Adaptation and Evaluation of Improved Pepper Varieties

Kassa Melese Atsbha Gebreslassie
Tigray Agricultural Research Institute, Po.Box 44 Abi-Adi, Tigray, Ethiopia

Abstract
Shekatekli (Mitswa) irrigation scheme is the most potential areas for pepper production .However,the yield and yield components of pepper producing at the specified area is low . An experiment was conducted on adaptation and evaluation of pepper varieties in 2005/2006 and 2006/2007 cropping seasons to enhance the production and productivity of pepper. The experiment was carried out at farmers' plot of land having four varieties in three replications. The treatments or varieties were Melkashote, Bacolocal, Marakofana and Melkawaze.In general, the result of the experiment implied that Melkawaze was the high yielder of all.
Keywords: yield, Pepper, yield components

1. INTRODUCTION

Pepper *(Capsicum annuum* L.*)* is the world's most important vegetable after tomato and used as fresh, dried or processed products, as vegetables and as spices or condiments (Acquaah, 2004). *Capsicum annuum* L.is commonly grown worldwide, with many general names in English, such as hot pepper, chili or chile pepper, and as well sweet pepper and bell pepper (Bosland, 1996).Chili belongs to the family *Solanaceae* and genus *Capsicum*. The genus *Capsicum* comprises 20-30 species (Lovelock, 1973).The pre-Columbian, indigenous Nahua (Aztec) Amerindian name for the plant was transcribed as chilli and the usual name in Spanish is chile, which results in the plurals of chillies, chilies, and chiles (Bosland, 1996).

Capsicum originated from tropical America; Peru and Mexico and spread to Europe where it grows as a shrub. From here it spread to other parts of the world such as African, Caribbean and Pacific countries (Dennis, 2013).

Capsicum annuum is usually grown as a herbaceous annual in temperate areas. However, ecologically it is a perennial shrub in tropical areas (which may live a few years to a few decades) and it can be grown as a perennial in climate-controlled greenhouses (Andrews, 1999).The species includes the vast majority of the cultivated pepper. Moreover, it includes both pungent and non-pungent (sweet) pepper species. There is phenotypic diversity in plant habit and especially in shapes, sizes, colours, pungency, and other qualities of the fruits among the species (Andrew, 1999). Chili pepper is a popular vegetable valued around the world for the color, flavor, spice, and nutritional value it contributes to many meals. Pepper varieties display a wide range of plant and fruit traits, and production practices vary greatly from region to region (Berke *et al*., 2005).

As a result of its multiple uses, pepper is produced in many parts of the Ethiopia (MARC, 2004). Although the time when the crop introduced to Ethiopia not certainly known, pepper cultivation in the country the most ancient of any other vegetable product (EEPA, 2003). Moreover, hot pepper has been cultivated in Ethiopia for long period of time (MARC, 2004).

2. OBJECTIVES

- To select the best pepper varieties with the participation of farmers
- To popularize the best selected varieties in the area

3. MATERIALS AND METHODS

3.1. Site Description

The experiment was conducted in Tanqua-Abergelle woreda at Shekatekli (Mitswa) irrigation scheme.Abergelle is situated in the central zone of the region which is about 120 kms away from Mekelle, the administrative city of Tigray.It is located 13°14'06"N latitude and 38°58'50"E longitude (CSA, 2000 In: Gebreyesus Berhane, 2004).It is agro-ecologically characterized as hot to warm sub-moist low land (SM1-4b) below 1500m.a.s.l.The mean annual rain fall and temperature is 350-700mm & 24-41Co respectively. The rain fall is erratic and unproductive nature (Legesse, 1999 .In: Gebreyesus Berhane, 2004).

