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Evaluation of mung bean genotypes for seed yield and other yield related traits in low lands of South Tigray, Ethiopia

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Abstract

Cereal mono cropping is very common in low land areas of Southern zone of Tigray region of Ethiopia. Hence, low yield due to declined soil fertility and crop failure due to pests (Stalk borer and striga in sorghum and shoot fly in tef) are frequent. Mung bean or green gram can be an important crop for crop rotation to improve the soil fertility of the area and decrease the pest attack. Six mung bean genotypes were laid out in randomized complete block design with three replications at wargiba peasant association, southern zone of Tigray region of Ethiopia at main season in 2012. Stand count after thinning and at maturity, days to maturity, plant height, number of pods per plant, number of seeds per pod and seed yield were collected and analyzed. Significant ($P<0.05$) differences among genotypes were observed for all response variables considered. The results indicated the potential for breeding efforts to improve the response variables studied. SM1-668 and bored were the late maturing genotypes with maturity dates of 71 and 70.7 days, respectively. The remaining genotypes (black bean, SMH-32, Gofa local and sheraro local) maturity dates ranged from 65.7 to 63 days. Bored showed maximum plant height (73.87cm) and SMH-32 was shorter (40.6cm) than the other studied genotype. Genotypes: SM1-668 and bored were significantly superior for grain yield (26.6 and 20.1 quintals per hectare, respectively) and are later to mature only by seven days than other genotypes. Therefore, these genotypes were promising for the study area. The rest other genotypes grain yield ranged between 3.2 to 4.8 quintals per hectare, which is only one fourth of the two selected genotypes' grain yield. As this result is based on one location trial on a year, further validation of this result across years and over location is important.

Keywords:, mono cropping, mung bean, crop rotation

1. Introduction

Greengram, *Vigna radiata* (L.) Wilczek also called mung bean is an annual food legume belonging to the subgenus *Ceratotropis* in the genus *Vigna*. It has been grown in India since ancient times. It is still widely grown in South East Asia, Africa, South America and Australia. It is an important subsistence crop in many developing countries where it is grown primarily for food purpose (Jood et al., 1989).

This crop is a rich source of protein which ranges from 19 to 29% and amino acid especially lysine which is the major limiting amino acid in cereal proteins for humans and mono gastric animals (Jood and Singh, 2001). This is particularly true for populations in the study area with their reliance on cereal-based diets. In addition, it is low in saturated fat and sodium, and very low in cholesterol. It is also a good source of thiamin, niacin, vitamin B6, pantothenic acid, Iron, magnesium, phosphorus and potassium, and a very good source of dietary fiber, vitamin C, vitamin K, riboflavin, folate, copper and manganese (Khalil and khan, 1994; Mohan and Janardhanan, 1993).

Its ability to fix atmospheric nitrogen, short duration maturity period, low input and minimum care requirement, and drought tolerance makes it suitable for incorporation into different cropping systems and it is a very useful forage for livestock and After picking of the pods, the whole plant may be ploughed in the soil to improve soil fertility (Subbarao et al., 1995).

In low lands of southern zone of Tigray region of Ethiopia, almost no pulse production, except a small area is covered by chick pea in conditions when residual moisture is available after crop harvest or as catch crop when cereal crops failed due to pest or flooding. Due to this, this area is exposed to different pest attack such as stalk borer and *striga* in sorghum and shoot fly in *tef.* The fertility of the soil is declining due to continuous cereal mono cropping. Therefore, this selection of genotypes took place to identify adaptive mung bean genotype/s for the area.

2. Materials and Methods

The trial was conducted in low land area of Southern zone of Tigray region of Ethiopia, Raya Azebo district, Wargiba peasant association which is found at an elevation of 1611masl and at coordinates of $12^{0}44'$ North and

039^{0}42' East. The site is located at about 115km South of Mekele town. Generally the area is characterized by semi-arid agro-ecology with low and erratic type of rainfall. The experiment contained six mung bean genotypes: bored, SM1-668, SMH-32, black bean, Gofa local and Sheraro local. The experimental design was randomized complete block design with three replications. The plot size was 2.4m width and 3m long, consisting 8 rows. Seeds were seeded at 15 cm and 30 cm intra row and inter row spacing, respectively. Phosphorus fertilizer was applied at the rate of 23kg P_2O_5 per hectare at planting. All agronomic data: initial and final stand count, days to physiological maturity, plant height, number of pods per plant, number of seeds per pod and seed yield were collected at respective phonological stages. and analyzed using SAS 9.2 computer statistical soft ware.

