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

Adhiena mesele1*, Muez Mehari1 and Mizan Tesfay1
1. Tigray Agricultural Research Institute, Alamata Agricultural Research Center, PO box 56, Alamata, Tigray, Ethiopia

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°44’ North and
The site is located at about 115 km 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 2.4 m width and 3 m 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 23 kg P$_2$O$_5$ 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 software.

### 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 deaths of emerged plants (10%) before maturity. This might be due to the low adaptability of the genotypes to 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 (61.33 cm), whereas, sheraro local, Gofa local and and SM1-668 scored medium plant height: 55.5, 52.3, 47.3 cm, 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 SM1-668 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 (6.5 seeds 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 (20.1 quintals per hectare). Genotypes: black bean, gofa, SMH-32 and

### Table 1. Agronomic parameters, yield and yield related traits of mung bean genotypes

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

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

References


The IISTE is a pioneer in the Open-Access hosting service and academic event management. The aim of the firm is Accelerating Global Knowledge Sharing.

More information about the firm can be found on the homepage: http://www.iiste.org

CALL FOR JOURNAL PAPERS

There are more than 30 peer-reviewed academic journals hosted under the hosting platform.

Prospective authors of journals can find the submission instruction on the following page: http://www.iiste.org/journals/  All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Paper version of the journals is also available upon request of readers and authors.

MORE RESOURCES

Book publication information: http://www.iiste.org/book/

Academic conference: http://www.iiste.org/conference/upcoming-conferences-call-for-paper/

IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digital Library, NewJour, Google Scholar