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Participatory Variety Selection and Evaluation of Released Faba Bean (*Vicia faba* L.) Varieties at Amigna Woreda, South Eastern Ethiopia

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Abstract

Faba bean is one of the important field crops grown in the mid and highlands areas of Ethiopia. More than 34 improved faba bean varieties has been released by different agricultural research centers in Ethiopia to date. However, farmers around the study areas depends on few low yielding local faba bean varieties. Taking this in to consideration the study was conducted at Amigna woreda, south eastern Ethiopia to evaluate the performance of improved faba bean varieties and recommend better varieties and increase production and productivity of the crops in areas. Six improved with one local faba bean varieties was used in the study. Significant different ($P<0.05$) were observed for considered traits (days to flowering, days to maturity, plant height, pods per plant, thousand seed weight and grain yield) but not for seeds per pod. The result of statistical analysis showed that variety Gora was the best yielder than other varieties with seed yield of 4631 kg/ha followed by Tumsa (3070.1 kg/ha) and Gebelcho (2800.4 kg/ha), while the Local check was the low yielder with seed yield of 1177.5 kg/ha at study area. Gora variety was also the largest seed with thousand seed weight of 731gm followed by Gebelcho 686.3 gm. Variety Gora, Gebelcho, and Tumsa were also selected by farmers. Thus, these three varieties are recommended and can be used by farmers around the study areas and similar agro-ecologies to increase production and productivities of the crop and improve livelihood of the farmers.

Keywords: Faba bean; Farmers selection; Participatory variety

Introduction

Faba bean (*Vicia faba* L.) is the most important food legume crop both in area coverage and volume of annual production in Ethiopia. According to FAO, 2019 Ethiopia is the second largest faba bean producer in the world next to China. The total cultivated area of Faba bean reached 466,697.68 hectares with total production of 10,067,518.28 quintals. The average national yield of Faba bean was about 21.57 quintals per hectare (CSA, 2019). It is mainly cultivated in mid and high altitude areas with an elevation ranging from 1800-3000 meters above sea level. The crop is grown in different agro-ecologies receiving average annual rain fall ranging from 700-1100 mm with daily temperature of 10-22ºc. Faba bean plays a significant role in the socio-economic lives of the farming communities of Ethiopia as a source of food and feed [1]. The crop is good source of cash to farmers and foreign currency to the country. It is also used in soil fertility restoration and good break crops to pests when rotated with cereals.

Over the years, a number of faba bean varieties have been evaluated and released by national and regional agricultural research centers. However, farmers do not grow improved varieties which are high yielding, disease and pest resistance as these varieties were released without the participation of farmers in considered areas. And also, they have no sufficient information about agronomic practices and economic importance of the released faba bean varieties [2]. Participatory Varietal Selection (PVS) is a selection of varieties by farmers in their target environments using their own selection criteria. In this method; Farmers' requirements in varieties are identified using PRA. Therefore, the objective of the study was to evaluate and recommend best performed, high yielding and disease resistant faba bean varieties through farmers' perceptions.

Materials and Methods

Description of experimental sites

The experiment was conducted in Amigna Woreda at Melekecho kebele FTC in Arsi zone South Eastern Ethiopia, during the main cropping season of 2018/2019 [3]. The kebele is located about 6 km far from the Adele town (the capital of Amigna woreda).

Experimental materials and design

Six released faba bean varieties namely, Ashebeka, Gora, Tumsa, Hachalu, Wolki, Gebelcho and one local check variety were used to test adaptability and farmers perceptions at selected area. The treatments were arranged in Randomized Complete Block Design (RCBD) with three replications [4]. Each variety was planted on a plot size of 6.4 m^2 with 40 cm between rows and 10 cm between plants. All other recommended agronomic practices were applied uniformly in all experimental plots.

Data collected

Data were collected on individual plant basis and plot basis. For those data that were collected on plant bases, five plants were taken randomly from the net harvestable plots and the mean value of these five plants were calculated using Micro soft Excel and used as plot

data for analysis [5]. Yield and yield component data that were collected on plant and plot basis are described as follows.

Plant basis

Number of pods per plant (PPL): It was recorded by counting the number of pods present on the main stem and branches in each five randomly selected sample plans and averaging over the number of the sample plants.

Number of Seeds Per Pod (SPP): It were estimated as the number of seeds per pod; the average number of seeds per plant were divided by the average number of pods per plants.

Plant Height (PH): It were taken as the average height of five randomly selected plants in each net plot measured in cm from the ground surface to the top of the main stem at physiological maturity.

Plot basis

Days to 50% flowering: Number of days taken by each variety from the day of sowing to the day on which 50 per cent of the plants on a plot opened a flower.

Days to 90% physiological maturity: Number of days from sowing to the stage when 90% of the plants in a plot have changed the color of their pods from green to lemon yellow.

Grain yield: This parameter were taken after harvesting, threshing and winnowing. The grain yield were weighed using electronic balance per plot (g/plot) basis and converted into kg/ha for each variety in three replications and adjusted to 10% of moisture content.

1000-seed weight: The well-dried and cleaned seeds from each variety were taken randomly and counted, weighed and were recorded in grams.

