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ECONOMIC ANALYSIS AND GROWTH INDICES OF DIFFERENT SEED RATES AND VARIETIES OF MUNGBEAN (*Vigna radiata L.*).

Jamana Lal Jat, Vikram Singh & Bheru Lal Kumhar
Sam Higginbottom Institute of Agriculture, Technology and Sciences Allahabad-211007 (U. P.)
Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli – 415 712 Distt. Ratnagiri (Maharashtra)
*Corresponding author email: prajapatiagro09@gmail.com

ABSTRACT
A field experiment was conducted in Randomized Block Design (Factorial) with three replication to "Economic analysis and growth indices of Different Seed Rates and varieties of Mungbean (*Vigna radiata L*.)" was conducted during *kharif* 2012 at the plot no. 200 of the Crop Research Farm, Department of Agronomy, Allahabad School of Agricultural, Sam Higginbottom Institute of Agriculture Technology and Sciences, Allahabad on sandy loam in texture, neutral (7.4), low in organic carbon content (0.28 %), low in available nitrogen (225.00 kg/ha), medium in available phosphorus (21.50 kg/ha) and low in available potassium (87.00 kg/ha). Varieties have three levels *i.e.* Samrat, SML-668 and HUM-12, and three levels of seed rate 15 kg/ha, 25 kg/ha and 35 kg/ha. The other common packages of practices were followed time to time and periodically observations were recorded on growth and yield to evaluate the treatment effects. Variety SML-668 with 25 kg ha^{-1} seed rate gave highest dry weight treatment and treatment Variety SML-668 with 35 kg ha^{-1} levels of seed rate gave higher Gross Return, Net Return and Benefit Cost Ratio as compared to other treatment combination.

KEY WORDS: *Vigna radiata L*; AGR; Cultivars; Seed yield; Mungbean; CGR.

INTRODUCTION

Mungbean (*Vigna radiata* L.) is a pulse or food legume crop used primarily as dried seed and occasionally as forage or green pods and seeds for vegetables (Lawn 1995). Almost 90% of mungbean production on a world scale is produced in Asia, with India, the world's largest producer, accounting for more than 50% of world production (Vijayalakshmi *et al.*, 2003). India is the largest producer of pulses, accounting for about 25 per cent of the global share. Being an inseparable ingredient in the diet of the vast majority of population and mainstay of sustainable crop production, pulses continue to be an important component of the rainfed agriculture since time immemorial. About a dozen of pulse crops, namely chickpea, pigeon pea, mungbean, urdbean, lentil, field pea, lathyrus, cowpea, common bean, moth bean, horse gram, and rice bean are cultivated on 22.47 million ha area under varied agro ecological conditions. Pulse production in the country has fluctuated widely between 13 to 15 million tons with no significant growth trend between 1991 to 2010. The latest estimates indicate that the present production of pulses is 14.66 million tons with productivity of 637 kg ha^{-1}. Stagnant growth in pulses production as compared to population growth rate of 1.4 per cent has led to progressive decline in *per capita* availability of pulses (41.6 g in 1991 to 34 g in 2010). The major producers of pulses in the country are Madhya Pradesh (24%), Uttar Pradesh (16%), Maharashtra (14%), Rajasthan (6%), Andhra Pradesh (10%) followed by Karnataka (7%) which together share about 77% of total pulse production while remaining 23% is contributed by Gujarat, Chhattisgarh, Bihar, Orissa and Jharkhand (IIPR Vision, 2030).

In general, the new mungbean varieties are resistant to MYMV, more compact, having a high harvest index, reduced photoperiod sensitivity, early (55-60 days) and synchronous maturity, bear pods at the top in bunches, have long pods with bold, shiny seeds, and determinate growth habits. Drooping pods with thick pod coats are desirable, as they are less damaged by rains and less prone to shattering at maturity (Bains *et al.,* 2007). Genotypes with these plant characteristics are more suited to rice fallows during summer. For maximum productivity, vegetative growth should terminate with flowering and assimilates should be channeled into production of more number of pods (Saini and Das, 1979).

