Biological Forum – An International Journal **7**(2): 719-721(2015)

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Effect of row distance and variety on number of branch per plant, Plant height, Harvest Index and Seed yield in mungbean

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(Received 12 August, 2015, Accepted 09 October, 2015)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: Mung bean is a main short-duration grain legume crop with vast adaptability, low input requirements and the ability to improve the soil by fixing atmospheric nitrogen. Mung bean is nice suited to a large number of cropping systems and constitutes an important source of high quality protein in the cereal-based diets of very people. Plant density describes the number of plants per square meter, which in turn determines the area available to each individual plant. For maximum crops, plant density has a major influence on biomass, crop yield and economic profitability. Treatments contained Cultivar (Sistan cultivar, Gohar cultivar, Indian cultivar) as sub plot and row distance (20, 40, 60 and 80cm) as main plot. Analysis of variance showed that the effect of variety and row distance on all characteristic was significant.

Key words: Plant height, Harvest Index, Seed yield

INTRODUCTION

The main legumes in Asia are chickpea, pigeonpea (*Cajanus cajan* L), and Mungbean (*Vigna radiate*). Mungbean is a warm season crop requiring 90–120 days of freeze free conditions from planting to maturation. Enough rainfall is required from flowering to late pod fill in order to ensure nice yield. Yield of Mung beans is worsening with the rapid expansion of drought-stressed areas of the universe. Mung bean (*Vigna radiate* L.) is an main short-duration grain legume crop with wide adaptability, low input requirements and the ability to meliorate the soil by fixing atmospheric nitrogen (Sadeghipour, 2009). Mung bean is well appropriate to a large number of cropping systems and constitutes an important fount of high quality protein in the cereal-based diets of maximum people in Asia (Khattak *et al*. 2001). Mungbean (*Vigna radiata* L.) is an important seed legume and is grown on 225 thousand hectares with total production of 130 thousand tones and average production of 577 kg ha^{-1} in Pakistan (Government of Pakistan, 2005). Mungbean is a widely-grown, short-duration grain legume crop grown in south and Southeast Asia. It is an important source of cheap protein and iron, and is a good substitute for meat in most Asian diets and a significant component of diverse cropping systems (Rudy *et al*., 2006; Srinives *et al*., 2000). Mungbean is considered as a substitute of animal protein and forms a moderate diet when used with cereals (Khan and Malik, 2001; Anjum *et al*., 2006; Mansoor, 2007; Delic *et al*., 2011). The magnitude of yield losses in mungbean caused by weeds depends mainly upon the weed species and their densities. Research workers have reported different levels of yield losses ranging from 30 to 85% (Sandhu *et al*., 1980; Singh *et al*., 1984; Singh, 1987; PARC, 1988). Plant density defines the number of plants per square meter, which in turn determines the area available to each single plant. For most crops, plant density has a major influence on biomass, crop yield and economic profitability (Rafiei, 2009; Albayrak *et al*., 2011; Ciampitti and Vyn, 2011). Therefore, optimizing plant density, which may be defined by both the number of plants per unit area and the arrangement of plants on the ground, is a pre-requisite for obtaining higher yield of faba bean. This is because the number of plants per unit area is an important determinant of final seed yield, it is the first yield component to be fixed at the early crop cycle, it is largely dictated and controlled by the farmer himself, and finally, it is largely unaffected by environmental change (Dantuma and Thompson, 1983). However, other yield components such as number and weight of pods and seeds per plant and 100 seed weight which are established at a later stage in the course of the crop cycle are significantly affected by environmental conditions. Furthermore, the portion efficiency of these components in the final seed yield is also associated with the number of plants per unit area (López-Bellido *et al*., 2005). In a study on the effect of plant density on yield and yield components of grain sorghum cultivars, Javadi *et al*. (2005) reported that higher plant density resulted in higher grain yield and biological yield and lower grain number per panicle, but plant density did not significantly influenced such traits as 1000-grain weight and harvest index. They stated that the increase in the density from 10000 to 260000 plants ha^{-1} resulted in 37.26 and 41.41% increase in grain and biological yield, respectively, but grain number per panicle was decreased by 36.86%.