3.2. Treatments

i. Bako local
ii. Melkashote
iii. Melka Awaze
iv. Marakofana

3.3 Plant Establishment

In nursery site, the seeds were planted in well prepared seed bed and the seed beds were covered or mulched with grass. After 48 days of planting ,healthy and vigorous seedlings were transplanted to the field. After transplanting 200kg/ha DAP and 100kg/ Urea in split form (50% during planting and 50% after one and half month) were applied. The trial were conducted at Sheka Tekli irrigation schemes(FTC)using randomized complete block design (RCBD in three replications having a plot size of 3mx4.2m . The spacing between plots, rows and plants were 50cm, 70cm and 30cm respectively.

3.4 Data collected

- Sowing dates
- Days to emergence
- Transplanting date
- Days to flowering (50%)
- Number of fruits per plant
- Fruit length and diameter (cm)
- Plant height (cm)
- Average fruit weight (kg)
- Marketable and unmarketable yield (kg/ha)
- Total yield (kg/ha)

4. RESULT AND DISCUSSION

Table 1. Effect of different varieties on yield Components of pepper in Shekatekli irrigation scheme

	Parameters											
	Days to 50%Emergence			transplanting date			days to 50% flowering			fruit no/plant		
Varieties	Y_1	Y_2	Mean	Y_1	Y_2	Mean	Y_1	Y_2	Mean	Y1	Y2	Mean
Bako local T_2	12	11	11.5	48	47	47.5	81.33	84.333	82.83	24.70^B	71.33	48
Melkawaze T_3	12	11	11.5	48	47	47.5	81.33	83.667	82.50	46.30^A	54.33	50.30
Marakofana T4	12	11	11.5	48	47	47.5	81.33	81.667	82.50	25.30^B	57.67	41.48
Melkashote T_1	12	11	11.5	48	47	47.5	80.33	85.000	82.66	45.30^A	45.00	45.15
LSD	Ns	Ns		Ns	Ns		Ns	Ns		10.51	Ns	
CV	0.00	0.00		0.00	0.00		1.66	5.1		24.26	23.8	
SED	0.00	0.00		0.00	0.00		0.35	1.050		3.78	0.43	

Where: $Y_{1=}$ 2005/2006 Cropping season

Y_{2} = 2006/2007 Cropping season

Days to 50% Emergence, transplanting date and days to 50% flowering

The analysis of data during the two cropping season showed that there was no statistically significant difference among pepper varieties at (p= 5%) in response to days to germinate. In both years of production, days taken to 50% germination to all varieties were equal.All varieties averagely took 11 and half day for germinate in.Not only this but also, there was no a difference in transplanting date.All pepper varieties were transplanted in 48 days and 47 days in year one and two respectively.Although there was no significance difference in that of days to 50% flowering the highest and the lowest mean days from the two years were recorded from Bacolocal (82.83day) and Markofana and Melkawaze(82.50) respectively.

Fruit number per plant:

The analysis of data 2005 cropping season showed that there was statistically significant difference at (p= 5%) among the variety of pepper in relation to fruit number per plant. The highest and lowest fruit numbers per plant were observed in Melkawaze(46.30) 1 and Bacolocal (24.70). However, this statistical difference was not repeated in the second year production season.In the second year of production, the differences observed among treatments were numerical; not statistical.

Table 2. Effect of different varieties on yield Components of pepper in Shekatekli irrigation scheme

