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Original Paper

Evaluation of Hot Pepper Varieties through Farmer's Participatory Selection at Teppi area, Southwestern Ethiopia

Shamil Alo Sora[1] and Betelhem Getahun[1]*
1) Ethiopian Institute of Agricultural Research, Teppi Agricultural Research Center, Po. Box. 34.
**) Corresponding Author: shamilalo99@gmail.com*

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***Abstract*— Three hot pepper varieties were evaluated in single plot in 2022/23 main cropping season. Farmers' evaluation was made at two different stages of the crop, namely at vegetative and at maturity using both direct-matrix and pair-wise ranking methods of selection scheme. Farmers' set; green pod yield, disease tolerance, pod color and size as selection criteria to evaluate and identify their preferred varieties. The results of analysis of variance indicated the existence of highly significant differences among varieties for all traits measured at 5% probability level. The highest mean green pod yield was obtained from the variety Melka Awaze (11.39 t/ha) and Melka Zala (8.39 t/ha). Likewise, these two varieties were identified as farmers preferred varieties from both pair-wise and direct matrix ranking evaluations. Thus, the varieties Melka Awaze and Melka Zala were chosen for their performance in the field and from farmers' evaluation perspective. Moreover, this study indicated participatory varietal selection is a viable method to gain greater insight into farmers' perceptions, preferences, merits and shortcomings of hot pepper varieties. Therefore, based on the results of this study, Melka Awaze and Melka Zala varieties are recommended for multiplication and distribution to farmers in the area.**

Keywords*— *Hot pepper, Farmers', South West, Teppi, Productivity

I. INTRODUCTION

Peppers are very important in fresh and processed forms along with different spices for daily consumption [1]. This crop is prominent cash crop for many developing countries such as Ethiopia, Nigeria, Ghana, China, India, Pakistan, Bhutan, Indonesia, Cambodia and Thailand [2]. It also lowers high blood pressure [3] and increase peripheral circulation and most popular dishes in Ethiopian cuisine [4]. Its importance is not only limited on consumption point of view but also very prominent to farmers by generating income, creating employment opportunity and ensuring food security. This enhances profitability of those who engaged in the production of pepper. According to [5] research indicated that investment in hot pepper production and other vegetables [6] is viable enterprise for income generation, poverty alleviation, job creation and improvement of food security to every household. Hot pepper is produced in many parts of the country. It is the main part of the daily diet of most Ethiopian societies. In Ethiopia, the total production shares of pepper, especially for red pepper is high as compared with other vegetables such as lettuce, tomatoes, head cabbage, onion and others [7]. Of the total estimated area under vegetables, the lion share which is about 73.09% and 16.33% was under Red peppers and Ethiopian Cabbage, respectively [7]. The current world average productivity of green and dry pepper is 32.3 t/ha and 3.8 t/ha respectively [8]. The average dry and green hot pepper production in Ethiopia is 1.6 and 10.7 t/ha, respectively [9], well below the global average.

The lack of specifically adapted varieties, a lack of released varieties that match well with the majority of farmers' growing conditions, and the use of traditional and readily accessible production techniques are the possible reasons of the inadequate adoption of new varieties. In numerous crops across many different countries, Participatory Variety Selection (PVS) has been found to be quite successful in solving many of these issues. PVS could be very helpful in identifying new varieties that farmers accept, allowing farmers to avoid the restrictions that force them to grow land races or obsolete varieties [10]; [11]; [12] and [13]. Therefore, participatory varietal selection has been proposed in this research as a way to evaluate and select the best disease resistant, high yielding, and adaptable hot pepper varieties through farmer selection preferences to diversify and popularize this economically valuable crop in the study areas.

II. MATERIALS AND METHODS

A. Description of the Study Area

The field experiment was conducted for three crop cycles at Teppi Agricultural Research Centre, in south western Ethiopia. Teppi is located in Sheka zone of southwestern Ethiopia at an elevation of 1200 meters above sea level. Teppi is located at about 611 km away from Addis Ababa in South Western Ethiopia in between 7° 3'E latitude and 35° 18'N longitude. The research center receives an annual rainfall of 1559 mm with maximum and minimum temperatures of 29.70C and 15.50C respectively. The soil of the experimental site is radish brown sandy clay loam classified as Nitosol with pH range of 5.6 to 6.

Gelesha is located in Godere District, Gambella Regional State, Southwest Ethiopia. The district is located between 7□08'-7□23' latitude and 34□52'-35□25' longitude. It also has an altitude ranging from 500 to 2400 m above sea level, with the natural forest area in the range of 500-1500. The climate of the area is a hot and humid type [14], and Meteorological data obtained from National Meteorology Service Agency (Addis Ababa) indicate that Godere District receives high rainfall between mid-March to October and low rainfall from November to February. The highest annual mean rainfall of the study area within twelve years (1998-2009) is 2726.7 mm. The lowest mean monthly temperature is 13.2°C and the highest mean monthly temperature is 33.1°C with an average temperature of 22.2°C. The soil of the district is reddish brown, well drained and clay in texture [15].

