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Yield potential study of various locally developed strains/cultivars of *Vigna radiata* L. under agro ecological conditions of Bahawalpur, Pakistan

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Abstract

A field trail was conducted to evaluate the yield potential of six hybrid mung bean (*Vigna radiata* L.) lines viz; BRM-310, BRM-311, BRM-325, BRM-331, BRM-334, BRM-335 and two varieties Chakwal mung and Azri mung-06 as check at research area of Regional Agricultural Research Institute Bahawalpur. Randomized Complete Block Design was used with three replications of each strain/variety. Recommended agricultural practices were applied uniformly. Various yield parameters were studied. The BRM-334 exhibited the highest number of pods per/ plant, number of grains per pods, 1000 grain weight, grain yield per plot and final yield also as well as it got maturity in minimum days as compared to other strains.

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Introduction

Pulses are major part of food in the world of which mung bean (*Vigna radiata* L.) is one. Mung beans are cultivated as an important crop of Pakistan. Thailand, India and Paksitan are three major countries for its production (Khalil & Jan, 2002). This crop has grown over an area of 217.7 thousand hectares with an annual production of 138.4 thousand tones and produced an average yield of 636 kg ha^{-1} (Anon, 2006-07). According to Bilal (1994), Pakistan has the average grain yield of Mung bean very low as compared to its potential yield i.e., 1295 kg ha-1. In Pakistan an average seed yield of Mung beans is 550 kg ha^{-1}(Govt. of Pakistan, 2009).

In Pakistan, the average grain yield of Mungbean is very low or marginal as compared to its potential yield i.e.1295 kg ha^{-1} (Bilal, 1994).Study regarding inheritance of grain yield and its related components is essential to successfully develop the available genetic variations in mung bean for grain yield (Khattak *et al.,* 2004). In Mung bean production, the major problem is stated to be the lack of cultivars with high yield potentials related to its low productivity (Achakzai *et al*., 2012).

Yield potential study of various crops leading to recognition of more yielder ones can bring an increment in existing food resources. The present study was conducted to evaluate the grain yield potential of different new strains of mung beans in order to evaluate the best yielder strain.

Materials and methods

Study site

The trail was conducted in the research area of Regional Agricultural Research Institute Bahawalpur during last week of June, 2014.

Research design

The experiment was laid out in Randomized Complete Block Design under three replications having a plot size of 1.8 × 6 m with line to line distance 30 cm and plant to plant distance 15 cm. Six local strains/varieties viz., BRM-310, BRM-311, BRM-325, BRM-331, BRM-334, BRM-335 and two approved varieties Chakwal-Mung and Azri Mung-06 were included in the experiment as a check.

Methodology

All the recommended agronomic practices were applied and kept uniform. Two irrigations were applied; first after 15 days of germination and second on flowering.

Observations recorded

All the data were recorded using international standard methods and methods privilege at Regional Agriculture Research Institute, Bahawalpur. At maturity data were recorded for plant population, plant height, number of pods per plant, number of grains per pod, days to physiological maturity, 1000 grain weight, grain yield per plot and grain yield kg/ha.

Statistical Analysis

Recorded data were analyzed statistically using fisher's analysis of variance techniques (Steel *et al*., 1997). Individual comparison of varietal means was made using LSD (Least Significant Difference) at 5% probability level.

Results and discussion

Plant population

An optimum plant population is considered the foundation for having increased yield. Tabulated data showed that varietal means for plant population do not differ significantly. Environment required for seed germination and subsequent plant growth and development was almost similar throughout the field so, the plants of all cultivars/varieties had equal opportunities to be benefited from soil and climatic conditions. Varieties did not affect the number of plants per unit area, exhibiting it as a physically controlled factor and not genetically controlled because the germination of seeds were approximately same for all varieties/cultivars. Results are in line with the findings of Rasul *et al.,* (2012) and Hussain *et al.,* (2011) who reported the non-significant differences in number of plants per meter square (m^{-}

²) among all varieties.

Plant Height (cm)

Agro ecological practices along with genetic characteristics of plants play important role in determining the plant height. Data on plant height at agro ecological practices were kept uniform for all replications**.** Data was recorded regarding edge effect. Results revealed that cultivar BRM-334 gained highest height as 52.67 cm and lowest was recorded in BRM-311as 48.00 cm. Data represented in table showed that varietal means for plant height do not differ significantly. It indicates the uniform germination of plants and better agricultural practices that have been applied to the experiment. Almost similar results were reported by Maqsood *et al.*, (1999).

Table 1. Mean values for yield and its related components of *Vigna radiata* L.

Varieties	Plant population	Plant height (cm)	Pods/plant	Grains /pod	1000 grain wt	Days to physiological maturity	yield/plot	yield kg/ha
BRM-310	17Ns*	48.66Ns*	24 Ns*	11.66B	52 BC	66.67 ABC	1.43B	1327.3AB
BRM-311	20.3	48	24.66	11.66B	53BC	68.00A	1.43 AB	1327.3AB
BRM-325	19.66	47.66	24	12.33AB	49D	65.00 BCD	1.25B	1157.5B
BRM-331	18.66	51.33	25.33	12.66AB	54.67 AB	63.33CD	1.28B	1188.37B
BRM-334	20.66	52.66	24.66	14.33A	56.33A	64.00D	1.53A	1416.78A
BRM-335	18.66	49.66	22.33	12.66AB	50.67CD	67.33AB	1.46AB	1348.87AB
Chak-wal Mung	19.66	47.66	27.66	12.33AB	50.67CD	67.67A	1.45AB	1342.7AB
Azri-Mung	20.66	49.33	28.66	12.33AB	53BC	68.00A	1.4AB	1296.4AB
LSD Value	2.531	5.595	7.58	2.248	2.999	2.405	0.2292	212.28

LSD value determined at 5% probability level.

