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Research Article

Assess Farmer's Skills on Chickpea (*Cicer arietinum* (L.) Seed Qualities and its Components in East showa Zone, Ethiopia

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ABSTRACT

In Ethiopia, chickpea is an important grain legume next to faba bean and common bean both in terms of area coverage and production. It is mainly grown as a source of food protein, income generation, and soil fertility restoration and used for animal feed. Quality seed production and associated technologies could be mentioned among the major challenges that limit chickpea production and productivity in Ethiopia. This study was therefore conducted to investigate the experiences and perception of farmers regarding chickpea seed quality. Two representative districts (Ada and Lume) were systematically selected from the major chickpea growing area. 84 seed producers were randomly selected from the districts and interviewed to gather information on perception and experience of chickpea seed production systems. The survey result indicated high adoption rate for improved chickpea varieties in the study areas. Arerti and Habru were among the dominant and widely grown chickpea varieties in the districts. Half of the farmers in the study area experienced that seed quality test are mandatory process in the seed production systems.In the study area, disease is as a major challenge for chickpea seed production so; the seed regulatory unit should consider future work associated to seed health.

Key words: Chickpea, Farmers, Quality seed, Physical Purity, Seed Health

INTRODUCTION

Chickpea is the world's second most important grain legume after common bean (*Phaseolus vulgaris* L.) (Guar *et al*., 2012). It is an important source of human food and animal feed, and traditionally grown in many parts of the world). It is readily available source of protein (19%), carbohydrates (60%), and minerals (phosphorus, calcium, and iron) (Ibrikci *et al*., 2003). Chickpea returns a significant amount of residue nitrogen to the soil and adds organic matter and fertility (Pande *et al*., 2005). It is used in crop rotation with cereals like *Tef* or wheat on heavy soils (Geletu and. Anbessa, 1996) in Ethiopia. Chickpea the major pulse crop in the world with a total production of 12.33 million tons from 12.90 million ha (FAO, 2015).

Ethiopia is considered as a secondary center of genetic diversity for chickpea (*Cicer arietinum)*, is found in Tigray region of Ethiopia (Yadeta and Geletu, 2002; Kanouni *et al*., 2011). Ethiopia shares 2% among the most chickpea producing countries next to India (64%), Turkey (8%) and Pakistan (7%) (ICRISAT, 2004). It is among the most important pulse crops grown in Ethiopia dominantly in crop-livestock based farming systems of the Central, North and Northwest highlands of Ethiopia where Vertisols are dominating. From 1,652,844.19 hectares of land allocated for pulse in 2015/2016 production season, chickpea covered 258,486.29 (15.6%) hectares of land with 472,611.388tons (19%) of grain production with the productivity of 1.83 t/ha (CSA, 2016).

On average chickpea yield in Ethiopia on farmers field is usually below 1.9 t/ha, although its potential is more than 5 t/ha (CSA, 2016). Several numbers of biotic and a biotic factor are responsible for its low yield like traditional local cultivar, seed borne diseases and low population density of plants (Melese, 2005).Although chickpeas are reported to be susceptible to more than 50 pathogens, few diseases *Ascochyta rabei*, *Fusarium Oxysporum* and *Rhizoctonia solani* are major recognized as significant economic constraints to chickpea production.

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The use of high yielding, disease and pest resistant and a biotic stress tolerant variety, coupled with improved crop management practices, is indispensible for increasing chickpea productivity and production. In line with study Amare *et al.,* (2014) suggested that farmers' seed management practices required to be improved to reduce incidence of disease causing micro-organisms and seed infection, and thereby to enhance seed planting value and productivity. However, the genetic potential of improved varieties is realized only if quality seeds of the varieties are used. Seed quality includes genetic purity as well as aspects of physical and physiological parameters such as seed physical purity, moisture content, viability, germination, seed vigor, etc., and seed health. These seed quality parameters are liable to deterioration due to various factors if standard conditions are not maintained along the seed value chain.

