

Participatory Variety Evaluation of Red Common Bean (*Phaseolus vulgaris* L.) in Borecha District of Southern Ethiopia

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Abstract

Red colour seed common beans are more demanded over the white beans at Borecha district. However seed producers established in the district were not started red common bean seed production due to lack of awareness in improved red common bean varieties. Therefore, farmer's participatory varieties evaluation and selection methods were applied to identify preferred common bean variety in Borecha district. Eight red common bean genotypes were planted in Randomized Complete Block Design as mother trial replicated on four villages of Borecha district to identify farmer's selection criteria; to popularize the variety and to enhance seed produces capacity in managing varieties portfolios. Farmer's preference related data was collected for eight red common bean traits. Common bean pre harvest traits such as earliness, seed per pod (>5 seed per pod), pod load, up right growth habit and height of basal pod from the soil are indentified as the best descriptors to accept and reject the varieties. Uniformity of red seed colour was identified as major decisive criteria for accepting and rejecting common bean variety after harvest. Hawassa dume and Dimtu were variety scored the best ranks for all criteria. Farmers selected and discarded the varieties at various stage of common bean growth with fairly high degree of precision.

Keywords: Common bean; Genotypes; Seed producers; Pre-harvest traits; Uniformity

Introduction

Over the millennia, farmers grew complex mixtures of bean types against drought, disease, and pest attacks. During this process, farmers have been using limitless genetic array of bean seed with a wide variety of colours, shape, and sizes to meet the growing conditions and taste preference of different growing regions. Seed color and size are important characters of consumers' preference. In Tanzania, Malawi, Kenya and Ethiopia consumers prefer large brownish/purple or reddish colour seeded beans Beebe et al. [1]. Red seed beans are preferred because of the red colour imparts to the food after cooking.

For instance, farmers in central rift valley prefer white bean while farmers of Southern Ethiopia prefer red bean Ferris and Kaganzi [2]. A local variety 'Red woliata' a red seeded bean is popular and almost the only improved variety grown by 91.4% farmers. The main reasons for its popularity were due to its earliness in maturity and its dual importance. First, it provides an excellent nutritional complement to maize and enset which is the main local dishes, and secondly it is major cash crop of the Borecha district LSB [3]. Furthermore, the demand for red beans in northern Kenya, associated with drought in these areas, has encouraged production of red beans in this region [2]. The local variety 'red woliata' passed many generations of natural and human selection and found to be low yielding and susceptible to insects. Beside to it is demand on the local market and for consumption, seed producer cooperative farmers were established in the district with a mandate of producing quality and demand driven common bean seed. However, improved common bean varieties developed at research institute has not evaluated for major common bean quality traits at seed producers farm condition of Borecha district. The seed producers has not informed about improved red beans. Therefore, this research is aimed to popularize improved variety of common bean to seed producers and their customers. It is also initiated to identify and select the most preferred common bean cultivars.

Materials and Methods

Descriptions of study site

The experiment was conducted in 2010 under rain fed condition in Boricha district with Kayyo seed producer cooperative (SPC). The site is located in Sidama Zone of Southern Ethiopia, which is selected as one of innovation site for Local Seed Business (LSB) Project. It is located 65 km away from Hawassa and 324 km from the capital city Addis Abeba in the South West direction. According to the Bureau of Agriculture and Rural Development of the Borecha district, 37,500 hectares of the land were cultivated in the area. Out of the land for cultivation, the share for maize and common bean was 38% and 37%, respectively. Common bean is grown as relay and intercropping. This practice makes the area covered by common bean very similar to that of maize. Followed to maize and common bean, enset accounts 21%, demonstrating the importance of this crop as the areas staple food Tesfaye et al. [4].

Experimental materials

Before selecting the experimental materials local needs were assessed using semi-structured interview. Based on their preference, early maturing varieties of red and red mottled common bean (Tables 1 and 2) were obtained from Pulse Crops Improvement Sections of Awassa and Melkasa Agricultural Research Centres.

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Data collection and analysis

Farmer's preferences were identified using Focus group discussions (FGD) held with 30 households. The households were randomly selected from seed producer and their customers. The introduced cultivars were visually evaluated at vegetative stage, maturity and after harvest. Farmers discussed and agreed on criteria they thought to be important for selecting a given variety at a particular development stage. Field days were arranged at different growth stages to collect the data using agreed criteria by research participant. To select varieties, the farmers were asked to give a score for major common bean traits on a scale of 1 to 6 i.e., (1=Excellent; 2=Best; 3=Very good; 4=Good and 5=Poor, 6=Bad). Then descriptive statistics were used for rating and means of score were used for comparison among genotypes. The picture also used to demonstrate the red beans varieties.

