

Enhancing productivity of Pepper (*Capsicum annuum* L.) by using improved varieties.

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Abstract

To determine the growth and productivity of hot pepper (*Capsicum annuum* L.) at north western zone of Tigray during the 2006 & 2007 cropping season under irrigation conditions, a field experiment was done which consisted of 3 released hot pepper varieties (Mareko Fana, Melka Awaze and Melka Shote) and one local arranged in Randomized Complete Block Design (RCBD) with four replications. In 2006 cropping season, days to 50 Flowering, days to 50% maturity, plant height, pod length, pod diameter, number of pods/plant and marketable yield were significantly influenced by varietal effect. Similarly, in 2007 significance difference were observed on days to 50 Flowering, days to 50% maturity, plant height, pod length, pod diameter, number of pods/plant and marketable yield. The highest mean marketable yield of the two seasons (90 q ha⁻¹) was gained using Mareko Fana variety in comparison to the lower marketable yield (72.6 q ha⁻¹) that was yielded using Melka Shote. Therefore, it can be recommended to use Mareko Fana variety for production by growers in the study area.

Keywords: Hot pepper varieties, Marketable yield, *Capsicum annuum* L.

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Introduction

The Capsicum is a member of the Solanaceae family that includes tomato, potato and tobacco. Knowledge about Capsicum was available from initial stages of civilization and been incorporated since 7500 BC in the human diet [1]. The crop is also produced in all the continents except Antarctica and originated from Latin America, to Africa in general and Ethiopia in particular.

Capsicum species can be classified into numerous groups based on characteristics of fruit/pod such as pungency, color, shape, proposed application, taste, and size. Regardless of their immense trait variances, most peppers commercially cultivated in the world belong to the species *C. annuum* L. [2,3].

Although, its history in Ethiopia may be the most ancient any other vegetable products, the specific time of its introduction cannot be established. Moreover, in Ethiopia, hot pepper has been cultivated for long era.

In Ethiopia, pepper is produced in several parts of the country as it is an important and a traditional constituent of Ethiopian societies' food menu because of its pungency and color. Moreover, hot pepper is a source of income for rural business as Ethiopia is among those few developing countries that produce paprika and capsicum oleoresins for export.

Regardless of its importance, hot pepper production for green and dry pod has a low yield (national average yield of 7.6 t/ha for green pod) whereas for dry pod, the yield was 1.6 t/ha (CSA, 2006) also considering the below average quality of varieties, lack of good cultivation practices and prevalence of microbial disease [4].

Even though hot pepper is a high value commodity, which has the potential for improving the income and the livelihood of numerous small hold farmers in Ethiopia, thereby, expanding and growing Ethiopia's agricultural export exchange earning, and pepper production has several productivity related issues [5].

In this study, limited Capsicum species and varieties were included, both improved and poor quality varieties [6]. Hence, the information is insufficient to speak for itself regarding the improvement of the crop for high fruit yield and quality in the existing agro-ecology. Studies of specific varieties were therefore, one of the best considerations to eliminate existing problems of procurement of the anticipated varieties for which the result of this study was going to contribute.

So, it was found promising to introduce and evaluate nationally released and highly accepted improved pepper varieties and undertake adaptation trial, so as to select the best adapted and high yielding (superior) variety/ies with their appropriate agronomic practices to increase productivity/ha and total production of the area.

Objectives

To study the productivity of several varieties of hot pepper & identify a high yield and disease resistance Capsicum variety.

Methodology

The experiments were conducted at Serenta & Meskebet irrigation schemes of Tselemti & L/Adiabo woreda's respectively during 2006-2007 cropping season. Three

improved pepper varieties (Mareko Fana, Melka Shote) including the local variety, were studied in two locations. The field experiment was carried out with four replications in a Randomized Complete Block Design (RCBD). Treatment was given arbitrarily to the experimental plot inside the respective block.

The plot dimension was 3.6 x 3 m (10.8 m²). 1.5 m distance was maintained between the blocks while 1.0 m space separated the plots inside the block. Each plot comprised of 5 rows having a length of 3 m, with a spacing of 60 cm between rows and 30 cm between the crops and has a total population of 50 plants. Acclaimed quantity of fertilizer (200 kg/ha DAP & 100 kg/ha Urea) was used. Standard recommendations for ploughing, cultivation, irrigating, nursery and transplanting method, weeding and others was followed and performed homogeneously on all the plots [7-9]. The experimental area was maintained weed free by following a strict hand plucking schedule of four times during the cropping season.

