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Response of two Cultivars of Mungbean (*Vigna radiata* L.) to Different Irrigation Levels

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Abstract: Different irrigation levels had significant effect on plant height, number of fruit-bearing branches per plant, number of grains per plant, 1000-grain weight, total plant biomass, grain yield and harvest index. Cultivar NM-92 gave significantly higher grain yield (1059 kg per ha.) and harvest index (21.42%) than NM-54 which gave grain yield and harvest index values of 992.3 kg per ha. And 20.27% respectively. Crop grown with three irrigations (I_3) gave significant higher grain yield of 1248.8 kg per ha. Compared to the grain yield of 785.8 kg per ha. Obtained from the crop grown without irrigation (I_0) throughout the growing period. NM-92 raised with three irrigations (V_2 I_3) produced maximum grain yield (1295.1 kg per ha.) while NM-54 gave minimum grain yield of 754.8 kg per ha. When grown without irrigation throughout the growing period (V, I_0).

Key words: Pakistan, Cultivars, Yield, Mungbean

Introduction

The mungbean is prized among the pulse species, for its seeds are high in protein, easily digested and low production of flatulence when consumed as food. Mungbean contains 24% protein, 58% of carbohydrates out of which, 28.8% is starch and high amounts of Ca, P and vitamins (Considine and Considine, 1982). This crop like other legumes is particularly important in the farming systems of dry areas due to their low water requirements and ability to symbiotically fix the atmospheric nitrogen through bacterial symbiosis.

In Pakistan, total area under mungbean is 195.4 thousand hectares with total grain production of 88.9 thousand tonnes and average yield of 455 kg ha^{-1} (Anonymous, 1999). In Pakistan, per hectare yield of mungbean is very low. Among the various factors responsible for yield gap, irrigation and use of cultivars with low inherent yield potential are of much importance. Mungbean is a deep rooted and drought tolerant crop. Its early maturity enables it to mature on limited soil moisture.

Materials and Methods

The effect of irrigation on various agro-physiological characteristics of two greengram cultivars was studied at the Agronomic Research Area, University of Agriculture, Faisalabad, during the year 1998. Experimental treatments comprised of mungbean cultivars NM-54 (V1) and NM-92 (V2) and four different irrigation levels i.e. control (no irrigation throughout the growing period, I_0), one irrigation at vegetative stage (I_1), two irrigations at vegetative and flowering stage (I_2) and three irrigations at vegetative, flowering and pod formation stage (I_3). The experiment was laid out in split plot design and replicated three times. The varieties were placed in the main plots and different levels of irrigation in sub-plots. Net plot size was 1.50 m × 5 m. The crop was sown on a well prepared seed bed with the help of a single row hand drill on August 10, 1998. Row to row and plant to plant distance was 30 cm and 10 cm, respectively using the seed rate of 20 kg ha^{-1}. A basal dose of N-P at 25-62 kg ha^{-1} was applied at the sowing time. All other agronomic practices were kept normal for all the treatments. Crop was harvested on October 18, 1998 and observations regarding plant height, number of fruit-bearing branches per plant, number of grains per plant, 1000-grain weight ig), grain yield per hectare and harvest index were recorded. The data were then analyzed statistically using the analysis of variance technique and LSD test at 5 percent probability level was applied to compare the difference among treatment means (Steel and Torrie, 1980).

Results and Discussion

Data revealed that both the varieties showed significant differences in plant height. Significantly greater plant height was recorded in variety NM-54 (V_1) as compared to variety NM-92 (V_2) which gave a plant height of 33.11 cm. Maqsood *et al*. (1999) reported more plant height of NM-54 compared to NM-92. The treatment having 3 irrigations (I_3) gave maximum plant height which was statistically at par with the treatments having 2 and 1 irrigations (I_2 and I_1). Significantly minimum plant height was recorded in the crop grown without irrigation (I_0) throughout the growth period. Previously similar results have been reported by Chinchilla *et al*. (1988) and Restuccia *et al*. (1992).

Both the varieties showed significant difference in number of fruit-bearing branches per plant. Higher number of fruit-bearing branches per plant was observed in NM-54. Variety NM-92 produced 4.57 fruit-bearing branches per plant.

The treatment having 2 irrigations (I_2) gave more number of fruit-bearing branches per plants which was statistically at par with the treatments having three (I_3) and one irrigations (I_1). Significantly minimum number of fruit-bearing branches per plant was recorded in the crop grown without irrigation (I_0) throughout the growing period.

Statistical analysis revealed that both varieties produced significantly different number of grains per plant. Higher number of grains per plant were counted for variety NM-92 as compared to NM-54. Variability in number of grains per plant between two varieties might be due to their different genetic make up.

Maximum number of grains per plant was recorded in plots grown with three irrigations (I_3) as against the minimum of 79.73 grains per plant obtained from crop grown without irrigation (I_0) throughout the growing period. The variability in number of grains per plant among various irrigation treatments is attributed to water deficiency during growth period. These results are in line with the findings of Restuccia *et al.* (1992) and Purcell *et al*. (1996).

Both the varieties did not differ significantly as regard to 1000-grain weight. However, slightly more 1000-grain weight was observed for variety NM-92 than NM-54. Maqsood *et al*. (1999) stated that two mungbean genotypes NM-92 and NM-54 did not significantly differed in 1000-grain weight.

