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Participatory varietal selection and agronomic performance evaluation of field pea (*Pisum sativum* L.) varieties in West Shewa, Ethiopia.

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ABSTRACT

The aim of this study was to evaluate on-farm and select farmer's preferred varieties comparing with agronomic performance of field pea varieties. The experiment was conducted both at on-station and on-farm in Western Shewa, Ethiopia. The on-station experiment was carried out at Ambo Agricultural Research Center using RCBD with three replications. Five improved varieties were evaluated by comparing with one local variety and selected for desirable attributes. Participatory variety evaluation and selection trials involving farmers were conducted at on-farm in the districts of Ambo, Dandi, and Wonchi during 2020 and 2021 main seasons, When the farmer's fields considered as replications. In addition to agronomic data such as days to flowering, plant height, pods per plant, seed per pod, farmers used different criteria to assess field pea varieties starting from emergence to maturity and after harvest of the crop. The major farmers' selection criteria were growth habit, yield performance, disease and pest resistance, marketability, and suitability for diet. Based on selection criteria, most of the farmers were highly select the variety of Bilalo followed by Burkitu. The result from agronomic data also confirmed that the farmers' preferred varieties were selected for their good performance in most tested traits. Accordingly, the combined analysis showed Bilalo was the best yielder with grain yield 2850 kg/ha followed by Burkitu (2800 kg/ha), whereas Bursa (2416.7 kg/ha), Gume (2333.3 kg/ha), Adi (2016.7 kg/ha), and local variety (1816.7 kg/ha). These results indicated that farmers had deep knowledge to select and make decision of the preferred superior varieties compared to the inferior varieties.

INTRODUCTION

Field pea (*Pisum sativum* L.) is one of cool-season legume crop grown worldwide for multi-purposes in different agro-ecologies (McKay et al. 2003). In Ethiopia, the crop is widely cultivated in mid to high altitude and ranks second in area coverage of 219,927.59 hectare with annual production of 3,762,368.83 quintals among highland pulses (CSA 2020/21). It is the most important food legumes with a valuable and cheap source of protein having essential amino acids (23-26%) which is mainly consumed by resource poor households (Kapila et al. 2012). The crop plays a significant role in soil fertility restoration as a suitable rotation crop that fixes atmospheric nitrogen which considered as minimization of fertilizer cost for the low income farmers (Stenvovic et al. 2005; Keneni et al. 2013). It also used as sources of income for the farmers and foreign currency for the country (Shahidur et al. 2010).

Despite multiple importance and large area coverage, the average yield of the crop is far below its potential 1.71t ha^{-1} in Ethiopia (CSA 2020/21), when compared to the World production of 2.4t per hectare (FAOSTAT 2019). Limitation in addressing improved field pea varieties to potential agro-ecologies is the main reason for low production of the crop. Although several improved field pea varieties has been released by the different regional and federal research centers to meet the needs of smallholder farmers (MOA 2018), currently in West Shewa Zone the production of field pea is constrained by low yielding of farmers' varieties that are widely affecting by several factors like diseases and insect pests. The available varieties have not been exposed to farmers and shortage of information with recent released varieties which are fits the existing cropping system in the crop production niches of area.

Poor participation of farmers in the selection process is the other main problems behind in sufficiency of improved varieties with wider adoption rate, agronomic practice, and other constraints (Tesfaye et al. 2021). At present the majority of the released varieties in Ethiopia were selected based on their limited agronomic traits and specific breeder's criteria which mainly focus on high yielder and disease resistance. With respective of this, several factors may account for the limited adoption of new varieties. The first identified factor is that the breeders' selection criteria may not match the needs and preferences of producers. Farmers consider different traits to satisfy their diverse needs which helping to determine the acceptance of a variety with desirable traits. Similar report also noted by (Vom et al. 2010), that farmers' selection traits are multivariate in nature. Involving farmers in variety evaluation is the one of important method to identify and assess traits that is important to small scale farmers (Almekinders and Elings 2001). It helps in assessing "subjective traits" such as taste, color, size, market demand and other culinary qualities, which can be a challenge for breeders to meaningfully assess and difficult to measure quantitatively (Bellon and Reeves 2002).