Results and Discussion

Farmer's preference

Farmers attended the participatory variety evaluation and selection had diversified selection criteria to accept and reject bean variety (Table 2). This diversity during selection is an indication of the complexity of users' preference. Asrat [5] 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. However, the result from FGD revealed that uniformity in red seed color after maturity (Figure 1) and high biological yield were the major decisive criteria in retaining and rejecting the variety. Asrat [5] reported similar findings where pure red and red mottled seed color and high yielding variety were reported as the major decisive criteria to accept or reject common bean in Southern Ethiopia.

The research participant farmers categorized common bean traits such as earliness, seed per pod (>5 seed per pod), pod load, up right growth habit and height of basal pod from the soil as descriptors of good common bean varieties. Asrat and Teshale et al. [5,6] reported similar findings for common bean variety evaluated by farmers. The score ranking indicated that Hawassa dume and Dimtu were 1st and 2nd respectively for various traits evaluated by seed producers and their customers (Table 2).

Varieties selected for seed production

Hawassa dumme and Dimtu fulfilled criteria of pure red seed colour after harvesting. This criterion is identified as major decisive criteria for accepting and rejecting common bean variety after harvest (Figure 1).

No	Variety	Year of release	Description	Source	Days to Maturity
1	Red woliata	1974	Local check	Farmer	90-100
2	Hawassudume	2008	Tested variety	AwARC	85-90
3	Omo-95	2003	Tested variety	AwARC	104
4	Ibado	2003	Tested variety	AwARC	-
5	Nazir	2003	Tested variety	MARC	86-88
6	Dimtu	2003	Tested variety	MARC	86-88
7	Melkadima	2006	Tested variety	MARC	80-90
8	Dinkinash	2006	Tested variety	MARC	95-100

Source: Awassa Agricultural Research Centre (AwARC) and Melkasa Agricultural Research Centre (MARC), 2010

Table 1: Details of common bean varieties used in this study.

Trait	Varieties local names							
	Melkadima	Dinkinash	Omo-95	Dimtu	Naser	Hawassadume	Ibado	Redwoliata(check)
Pods load	4	6	5	2	5	1	3	6
Earliness	4	6	5	2	1	3	5	4
Yield	5	6	5	1	3	1	3	4
Seed/pod	3	6	4	2	3	3	2	1
Seed size	2	6	5	2	5	2	1	4
Red color	3	2	5	3	3	2	6	1
Redness after moisture deficit	5	2	6	1	3	1	6	2
Salk strength	1	5	6	2	6	2	1	6
Market value	4	3	6	1	4	1	4	2
Seed shape	4	6	6	1	5	1	4	5
Seed plumpness	3	6	5	1	5	1	5	3
Synchrony of maturity	3	4	6	1	2	1	3	4
Disease Resistance	6	5	2	1	4	1	1	2
Insect Resistance	5	6	4	1	3	1	1	4
Pod appearance	1	5	6	2	3	1	1	5
Green leaf	6	1	5	1	3	1	4	3

Shattering	1	5	4	1	6	1	2	3
Snow rainfall resistance	6	3	2	1	1	1	5	3
Lodging	1	5	6	1	5	1	1	6
Days emergency	3	2	3	2	1	2	3	5
Days to pod	1	6	4	3	3	2	3	4
Height of basal pod from soil	1	3	4	2	6	2	1	5
Leaf shading	1	6	5	1	1	1	4	5
Whole plant vigor	1	6	3	3	5	2	1	5
Leafiness	4	5	1	2	3	2	1	3
Suitability for Intercropping	6	2	1	4	5	4	5	2
Mean preference rating	3.23	4.53	4.38	1.69	3.61	1	2.80	3.73
Rank	4	8	7	2	5	1	3	6

Table 2: Common bean traits used for variety evaluation and selection.