Seed deterioration is a serious problem in developing countries where seeds are usually stored in places without a proper control of humidity and temperature. Temperature and seed moisture content (and/or relative humidity) are the main factors influencing seed deterioration and viability loss in storage (Abbas *et al*., 2004). Low temperature and humidity result in delayed seed deteriorative process and aging there by leads to extended viability period. Seed ageing is generally marked by reduction in vigor (Gupta and Aneja, 2004), viability, rate and capacity of germination (Arefi and Abdi, 2003), increased solute leakage (Basra *et al*., 2003) and susceptibility to stresses and reduced tolerance to storage under adverse conditions. High seed vigor, *i.e.*, rapid, uniform and complete emergence of vigorous seedling, leads to high grain yield potential of crop, by enhancing the establishment of optimum canopy structure that minimizes interplant competition and maximizes crop yield. Rapid emergence provides the plants temporal and spatial advantages to compete with weeds (Soltani *et al*., 2001).

A number of factors genetic and environmental factors affect the quality of seeds at different developmental stage of the crops occurred during planting, harvesting, threshing, cleaning, and storage. Therefore, seed quality assessments in the major growing areas are very important to determine the planting value of seed produced in the study area. However, the quality standards of seed production management by the different seed producer are not studied well in Ethiopia. Therefore, this study was initiated with the following objectives, to investigate the experiences and perception of farmers regarding seed quality and its components.

MATERIALS AND METHODS

Description of the study area

The survey for assessing the skills of farmers regarding seed quality and its components was conducted in Ada and Lume districts, in the east Showa zone of Oromia region. The East Showa Zone is located in the middle of Oromia, connecting the western regions to the eastern ones. The two districts (Ada and Lume) range in altitude from 1500 to 2300 meters above sea level, except small areas with over 2300 in altitude. A survey of the land in these districts shows that 54.3% is arable, 3% pasture, 2% forest, and the remaining 20% is considered degraded or otherwise unusable.

Household Sampling

The sample farmers for the survey study were chosen from four kebeles of Ada and Lume districts (Denekaka, Gechegarabobo, Dekebora and Nanewa). East Showa zone was intentionally selected due to early introduction and expansion of improved chickpea varieties. Four kebeles, two from each district were selected systematically based on previous chickpea production potentials and 46 households from Lume and 34 from Ada Districts were randomly selected to represent the population. The rationale behind the decision to use random sampling system was to provide equal opportunity for each farmer in the districts. The following formula was used to determine the sample sizes for the study (Glenn, 2009).

$$\mathbf{n} = \frac{x^2 pq}{e^2}$$

Where, n= sample size, x= sample standard deviation, e= level of precision (10%), p= the 50% proportion of population who responded agreement while q is the 50% proportion of population who responded disagreement. Accordingly, from a total of 84 interviewed farmers, four were rejected due of lack of consistencies and clarity. Therefore, based on the above formula, the sample was calculated as follows:

$n = 1.96^{2}/0.05^{2} \times 0.5\ (1- 0.5)$
$n = 3.84/0.015 \times 0.5\ (0.5)$
$n= 84$

Method of data collection

Primary data

This study relied on primary data, which was collected from well-structured questionnaire and seed laboratory test. The questionnaire was adapted from literature and previous studies. To enhance its quality, the questionnaire was examined by area expertise and was tested using Cronbach's alpha. Primary data were collected from 84 Farmers seed sources in order to obtain relevant, reliable and sufficient information.

Secondary data

Secondary data were collected published articles unpublished project documents, websites and different reports.

Method of Data analysis

The process of survey data analysis involved several stages. Questionnaires were edited for completeness and consistency followed by data cleaning and explanation. The data was then coded and checked for any errors and omissions. The Statistical Package for Social Science (SPSS) Version 21 was used to analyze the collected survey using both descriptive and inferential statistics were used.

RESULTS AND DISCUSSION

Response rate

All the 84 questionnaires dispatched to the respondent farmers were filled and returned, which represented 100% response rate. Mugenda and Mugenda (2003) observed that a 50 percent response rate is adequate, 60 percent and above is very good. This implies that the response rate in this study was very good. These responses were examined for accuracy, four questionnaires were rejected during the

data examination process due to inconsistencies, and clarity and the remaining 80 response (95%) were considered for analysis.