Method of Data Collection

The central three exclusive rows by excluding plants from either end of the rows were used to collect data for the study. For data collection such as growth, yield, two plants per row or 6 plants per plot were tagged randomly and observed from such as: days to 50% flowering, days to maturity, pod number/plant, plant height, pod diameter and pod length (pod size) in cm, marketable and un marketable yield (gm/plant) total yield (qt/ha) were recorded periodically.

Method of Data Analysis

All data collected in this study were studied using two way statistical analysis of variance (ANOVA) following a protocol as suggested by Gomez and Gomez, 1984. Least significance

differences (LSD) by Dun ken's multiple range comparison was used for mean separation at p=0.05 after the treatment was found significant.

Results and Discussion

The analysis of variance (Table 1) indicated significant difference in Days to 50% flowering (DF), Days to maturity (DM), plant height (P.ht), pod length(PL), pod diameter (PD), number of pods/plant and marketable yield were significantly (P<0.05) affect the variety at both years.

Days to 50% flowering and maturity (DF)

With respect to Table 1, variety had significant (P<0.05) effect on days to 50% Flowering and maturity in 2006 cropping season at Tselemti site. In 2006, significantly higher day to 50% flowering and maturity (67.25 & 91.10) respectively was achieved in Melka Shote, while significantly lower days to 50% flowering and maturity (52.75 and 81.75) respectively was achieved using local variety. There was no significant difference in days to flowering and maturity in 2007 cropping season (Table 1).

Pod length (PL)

Variety was exerted significant (P<0.05) influence on pod length of hot pepper plant in 2006, the maximum pod length (8.04 cm) was receded at Mareko Fana while the minimum pod length (4.857 cm) was recorded at local variety. In the second cropping season (2007), higher pod length (8.72 cm) was attained in Melka Awaze but significantly did not differ when compared to Mareko Fana variety. On the other hand, significantly lower pod length (7.3 cm) was achieved at local variety (Table 2).

Table 1. Varietal effect on 50% DF, DM & PL of pepper (Tselemti site).

S/N	Variety	50% DF			DM			PL (cm)		
		2006	2007	Mean	2006	2007	Mean	2006	2007	Mean
1	Mareko Fana	59.75	67.00	63.375	88.25	103.00	95.625	8.043	8.321	8.182
2	Melka Awaze	64.25	67.25	65.75	91.0	103.50	97.25	4.857	8.721	6.789
3	Melka Shote	63.75	67.75	65.75	91.10	104.50	104.5	5.707	8.383	7.045
4	Local	52.75	66.50	59.625	81.75	102.50	92.125	6.447	7.300	6.8735
	Mean	60.12	67.12		88	103.38		6.26	8.181	
	SEM	1.588	0.559		0.825	0.595		0.807	0.3628	
	CV	5.3	1.7		1.9	1.2		15.8	8.9	
	LSD	5.079	1.788		2.639	1.904		2.581	1.1605	

The varietal effect on 50% DF, DM & PL of pepper on L/Adiabo site are listed below also (Table 2).

Table 2. Varietal effect on 50%DF, DM, PL & PD of pepper (L/Adiabo site).

S/N	Variety	50% DF		Mean	50% DM		Mean	PL(cm)		Mean	PD(cm)		Mean
		2006	2007		2006	2007		2006	2007		2006	2007	
1	Mareko Fana	65.00	55.50	60.25	89.50	88.50	89	8.750	9.862	9.306	5.200	2.142	3.671
2	Mareo Awaze	53.75	68.50	61.125	79.00	97.25	88.125	8.950	8.879	8.9145	4.350	1.346	2.848
3	Melka Shote	59.25	69.25	64.25	81.00	99.50	90.25	9.125	9.488	9.488	4.450	1.033	2.7415
4	Local	51.75	61.50	56.625	76.50	97.25	86.875	6.375	5.083	6.375	3.925	1.354	1.354
Mean		57.4	63.7		81.5	95.62		8.3	8.328		4.48	1.469	
SEM		2.41	2.05		1.712	1.387		0.291	0.3293		0.28	0.099	
CV		4.83	6.4		4.2	2.9		7	7.9		12.5	13.5	
LSD		7.72	6.54		5.477	4.437		0.932	1.0534		0.895	0.3167	

Plant height (Pht)

The plant height had significant influence ($P < 0.05$) due to the varietal effect in both cropping seasons at Tselemti site (Table 3). Melka Awaze was recorded the highest plant height (74 cm) in 2006. While the lowest plant height (58.13 cm) was recorded at local variety the same year. Similarly, in 2007 significantly higher plant height (72.72 cm) was recorded at Melka Awaze; whereas, significantly lower value (60.83 cm) was recorded at local variety (Table 3).