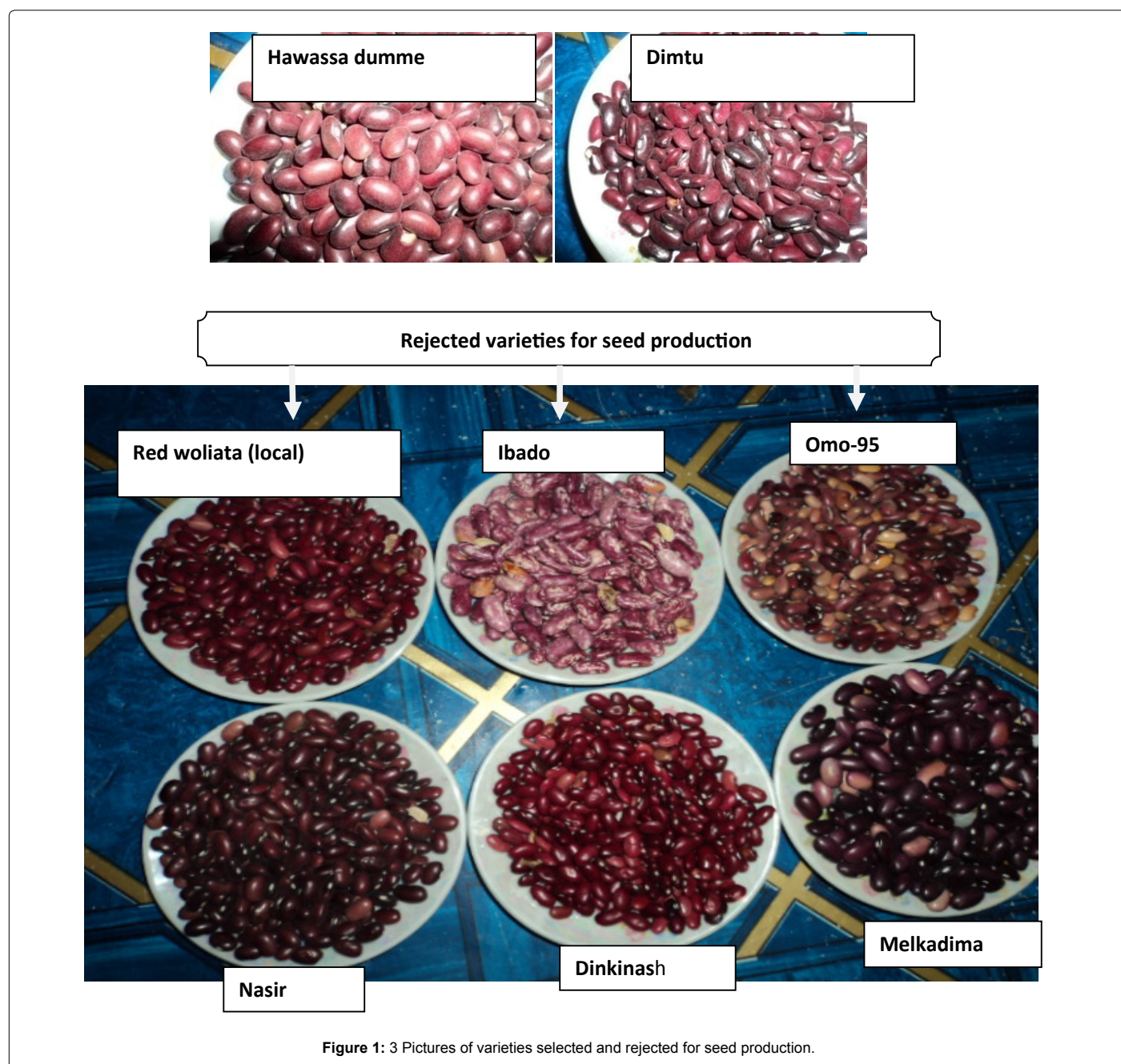


Figure 1: 3 Pictures of varieties selected and rejected for seed production.

Conclusion and Recommendations

Common bean seed production can be enhanced through selection of bean varieties suitable both for seed producers and customers as the users have been diversified preference, which may result in varietal diversity for seed producer cooperatives. Several PVS experiments on different crops have shown the importance of variety evaluation and its selection with farmers. Thus doing participatory varietal evaluation and selection with seed producer's and their customer was very important to enhance seed producer research capacity, product line and strength the link between their customers since preferred trait was included during selection process.

Thus, introducing new varieties through PVS help the farmers to choose the variety that possesses the character preferred by SPC and customer on market. Besides, the training given during PVS process enhances capacity of the SPC for managing varietal diversity. It was observed that as the area is highly market-oriented, high-yielding varieties were still top on their selection list with uniform pure red bean seed. However, most of the customers were looking for red bean which is suitable for intercropping. In view of this, PVS was conducted at Borecha district common bean seed producer cooperative and their customers in 2010 to evaluate eight common bean varieties. Seven varieties and one local check were used for mother trial four replication were used. Seed producer established in the district were producing white haricot bean seed from Awash one and Awash melka. Even though the demand for red bean is high the production is not started.

Additionally, there is one local red bean variety in Borecha district. The varieties that have "passed" the evaluation of farmers during participatory evaluation were spread in the community by commercial system. In addition the varieties will be part of seed producers' product line and help them as additional varieties which increase diversity of their product range. Markowitz [7] recommend that, "seeding a large percentage of land by a variety is not recommended; planting several varieties minimizes the risk of damage from adverse weather and disease and pest epidemics and increases the chance for quality seed with maximum yields which resulted in positive economic benefits for seed producer". Lanier et al. [8] also states that, application of portfolio theory to variety selection is new, but it helps seed producer's potential to increase yield and decrease yield variability simultaneously. Three

varieties: Hawassa dume, Dimtu and Ibado were selected by majority of the scored criteria. Four varieties namely Red woliata (local check), Omo-95, Dinkinash and Nasir were discarded since they did not fulfil characteristics that the SPC and customers preferred [9]. Thus, introducing new varieties through PVS help the farmers to choose the varieties those possess the character preferred both by SPC and their customer. Further research is recommended to identify potential red bean varieties since most of the customers were looking for red bean which is suitable for intercropping.

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