Backgrounds of the respondent

In this study data from interviewed were collected through enumerator-administered questionnaire. The background information sought comprised of region, districts, Kebeles, sex of respondent, age of respondent, education status**,** and number of years spent in seed production

The composition of the respondents by sex revealed that the majority of farmers seed producers (92.45) were males while (7.5%) of the respondents were females. The sample peasant associations were Denekaka, Geche garababo, Dekebora and Nanewa, the first two kebeles were from Ada district and remaining two kebeles were form Lume district (Table 2). In terms of educational status, 76.2% of respondents can at least read and write and remaining 23.8% were illiterate. This information shows that the respondents were relatively able to articulate and contribute to the issues under study.

Table 1: Demographic profile of respondents

Description		Frequency	Percent	Cumulative Percent
Kebele	Denekaka	12	15.0	15.0
	Gechegaraabo	22	27.5	42.5
	Dekebora	16	20.0	62.5
	Nanewa	30	37.5	100.0
Gender of household	Female	6	7.5	7.5
	Male	74	92.5	100
Educational status	Illiterate	19	23.75	23.75
	Read and write	14	17.5	41.25
	Elementary	23	28.75	70
	Secondary	17	21.25	91.25
	High school	6	7.5	98.75
	Above 12	1	1.25	100

Relative importance of major crops grown in the study area

Chickpea is the second most important crop grown after *tef* in the districts during 2016/2017 cropping season. The average size of land allocated for *tef*, Chickpea, wheat, lentil and faba bean were 46%, 24%, 20%, 8%, and 2%, respectively. During the same period, the unit price of chickpea was higher than other common crops grown in the study areas (Figure 1).

Chickpea coverage and varietal preference

The survey result revealed that out of all area allocated for chickpea almost all (98.03%) was covered by improved chickpea varieties while the remaining 1.97% was covered by local varieties (Figure 2). This implies that the adoption rate of improved chickpea varieties in the study areas is very high.

The technological adaptation of the area can also be confirmed from the highest yield gain (2885 kg/ha) of the zone (CSA, 2015). Then, it is rewarding for the research and development investment as production benefit is obviously attractive, like more than 60000 birr per hectare.

Among improved chickpea varieties, Arerti was the dominant and most preferred variety that is widely grown by almost all respondents (Figure 3), both in Ada and Lume districts. Habru ranked second with a share of (93%) followed by Ejere (64%) and Natoli (11%). The preference was based, among other things on better yield and good price in the local market.

Farmers' perception on chickpea seed related treat in the study area

Rating was done to determine the chickpea seed most preferred by the farmers. These included seed quality, marketability, disease resistance, high yielder and better food quality. The result indicated that yield (98.8%); disease resistance (97.5%) and marketability (96.3%) were among the most important traits considered by producers (Table 3).

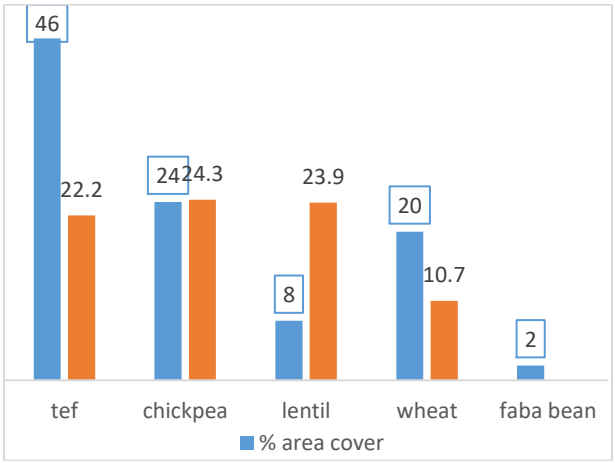

Fig. 1: Comparison of area covered by crops (percentage), and unit price (birr/kg) for each of the crops grown in the study area.

