Dwivedi (3) and Mishra et al. (5).

Application of 40 kg/N/ha recorded maximum harvest index of 23.68% followed by that of 20 kg N/ha (21.95%), control (21.06%) and 60 kg N/ha (19.21%). The lowest harvest index of 19.21% recorded at 60 kg N/ha might be due to more production of biomass at this level of N application and lower conversion of photosynthates towards seed yield. These results are in conformity with the earlier findings of Khanda and Mishra. (6).

Application of 40 kg N/ha incurred higher net return of Rs 5,124/ha than that due to 60 kg N/ha (Rs 3,055/ha). This might be due to lower grain yield at 60 kg N/ha.

The maximum uptake of total nitrogen, phosphorus and potassium was 52.8, 7.15 and 31.16 kg/ha when supplied with 40 kg N/ha followed by 50.6, 6.53 and 28.84 kg/ha, N,P & K, respectively due to 60 kg N/ha. Similar findings was also recorded by earlier (6).

A judicious combination of suitable genotype RBL-6 and 40 kg N/ha may be advocated for raising

kharif ricebean for higher productivity and net return.

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