Alavi and Saeed (2008) studied the effect of densities of 50 000- 110 000 plants ha^{-1} on sorghum and showed that the effect of density was significant on dry matter yield and 1000-grain weight at 1% level, so that the increase in density brought about a significant increase in dry matter yield, but a significant decrease in 1000-grain weight. Javanmard (1996) studied the effect of different densities on yield and yield components of grain sorghum and reported that higher densities resulted in higher panicle number per unit area paving the way to realize the maximum grain yield. Saberali (2007) investigated the effects of plant density and planting pattern on growth and physiological index of maize (*Zea mays* L.). Plant density treatment was at two levels: Recommended plant density (70000 plant ha^{-1}) and 1.5 times recommended plant density (105000 plant ha^{-1}). Planting pattern treatment was at two levels: One and two rows planting (planting on both of ridge sides). The results showed that in high maize density, leaf area index, total dry weight and crop growth rate increased than low maize density in and throughout of growth season. Two row planting pattern also increased leaf area index, total dry weight and crop growth rate contrast to one rows planting pattern, although, it does not have the same effect as plant density. Plant density affects yield by effecting yield components such as number of ears, number of kernels per ear, and kernel mass (Ahmadi *et al*., 1993). Scarce plant density results in unnecessary sacrifice of yield and higher density also lead to dispensable stress on the plants.

MATERIAL AND METHODS

Location of experiment. The experiment was conducted at the agriculture and natural resources in zahak region between 31° North latitude and 61° East longitude.

Composite soil sampling. Composite soil sampling was made in the experimental area before the imposition of treatments and was analyzed for physical and chemical characteristics.

Field experiment. The field experiment was laid out in split plot design with factorial design with three replications.

Treatments. Treatments included Cultivar (Sistan cultivar, Gohar cultivar, Indian cultivar) as sub plot and row distance (20, 40, 60 and 80cm) as main plot.

Data collect. Data collected were subjected to statistical analysis by using a computer program MSTATC. Least Significant Difference test (LSD) at 5 % probability level was applied to compare the differences among treatments` means.

RESULTS AND DISCUSSION

A. Number of branch per plant

Analysis of variance showed that the effect of variety on number of branch per plant was significant (Table 1). The maximum of number of branch per plant of treatments indian was obtained (Table 2). The minimum of number of branch per plant of treatments sistan was obtained (Table 2). Analysis of variance showed that the effect of row distance on number of branch per plant was significant (Table 1). The maximum of number of branch per plant of treatments 80was obtained (Table 2). The minimum of number of branch per plant of treatments 20 was obtained (Table 2).

B. Plant height

Analysis of variance showed that the effect of variety on plant height was significant (Table 1). The maximum of plant height of treatments gohar was obtained (Table 2). The minimum of plant height of treatments sistan was obtained (Table 2). Analysis of variance showed that the effect of row distance on plant height was significant (Table 1). The maximum of plant height of treatments 20 was obtained (Table 2). The minimum of plant height of treatments 80 was obtained (Table 2).

Table 1: Anova analysis of the mungbean affected by variety and row distance.

S.O.V	df	Number of branch per plant	Plant height	Harvest Index	Seed yield
R	2	7.58	125.59	0.33	308.77
row distance (D)	3	13.21^{**}	485.01^{**}	1478.80^{**}	664030.76^{**}
Variety (V)	2	10.33^{**}	380.84^{**}	96.86^{**}	319289.91^{**}
D*V	6	0.18^{ns}	3.38^{ns}	9.35^{**}	2262.73^{ns}
Error	16	0.09	5.16	0.84	3441.50
CV	-	4.73	3.53	4.07	6
*, **, ns: significant at p<0.05 and p<0.01 and non-significant, respectively.					

C. Harvest Index

Analysis of variance showed that the effect of variety on Harvest Index was significant (Table 1). The maximum of Harvest Index of treatments gohar was obtained (Table 2). The minimum of Harvest Index of treatments indian was obtained (Table 2).

Analysis of variance showed that the effect of row distance on Harvest Index was significant (Table 1). The maximum of Harvest Index of treatments 80was obtained (Table 2). The minimum of Harvest Index of treatments 20 was obtained (Table 2).

Table 2: Comparison of different traits affected by variety of corn and row distance.

Treatment	Number of branch per plant	Plant height	Harvest Index	Seed yield
Variety				
Sistan	5.58c	59.88b	20.91b	835.42c
Gohar	6.75b	70.57a	25.81a	1155.08a
Indian	7.42a	62.12b	20.87b	938.80b
Row distance (cm)				
20	5d	73.19a	9.59d	691.67d
40	6.44c	66.51b	15.34d	826.39c
60	7b	60.91c	36.61b	1086.11 b
80	7.89a	56.16d	38.57a	1301.56a
Any two means not sharing a common letter differ significantly from each other at 5% probability				

D. Seed yield

Analysis of variance showed that the effect of variety on seed yield was significant (Table 1). The maximum of seed yield of treatments gohar was obtained (Table 2). The minimum of seed yield of treatments sistan was obtained (Table 2). Analysis of variance showed that the effect of row distance on seed yield was significant (Table 1). The maximum of seed yield of treatments 80was obtained (Table 2). The minimum of seed yield of treatments 20 was obtained (Table 2).

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