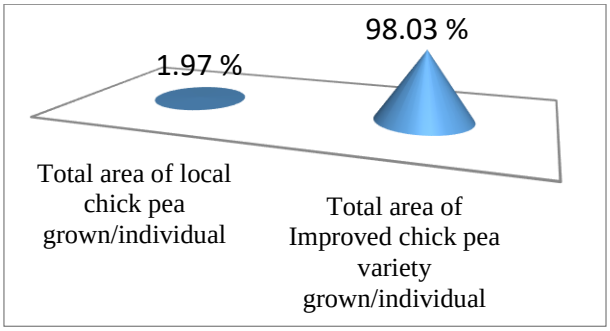

Fig. 2: Comparison of local and improved chickpea usage in the study area

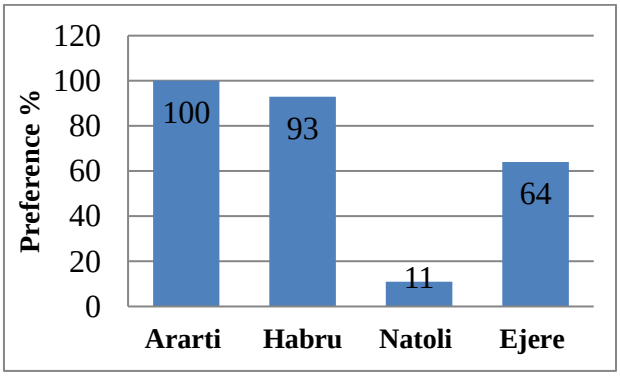

Fig. 3: Types of improved chickpea variety grown in the study areas.

Table 2: Farmers' preferences (percentage) for chickpea trait in the study area

Preference criteria for chickpea varieties	Response	Frequency	Percent
Better seed quality	Yes	27	33.8
	No	53	66.3
	Total	80	100.0
Disease resistance	Yes	78	97.5
	No	2	2.5
	Total	80	100.0
High yield	yes	79	98.8
	no	1	1.3
	Total	80	100.0
Better food quality	yes	7	8.8
	no	73	91.3
	Total	80	100.0
Marketability	yes	77	96.3
	no	3	3.8
	Total	80	100.0

Rouging practices

Farmers were required to indicate the number of rouging practices for chickpea seed production. The results revealed that most farmers (62.5%) were undertaking rouging practice twice per season, 36.3% of them once and remaining 1.3% experienced 3 times rouging (Table 3). The result indicated that rouging was a common practice, but with varied frequency. Therefore, it appears that rouging practice contribute to improved seed purity by removing undesirable source of contaminants.

Table 3: Frequency of rouging by farmers during seed production

	No. of rouging	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	29	36.3	36.3	36.3
	2.00	50	62.5	62.5	98.8
	3.00	1	1.3	1.3	100.0

Chickpea field inspection practices

Most of respondents (96.3%) reported that their field was inspected by certification agency at least once in the season. The result further indicated that (72.5%) of the respondents reported that their field was inspected at flowering and maturity stage (Figure 4). Only 7.5% respondents indicated that the inspection was done at flowering stage. Seed producing farmers were organized to maintain and evaluate the quality of chickpea at farm level by forming internal committee from their association.

Farmer seed testing practice

The quality of the seed should be assessed before marketing. In the study area, most of seed producers (73.8%) provide their product to seed regulatory bodies for seed certification. Only 26.3% (Table 5) of the respondents verified that their seeds did not provide their product for seed quality test and certification. Only seed purity, germination and moisture content were considered as seed quality parameters by seed regulatory bodies. However, seed health is one of the most important quality parameters that have to be considered by seed regulatory body of Ethiopia. In line with this, Hampton, (2002) reported that over 80 to 90% of seeds are tested based on physical and physiological seed quality parameters. According to (Dereje *et al*., 2008) quality seed production should be made in pest free areas where effective pest managements are practiced. He also suggested that regular field inspection and seed health test should be included in the seed inspection and certification system of Ethiopia.

Seed packing and labeling

The primary role of packing is to contain, protect and preserve seed from quality deterioration. Like packaging, labeling should also be done with extra care. The result in (Table 5) shows that the majority of respondents (67.5%) in the study areas did not consider seed packaging and labeling as mandatory seed regulatory procedure. Lack of knowledge, access to inputs, and affordability and marketing structure were among the major reason for not packing and labeling. Farmers in the study area should be awarded about the advantages of seed packaging and labeling through training and experience sharing.

