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Evaluation and adaptability study of desi type Chickpea (*Cicerarietinum* L.) varieties at hirna districts of west harerghea zone, Eastern Ethiopia

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ABSTRACT

Aim: The study was aimed to evaluate the yield performance and adaptability among released Desi type chickpea varieties for the target area.
Materials and Methods: The experiment was conducted under rain fed condition at Chiro National sorghum research and training center at Hirna research site during the year of 2019 main cropping season. The varieties were laid out in a randomized complete block design with three replications. Data were recorded on days to flowering, days to maturity, plant height, number of pods per plant, hundred seed weight and grain yield.
Results: The analysis showed significant difference for the varieties, implying that there was best fit cultivar the studied location. Accordingly, Akaki , DZ-10-11 and Fetenech Desi type chickpea varieties were top three high grain yield scorers.
Conclusion: It was concluded that Desi type chickpea varieties were top three highgrain yield scorers and could be promoted and recommended for Hirna and similar agro ecological zones of the western Hararghe of Eastern Ethiopia.

Keywords: Desi Chickpea, Adaptation, Grain yield, Variety.

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Introduction

Chickpea is one of the most important cool season food grain legumes in the world after common bean (*Phaseolus vulgaris* L.) and field pea (*Pisum sativum* L.) (Muehlbauer and Sarker, 2017). It is annual, self-pollinated and diploid species with 2n=2x=16 chromosomes (Van der Maesen, 1987). Chickpea is high in fiber, low in sodium and fat, and also cholesterol free. It is a healthy food that is beneficial to the prevention of coronary and cardiovascular diseases (Yadav *et al*., 2007). Grain legumes have high potential as novel ingredients for the nutritional quality improvement of foods due to their high protein and fiber content, gluten-free status (identified as one of the fastest growing new product trends), low glycemic index, antioxidant potential, as well as functional properties like water binding capacity and fat absorption (Watts, 2011).

According to these authors, it may also lower blood cholesterol levels due to high content of soluble fiber and vegetable protein. Chickpea is one of the top competitive enterprise both for local and export marketing, among different categories of crops viz., coffee, oil crops, cereals, legumes, vegetables, fruits, stimulants, fiber crops of some 100 commercialized species in the country(Asnake and Dagnachewu, 2020). It also plays a significant role in maintaining soil fertility, can be grown as a second crop using residual moisture, used as animal feed, as fuel and source of cash (Legese *et al*., 2005).

Chickpea is widely grown in different agro-ecological zones falling between 1400 to 2300m above sea level where the mean annual rainfall ranges from 700 to 2000mm (Geletu and Million, 1996). The major chickpea growing regions include Amhara (Gondar, Gojam, Wello, and North Shewa Zones) and Oromia (East, West, and Northwest Shewa, and Arsi Zones) which account for 49 % and 47 % of the total chickpea production, respectively, while the contribution of Tigray and SNNP is about 2%(CSA, 2015a).

So far, the national and regional research institutions in the country have been released13desi chickpea varieties adaptable to a wide range of environment for commercial production. The new chickpea varieties have comparative advantages in terms of earliness, Aschochyta blight tolerance, seed size, grain yield, suitability for mechanization and rust resistance among others (Asnake *et al*., 2018). The improved varieties have high yield potential of four to five folds of the local cultivars. These varieties do not only excel the local varieties by their yield potential but also have larger seed size (Legesse *et al*., 2005a).

The potential of desi chickpea is not exploited in this part of the zone due to lack of improved varieties, poor management practice, biotic and abiotic factors. Even though, chickpea is the most important growing pulse crop in Ethiopia and is adapted to a wide range of agro ecological conditions, the access of this technology is highly limited at Hirna, western Hararghe Zone of Oromia. Therefore, the objective of this study was to evaluate the yield performance and adaptability among released desi varieties for the target area.

Materials and Methods

Description of the Study Areas

A field experiment was conducted under rain fed condition at Chiro National sorghum research and training center at Hirna site during the year of 2019 main cropping season. Hirna is Located in the West Hararghea Zone, it has a latitude of 9°13′N and longitude of 41°06′E at an altitude of 1763 meters above sea level. The area is characterized by annual minimum and maximum temperatures of 12 and 23^{o}c, respectively and receives 9800mm average annual rainfall with soil type of black vertisols class.

*Experimental Materials and Design***:**

The experiment consisted of thirteen desi type chickpea varieties (Table 1) released since 1974 by the Federal and regional Agricultural research centers of Ethiopia. The experiment was planted in a Randomized Complete Block Design (RCBD) with three replications on a plot size of 4 rows each 4m long and 1.2m wide (4.8m^2) with spacing of 30cm between rows, 10cm between plants and 1m between blocks was used. Data were recorded on: days to flowering, days to maturity, plant height, number of pods per plant, hundred seed weight and grain yield.