Among the cultural technologies seed rate is one of the important components, manipulation of which is an essence for optimizing yield. There are large differences in yield among the mungbean varieties (Ahmad *et al*., 2003) and the maximum potentiality can be achieved from the optimum spacing. Various experiments and work on spacing of mungbean have been carried out in different countries to find out the suitable plant population to get maximum yield. Improper spacing reduced the yield of mungbean up to 20-40% (AVRDC, 1974) due to competition for light, space, water and nutrition. The optimum spacing favours the plants to grow in their both aerial and underground parts through efficient utilization of solar radiation and nutrients and thus increase grain yield (Miah *et al*., 1990). Plant spacing directly affects the physiological activities through intra-specific competition. Narrowing of plant spacing by increasing seed rate generally means a more uniform distribution of plants over a given area, thus matching the plant canopy effective in intercepting radiant energy and shading weeds. Though wider space allows individual plants to produce more branches and pods, but it provides smaller number of pods per unit area due to fewer plants per unit area. Thus, the branch production may compensate partially the number of plants in wider spacing and it would end up with low yield by misusing land space (Singh *et al.*, 2003). So, optimum seed rate should be ensured for the plant to grow properly in order to give higher yield (Miah *et al.*, 1990).The yield and quality of mungbean can be improved by applying best agronomic practices such as optimum seed rate and use of high yielding varieties. Optimum seed rate plays an important role in contributing to the high yield because in case of thick plant population, most plants remain sterile, easily attacked by diseases as compared to normal population.

MATERIALS & METHODS

The experiment was carried out at the plot no. 200 of the Crop Research Farm, Department of Agronomy, Allahabad School of Agricultural, Sam Higginbottom Institute of Agriculture Technology and Sciences, Allahabad on was sandy loam in texture, neutral (7.4), low in organic carbon content (0.28 %), low in available nitrogen (225.00 kg/ha), medium in available phosphorus (21.50 kg/ha) and low in available potassium (87.00 kg/ha). Variety has three levels *i.e*. Samrat, SML-668 and HUM-12, and three levels of seed rate 15 kg/ha, 25 kg/ha and 35 kg/ha. The experiment was laid out in Randomized Block Design (3×3×3 factorial). The gross plot size measured 3 x 4 m. The crop was sown on 23rd July, 2012 manually on a well prepared seed bed on a sandy loam soil in plant to plant 15 cm and row to row 45 cm spacing. Fertilizers were applied as side placement, for which 4-5 cm deep furrows were made along the seed rows with a hand hoe. The recommended dose of 25 kg N & 40 kg P_2O_5 ha^{-1} was applied details through Urea and SSP. Whole of nitrogen and phosphorus was applied as basal at the time of sowing. All other agronomic practices were kept normal and uniform in all treatments. Data so collected were analyzed statistically using Fisher’s analysis of variance techniques and Least Significant Difference (LSD) test at 5% probability level was employed to test the significance among treatment’s means Fisher, R. A. (1950) (Table-1).

RESULTS & DISCUSSION

In general, the dry matter production increased as the growth progressed. The rate of increase dry matter production nevertheless remands slower up to 30 DAS but increased markedly thereafter. The variety SML-668 (9.74 and 13.14 g) had significantly higher dry matter accumulation as compared to HUM-12 (9.39 and 12.79 g) at 45, 60 DAS and respectively. In case of seed rate, the maximum (1.27, 9.53 and 12.93 g) and the minimum (1.16, 9.17 and 12.57 g) dry matter accumulation was observed in S_2 (25 kg) and S_1 (15 kg), respectively.