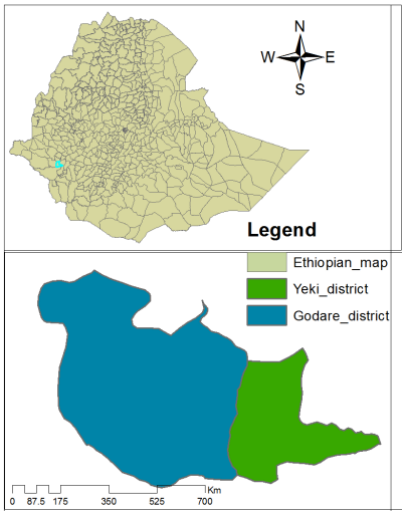

Fig. 1. Map of the study area

III. Results And Discussion

For this experiment, a total of three hot pepper varieties that were brought from the Melkassa Agricultural Research Center were used. The experiment was set up using a single plot. The spacing of 70 cm between rows and 30 cm between plants were used. The planting site was prepared two months before planting and seeds of each variety were raised on seed bed and transplanted to main field after 45 days. All-important field management practices like weeding, fertilizer application and other practices were followed as per recommendation.

A. Data Collection and Analysis

From the planting date through the harvest time, several parameters were recorded. The following is a list of the key parameters gathered: The number of fruits per plant, average fruit weight, and total yield per hectare were collected, along with phonological data such as days from planting to flowering and days from flowering to harvest. Growth parameters like plant height, number of primary, secondary and tertiary branches, and fruit number per plant, fruit length and diameter, total yield per hectare were collected and analyzed using SPSS.

B. Data Collection and Farmer's Participation

Through farmers' participation, information on the agronomic performance of hot pepper varieties and farmer preferences for the varieties was gathered. A total of 20 hot pepper-producing households from two districts constituted the farmers from different kebeles were involved in the process of variety selection. Farmers' preferences were gathered and ranked by the frequency of their selections.

IV. Conclusions

Hot pepper is prominent cash crop for many developing countries including Ethiopia. It is very important in fresh and processed forms along with different spices for daily consumption. Now a days, there is an increasing demand by farmers for production and consumption of improved hot pepper varieties in the study areas. In order to respond to farmer requests, participatory variety selection trial was conducted with the objective of selecting superior hot pepper varieties with farmer's preferred traits. The participated farmers have given a rank for the traits used for selection and evaluated the varieties using their own selection criteria. As a result, based on their preferences Melka Awaze and Melka Zala varieties were selected as the first and second choices. Therefore, scaling up of these selected varieties should be done in the study area so that producers can able to access the variety to produce and to overcome the nutritional deficiency and economic problem

TABLE 2. FARMERS PREFERENCES FOR HOT PEPPER AT GELESHA IN 2021/22

Relative weight	**Ranking of selection criteria for each variety**											
variety	Vegetative performance	Plant height	No. of branches	Maturity	No. fruits/plant	Fruit length	Fruit diameter	Fruit yield/plant	Market preference	Disease tolerance	Total score	Rank
	2	*1*	*2*	*3*	*3*	*3*	*3*	*3*	*2*	*3*		
Melka Awaze	1(2)	2(2)	1(2)	1(3)	1(3)	2(6)	2(6)	1(3)	2(4)	1(3)	*34*	*1*
Melka Zala	2(4)	1(1)	2(4)	2(6)	2(6)	2(6)	1(3)	2(6)	2(4)	2(6)	*46*	*2*
Mareko Fana	3(6)	3(3)	3(6)	3(9)	3(9)	3(9)	2(6)	3(9)	3(6)	3(9)	*72*	*3*

TABLE 2. FARMERS PREFERENCES FOR HOT PEPPER AT TEPPI IN 2021/22

Relative weight	**Ranking of selection criteria for each variety**											
variety	Vegetative performance	Plant height	No. of branches	Maturity	No. fruits/plant	Fruit length	Fruit diameter	Fruit yield/plant	Market preference	Disease tolerance	Total score	Rank
	2	*2*	*3*	*3*	*3*	*3*	*3*	*3*	*2*	*3*		
Melka Awaze	1(2)	2(4)	1(3)	1(3)	1(3)	1(6)	2(6)	1(3)	1(2)	2(6)	*38*	*1*
Melka Zala	1(2)	1(2)	2(6)	1(3)	2(6)	1(3)	2(6)	1(3)	1(2)	2(6)	*39*	*2*
Mareko Fana	3(6)	3(6)	3(9)	3(9)	3(9)	3(9)	1(3)	3(9)	2(4)	3(9)	*74*	*3*

Number of participants=20 (12=male, 8 =female), rating, and 1= very good, 2=good, 3=poor. Relative weight of selection criteria: 3=very important, 2= important and 1=less important, the numbers in the parenthesis indicates the product of relative weight of selectin criterion and the performance of cultivars by farmers.

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