



Evaluation of Improved Hot Pepper Varieties in North Gondar under Irrigation Condition for Wilt Disease

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ABSTRACT

A field experiment was conducted at Gondar agricultural research center, Megech and Gondar Zuria irrigation site, to investigate the performance of different varieties of hot pepper for growth, dry pod yield and quality. The experiment was conducted from December 2015 to June 2016 under irrigated condition using four released (Melka Eshete, Melka Waze Melka Zala and Mareko Fana) and two introduced (Indam 10 and Indam 42) varieties. The experiment was conducted on a randomized complete block design with three replication. The combine ANOVA showed that significant difference on days of 50% flowering, days to 50% maturity, days to pod development, fruit length and plant height. As a result the earliest variety to attain days to 50% flowering was Indam 10 and Indam 42; the variety to attain shortest days to maturity were as Indam 10 and Indam 42, while the highest pod length was recorded at Melka Eshet. On the other hand the highest plant height was recorded at Melka Awaze and Mareko Fana varieties; the highest marketable yield (Qt/ha) of hot peppers was recorded for Mareko Fana, Indam 10 and Indam 42 respectively, while Melka Zala was relatively tolerant to the disease. Since this study was done two seasons at one location; it would be advisable to use Mareko Fana, Indam 10 and Indam 42 varieties to north Gondar areas or on this given area to gain higher yield.

Keywords: Hot pepper; Variety; Irrigation; Marketable yield

INTRODUCTION

Hot pepper is a short-lived herb normally grown as annual under warm and humid weather conditions. Peppers are adapted to high temperatures. It is one of the popular and widely cultivated vegetable crops in Ethiopia. It forms an indispensable adjunct in every house on daily basis. People consume pepper for intake enhancement as well as to supplement the dietary needs. It is also one of the major income-generating crops for most households of the pepper producing areas and it plays a vital role in food security in Ethiopia. It is agro-ecologically characterized as hot to warm sub-moist low land below 1500 m.a.s.l. The mean annual rain fall and temperature is 350 mm-700 mm and 24-41 Co respectively. Hot pepper is the leading vegetable crop produced in the country. CSA indicates that dry and green pepper production in the Amhara region was 60,801.45 t and 12,118.72 t with average productivity of 2.04 t ha⁻¹ and 9.02 tha⁻¹ respectively.

On the other hand, the national level production of dry and green hot pepper was 209,872.12 t and 57,772.68 t with average productivity of 2.52 t ha⁻¹ and 9.98 t ha⁻¹ respectively. Varieties Melka Eshet, Marko Fana, Melka Awaze and Melka Zala were confirmed to give the average marketable green pod yield of 15 t/ha-20 t/ha in research condition. In N/Gondar, hot pepper is vegetable crop produced by the farmers. Therefore, strong help for producers to achieve sustainable production in order to increase their income and secure their livelihood by providing best adaptable and high yielding varieties [1]. The present situation indicates that in Gondar Zuria, there is limitation of well adapting hot pepper varieties. As a result, varietal information for the improvement of the crop for high fruit yield in the existing agro-ecology is insufficient. The decline of hot pepper production in the area is also attributed mainly to lack of improved and good quality varieties, poor agronomic practices, poor disease and pest

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management, inappropriate fertilizer utilization (due to an increase in the price of fertilizers), poor harvesting and post harvest practices, absence of use of herbicides. In addition to this, there is no research work on evaluation of hot pepper which enables the growers to select best performing varieties in the study area [2].

Objectives

To select high yielding, adaptive and disease resistance hot pepper varieties.

MATERIALS AND METHODS

Four released (Melka Eshete, Melka Waze Melka Zala and Mareko Fana) and two introduced (Indam 10 and Indam 42) varieties were evaluated for green pod production at Megech irrigation command area and at Gumara Makisegnit water shade area using RCB design with three replications. Seedlings were raised on seed beds and transplanted at a spacing of 60 cm × 30 cm inter and intra-row spacing, respectively. The plot size was 2.4 m × 2.4 m (5.76 m²) with 4 rows on each plot. Irrigation was applied at 7 days interval. Fertilizer were applied at a rate of 200 kg/ha DAP and 100 kg/ha urea. Urea was applied in two splits half at planting and half at flowering. All other agronomic practices were applied as per the recommendation [3].