Understanding farmers' preferences in variety evaluation and selection is an important and easiest way for breeding programs which able to release acceptable varieties by farmers (Cavatassi et al. 2011). So participatory variety selection is the basic approach for breeding that brings breeders, social scientists, farmers, and extension personnel together in a field setting to jointly evaluating new varieties, prioritize and target traits of importance along with existing local varieties (Tesfaye et al. 2021). Therefore, this study aimed to evaluate field pea varieties through collaboration with farmers and to identify farmers' preferred variety with comparison of agronomic performance.

2. MATERIALS AND METHODS

2.1. Experimental condition

The study was carried out in two phases; (I) On-station as mother trial and (II) On-farm as baby trials. In phase I, the experiment was conducted at the Ambo agricultural research center on-station for two consecutive years during the main cropping seasons of 2020 and 2021. In second phase, the study was set up at farmers' field of three districts. In each district, two farmers' fields were identified with the help of district agricultural extension workers, to host the on-farm participatory trials. Each farmer was treated as a replication; hence, there were two replications per district.

2.2. Plant materials and Design

Five nationally released field pea varieties obtained from Holleta Agricultural Research Center and one local check (Table 1) were used both at on-station and on-farm. A randomized completed block design (RCBD) with three replications was used in on-station study. The distance between replications was 1.5m and each plot consists 8 rows of 3m length. While 5m*5m single plot was used for on-farm trials. The trials were designed by researcher and planting was done jointly by the research team and farmers, but all cultural practices were managed by farmers.

2.3. Data collection and analysis

Phase I (On-station): All agronomic traits like days to flowering, plant height, pods per plant, seeds per pod, days to maturity, thousand seeds weight and grain yield, and the occurred disease reaction such as powdery mildew, downy mildew and aphids were recorded to evaluate the performance of the field pea

varieties. All data were collected from five randomly taken plants from the middle rows.

Phase II (On-farm): During the study, participatory on-farm trials were used to assess and select best varieties for eight traits in addition to the traits identified in phase I. The eight traits were growth habit, grain color, seed size, early maturity, yield performance, marketability, suitability to diet and disease resistance. About 18 farmers, 11 men and 7 women were actively participated on the varieties evaluation. All feedbacks and traits of farmers' value or consider important from individual farmer and focus group discussions were analyzed and compared with agronomic data recorded from both on-farm and on-station experiments. The trials evaluation processes was started from the crop emergence, but variety selection for the traits of growth habit, earliness, disease and overall yield attribute was carried out close to physiological maturity; while selection for the traits of grain yield, seed color, seed size, suitability to diet and marketability was done after harvest and trashed. In all assessments, the improved varieties were rated against the local check using a scale of 1-4 where; 1 = much better than local variety 2 = a little better than check variety; 3 = same as local variety; 4 = worse than local variety modified from (Emmanuel et al. 2017). The farmer's traits values for evaluating the varieties were discussed with the participants in the field trials on how to farmers rate the varieties for each trait based on the scale. During the assessment, varieties were identified by plot numbers rather than by their names in order to avoid bias; as suggested by (Kapinga et al. 2003). The yield data was recorded per plot and converted to yield per hectare. The farmers' preference score was also calculated by using the formula (Sheikh et al. 2017):

$$\text{Preference Index} = \left(\frac{No.\ of\ positive\ votes - No.\ of\ negative\ votes}{Total\ No.\ of\ votes}\right).$$

All recorded data were subjected to analysis of variance (ANOVA) using SAS 9.4 version at $P<0.05$. The significant differences among the treatment means were tested by the Duncan's Multiple Range Test (DMRT) of mean comparison.