Varieties	Parameters											
	average fruit wt/g			Fruit length(cm)			Fruit diameter (cm)			Plant height (cm)		
	Y_1	Y_2	Mean	Y_1	Y_2	Mean	Y_1	Y_2	Mean	Y1	Y2	Mean
Bako local T_2	6.47 ^{B}	6.33 ^{B}	6.40	8.870BC	9.00 ^{A}	47.5	1.0300 ^{B}	0.93	0.98	39.7 ^{B}	49.33 ^{B}	
Melkawaze T_3	8.47 ^{A}	9.20 ^{A}	8.83	10.400 ^{AB}	8.66 ^{A}	47.5	1.0400 ^{B}	1.24	1.14	50 $^{B\,A}$	66.66 ^{A}	
Marakofana T4	7.670 ^{A}	9.66 ^{A}	8.66	8.530 ^{C}	9.00 ^{A}	47.5	1.4930 ^{A}	1.16	1.33	41.0 ^{B}	52.33 ^{BA}	
Melkashote T_1	8.17 ^{A}	7.33 ^{B}	7.75	11.130 ^{A}	10.33 ^{A}	47.5	1.0130 ^{B}	0,93	0.97	56.7 ^{A}	54.66 ^{BA}	
LSD	1.112	1.16		Ns			0.4831	Ns				
CV	7.42	8.6		9.38	8.70		20.56	21.1		16.8	16.4	
SED	7.47	0.43		0.39	0.33		0.084	0.06		2.84	2.79	

Where: $Y_{1=}$ 2005/2006 Cropping season
Y_{2} = 2006/2007 Cropping season

Fruit weight (gm):

Fruit weight of pepper showed statistically significance among the varieties in both years of production ($p=$ 5%). The highest and lowest fruit weight in the first year, was recorded in Melkawaze and Bacolocal which accounts8.47gms and 6.47gms respectively.

Fruit Length (cm)

As fruit length of the pepper variety is concerned, there was statistically significant difference ($p=$ 5%) among pepper varieties in first cropping season,Melkashote which is statistically similar with Melkawaze (10.40cm) showed the highest fruit length(11.130)and Markofana which is statistically similar with Bacolocal (8.87cm) showed the lowest fruit length(8.530cm).However, there were no significance difference of fruit length in all varieties of pepper in the second production season.

Fruit diameter (cm):

Based on the analysis of variance, there was significance in year one.The highest and lowest diameter in year one were recorded from Markofana and Melkashote which was1.4930cm and1.0130cm respectively.However,there was no significance difference in the second cropping season.

Plant height (cm):

The analysis of variance showed that there was statistically significance difference at ($p=$ 5%) among pepper variety during the 2005/2006 cropping season. Melkashote which was statistical similar with Melkawze (50cm) showed the highest plant height(56.7cm).Bacolocals which was statistically similar with Marakofana (41cm) and Melkawaze showed the lowest plant height (39.7cm)In 2006/2007 production season,Melkawaze which was statistically similar with Markofana(52.33cm) and Melkashote(54.66cm) showed the highest plant height (66.66cm).Bacolocal which was statistically with Melkashote and Markofana showed the lowest plant height(49.33cm).

Table 3. Effect of different varieties on yield and yield Components of pepper in Shekatekli irrigation scheme

Varieties	Parameters											
	Days to 50% maturity			Marketable yield Qt/ha			Unmarketable yield Qt/ha)			Total yield (Qt/ha)		
	Y_1	Y_2	Mean	Y_1	Y_2	Mean	Y_1	Y_2	Mean	Y1	Y2	Mean
Bako local T_2	126.670 $^{B\,A}$	118.33	122.5	92.70 ^{C}	163.02 ^{A}	127.86	0.00	2.11	2.11	92.70 ^{C}	165.13 ^{A}	128.92
Melkawaze T_3	127.670 $^{B\,A}$	119.00	123.33	126.28 ^{A}	139.05 ^{BA}	132.66	0.00	4.21	4.21	126.28 ^{A}	143.26 ^{BA}	134.77
Marakofana T4	128.000 ^{A}	119.33	123.66	106.20 ^{CB}	130.40 ^{BA}	118.3	0.00	2.11	2.11	106.20 ^{CB}	132.51 ^{BA}	119.35
Melkashote T_1	126.330 ^{B}	119.66	122.45	108.10 ^{B}	107.40 ^{B}	107.75	0.00	3.45	3.45	108.10 ^{B}	110.85 ^{B}	109.48
LSD	1.489	Ns		4.018	36.27		Ns	Ns		4.018	34.55	
CV	0.68	0.7		6.67	12.8		0.00	50.40		6.67	11.8	
SED	0.29	0.26		4.018	7.64		0.00	0.42		4.018	7.43	