TABLE 1: Effect of cultivars and seed rates on dry matter accumulation (g) of mungbean

Treatments	Dry matter accumulation (g)			
	15 DAS	30 DAS	45 DAS	60 DAS
Variety (V)				
V_1 – (Samrat)	0.26	1.19	8.96	12.36
V_2 – (SML668)	0.24	1.40	9.74	13.14
V_3 – (HUM-12)	0.27	1.04	9.39	12.79
F-test	NS	S	S	S
S. Em. (±)	0.02	0.11	0.21	0.21
C.D. at 5%	0.05	0.24	0.44	0.44
Seed rate (S)				
S_1 – (15 kg ha^{-1})	0.26	1.16	9.17	12.57
S_2 – (25 kg ha^{-1})	0.27	1.27	9.53	12.93
S_3 – (35 kg ha^{-1})	0.24	1.21	9.39	12.79
F-test	NS	NS	NS	NS
S. Em. (±)	0.02	0.11	0.21	0.21
C.D. at 5%	0.05	0.24	0.44	0.44

TABLE 2: Effect of cultivars and seed rates on CGR (g $m^{-2}day^{-1}$) of mungbean

Treatments	CGR (g $m^{-2}day^{-1}$)			
	15 DAS	30 DAS	45 DAS	60 DAS
Variety (V)				
V_1 – (Samrat)	0.58	2.65	19.92	27.47
V_2 – (SML668)	0.54	3.12	21.64	29.20
V_3 – (HUM-12)	0.59	2.31	20.86	28.42
F-test	NS	S	S	S
S. Em. (±)	0.05	0.25	0.46	0.46
C.D. at 5%	0.12	0.54	0.97	0.97
Seed rate (S)				
S_1 – (15 kg ha^{-1})	0.58	2.57	20.38	27.93
S_2 – (25 kg $ha^{-1)}$	0.59	2.82	21.17	28.73
S_3 – (35 kg ha^{-1})	0.54	2.69	20.87	28.43
F-test	NS	NS	NS	NS
S. Em. (±)	0.05	0.25	0.46	0.46
C.D. at 5%	0.12	0.54	0.97	0.97

However the effect on plant dry weight at 45 DAS SML-668 with level of seed rate 25 kg ha^{-1} resulted higher plant dry weight (10.43 g) and found significant, this was followed by (9.67 g) HUM-12 with Level of seed rate 15 kg ha^{-1} was applied. The lower plant dry weight (8.60 g) was found in Samrat with 15 kg ha^{-1} level of seed rate was applied. The effect variety and level of seed rate The interaction effect on plant dry weight at 60 DAS SML-668 with level of seed rate 25 kg ha^{-1} resulted higher plant dry weight (13.83 g) and found significant, this was followed by (13.07 g) HUM-12 with Level of seed rate 15 kg ha^{-1} was applied. The lower plant dry weight (12.00 g) was found of in Samrat with 15 kg ha^{-1} level of seed rate was applied. The effect variety and Level of seed rate their interaction on plant dry weight was found significant at 60 DAS. Increased stover yield with increasing seed rate might be due to increased plant number per unit area with increasing seed rate. The result is consistent with the findings of Donald, C.M. and Hamblin, J. (1976), who reported that total dry matter in mungbean per unit area increased with increasing seed rates.

CGR g m^{-2} day $^{-1}$

The potentiality of this character was affected to a considerable extent among different varieties. Slower increase in CGR g m^{-2} day^{-1} during 15 to 30 DAS as compare to 45 to 60 DAS. The variety SML-668 was found statically at par from HUM-12 and significant from variety Samrat at 45 DAS. The SML-668 produced highest (29.20 g m^{-2} day^{-1}) at 60 DAS and it was 2.74 per cent higher over HUM-12 (Table-2).

The effect of seed rate on CGR g m^{-2} day^{-1} was found non-significant at 15 and 30 DAS growth stages.

RGR g g^{-1} day^{-1}

The Potentiality of this character was affected to a considerable extent among different varieties. Slower increase in RGR g g^{-1} day^{-1} during 15 to 30 DAS as compare to 45 to 60 DAS. The variety SML-668 was found statically at par from HUM-12 and significant from variety Samrat at 45 DAS. The HUM-12 produced highest (0.149 g g^{-1} day^{-1}) at 45 DAS and it was 9.55 per cent higher over Samrat (Table-3).