Table 1: List of field pea varieties

S/N	Varieties	Year of release (G.C)	Character
1	Adi	1995	Kik-type
2	Bilalo	2012	Kik-type
3	Burkitu	2009	Kik-type
4	Bursa	2015	Shiro-type
5	Gume	2006	Kik-type
6	Local check	-	Shiro-type

3. RESULTS AND DISCUSSION

3.1. Analysis of Variance

The combined data from the two seasons at on-station and pooled data from six individual farmers' fields were subjected to analysis of variance to identify the significant variation between varieties in tested traits. Accordingly, the analysis of variance for mother trial (on-station) showed that highly significant differences among varieties in all tested agronomic traits except for plant height; the ANOVA for the interaction of variety with year however, showed non-significant in all traits in on-station experiment (Table 2), which implies that the season is not influence the experiment in this study. On the other hands, the results from combined analysis of variance for baby trials (on-farm trials) revealed that there were significant variations between varieties in the traits of days to flowering, seeds per pod, thousand seeds weight and grain yield, whereas non-significant in plant height, pods per plant and days to maturity. Three districts and two farmers' fields at each district were used to evaluate field pea varieties, in which all traits were statistically non-significant among the farmer's field except in days to flowering, plant height and thousand seeds weight; whereas significant variation observed in days to flowering, days to maturity, thousand seeds weight and grain yield between the districts. The interactions of varieties with locations however, revealed non-significant variation in all tested traits, except in thousand seeds weight (Table 3).

Table 2: Mean square from combined ANOVA for yield and yield-related traits of 6 field pea varieties tested at on-station during main season of 2020-2021.

Source of variations	Df	Mean Square						
		DF	PH	PP	SP	DM	TSW	GY
Variety	5	5.5**	545.8^{NS}	11.1*	0.4*	79.7*	2411.03**	1067411**
Rep.	1	21.8**	7867.7**	3.9**	0.13^{NS}	14.7^{NS}	380.25^{NS}	34566.2^{NS}
Year	2	0.03^{NS}	556.1^{NS}	0.2^{NS}	0.04^{NS}	0.5^{NS}	568.8^{NS}	15130.5^{NS}
Var. x Year	5	1.2^{NS}	794.9^{NS}	1.9*	0.32^{NS}	1.2^{NS}	254.7^{NS}	19958.8^{NS}
Error	22	0.03	654.9	0.52	0.174	0.32	285.4	13234.5
CV		0.27	15.12	6.05	7.87	0.5	8.08	5.41

**= significant at P ≤ 0.05, **= significant at P ≤ 0.01*, ^{NS}= non-significant, *Df= degree of freedom, DF= days to flowering, PH= plant height, PP= pods per plant, SP= seeds per pod, DM= days to maturity, TSW= thousand seeds weight and GY= grain yield.*

Table 3: Mean square from combined ANOVA for yield and yield-related traits of 6 field pea varieties evaluated at three districts on two farmers' fields of each district.

Source of variations	Df	Mean Square						
		DF	PH	PP	SP	DM	TSW	GY
Varieties	5	7.0*	168.1^{NS}	13.9*	1.12**	46.98*	4273.6**	731272.1*
Loc.(District)	2	4.8**	521.5^{NS}	4.4^{NS}	0.02^{NS}	180.4*	168.6**	1162166.8*
Rep.(F. fields)	1	1.4*	1084.5*	3.6^{NS}	0.03^{NS}	11.1^{NS}	210.3**	37692.7^{NS}
Var. x Loc.	10	0.4^{NS}	18.5^{NS}	0.7^{NS}	0.1^{NS}	3.2^{NS}	71.417*	141689.3^{NS}
Var.x Rep.	5	0.1^{NS}	28.4^{NS}	1.1^{NS}	0.1^{NS}	1.9^{NS}	76.38*	102293.6^{NS}
Residuals	12	0.22	238.99	3.096	0.126	2.86	21.44	245045.3
CV		0.73	9.64	16.35	6.72	1.27	2.35	24.63