Means sharing a letter common are not significantly different from each other.

Number of pods per plant

Number of pods per plant is a key factor for determining the yield performance in leguminous plants. The productive capacity of mungbean plant is ultimately considered by the number of pods per plant. The data pertaining to number of pods per plant showed non-significant difference among all varieties/strains included in the experiment. However, the maximum number of pods were recorded in Azri mung-06 as 28.66 followed by Chakwal mung as 27.66, while minimum number of pods per plant was noted in BRM-335 as 22.33. Results are in line with the findings of Rohman & Hussain (2003) and Rahim *et al.*, (2014) who reported maximum direct effect of pods per plant on seed yield.

Number of grains per pod

Number of seeds per pod is considered as an important factor that directly imparts in exploiting potential yield recovery in leguminous crops. It was noted that cultivars and varieties had significant difference in the number of seeds per pod. The maximum number of grains per pod was recorded in mung strain BRM-334 as 14.33 followed by BRM-331 and BRM-335 as (12.67) which were statistically at par to each other. While Chakwal Mung, Azri Mung-06 and BRM-225 were also statistically at par to each other with 12.33 number of grains per pod. Minimum number of grains per pod was recorded in BRM-310 and BRM-311 as 11.67. Similar results were reported by Tabasum *et al.*, (2010) and Rahim *et al.,* (2014) who found maximum effect of grains per pod towards final grain yield in mung bean.

Days to Physiological Maturity

Days to physiological maturity varied significantly from 64 to 68 days. Average values of days to physiological maturity delayed in Azri mung as 68, followed by Chakwal-mung, BRM-311 that took maximum days to physiological maturity as 67.67 and these were statistically at par. BRM-334 matures in minimum days as compared to others. The difference in days to maturity could be due to photoperiod, because different varieties respond differently to a particular photoperiod. This variation might be due to

different genetic make-up of different cultivars. These results are in close conformity with those of Amanulla and Muhammad (2011) who reported difference in days to maturity in different germplasm.

1000 grain weight (g)

Among the various parameters contributing towards final yield of a crop, 1000-seed weight is of prime importance. Results revealed that varieties were significantly affected by 1000-seed weight. Data pertaining to 1000 grain weight presented in table, showed significant results. The maximum number of grain weight recorded in BRM-334 as 56.33g followed by BRM-331 as 54.67g while lowest value was recorded in BRM-325 as 49.00g. Moreover, BRM-335 and Chakwal mung are statistically at par having 50.67g of thousand grain weight. It may be due to better availability of resources for photosynthesis and facing less competition. The results are in line with Amanullah & Muhammad (2011) who reported significant variations in 1000 grain weight among various varieties of mungbean. Rasul *et al.,* (2012) revealed significant difference in 1000 seed weight from different varieties.

Grain Yield per plot (kg)

Data regarding number of grain yield per plot presented in table showed significant results. The maximum grain yield per plot was recorded in BRM-334 as 1.53kg followed by BRM-335 and Chakwal mung as 1.45kg while lowest value was recorded in BRM-325 as 1.25kg. BRM-310 and BRM-311 are statistically at par having grain yield per plot as 1.433kg.Results are in line with Rasul *et al.*, (2012) who reported significant differences in 1000 seed weight among various varieties of mung bean. Abbas (2000) reported significant differences in the yield of various cultivars.

Grain Yield kg/ha

Dry matter production and its transformation into economic yield is the ultimate outcome of various physiological, biochemical, phonological and morphological events occurring in the plant system. Seed yield of a variety is the result of interplay of its genetic makeup and environmental factors in which plant grows. Grain data recorded from plots were converted to per hectare basis. Related table elucidates highly significant results. The highest grain yield in kilogram per hectare was recorded in BRM-334 as 1416.8 kg/ha, followed by BRM-335 as 1348.9 kg/ha while minimum grain yield was recorded in BRM-325 as 1157.5 kg/ha. BRM-310 and BRM-311 are statistically at par comprising of the grain yield as 1327.3 kg/ha. This significant difference in grain yield among various mung strains/varieties may be due to better genetic potential and utilizing better photosynthetic resources by that specific cultivar. These findings are quite in line with the findings of Resul *et al.*, (2012) who reported that all varieties were significantly affected the seed yield. Abbas (2000) reported significant differences in the yield of various cultivars.

Conclusion

The seed yield is an important parameter among all the morphological as well as yield traits/parameters. Improvement in seed yield in mungbean could be brought through selection of component characters directly concerned with final yield like plant height, pods per plant, number of grains per pod, 1000 seed weight which showed positive direct effects towards maximum grain yield. In aforesaid discussion, it is concluded that the yield potential of BRM-334 is highest among all yield parameters and finally the grain yield as well as it matures in minimum days as compared to other strains. Hence it can be recommended that mungbean variety BRM-334 should be grown preferably under the agro-ecological conditions of Bahawalpur in order to achieve optimum yield. Moreover, BRM-335, BRM-310 and BRM-311, all were better from control varieties (Chakwal mung and Azri mu
ng-06).

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