International Journal of Plant Research 2019, 9(2): 19-22
DOI: 10.5923/j.plant.20190902.01

Participatory Variety Selection of Lentil (*Lens culinaris* M.) in Siltie and Hadiya Zones

Mukerem Elias*, Shimelis Mohammed

Southern Agricultural Research Institute, Worabe Agricultural Research Center, Worabe, Ethiopia

Abstract Participatory variety selection trial was conducted in two districts namely of Siltie zone Silti site and Hadiya zone Lemo site of Southern Ethiopia, during 2013/14 to 2014/15 main cropping seasons with the objective of obtaining high yielding Lentil varieties and selecting farmers preferred varieties. Seven improved and one local lentil varieties were used for the experiment. Randomized Complete Block Design with three replications was used for the experiments. According to the result days to 50% flowering, days to 90% maturity, plant height, number of pod per plant, thousand seed weight and grain yield showed highly significant variation and days to 90% maturity and number of primary branches per plant had showed significant variation among the varieties. Denbi, EL-142, Assano and Local varieties had showed higher yield performance across locations. Alemaya, EL-142 and Derashe varieties selected by farmers at Silti site whereas at Lemo site Local, Alemaya and Derashe were selected by the farmers.

Keywords Lentil, Participatory variety selection

1. Introduction

Lentil (*Lens culinaris* M.) is an invaluable source of protein for the vast majority of Ethiopian people. It also maintains soil fertility through symbiotic nitrogen-fixation in association with *Rhizobium leguminosarum* bv. V*iciae* [1]. Lentil is one of the highland crops widely grown in Ethiopia. It is largely produced in the highland and semi-highland regions of the country mainly on clay soil [2]. The Ethiopian Export Promotion Agency reports that improved varieties yield 1.4–5.0 t ha^{-1} on research fields and 0.9–3.0 t ha^{-1} on farmers' fields. Lentils are produced in the high altitude areas of Ethiopia. They are a winter crop, particularly important in Oromia and Amhara and also grown in parts of the SNNPR and

1400mm. The rainy season lasts from June to August. Temperature data obtained from Hosanna meteorology station shows that of 22.54℃. annualmean maximum temperature. Mean minimum annual temperature is 10.54℃. The size of this zone is 346958.5 hectares. From this 12.9% is *Qola* low altitude, 68.1% is *Woina-dega* and 19% is *Dega* or high altitude areas. Its average temperature range from 15.1-20℃, the average annual rainfall ranges from 1001-1200 mm and the elevation ranges from1501-2500 meters [5].

2.2. Methods

The experiment was conducted at two locations for two years. Randomized Complete Block Design four replications were used. Eight varieties were used for this experiment. These are Chalew, Checol, Adaa, Alemaya, Alemtena, Assano, Teshale and local varieties. The experiment was based on a total of 24 plots and each plots had the area of 2 m by 1.6 m; 3.2 m^2. The gap between the block was 1 m and the spacing between the plots 50 cm. The spacing between the raw and plant was used 20 cm and 2.5 cm respectively. 100 kg DAP per hectare was used. Farmers selected their own preferred varieties before and after harvesting at both locations. Twelve and ten farmers were participated in variety selection at Silti site and ten farmers at Lemo site respectively. Before harvesting they mainly considered the number of pod per plant and maturity days, and after harvesting they considered the yield productivity. These varieties were ranked based on these traits and gave 8 scores for the highest and 1 score for the lowest performed variety.

2.3. Data Collection

Days to 90% maturity and plant height were collected for two years at both locations. Grain yield was measured at both locations for two seasons. Days to 50% flowering, number of pod per plant, primary branch per plant and thousand seed weight were collected for a single year at each location. Day to flowering data was counted as the number of days after planting up to 50 percent of the plant gives the first flower. Day to maturity was counted as the number of days after planting up to 90 percent of the plant matured. Number of primary branches per plant and pod per plant were counted from four plants of each central row at harvesting stages. Plant height (cm) was measured the height of four randomly selected plants from the ground to the tip of the apex and their average used for analysis. The grain yield was measured by using the yield of four central rows then converted to yield per hectare. The thousand seed weight was also measured by using the randomly taken seed of each plot.

2.4. Statistical Data Analysis

Analysis of variance was done by using SAS (version 9.0) software package [7] based on the procedures of [8]. Varieties that showed significant difference were subjected to least significant difference (LSD) tested at 0.05 probability levels for mean separation.