**= significant at P ≤ 0.05, **= significant at P ≤ 0.01*, ^{NS}= non-significant, *Df= degree of freedom, DF= days to flowering, PH= plant height, PP= pods per plant, SP= seeds per pod, DM= days to maturity, TSW= thousand seeds weight and GY= grain yield,*

3.2. Agronomic performance

The results from analysis of variance revealed that there is significant variation between varieties in most of evaluated agronomic traits (Tables 3 and 4). Based on their combined mean for tested phonological traits, some varieties were selected for their well performed both at on-station and on-farm. The performance of the varieties was also evaluated through variety-disease reaction measurement by scoring of disease prevalence and severity during this PVS. The major diseases occurred during the study were powdery mildew, downy mildew and aphids, but powdery mildew was a series one. Significant variations in the mentioned traits between the varieties can be attributed to variations in the ability of host plants defense to or influenced by the diseases. The result from analyzed disease data revealed that no significant variation in incidence and severity of all mentioned diseases between Bilalo, Burkitu Bursa and Gume, varieties which have less reaction with identified diseases (Table 7), whereas Adi and Local varieties were highly severed by those diseases.

Despite different in agronomic performance and disease reaction from variety to variety, no single variety is found that showed generally superior performance in all tested traits across the two testing conditions. But, one variety was observed superior in most traits than the others. Accordingly, the highest in plant height, pod per plant, seed per pod and thousand seed weight were recorded from Bilalo variety with mean grain yield of 2668.43 kg/ha in mother trial and 2539.63 kg/ha in baby trials followed by Burkitu with mean grain yield of 2595.19 kg/ha and 2115 kg/ha at on-station and on farmers field, respectively; while the intermediate to lower values of agronomic traits were recorded from varieties Bursa, Gume, Adi and Local check consecutively (Table 4). Identification of these traits was used to compare the agronomic performance with farmers' perception and criteria which helps to confirm either the farmers' preferred varieties were accepted or rejected.

Farmer's selection criteria: The farmers attended in participatory varietal selection were listed about eight different traits that guide their selection decisions on field pea varieties for adoption (Table 6). All traits were

considered either as important or most important by the participants. Therefore, while farmers consider many traits, there are a few traits that they often use which need to be identified. Previous study by (Asfaw et al. 2012) work on common beans reported similar findings of farmers using a combination of a few traits when evaluating new varieties.

In this study, out of the sixteen different traits, the most important criteria mentioned by farmers in their selection of varieties both at field and after harvesting were growth habit, disease reaction, yield performance, seed color, seed size, earliness, marketability, and suitability to diet (Table 6) that they often use when evaluating field pea for adoption. From the individual interviews in each location, majority of farmers preferred varieties with disease resistance, erected and continues flowering, good pod loads and pod length. These criterions were identified as major decisive and their decision-making criteria to retain or reject a variety, the remaining criteria being descriptor to select a good variety. As a results variety "Bilalo" was selected by majority (about 88.9%) of farmers, which also best performed across all locations (Table 4).

In general involving farmers in field pea variety adaptation can improve variety selection as the farmers are capable of identifying superior varieties that meet their specific requirements within relatively short period and increase the chance of adoption of new varieties by other farmers in a community.

Farmer rating of varieties: Farmers ranking the five released field pea varieties against local check using 1-4 given scale for the mentioned traits; where, 1 is given for varieties much better than local variety (very good), 2 is for varieties little better than local variety (good), 3 is for varieties same as local variety (poor) and 4 is for varieties worse than local variety (very poor). Based on the mean value of farmers' perception, all varieties were ranked 1-6 (Table 4). The variety 'Bilalo' was preferred by large number of participants and superior over the others in most of tested traits, followed by Burkitu variety; despite they had relatively similar perception for some traits (Table 5). Bursa also one of the competent varieties with the preferred variety in most of traits, while the two remaining varieties Adi and Gume had lower rank and relatively similar log odds ratios for growth habit, earliness, yield, marketability and suitability to diet, but varied in disease reaction, seed size and seed color. In general, the result from combined farmers' perception indicated that Bilalo, Burkitu and Bursa were ranked 1st, 2nd and 3rd, respectively, whereas Gume, Adi and Local varieties were ranked 4th, 5th and 6th, consecutively (Table 5).