Where: $Y_{1=}$ 2005/2006 Cropping season
Y_{2} = 2006/2007 Cropping season

Days to Maturity

The analysis of data during 2005/2006 cropping season showed that there was statistically significant difference among pepper varieties at ($p=$ 5%).The highest maturity date was recorded from Markofana(128.days). However, it was statistically similar with Melkawaze (127.670days) and Bacolocal (127.670days).The lowest days to maturity was recorded in that of Melkashote (126.33days).In 2006/2007 production season,all the treatments(varieties) of pepper showed statistically similar maturity dates.But the highest and the lowest days to maturity were recorded in Melkashote and Bacolocal which were 119.66 days and 118.33 days respectively.

Marketable Yield (qt/ha)

Regarding with marketable yield of pepper, the analysis of data during the 2005/2006 cropping season showed that there was statistically significant difference at ($p=$ 5%) among the varieties in marketable yield/ha. The highest and lowest marketable yield was observed in Melawaze and Bacolocal which were 126.28Qt and 92.70qt respectively. In the second season (2006/2007 cropping season).The analysis of variance showed significance difference in response to marketable yield/ha.The highst and the lowest market able yield were observed in

Bacolocal a**nd** Melkashote which was 163Qt and 107.04Qt respectively.

Unmarketable yield qt/ha

The analyzed data in both production seasons showed that there was no significance difference in response to unmarketable yield.

Total Yield Qt/ha

As we can see from the table, in the first production season, there was any loss of production. This implies that marketable yield/ha equivalent to that of total yield/ha.In2006/2007 production season,Bacolocal,Melkawaze and Markofana showed statistical similarity in relation to total yield/ha and Melkashote was significantly different from others. The highest total yield/ha which was165.13Qt was recorded from Bacolocal and the lowest from Melkashote (110.85).

5. CONCLUSIONS AND RECOMMENDATIONS

The research was conducted in a farmer land of Shekatekli irrigation Scheme in 2005/2006 and 2006/2007 production seasons. Among the varieties of pepper(Melkawaze.Markofana,Melkashote and Bacolocal),Melkawaze gave good yield in both production seasons.however,although Bacolocal was considered as low yielder in the first production season, it sharply increases its yield in 2006/2007 production season and become statistically similar with Melkawaze and Markofana.Not only this but also most farmers prefer Bacolocal due to high fruit number/plant in the second production season. The yield for Markofana In the experiment was much lower of Melkawaze and Bacolocal.But farmers prefer it for Awaze(dry pod yield).Therefore, farmers are better to use Melkawaze and Bacolocal for better pepper yield. However, if their intention is dry pod yield they have to use Markofana.

6. REFFERENCES

Acquaah, G. 2004. Horticulture: Principles and Practices. 2nd Edition. Prentice Hall of India Private Ltd. New Delhi, India. P.78.

Andrews, J. 1999.The Pepper Trail: History and Recipes from and round the World. University of North Texas Press, Denton, Texas. 261pp.

Berke, T.,Black.N.S.,Talekar. J.F. Wang,P.,Gniffke.S.K.,Green, T.C.Wang and R.Morris. 2005. Suggested Cultural Practices for Chili Pepper. International Cooperators Guide. AVRDC.Pub#05 620.

Bosland, P.W. 1996. Capsicums: Innovative Uses of an Ancient Crop. Pp. 479-487 In J.

Janick ed.Progress in New Crops. ASHS Press, Arlington, Virginia, USA.

Dennis S. Ashilenje. 2013. Learn How to Grow Peppers. Nairobi, Kenya.

Lovelock, Y. 1973. Various Herbs Spices and Condiments. The Vegetable Book. New York: St. Martin Press.

Melkasa Agricultural Research Center. 2004. Progress Report Addis Ababa, Ethiopia.