3. Results and Discussion

The combined analyses of variance (Table 1) showed that highly significant deference at ($P<0.01$) for days to 50% flowering, days for 90% maturity, number of pod per plant, thousand seed weight and yield per hectare across location and significant variation at ($P<0.05$) for number of primary branches per plant. Plant heights had showed non-significant variation. This result agrees with the finding of [9] and [10] who reported significant difference among lentil genotypes for days to flowering, days to maturity, plant height and pod per plants, with [9] and [11] for grain yield and 100 seed weight of lentil genotypes.

Table 1. Mean square values of yield and yield components of lentil varieties across locations and years

Source of variation	Degree of freedom	Days to 90% maturity	Plant height	Grain yield
Year	1	104.17*	1177.40**	9925991.26**
location	1	73.50^{ns}	994.59**	395138.34^{ns}
Replication (location)	4	58.61	44.01	242137.99
Variety	7	96.30**	30.03^{ns}	494108.30**
location*Variety	7	35.29	11.44	40997.65
Year*Variety	7	41.19	22.69	100295.57
Year*location*Variety	7	28.85	440.29	154043.12

ns=non significant variation, * = significant variation at ($p < 0.05$) and ** = significant variation at ($p<0.01$).

Table 2. Mean square values of yield components of lentil varieties across locations

Source of variation	Degree of freedom	Days to 50% flowering	Pod per plant	Branch per plant	Thousand seed weight
Location	1	56.33**	67.21*	0.001^{ns}	0.05^{ns}
Replication (Location)	4	0.10	4.73	2.373	7.17
Variety	7	9.67**	72.71**	3.904*	267.50**
Location*Variety	7	0.67	41.33	0.262	15.26

Table 3. Average values of yield and yield related attributes of lentil varieties across locations and years

Varieties	Days to 90% maturity	Plant height	Grain yield
Alemaya	107.75[b]	39.33	1682.8[c]
Adaa	112.25[a]	40.48	1630.0[c]
EL-142	105.08[bc]	37.37	2127.9[a]
Derashe	104.42[bc]	38.80	1990.8[a]
Chekol	107.25[b]	37.25	1830.3[c]
Denbi	107.17[b]	40.33	2195.2[a]
Local	105.33[bc]	38.45	1976.2[a]
Assano	102.92[c]	35.93	2039.5[a]
LSD (5%)	3.79	3.81	274.10
CV (%)	4.36	12.19	17.35

Similar letter indicated there is no significant difference among varieties for that traits, different letter indicated there is significant difference among the varieties for that traits

Table 4. Average values of yield related attributes of lentil varieties across locations

Varieties	Days to 50% flowering	Number of pod per plant	Number of primary branch per plant	Thousand seed weight (g)
Alemaya	62.0[c]	20.70[ab]	6.43[ab]	26.7[de]
Adaa	65.0[a]	13.13[c]	5.07[c]	37.0[b]
EL-142	62.2[c]	24.07[a]	7.23[a]	23.8[e]
Derashe	62.0[c]	18.77[b]	6.50[ab]	28.7[cd]
Chekol	62.7[bc]	23.53[a]	5.07[c]	23.0[e]
Denbi	64.8[a]	21.23[ab]	6.13[ab]	25.2[de]
Local	62.0[c]	19.90[ab]	7.07[ab]	30.9[c]
Assano	63.3[b]	22.67[ab]	6.07[bc]	41.8[a]
LSD	285.5	4.22	1.15	2.4
CV	0.99	17.41	15.70	11.8

CV = Coefficient of variation, LSD = least significant difference.

Table 5. Farmer's selected lentil varieties at Silti and Lemo sites

	Silti					Lemo site				
Varieties	DM	PP	Yield	sum	Rank	DM	PP	Yield	sum	Rank
Alemaya	8	7	5	20	1	8	7	7	22	2
Adaa	5	4	2	11	4	2	5	2	9	5
EL-142	6	6	6	18	2	5	2	1	8	6
Derashe	7	8	3	18	2	6	6	6	18	3
Chekol	4	5	4	13	3	4	4	4	12	4
Denbi	2	1	8	11	4	3	3	3	9	5
Local	3	3	2	8	6	7	8	8	23	1
Assano	1	2	7	10	5	1	2	2	5	7

Mean performances of lentil varieties for selected traits.