Table 4. Combined Mean grain yield and other agronomic traits of field pea varieties evaluated at on-farm and on-station.

variety	DF	PH	PP	SP	DM	TSW(gm)	GY (kg/ha)
On-station variety evaluation (Mother trail)							
Adi	61.5^{b}	174.7^{a}	11.2^{b}	4.9^{b}	115.0^{c}	220.2^{ab}	1935.2^{c}
Bilalo	60.5^{c}	181.5^{a}	12.8^{a}	5.7^{a}	111.0^{e}	234.5^{a}	2668.4^{a}
Burkitu	60.5^{c}	157.8^{a}	13.0^{a}	5.3^{ab}	112.2^{d}	215.2^{abc}	2595.2^{a}
Bursa	59.5^{d}	163.1^{a}	11.9^{b}	5.0^{b}	109.8^{f}	209.7^{bc}	1860.5^{c}
Gume	61.5^{b}	176.5^{a}	13.1^{a}	5.3^{ab}	117.0^{b}	198.7^{c}	2089.9^{b}
Local check	62.2^{a}	161.8^{a}	9.6^{c}	5.3^{ab}	119.17^{a}	176.0^{d}	1609.3^{d}
LSD	0.20	30.64	0.86	0.50	0.67	20.23	137.74
On-farm participatory variety (Baby trails)							
Adi	65.0^{b}	162.1^{a}	10.5^{bc}	5.5^{a}	133.5^{b}	205.3^{c}	1973.8^{ab}
Bilalo	63.7^{c}	165.8^{a}	11.4^{ab}	5.0^{b}	128.7^{c}	190.2^{d}	2037.9^{ab}
Burkitu	64.8^{b}	159.4^{a}	10.3^{bc}	5.0^{b}	132.8^{b}	206.0^{bc}	1940.8^{ab}
Bursa	64.2^{c}	165.5^{a}	13.0^{a}	5.8^{a}	131.8^{b}	222.7^{a}	2539.6^{a}
Gume	65.0^{b}	156.7^{a}	11.0^{ab}	5.6^{a}	132.5^{b}	211.3^{b}	2115.0^{a}
L.check	66.8^{a}	152.2^{a}	8.4^{c}	4.7^{b}	137.3^{a}	147.0^{e}	1452.3^{b}
LSD	0.59	19.43	2.21	0.45	2.13	5.83	622.71

DF= days to flowering, PH= plant height,PP= pods per plant, SP= seeds per pod, DM= days to maturity, TSW= thousand seeds weight and GY= grain yield,

Table 5: Mean of farmers' perception and selection criteria for field pea varieties evaluated on two farmers' fields per three districts.