The effect of seed rate on RGR g g^{-1} day^{-1} was found non-significant at all growth stages viz. 15, 30, 45 and 60 DAS. The RGR g g^{-1} day^{-1} ranges between 0.140 to 0.137 g g^{-1} day^{-1} at 45 DAS. The RGR recorded negatively at early growth stages 15 and very low at 60 DAS.

TABLE 3: Effect of cultivars and seed rates on RGR (g g^{-1} day^{-1}) of mungbean

Treatments	RGR (g g^{-1} day^{-1})			
	15 DAS	30 DAS	45 DAS	60 DAS
Variety (V)				
V_1 – (Samrat)	-0.038	-0.092	0.010	0.146
V_2 – (SML668)	-0.041	-0.095	0.021	0.152
V_3 – (HUM-12)	-0.035	-0.088	0.001	0.149
F-test	NS	NS	S	S
S. Em. (±)	0.006	0.006	0.007	0.001
C.D. at 5%	0.013	0.013	0.016	0.003
Seed rate (S)				
S_1 – (15 kg ha^{-1})	-0.037	-0.091	0.008	0.148
S_2 – (25 kg ha^{-1})	-0.036	-0.089	0.013	0.150
S_3 – (35 kg ha^{-1})	-0.042	-0.095	0.011	0.149
F-test	NS	NS	NS	NS
S. Em. (±)	0.006	0.006	0.007	0.001
C.D. at 5%	0.013	0.013	0.016	0.003
C.D. at 5%	0.023	0.027	0.027	0.002

TABLE 4: Economics of different varieties and seed rate of Mungbean

	Treatments	Grain yield Kg/ ha	Gross return (ha^{-1})	Cost of cultivation (ha^{-1})	Net return (ha^{-1})	B:C ratio
T_1 :	V_1= Samrat S_1 = 15	1010.67	49176.67	23865.00	23311.67	1: 1.06
T_2 :	V_1 =Samrat S_2 = 25	1283.33	61756.00	23865.00	37891.00	1: 1.58
T_3 :	V_1 =Samrat S_3 = 35	1135.67	55462.33	23865.00	31597.33	1: 1.32
T_4 :	V_2 = SML-668 S_1 = 15	1142.00	55146.67	23865.00	31281.67	1: 1.31
T_5 :	V_2 = SML-668 S_2 = 25	1366.33	65718.33	23865.00	41853.33	1: 1.75
T_6 :	V_2 = SML-668 S_3= 35	1268.33	61802.33	23865.00	37937.33	1: 1.58
T_7 :	V_3= HUM -12 S_1=15	1086.00	52592.67	23865.00	28727.67	1: 1.20
T_8 :	V_3= HUM -12 S_2=25	1326.00	63830.00	23865.00	39965.00	1: 1.67
T_9:	V_3= HUM -12 S_3=35	1202.00	58598.00	23865.00	34733.00	1: 1.45

Economics

This chapter contains, cost of cultivation for all treatment. Total cost of cultivation for each treatment combination mean grain and straw yield (q ha^{-1}) and gross return economics and production of mungbean crop after post-harvest observation, the economic feasibility of each treatment was estimated to find cost of cultivation, gross return, and net profit and benefit cost ratio. The data relating to economics of the treatments and benefit cost ratio has been worked out and presented in table 4, treatment Variety SML-668 with 35 kg ha^{-1} levels of seed rate recorded higher Gross Return, Net Return and Benefit Cost Ratio as compared to other treatment combination.

CONCLUSION

Variety SML-668 with 35 kg ha^{-1} levels of seed rate is worth recommendable among the farmer belonging to the vicinity of the Sam Higginbottom Institute of Agriculture, Technology and Sciences Allahabad-211007 (U. P.).

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