Participatory varietal selection

Farmers were sated their own selection criteria for Faba bean varieties and evaluate the performance of each variety based on their selection criteria [6]. A total of 20 farmers from both male and female were participated and selected varieties.

Data analysis

All measured Data (morphological, seed yield and yield components) were subjected to analysis of variance (ANOVA) using GLM procedures of SAS software version 9.0 (Anonymous, 2002) and R- software, to assess the difference among the tested varieties at $P \leq 0.05$ level of significance differences according to Gomez and Gomez (1984). Comparison of mean treatment was done based on Least Significant Difference (LSD) [7].

Results and Discussion

Agronomic trait

The analysis of variance (ANOVA) showed that the presence of significant ($P<0.01$) differences among the faba bean varieties for considered traits (days to flowering, days to maturity, plant height, pods per plant, thousand seed weight and grain yield) except for seeds per pod (Table 1).

The shortest day to flowering were recorded for Gebelcho and local varieties, while the longest days to flowering was recorded for Ashebeka variety. The Longest days to maturity was recorded for Tumsa followed by Gora, Ashebeka, Gebelcho, Hachalu, walki and Local variety. Mean grain yield of the tested varieties ranged from yield 1177.5 kg/ha for local variety to 4631 kg/ha for Gora with over all mean value of 2485.03 Kg/ha [8]. These showed that the highest grain yield was obtained from variety Gora (4631 kg/ha), followed by Tumsa (3070.1 kg/ha) and Gebelcho (2800.4 kg/ha), while the lowest grain yield was obtained from local check (1177.5 kg/ha). Yasin Goa Chondie also reported that significant difference among tested varieties they considered. It also in agreement with that variety Gora was the high yielder in their study.

Source of variations	Df	Mean squares						
		DF	DM	PH	PPP	SPP	TSW	GYLD
Replication	2	0.62	2.9	106.5	5.76	0.206	5726.6	21451 3.46
Variety	6	13.76	7.9	73.6	31.7	0.048	56308.7	39276 72.34
Error	12	0.62	2.3	17.7	3.76	0.16	1007.01	36638. 94
Total	20							

Table 1: Analysis of Variance (ANOVA).

Farmer's variety evaluation and criteria

Farmers evaluated and selected the varieties depending on their criteria's. Selection was carried out at maturity by organizing a field day and setting selection criteria. The criteria used by farmers' were days to maturity (earliness), plant height, pods per plant, seed size, disease and grain yield as their selection parameters. Accordingly, based on the selected criteria variety like Gora, Gebelcho and Tumsa were selected by farmers. The study was in line with the study of Yasin Goa and Esrael Kambata (2017) in which Variety Tumsa and Gebelcho have been selected by farmers in Figure 1.

Figure 1: Pictures taken during Participants evaluating and selection Faba bean varieties.

Conclusion

Significant different ($P<0.05$) were observed among seven faba bean varities used in the study for days to flowering, days to maturity, plant height, pods per plant, thousand seed weight and grain yield but not for seeds per pod. The result of statistical analysis showed that

variety Gora was the best yielder than other varieties followed by Tumsa and Gebelcho while the Local check was the low yielder at study area. From farmers' evaluation, the highest score was also recorded for Gora, Gebelcho and Tumsa which also similar with the result of statistical analysis.

Generally, in this study farmers 'and breeders evaluation and selection were confirmed that Gora, Gebelcho and Tumsa were found good for yield potential and other agronomic traits among the tested varieties. Therefore, these selected varieties should be addressed the farmers around the study areas by any means to increase faba bean production and productivity and improve livelihood of the farmers.

References

1. Adugna A (2010) Assessment of Yield Stability in Sorghum. Afr Crop Sci J 15: 83-92.
2. Alwala S, Kwolek T, McPherson M, Pellow J, Meyer D (2010) A Comprehensive Comparison between Eberhart and Russell Joint Regression and GGE Biplot Analyses to Identify Stable and High Yielding Maize Hybrids. Field Crop Res 119: 225-230.
3. Annicchiarico P, Harzic N, Carroni AM (2010) Adaptation, Diversity, and Exploitation of Global White Lupin (Lupinus albus L.) Landrace Genetic Resources. Field Crops Res 119: 114-124.
4. Dehghani H, Sabaghnia N, Moghaddam M (2009) Interpreta¬tion of genotype-by-environment interaction for late maize hybrids' grain yield using a biplot method. Turk J Agric Fores 33: 139-148.
5. Gabriel KR (1971) The biplot graphic of matrices with application to principal component analysis. Biometrics 58: 453-467.
6. Gauch HG, Zobel RW (1997) Identifying Mega-environments and Targeting Genotypes. Crop Sci 37: 311-326.
7. Hassanpanah D (2011) Analysis of G×E Interaction Using the Additive Main Effects and Multiplicative Interaction (AMMI) in Potato Cultivars. Afr J Biotechnol 10: 154-158.
8. Ilker E, Tonk FA (2009) Assessment of Genotype× Environment Interactions for Grain Yield in Maize Hybrids Using AMMI and GGE Biplot Analysis. Turk J Field Crops 14: 123-135.