Variety	Farmers' criteria and perception									
	GH	DR	ER	SC	SS	Yld.	MR	SD	Mean	Rank
(a) Ambo District (Location I)										
Adi	2.45	2.90	2.70	3.10	2.20	2.75	2.15	2.40	2.58	5
Bilalo	1.30	1.25	1.80	1.40	1.40	1.20	1.61	1.45	1.43	1
Burkitu	1.52	1.60	1.80	1.34	1.33	1.35	1.54	1.55	1.50	2
Bursa	2.00	1.40	1.00	1.35	1.70	2.00	1.30	1.60	1.54	2
Gume	1.83	1.80	2.60	1.64	1.60	2.70	2.67	2.25	2.14	4
Local ch.	2.80	4.00	3.50	4.00	2.81	3.80	3.74	3.75	3.55	6
(b) Dandi District (Location II)										
Adi	2.58	3.39	2.80	2.80	2.10	2.86	2.15	2.80	2.69	5
Bilalo	1.40	1.20	1.60	1.38	1.80	1.26	1.61	1.53	1.47	1
Burkitu	1.58	1.60	1.76	1.37	1.33	1.58	1.56	1.62	1.55	2
Bursa	2.25	1.60	1.75	1.36	1.80	2.00	1.25	1.55	1.70	3
Gume	2.50	2.20	2.36	1.70	1.60	2.50	2.90	2.20	2.25	4
Local ch.	3.60	3.70	3.40	3.82	3.00	3.86	3.80	3.30	3.56	6
(c) Wonchi district (Location II)										
Adi	2.66	2.90	2.67	2.76	2.20	2.88	2.20	2.60	2.61	5
Bilalo	1.46	1.38	1.44	1.39	1.63	1.20	1.61	1.44	1.44	1
Burkitu	1.57	1.63	1.78	1.45	1.33	1.40	1.58	1.55	1.54	2
Bursa	2.25	1.33	1.10	1.45	1.66	2.00	1.30	1.57	1.58	3
Gume	2.00	2.00	2.73	2.00	1.63	2.30	2.60	2.25	2.19	4
Local ch.	3.45	3.65	3.26	4.00	3.00	4.00	3.80	3.40	3.57	6
Pooled Mean										
Adi	2.56	3.06	2.72	2.89	2.17	2.83	2.17	2.60	2.63	5
Bilalo	1.39	1.28	1.61	1.39	1.61	1.22	1.61	1.47	1.45	1
Burkitu	1.56	1.61	1.78	1.39	1.33	1.44	1.56	1.57	1.53	2
Bursa	2.17	1.44	1.28	1.39	1.72	2.00	1.28	1.57	1.61	3
Gume	2.11	2.00	2.56	1.78	1.61	2.50	2.72	2.23	2.19	4
Local ch.	3.28	3.78	3.39	3.94	2.94	3.89	3.78	3.48	3.56	6

GH=growth habit, DR=disease resistance, ER=earliness, SC=seed color, SS=seed size, Gld= yield, MR=marketability and SD=suitability for diet

Farmer's preference

Farmer's participatory variety evaluation and selection in the present study had diversified perception, but relatively similar selection criteria to accept and reject field pea variety, in which they mainly concentrated on about eight traits as their major selection criteria (Table 5) out of sixteen important traits considered in this PVS. The diversity of farmers' perception during selection is an indication of the complexity of users' preference, which directly and indirectly helps as strainer of real variety with desired traits. Similarly (Asrat 2008) reported that when there is more diversity in selection criteria, there is better chance of maintaining on farm diversity since positive traits are seldom found on single variety. Although, is it impossible to find single variety that fulfills all the characteristics farmers want (Dorp et al. 1993), the result from farmers' preference score analysis revealed "Bilalo" has got maximum farmers' preference with higher positive selection. The varieties Adi, Bursa, Gume were statistically found at below in term of mean preference, but Gume was received higher number of negative selections among improved varieties while farmer's variety was the least preferred variety with maximum number of negative vote (Table 6).

During farmer's preference score, each farmer was given two cards to vote for their preferential variety (green card for preferred varieties and red for non-preferred variety) to confirm the farmers' preferred varieties, little modified Sheikh et al (2017); the vote was made both for traits evaluated at field and after trashing. At the variety vote process for post-harvest traits, any information of each variety during field

evaluation is strictly secured to avoid a bias. Most of the farmers however had select the variety which they voted at field, whereas few of them inversely surprised by the traits of varieties after trashing, this implies that the accessibility of varieties with different suites of traits allows farmers to satisfy their multiple needs is very rare (Semagn et al. 2017). The number of positive vote and selection percentage were the major decisive criteria in retaining and rejecting the variety.