Data collected

Stand count at harvesting, plant height (average from 5 sample plant), days to 50% flowering, days to pod development, days to

pod maturity, pod length (average from 5 sample plant), number of branches per plant, pod diameter (average from 5 plants), number of pod/plant (average from 5 plants), marketable yield (kg), unmarketable (kg), total yield (kg) and pest and disease incidence (%).

RESULTS AND DISCUSSION

Disease was a major problem, resulting in very low yields. Powdery mildew (*Leveillula taurica*) was the main disease occurred, resulting in defoliation across all plot. All plots had greater than 75% infestation (average 85%). Particularly, early maturing hot pepper varieties (Indam-10 and Indam-42) were highly affected by powdery mildew. On the underside of leaves all varieties, white powdery spores was developed [4]. Severely infected plants were dropped off their leaves. The occurrence of warm or hot weather and high humidity in the study area during winter season has favored the disease to occur. Despite the disease was occurred on all varieties there were difference in susceptibility. Melka Zala was relatively tolerant to the disease whereas both Indam-10 and Indam-42 were relatively susceptible.

Additionally, bacterial wilt was occurred in the field and resulted in a high rate of plant loss, especially at megch site (Table 1). It was occurred before and after emergence of seedlings. Some plants/seedlings failed to emerge and once emerged, several seedlings were wilted and dead due to bacterial wilt disease [5].

Table 1: The number of plants harvested from the central two rows of each plot.

Varieties	Replication	No of plants harvested	Mean
Melka Eshet	1	18	15.3
	2	16	
	3	12	
Marko Fana	1	16	16.7
	2	18	
	3	16	
Melka Awaze	1	17	16.7
	2	15	
	3	18	
Indam-42	1	19	18
	2	15	
	3	20	
Indam-10	1	15	17

	2	19	
	3	17	
Melka Zala	1	18	17
	2	20	
	3	13	
Total mean			16.8
CV			15.6
LSD			4.76

Green pod yield and yield related traits

Due to diseases infestation all hot pepper varieties did not give best green pod yield and their green pod yield performance were much less compared to when released as well as the crop yield potential. Varieties Melka Eshet, Marko Fana, Melka Awaze and Melka Zala were confirmed to give the average marketable green pod yield of 15 t/ha-20 t/ha in research condition [6]. However, all tested varieties have given lower green pod yield than the national average green pod productivity of 9.02 ton/ha.

The combined mean analysis table revealed that there were significant statistical difference ($p < 0.05$) for all variables except for number of branches per plant. All varieties reached 50% of flowering around two month and ten days after planting. Some of the earliest to flower, to develop pod and to mature (Indam-10 and Indam-42) were also among the highest yielding. These hot pepper varieties were the fastest to develop pod and to reach pod maturity. Slightly longer day to 50% flowering, pod development and maturity was obtained at Melka Eshet, Melka

Awaze and Melka Zala varieties. According to the result Melka Awaze, Melka Fana and Melka Zala were recorded the highest plant height while the lowest plant height was recorded at Indam-10.

Variety Indam-10 and Indam-42 had the highest number of pods while the least number of pods per plant was recorder from Melka Zala. The longest fruit length was recorded from variety Melka Zala followed by Melka Eshet. The widest fruit was obtained from variety Marko Fana followed by Melka Awaze while the least pod width was observed from varieties Indam-10 and Indam-42. Varieties Marko Fana, Indam-10 and Indam-42 were the best performing pepper varieties in terms of green pod yield compared to other varieties [7]. Marko Fana outperformed the other hot pepper varieties in terms of green pod yield (Table 2).

Table 2: Combined mean of green pod yield and yield related traits of different hot pepper varieties tested at Gondar Zuria and Megech in, 2015.