Pod diameter (PD)

Table 2 also evidenced the availability of data regarding pod diameter was significantly ($P < 0.05$) affected by varietal

difference in 2007; higher pod diameter (2.135 cm) was recorded at Mareko Fana while slightly lower fruit diameter (1.602 cm) was recorded at Melka Shote variety (Table 3).

Marketable yield

Variety was exerted significant ($P < 0.05$) influence on marketable yield of hot pepper plant in 2006 & 2007. In 2006, the maximum marketable yield (99.59 q ha⁻¹) was achieved in Mareko Fana whereas the minimum marketable yield (53.88 q ha⁻¹) was achieved in Melka Awaze. In 2007, even if variety had no any influenced on marketable yield slightly higher (161.7 q ha⁻¹) and lower (131.2 q ha⁻¹) value was achieved using Mareko Fana and local varieties respectively (Table 3).

Table 3. Varietal effect on PD, No.p/pt, Pht & marketable yield of pepper (Tselemti site).

S/N	Variety	PD(cm)			No.p/pt.			P.ht(cm)			MY(QI/ha)		
		2006	2007	Mean	2006	2007	Mean	2006	2007	Mean	2006	2007	Mean
1	Mareko Fana	5.780	2.135	3.9575	51.00	79.5	65.25	71.50	65.67	68.585	99.59	160.3	129.945
2	Melka Awaze	2.772b	1.856	2.314	53.00	103.6	78.3	74.00	72.72	73.36	53.88	157.9	105.89
3	Melka Shote	2.425	1.602	2.0135	76.00	124.5	100.25	72.50	71.44	71.97	88.02	161.7	124.86
4	Local	5.322	2.027	3.6745	61.00	109.2	85.1	58.13	60.83	59.48	69.39	131.2	100.295
Mean		4.07	1.905		60.2	104.208		69	67.662		77.72	152.774	
SEM		0.56	0.0931		2.87	5.6019		2.86	1.9162		733.9	14.1044	
CV		27.7	9.8		9.5	10.8		8.3	5.7		13.8	18.5	
LSD		1.803	0.2978		9.18	17.9214		9.16	6.1304		18.9	45.1225	

The varietal effect on No.p/pt, Pht & Market Yield of pepper on L/Adiabo site are listed below in (Table 4).

Table 4. Varietal effect on No.p/pt, Pht & Market Yield of pepper (L/Adiabo site).

S/N	Variety	No.p/pt.		Mean	Pht (cm)		Mean	MY (Ql/ha)		Mean
		2006	2007		2006	2007		2006	2007	
1	Mareko Fana	62.00	32.17	47.085	47.00	43.87	45.435	120.37	60.84	90.605
2	Mareo Awaze	41.50	46.96	44.23	42.25	47.17	44.71	100.69	53.43	77.06
3	Melka Shote	51.50	70.00	60.75	43.00	46.25	44.625	90.86	54.42	72.64
4	Local	57.75	57.12	57.435	39.25	38.33	38.79	103.01	56.42	79.715
Mean		53.2	51.562		42.9	43.906		10.37	56.279	
SEM		5.58	4.8673		2.15	2.0147		6.47	4.7201	
CV		21	18.9		10	9.2		12.5	16.8	
LSD		17.85	15.5714		6.89	6.4454		2072.9	15.1004	

Conclusion

This study which is aimed to ascertaining best performing hot pepper varieties [10,11] in north western zone was performed with irrigation for two successive cropping seasons. Variety exerted significant difference on saleable, unmarketable and overall yield in 2006 cropping season; however, it did not show any significant influence in the second season (2007). The two year mean result revealed that highest marketable yield, was produced from Mareko Fana. Therefore, Mareko Fana was well performed and better to recommend for production by growers in the study area.

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