The treatment having three irrigations (I_3) gave maximum 1000-grain weight which was statistically at par with the treatments having two and one irrigations (I_2 and I_1). Minimum 1000-grain weight (46.13 g) was recorded in crop grown without irrigation throughout the growing period (I_0). Similar results have been narrated by Restuccia *et al*. (1992), Thomas and Costa (1994) and Purcell *et al*. (1996) (Table 1).

Table 1: Effect of different irrigation levels on the growth and yield of two mungbean cultivars

Treatments	Plant height at harvest	Fruit bearing branches per plant	Number of grains per plant	1000-grain weight	Grain yield	Harvest index
Varieties						
V_1	47.08a	4.92a	91.72b	47.18	992.37d	20.27b
V_2	33.11 b	4.57b	151.77a	49.02	1059.03a	21.42a
Irrigations						
I_0	34.96b	3.47b	79.73d	46.13b	785.78d	17.70d
I_1	40.71a	5.00a	112.70c	48.37a	920.07c	19.96c
I_2	41.89a	5.47a	140.85b	48.92a	1148.17b	22.28b
I_3	42.84a	5.03a	153.70	49.02a	1248.77a	23.45a

It was observed that both the cultivars significantly differed from each other in grain yield. Higher grain yield of 1059.03 kg ha^{-1} was obtained for variety NM-92 as compared to grain yield of NM-54. Maximum grain yield was obtained from the crop grown with three irrigations (I_3). The lowest grain yield was recorded from the crop raised without water supply throughout the growing period (I_0). It is quite expected that with increasing number of irrigations, number of pods per plant and grains per plant also increased and these two parameters appeared to be crucial in determining the yield potential. Similar results have been reported by Sukhvinder *et al*. (1990), Sarkar (1992), Varughese and Iruthayaraj (1993), Akthar *et al*. (1994), Haqqani and Pandey (1994) and Sachidanand *et al*. (1995).

Both cultivars gave significantly different harvest index values. Higher harvest index value of 21.42 percent was recorded for NM-92 as compared to cultivar NM-54 having harvest index value of 20.27%.

Irrigation treatments significantly differed in harvest index. Maximum harvest index of 23.45 percent was observed for the crop grown with three irrigations (I_3). The minimum harvest index (17.7%) was recorded for the treatment with no irrigation throughout the growing period.

References

Akthar, B., A. Hussain, A.H. Ahmad, M. Saleem, N. Mahmood, M. Aslam and A.W. Khurshid, 1994. Optimizing irrigation requirements for maximizing yield of moong beans: An experimental study. Pak. J. Agric. Sci., 31: 331-335.

Anonymous, 1999. Economic survey, 1997-98. Govt. of Pakistan, Finance Division, Economic Advisor's Wing, Islamabad, pp: 11-12.

Chinchilla, R.G., S.P. Carrillo, O.O. Agudelo and H. Rojas, 1988. Evaluation of soybean (*Glycine max* L.) cultivars with different growth habits according to irrigation level. Acta Agron., 38: 7-22.

Considine, D.M. and G.D. Considine, 1982. Foods and Food Production Encyclopedia. Springer, New York, USA., Pages: 173.

Haqqani, A.M. and R.K. Pandey, 1994. Response of mung bean to water stress and irrigation at various growth stages and plant densities. II: Yield and yield components. Trop. Agric., 71: 289-294.

Maqsood, M., S.I. Zamir, N. Akbarb and M.M. Zaidi, 1999. Comparative study on phonology, growth and yield of different mungbean (*Vigna radiate* L.) varieties. Int. J. Agric. Biol., 1: 116-117.

Purcell, L.C., C.A. King and A. De, 1996. Drought and nitrogen fertilization effects on yield in soybean. Res. Series: Arkansas Agric. Exp. Station, 450: 37-38.

Restuccia, G., G. Mauromicale and A. Ierna, 1992. Effect of irrigation regime on the agronomic behavior of soybeans grown in the Mediterranean. Riv. Agron., 26: 777-784.

Sachidanand, B., O.P. Verma, N.S. Yadav and L.D. Koshta, 1995. Effect of irrigation and mulch on the yield of summer mung. Jawaharlal Nerhru Krishi Vishwa Vidyalaya. Res. J. India, 27: 16-20.

Sarkar, R.K., 1992. Response of summer greengram (*Phaseolus radiates*) to irrigation and phosphorus application. Indian J. Agron., 37: 123-125.

Steel, R.G.D. and J.H. Torrie, 1980. Principles and Procedures of Statistics: A Biometrical Approach. 2nd Edn., McGraw Hill Book Co., New York, USA., ISBN-13: 9780070609266, Pages: 633.

Sukhvinder, S., R.D. Misra and S. Singh, 1990. Growth analysis of spring Mung bean (*Vigna radiate* L.) relative to irrigation levels. Indian J. Ecol., 17: 164-166.

Thomas, A.L. and J.A. Costa, 1994. Effect of water stress on development and yield of soybean. Pesquisa Agropecuaria Brasileira, 29: 1389-1396.

Varughese, K. and M.R. Iruthayaraj, 1993. Effect of water stress at different phenophases of greengram Co-3. Agric. Sci. Digest (Karnal), 13: 87-89.