Table 3 and 4 data revealed that, Adaa (65) and Denbi (64.8) varieties were late whereas local, Derashe, Alemaya and El-142 had showed early days to 50% flowering (62.0) for varieties for both locations. Adaa (112) and Assano (103) had showed late and early days to 90% maturity respectively. The highest thousand seed weight was (41.8 gram) for Assano variety whereas the lowest thousand seed weight was 23 gram EL-142 varieties. Number of pod per plant and primary branches per plant were highest for EL-142 (24.07). The lowest was observed for Adaa and Derashe varieties were lower branches per plant. The highest grain yield was 2.20 t ha^{-1}, 2.13 t ha^{-1} and 2.04 t ha^{-1} measured for Denbi, EL-142 and Assano varieties respectively. On the other hand, the lowest grain yield was 1.63 t ha^{-1} measured for Adaa variety. The yield performance of local variety was 1.98 t ha^{-1}.

Farmers selected lentil varieties at Silti and Lemo site.

Farmers were selected their own preferred varieties based on their criteria. Before harvesting they are mainly

considered the number of pod per plant and maturity days while after harvesting the considered the yield productivity. These varieties were ranked based on these traits. The highest value variety gave 8 score whereas the lowest variety gave 1 score. Based on these criteria Alemaya, EL-142 and Derashe varieties selected by farmers at Silti site whereas Local, Alemaya and Derashe were selected by the farmers at Lemo site.

4. Conclusions and Summary

Generally Denbi, EL-142, Assano and Local varieties were showed high yield as compared to other varieties across both location. Therefore these varieties must be distributed for the farmers through pre extension and demonstration for the study area to increase the production of lentil and farmer's income source. Alemaya and Derashe varieties were selected by farmers at both locations. In addition to these varieties at Silti site EL-142 and at Lemo Local varieties were selected by farmers. In addition to higher yielder EL-142 and Local varieties were selected by the farmers. Therefore, based on farmer's preference and combined analysis of variance result, Derashe, EL-142, Denbi must be recommended in addition to Local variety for these locations to increase their lentil production as well as income.

ACKNOWLEDGEMENTS

The authors would like to thank Southern Agricultural Research Institute Worabe Agricultural Research Centre for financial support; Debre ziet agricultural research center for providing these varieties. The woreda and kebele experts participated of each districts for provide the trial land for this experiment.

REFERENCES

[1] Jida M and Assefa F. Phenotypic and plant growth promoting characteristics of *Rhizobium leguminosarum bv. Viciae* from lentil growing areas of Ethiopia African journal of microbiology research 5(24), 4133-4142. DOI:10.5897/AJMR11.400.

[2] Ministry Of Agriculture and Rural Development Animal and Plant Health Regulatory Directorate Crop Variety Register Issue No. 12 June, 2009 Addis Ababa, Ethiopia.

[3] Kate Schneider & Professor Leigh Anderson, October 12, 2010, Yield Gap and Productivity Potential in Ethiopian Agriculture: Staple Grains & Pulses Evans School Policy Analysis and Research (EPAR) *of the Bill & Melinda Gates Foundation Professor Leigh Anderson, PI and Lead Faculty Associate Professor Mary Kay Gugerty, Lead Faculty* EPAR Brief No. 98.

[4] CSA (Central Statistical Agency) April, 2018. "Agricultural Sample Survey Statistical report volume I on area and production of major crops (private peasant holdings, *meher* season)," Addis Ababa, Ethiopia.

[5] Legbto Ahmed, September 2012. South nation nationalities and people regional government Siltie zone finance and economic development data collection and dissemination zonal statistical abstract.

[6] Hadya Zone Statistical Abstract. 2012. South nation nationalities and people regional government Hadya zone finance and economic development data collection and dissemination zonal statistical abstract. Hosanna God Son, Ethiopia.

[7] SAS Institute inc. 2002. SAS system for windows release 9.0. Cary, NC, USA.

[8] Gomez, K.A., Gomez, A.A. 1984. Statistical Procedure for Agricultural Research 2nd Edition. John Wiley and Sons, New York.

[9] Mekonnen, Fikru, Firew Mekbib, Shiv Kumar, Seid Ahmed, and T. R. Sharma. 2014 "Phenotypic variability and characteristics of lentil (Lens culinaris Medik.) germplasm of Ethiopia by multivariate analysis." *Journal of agricultural and Crop Research* 2, no. 6: 104-116.

[10] Bogale, D.A., Mekbib, F. and Fikre, A., 2015. Genetic improvement of lentil (Lens culinaris Medikus) between 1980 and 2010 in Ethiopia. *Malaysian Journal of Medical and Biological Research*, *2*, pp.284-292.

[11] Dugassa, A., Legesse, H. and Geleta, N., 2015. Genetic Variability, Yield and Yield Associations of Lentil (Lens culinaris Medic.) Genotypes Grown at Gitilo Najo, Western Ethiopia. *Science, Technology and Arts Research Journal*, *3*(4), pp.10-18.