

Report on Capacity Strengthening efforts for better technology generation, promotion and dissemination of food-feed traits of chickpea

2019



Introduction

The field day on participatory varietal selection of chickpea varieties for food-feed traits was undertaken on December 23, 2019 at Adadi Bole *Kebele* in Chefe Donsa. Chefe Donsa (08° 57'N 39° 06'E) is the administrative center of Gimbichu district in East Shewa zone of Oromia Regional State, located 35 km east of Debre Zeit and about 40 km Northeast from Addis Ababa in the Central Highlands at an altitude of 2450 m.a.s.l and annual rainfall of 843mm.

Chickpea is an important food and cash crop for many households in wheat-based cropping systems of the Ethiopian Highlands, specifically in 3 regions, namely Amhara, Oromia and Tigray. Chickpea haulm (straw) is the main by-product produced after threshing of chickpea grain which contains more nutritive value (more protein and metabolizable energy) and lower neutral detergent fiber (NDF) than most cereal straws. The field day was organized to identify farmer preferred varieties and lines of chickpea with a focus on livestock feed. This field day is part of a larger study that seeks to determine how the preferred traits of farmers for chickpea varieties relate to the feed nutritive quality of the varieties. Specifically, the field day sort to identify farmer preferred varieties for livestock feed and to identify farmer preferred traits of chickpea varieties in relation to livestock feed.

The existence of wide ranges among genotypes of chickpea for grain and straw yields and straw nutritive traits is promising for selection of genotypes with superior food-feed traits (Wamatu et al., 2017). The weak relationship between grain and straw traits implies the independent improvement of both food and feed traits. There is promise to the possibility for simultaneous improvement of grain yield and straw traits to address the high demand existing for dual-purpose, food-feed type of chickpea genotypes in mixed crop-livestock farming systems. Chickpea genotypes which have these dual-purpose traits have been identified for Ethiopia, however, breeding programs still do not consider straw traits as criteria either for varietal evaluation or for release of new genotypes.

Participants of the field day included 102 farmers (31 females, 71 male), development agents and NARS researchers from DebreZeit Centre and Debre Birhan Research Center. The farmers are part of a larger group of 150 farmers who are participating in on-farm trials. It was intended for chickpea breeders from the NARS to hear directly from farmers the traits they consider for feed value. Participatory varietal selection meetings have previously focused only on food traits.

Table 1: Participants at the Field day and farmers in on-farm trials

Kebele/Institution	On farm trials		Field day Participants			
	Farmers		Farmers		Development agents	NARS Researchers
	Female	Male	Female	Male		
Lemlem Chefe	5	12	7	32	2	
Girmi	7	10	10	22	3	
Adadi Bole	3	12	14	17	3	
Debre Zeit Station						3
Debre Birhan ARC						3
	15	34	31	71	7	6
Total	49		115			

Evaluation process by farmers

Before the evaluation began, farmers were familiarized with the selection criteria and process. Farmers were then given time to walk around the marked plots (Fig. 1) and individually ranked each of the 7 chickpea varieties and 1 chickpea genotypes based on length and number of branches, plant density, livestock preference, grain/straw yield and disease and drought resistance. The plants were at flowering stage. They included 1 **local** variety; 3 **kabuli** type (Ararti, Hora, Ejeri) and 3 **Desi** type (Teketay, Minjar, Dalota) and 3 **elite lines** i.e. DZ-0235, DZ- 0239, DZ-0058. ICARDA has previously identified the elite lines to have both food (high grain yield) and feed (good straw yield and quality). All seeds had been provided by DebreZiet Agricultural Center. However, two of the 3 elite lines (DZ-0235 and DZ- 0239) showed poor emergence in all farmers plots. This was unfortunately due to seed dormancy as a result of long storage. Farmers, therefore, ranked only 7 varieties and 1 elite line. The criteria was based on Branch numbers, plant density, straw yield, palatability by livestock (if known) and disease resistance. Farmers give a 1-5 scale rank (Very good (5), good (4), average (3), poor (2) and very poor (1) (Table 2). The 5 most preferred varieties/lines were *Teketay*, *Dalota*, *DZ-0058*, *Hora* and *Ejeri* were the most preferred varieties by farmers based on the above criteria.

Table 2: Ranking of chickpea varieties by farmers

Variety/line	Selection Criteria (Rank 1-5)						
	Branch no. and length	Plant density	Livestock palatability	Straw Yield	Disease resistance	Mean	Rank
Local	1	3	4	1	5	2.8	8
Ararti	3	3	4	3	4	3.4	6
Hora	4	4	4	4	4	4.0	3
Ejeri	3	4	4	3	4	3.6	5
Teketay	5	5	4	5	4	4.6	1
Minjar	3	4	4	3	2	3.2	7
Dalota	5	4	4	4	4	4.2	2
DZ-0058	5	5	unknown	5	5	4.0	3

After evaluations, the farmers, development agents and chickpea researchers held discussions summarized as follows:

- The farmers stressed on disease as the predominant problem and therefore their main preferences for varieties focused on this, followed by poor yielding varieties and feed shortage.
- They feed chickpea straw for a maximum of 3 days to ruminants. After 3 days ruminants refuse to consume the chickpea straw.
- They could not differentiate between chickpea straws of different varieties in terms of duration of tolerance by livestock.
- Livestock select chickpea straw preferably from other feed resources.
- Horses and donkeys tolerate chickpea straw for longer periods., therefore straw remaining after 3 days is fed to them.

Chickpeas is reported to contain a variety of secondary compounds that can impair nutrient absorption from the gastrointestinal tract of monogastric animals (Bampidis and Christodoulou 2011). These secondary compounds may be the reason for low tolerance of chickpea straw by ruminants.



Fig.1: Farmers evaluating chickpea varieties. Photo credit/Nahom Ephrem.

Parallel collaborative (ICARDA, Debre Birhan Research Center, Debre Birhan University) on-farm trials are ongoing on 49 farmers' fields (Table 1; Fig 2) in 3 kebeles namely Girmi, Lemlem Chefe and Adadi Bole. These trials aim to evaluate 7 chickpea varieties and 3 elite lines for variation in chemical composition, *in sacco* digestibility and anti-nutritive factors along with other agronomic parameters for evaluation for food-feed traits. Sowing was done on October 2-5 in the 3 kebeles on 5m x 5m blocks per farmer using agronomic practices recommended by DebreZeit Agricultural Research Center.

Conclusion

The farmer evaluation revealed that breeding and selection of chickpea varieties in the area is very advanced based on food traits and disease resistance. Continuous extension services based on these criteria has pushed back their preferences of varieties based on livestock feed traits. However, this field day is a step in the direction towards realization by chickpea breeders, mainly based in DebreZeit Center that farmers keep ruminants whose feed resources are diminishing as the years go by. Incorporating feed traits in chickpea breeding would be right step in sustaining the wheat-based mixed crop-livestock system, which currently relies heavily on low-quality wheat straw to feed its dairy cattle and small ruminants.

The field day facilitated conversation between plant breeders and farmers, allowing farmers to realize that it may be possible to have more benefits from new crop varieties, thereby increasing their feed sources.



Fig.2: Farmers planting chickpea varieties. Photo credit/Nahom Ephrem

References

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Bampidis, V. and V. Christodoulou. 2011. Chickpea (*Cicer-arietinum L.*) straw in animal nutrition: A review. *Animal Feed Science and Technology*. 168:1-20.

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