Varieties	Days to 50% flowering	Days to pod dev't	Days to pod maturity	Plant height (cm)	Number of branches per plant	No of pod/ plant	Pod length (cm)	Pod diameter (cm)	Marketable yield (Q/ha)
Melka Eshet	81a	101b	127ab	48.1bc	5.3a	17.0c	14.7b	0.94d	27.68b
Marko Fana	74b	93d	120c	53.2ab	4.2b	10.8d	8.7e	1.8a	36.08a
Melka Awaze	80a	98c	126b	57.9a	5.0ab	12.5d	9.6d	1.3b	18.94c
Indam-42	69c	90e	111d	46.9c	5.3a	21.2b	9.6de	1.06cd	37.87a
Indam-10	67c	88f	109e	43.2c	4.8ab	25.0a	10.7c	0.94d	35.23a
Melka Zala	81a	102a	128a	56.0a	4.7ab	6.8e	17.3a	1.14bc	14.34c
Mean	75	95	127ab	50.9	4.9	15.58	11.8	1.21	28.36
CV	2.02	0.94	1.23	9.68	16.82	19.41	6.64	10.09	19.2
LSD	1.83	1.08	1.7	5.9	0.99	3.62	0.94	0.14	6.51
Sig (loc*trt)	**	**	**	*	ns	ns	**	ns	ns

Generally, Indam 10 and Indam 42 were early maturing, high number pods producing varieties as well as best performing varieties in terms of green pod yield performing. However these varieties are characterized by narrower in diameter and shorter in length which fails to meet the best green pod market quality

requirement. Melka Eshet and Melka Zala had higher pod length but gave lower yield. Marko Fana had wider pod diameter and gave better yield than other varieties. In terms of green pod yield Marko Fana, Indam 10 and Indam 42 were the best performing varieties [8].

Social data

A group of farmers consisting 15 people have visited the experiment at horticultural maturity stage to select the best performing varieties. Before the selection was carried out, farmers have set their own selection criteria for hot pepper green pod production [9]. The selection criteria's are pungency, pod size, test, color, diseases tolerance, number of pods per plant, pod weight. One to three ranks was given to their level of choice and one is equivalent to very good and three is equivalent to poor. According to their criteria, a group of farmers have selected Marko Fana the best performing variety followed by Melka Zala [10].

In addition, farmers have also selected best traits for breeding of hot pepper. According to farmers preference the following traits are very significant in hot pepper breeding in order of importance: Disease tolerance, pod weight, no of pods per plant, pod color, pod size, test and pungency.

The same type of experiment without any changes in experimental procedures with same type of varieties was conducted at megech irrigation command area in Dembiya woreda in the same year [11]. At Dembiya location, bacterial wilt disease was also occurred which results in a loss of a considerable amount of plant and green pod yield reduction. The two locations data were combined and subjected to Analysis of Variance (ANOVA) using SAS to study the interaction effect of locations over varieties. The results showed that there was no interaction effect of locations with varieties in terms of number of branches per plant, no of pod per plant, pod diameter and marketable yield which indicates that the varieties have performed similarly across locations.

CONCLUSION

Even though, this report shows only the one year trial results and severe damage by disease (powdery mildew and bacterial wilt) resulted in high amount of plant loss and yield reduction, it was observed that there is similar result in both sites (Gumara-Makisegnit water shade and Megech irrigation command area). Moreover, there was no interaction effect between locations and varieties in terms of green pod yield and other yield related traits. Considering of the above results, it was concluded that Marko Fana, Indam-10, Indam-42 varieties were recommended for farmers who grow peppers for green pod production in the study area. Farmers who were participated in the variety

selection also showed interest and selected these varieties for hot pepper green pod production. However, it was observed that developing or adapting and demonstrating of improved technologies for diseases management options required due attention and immediate action. The selected varieties with the diseases management options should be demonstrated and pre-scaled up for hot pepper growing farmers for green pod production under irrigation condition.

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