3. Result and Discussion

A significance difference ($P<0.05$)was observed among the genotypes for all parameters considered (Initial stand count, final stand count, days to maturity, plant height, number of pods per plant, number of seeds per pod and seed yield) which indicated the effectiveness of selection from the tested genotypes. Significantly lower number of stands after thinning and at harvest was recorded for genotype sheraro local (87.3 and 79 plants per plot respectively) (table 1). This showed this genotype had low emerging ability and had greater

Table1 Agronomic parameters, yield and yield related traits of mung bean genotypes

SN	Genotypes	Stand count		Days to maturity	Plant height (cm)	Pods per plant	Seeds per pod	Seed yield quintal per ha
		After thinning	At maturity					
1	Black bean	94ab	91a	63.7c	61.33ab	38.33b	10.3a	3.2c
2	SM1-668	96.7a	88.3ab	71a	47.27bc	52.87a	6.5c	26.6a
3	Bored	86.7ab	78c	70.7a	73.87a	31.73bc	10.3a	20.1b
4	SMH-32	91.3ab	83abc	65.7b	40.6c	19.8c	8.2b	4.8c
5	Gofa	95.3a	87abc	63.7c	52.27bc	21.8c	9.9a	4.5c
6	Sheraro	87.3b	79bc	63c	55.53bc	35.27b	9.5ab	4.8c
	CV (%)	8.09	6.59	1.20	16.9	21.3	9.7	24.5

Levels not connected by same letters have significant difference
CV=Coefficient of variance

deaths of emerged plants (10%) before maturity. This might be due to the low adaptability of the genotypes this environment. Genotypes like SM1-668, SMH-32 and Gofa local had optimum and nearly optimum population density both after thinning and at maturity. These genotypes had adaptive problem neither at emergency nor during growth periods. The genotype bored was good to establish initially (86.7 plants per plot), but much number of deaths were recorded (10%) after thinning, but before maturity. Considering days to maturity the local checks (sheraro local and gofa local) and black bean were the earliest maturing genotypes with maturity periods of 63, 63.7 and 63.7 days respectively. SMH-32 was medium maturing (65.7 days). Genotypes SM1-668 (71 days) and bored (70.7 days) matured later than the rest other genotypes; In addition, these genotypes have indeterminate nature that the date recorded considered only for first harvest. Bored was statistically longest genotype (73.87 cm) followed by black bean (61.33cm), whereas, sheraro local, Gofa local and and SM1-668 scored medium plant height: 55.5, 52.3, 47.3cm, respectively. One genotype called SMH-32 were the shortest (40.6 cm) of all genotypes considered.

The highest number of pods per plant was recorded by SM1-68 which reached about 52.87 pods. 38.33 pods per plant were recorded by black bean. The number of pods per plant recorded by sheraro local and bored was 35.27 and 31.73 respectively. SMH-32 and and gofa local had the lowest number of pods per plant (19.8 and 21.8 pods per plant, respectively). The highest number of seeds per pod were obtained from Bored and black bean each scored 10.3 seeds per pod. The lowest number of seeds per pod was obtained from SM1-668 (6.5seeds per pod).the three genotypes: SMH-32, sheraro local, and gofa local had 8.2, 9.5, and 9.9 seeds per pod.

Regarding grain yield SM1-668 were significantly higher yielder ($P<0.05$) than the rest other genotypes (26.62 quintals per hectare) followed by bored (20.1quitals per hectare). Genotypes: black bean, gofa, SMH-32 and

Sheraro grain yield had 3.2, 4.5, 4.8, and 4.8 quintals per hectare respectively which is much lower than SM1-668 and bored. This difference is not only by the adaptability nature of the genotypes, but also the indeterminate nature of genotypes SM1-668 and bored and the determinate nature of black bean, gofa, SMH-32 and sheraro.

4. Conclusion

The result of this study indicated that all the six genotypes studied were able to produce mature and fertile seeds. However, the seed yields recorded by the genotypes were significantly ($P<0.05$) different. Two genotypes (SM1-668 and Bored) scored more than four folds grain yield than the other four genotypes and are late to mature only by a week. Therefore, these genotypes are promising for this area. This conclusion is preliminary because it is based on the result of only one year-location trial. Validating the result with more years and location is important.

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