Statistical Analysis

All measured parameters were subjected to analysis of variance (ANOVA) using PROC GLM of SAS software version 9.0 to assess the difference among the tested varieties. Mean separation was carried out using Least Significant Difference (LSD) Test.

Results and Discussion

Analysis of variance:

Analyses of variance have been done for grain yield and other agronomic traits; days to 50% flowering, days to 95% maturity, plant height, number of pod per plant and hundred seed weight (Table 1). The data available revealed that differences among varieties were significant for grain yield (($p < 0.01$), days to maturity($p< 0.01$), plant height, number of pods per plant, hundred seed weight. These findings are in agreement with Ines C. Gonzales and Fernando R. Gonzales (2014) who reported considerable variation in the grain yield, number of pod, hundred seed weight and plant height of different chick pea varieties. The days to flowering showed no significant differences among the varieties

Grain Yield Performance of Desi Chickpea varieties

The mean grain yield ranged from 449.49 kgha^{-1} to 1609.3 kgha^{-1} . Akaki andDZ-10-11were recorded as high yielding varieties and also there was no much significant yield differences between them. Fetenech, Natoli and Worku recorded the next high grain yielder varieties at thestudied site. Minimum grain yield was obtained from Dalota and Dubie. Yasin and Mathios (2016) reported the oldest varieties of Akaki and worku were superior in yield overall to the standard and local check. Therefore, the result indicates that the superior varieties Akaki and DZ-10-11 showed chance of wider dissemination to the farmers in the study area.

Days to flowering ranged from 49.67 days to 51.67days.All genotypes were matured between 148.33 day and 155 days. Plant height ranged from 39.67 cm to 48 cm. These results are in line with Bicer B. Tuba, Yilmaz Abdurahim, 2013 revealed that, in 37 chick peas germplasm at Diy Arbaki, Turkey days to flowering ranged from 57 to 73 days and days to maturity varied from 97 to 105 days. He also noted that plant height varied from 27 to 39cm. The mean number of pod per plant ranged from 41.33 to 74.33.Another yield component measured was hundred seed weight. The varietal effect on the hundred seed weight

was significance, which ranged from 14.33gm to 28.6gm

Table 1. Mean values of different traits of Desi chick pea varieties at Hirna station in 2019 cropping season

Variety	DF	DM	NPPP	PH	HSW	GY
DZ-10-11	51.00	154.67	65.33	39.67	14.83	**1529.46**
Minjar	50.33	148.33	47.00	41.00	20.10	733.02
dalota	50.33	150.33	46.33	44.00	28.33	449.39
Teketay	49.67	148.33	48.67	48.00	26.77	572.11
Dimtu	51.67	154.67	49.67	41.33	28.63	563.66
Dubie	50.33	151.33	42.67	42.50	21.40	519.37
Mariye	50.67	152.00	41.33	46.67	19.40	528.91
Worku	51.00	152.00	61.33	47.50	21.10	**851.90**
Akaki	51.33	153.00	74.33	42.33	25.43	**1609.52**
Kutaye	51.33	154.67	46.67	41.50	20.63	595.28
Mastewal	50.67	151.33	62.33	40.00	22.73	685.85
Fetenech	51.00	152.67	46.33	47.00	21.83	**1008.48**
Natoli	51.33	155.00	48.00	44.00	24.93	**936.70**
Grand Mean	**50.82**	**152.18**	**52.31**	**43.14**	**22.78**	**814.13**
CV	*2.46*	*2.05*	*17.4*	*9.26*	*18.89*	***14.57***
LSD (0.05)	*2.1*	*5.26*	*15.3*	*6.72*	*7.24*	***199.48***
F-test	***NS***	***	**	*	*	***

**, *, ns= Significant at P < 0.01, significant at P < 0.05 and non-significant respectively

DF= days to flowering, DM=days to physiological maturity, PTH= plant height (cm), NPPP= number of pods per plant, HSW= hundred seed weight (gm) and GY= grain yield (Kg ha^{-1}).

Conclusion

It was concluded that a significant difference among the varieties for grain yield, days to maturity, plant height, number of pods per plant and hundred seed weight implying. Each of the tested variety has different performance for different characters as well as Grain yield. Accordingly, Akaki ,DZ-10-11 and Fetenech Desi type chickpea varieties were top three highgrain yield scorers and could be promoted and recommended for Hirna and similar agro ecological zones of the western Hararghe of Eastern Ethiopia.

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