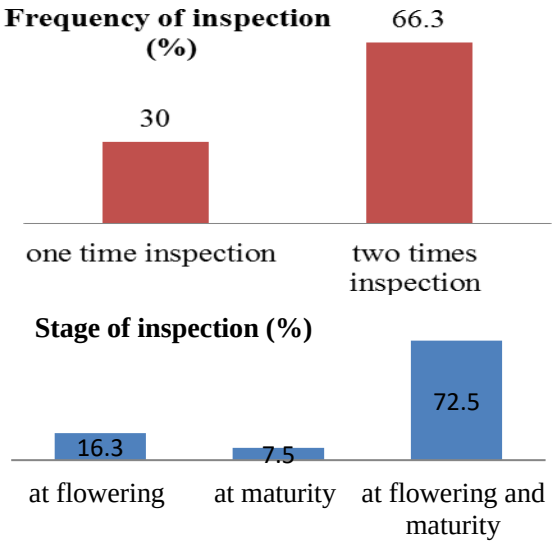

Fig. 4: Field inspected by certification agency.

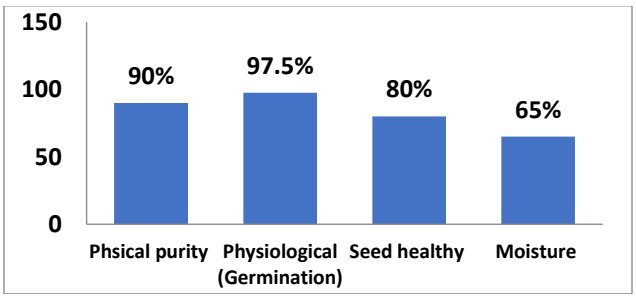

Fig. 5: Percentage of farmers' quality dimensions preference

Table 4: Percent of seed producers who used seed certification service

Seed certification	Frequency	Percent	Cumulative Percent
Used seed certification service	59	73.8	42.5
Did not use seed certification service	21	26.3	100.0
Total	80	100.0	

Table 5: Chick pea seed packed and labeled

Response	Frequency	Percent	Cumulative Percent
Packaged and labeled	26	32.5	32.5
Not packaged and labeled	54	67.5	100.0
Total	80	100.0	

Table 6: Major Challenges of quality chickpea seed production

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Lack of quality seed and fungicide, pesticides	16	20.0	20.0	20.0
	disease and pest	15	18.8	18.8	38.8
	lack of market information and training	2	2.5	2.5	41.3
	both	47	58.8	58.8	100.0
	Total	80	100.0	100.0	

Farmer perceptions on chickpea quality parameters

Quality test such as physical purity, physiological parameters and associated diseases are some of the mechanisms to measure the quality standard of seed from any sources. In this study, farmers rated the importance of these quality parameters in chickpea seed production (Figure 5). Seed germination was mentioned as the most important quality parameter by 97.5% of the respondents followed by physical purity, which was mention as most important by 90% of the respondents. Moisture content of the seed was the least considered parameter by the respondent.

Major Challenges to Chick pea Seed Production

The result of the study showed that lack of quality seed, unavailability of chemicals to control diseases and pest, information and training were among the major constraints mentioned by seed producers in the study area. Accordingly, 47 % of the respondents confirmed all the lists of the challenges described in the checklist. Besides these, 16 and 15 % of the respondents indicated that low quality of chickpea seed and ineffective fungicides, insecticides, and unavailability of chemicals were among the major concerns in the study area respectively (Table 6). Lack of market information and training opportunity were among the least priority challenges in the study area that needs attention for quality seed production.

Conclusion

In Ethiopia, lack of quality seed production and associated technologies could be mentioned among the major challenges that limit chickpea production and productivity in Ethiopia. This study was therefore conducted to investigate the experiences and perception of farmers regarding quality seed management, production inspection, seed certification and challenges of chickpea seed production components.

The survey result revealed that almost all (98.03%) respondents used improved chickpea varieties while the remaining 1.97% was still relied on local varieties indicating high adoption rate for improved chickpea varieties in the study areas. It was also indicated that Arerti, Habru, Natoli and Ejere were among the dominant and widely grown chickpea varieties in the districts. High yield (98.8%), followed by disease resistance (97.5%) and marketability (96.3%) were the predominant chickpea quality parameters considered by seed producers in the study area. In general, about 45 % of the farmers in the study area experienced that seed quality test is mandatory process in the seed production systems and some 47 % of the respondent indicated lack of quality, unavailability of fungicides and insecticides to control diseases and pests, inadequate information and training were among the major challenges to chickpea seed production. Farmers rated seed health quality parameters next to germination and physical purity, but disease is as a major challenge for chickpea seed production in the area and this implies that farmers scarce the important of seed health test. Seed health is one of the most important seed quality parameters that ignored by seed regulatory system highly needs focused. As a recommendation, future work associated to seed health test and seed certification system should be assessed in the seed regulatory system of Ethiopia.