The mean preference score was analyzed from combined mean of six locations on the basis of traits specified by farmers, which little modification was made from the result reported by (Sheikh et al. 2017). Of six tested field pea varieties, three improved varieties such as Adi, Bursa and Gume, and one local variety were negatively preferred by farmers with less than 50% of selection percentage, while the two remain varieties Bilalo and Burkitu were positively preferred with more than 50% selection percentage, despite they varied in ranks. However, amongst the all varieties "Bilalo" variety was highly selected (about 83.33%) and ranked first by farmers at all farmers' fields with higher mean preference index (0.67) (Table 6). This variety was preferred by men farmers for its high yield performance and more attractive to market; while women consider the variety with good culinary traits such as easy to cook and good taste; Similar report also noted by (Asfaw et al. 2012).

The selection percentage was calculated from the number of participant positively select the variety (positive vote) divided by the total number of participant and multiplying by 100, when the non-selection percentage can be derived from number of negative vote divided to the total number of participant multiplying by 100, i.e.

Selection Percentage = $(\frac{No.\ of\ positive\ votes}{Total\ No.\ of\ votes})$ x 100.

The preferential ranking was also given for the varieties based on the values of preference score index and selection percentage derived from positive vote and negative vote using the given formula.

Table 6: Combined Mean of Farmers' preference score, selection percentage and preferential ranking of field pea varieties tested in baby trails at six different farmers' fields

Variety	Positive vote	Negative vote	Total	Preference score (Index)	Selection percentage (%)	Rank
Adi	6	12	18	-0.33	33.33	4
Bilalo	15	3	18	0.67	83.33	1
Burkitu	10	8	18	0.11	55.55	2
Bursa	8	10	18	-0.11	44.44	3
Gume	5	13	18	-0.44	27.78	5
Local check	1	17	18	-0.89	5.56	6

Table 7: Combined mean prevalence and severity of diseases on field pea varieties tested in baby trails at six different farmers' fields and in mother trial at on-station in %

	Powdery mildew		Downy mildew		Aphids	
Varieties	Incidence	Severity	Incidence	Severity	Incidence	Severity
Adi	58.3^{c}	21.7^{c}	18.3^{c}	6.0^{bc}	13.3^{bc}	6.7^{b}
Bilalo	36.3^{ab}	15.0^{ab}	10.3^{ab}	3.0^{ab}	5.0^{a}	1.7^{a}
Burkitu	34.3^{ab}	13.3^{a}	15.0^{bc}	5.0^{abc}	16.7^{cd}	6.7^{b}
Bursa	28.3^{a}	13.3^{a}	8.3^{ab}	3.3^{ab}	10.0^{b}	1.7^{a}
Gume	25.0^{a}	11.7^{a}	5.0^{a}	1.7^{a}	13.3^{bc}	5.0^{b}
Local check	39.7^{bc}	18.3^{bc}	16.7^{c}	8.3^{c}	20.0^{d}	11.7^{c}

CONCLUSION

The analyzed results of this study indicated that field pea variety in western shewa is greatly influenced by the low yielder and market; thus, farmers seek for varieties that give them a high yielding and marketing edge. Farmers preferred variety with good seed color and size which is attractive or marketable at a premium prices for income purpose, while yield and culinary qualities for consumption. Therefore, field pea variety with a combination of traits such as disease resistance/tolerance, early maturity, high yield, large seed size, white-yellowish color, and good taste have a higher likelihood of being accepted by farmers in the western shewa of Ethiopia. In general involving famers in research, specially, in crop breeding can improve variety development as the famers are capable of identifying superior lines that meet their specific

requirements within relatively short period and increase the chance of adoption of new varieties by other farmers in a community.

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Conflict of Interest

The author(s) would like to declare(s) that there are no conflicts of interest regarding the submission and publication of this article.

NB: The full work of this study is done and contributed sufficiently for the completion of the manuscript by single author.

Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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