REFERENCES

Abbas Biaban, Lynne Carpenter Boggs, and Hosein Saboury, 2004. Effects of seed deterioration and inoculation with Mesorhizobium Ciceri on chickpea plant performance under laboratory conditions, Scientific Papers. Series A. Agronomy, Vol. LVII.

Amare Kebede, Mashilla Dejene, V Alex Albert and Firew Mekbib, 2014. Saved barley (Hordeum vulgare) seed quality in midaltitudes and high-lands of Southern Ethiopia African Journal of Agricultural Research Vol. 9: 448-454.

Arefi HM and N Abdi, 2003. Study of variation and seed deterioration of Festucaovina germplasm in natural resources gene bank. Iranian J. Rangelands and Forests Plant Breeding and Genetic Res, 11: 105-125.

Basra MAS, EA Ehsanullah, MA Warraich and l Afza, 2003. Effect of storage on growth and yield of primed canola (Brassica napus) seeds I. Intl. J. Agric. Biol, 5:117-120.

CSA (Central Statistical Agency), 2016. Agricultural sample survey report on area and production of crops private peasant holdings, meher season. Addis Ababa, Ethiopia.

FAO, 2015. FAOSTAT Statistical Database of the United Nation Food and Agriculture Organization (FAO) Statistical Division. Rome. Available at: http://faostat.fao.org/site/Accessed Jan 2016.

DerejeGorfu and S Sangchote, 2008. Prevalence of Ascochytapinodes on field pea seed produced in central Ethiopia and its relation to seedling infection. PMJOE, 12: 9-17

Geletu B and Y Anbessa, 1996. Breeding chickpea for resistance to drought. International symposium on pulse research, April 2-6. New Delhi, India, pp: 145-146

Glenn A. Bowen, (2009). Document analysis as qualitative research methods. Qualitative Res J, 9: 27-40

Guar PM, AK Jukanti, and RK varshney, 2012 Impact of genomic technologies on chickpea breeding strategies, Agronomy, 2: 199-221.

Gupta A and KR Aneja, 2004. Seed deterioration in soybean varieties during storage-physiological attributes. Seed Research, 32: 26-32.

Hampton G, 2002. What is seed quality? Seed Science and Technology, 30: 1–10.

Ibrikci H, S Knewtson and MA Grusak, 2003. Chickpea leaves as vege green for humans: Evolution of mineral composition. J Sci Food Agric, 83:945-950.

ICRISAT, 2004. Area production and productivity of Chickpea (*Cicerarietinum* L.). Patancheru, Hyderabad India pp31-35

Kanouni H, A Taleei, M Okhovat, 2011. Ascochyta blight (Ascochytarabiei (Pass.) Lab.) of chickpea (*Cicerarietinum* L.): Breeding strategies for resistance. International Journal of Plant Breeding and Genetics, 5(1): 1-22

Melese D, 2005. Morphological and RAPD marker variation analysis in some drought tolerant and susceptible chickpea (Cicer arietinumL.) genotypes of Ethiopia. M.Sc Thesis, Addis Ababa University, Ethiopia 2-5.

Mugenda, OM and AG Mugenda, 2003. Research methods: quantitative and qualitative approaches. Nairobi: African Centre for Technology Studies

Pande S, KM Siddique, GK Kishore, B Bayaa, PM Gaur, CLL Gowda, TW Bretaga and JH Crouch, 2005. Ascochyta blight of chickpea (Cicerarietinium L.): a review of biology, pathogenicity and disease management. Australian Journal of Agricultural Research, 56: pp1-4.

Soltani A, E Zeinali, S Galeshi and N Latifi, 2001. Genetic variation for and interrelationships among seed vigor traits in wheat from the Caspian Sea Coast of Iran. Seed Sci. Technol, 29: 653-662.

Yadeta A and B Geletu, 2002. Evaluation of Ethiopian chickpea landraces for tolerance to drought. Genetic Resources and Crop Evolution, 49:557-564.