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Evaluation and selection of introduced and released hot pepper (*Capsicum annuum* L.) varieties for pod yield and quality in Southern Ethiopia

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Abstract

The field experiment was conducted using 19 pepper genotypes at two locations in wolaita zone, Ethiopia, in 2014/15 using Randomized Complete Block Design with 3 replications to evaluate the performance and select the best variety in terms of pod yield and quality. ANOVA indicated there was significant difference (p=0.05) among genotypes in all tested parameters. At Wolaita Sodo the highest fresh pod yield (22,173kg/ha) and the lowest (9,432kg/ha) was recorded for treatments 2 and 7, respectively with yield range of 12,741kg/ha. The highest (4,404.3kg/ha) and lowest (646.2kg/ha) dry pod yield was observed for treatments 13 and 11, respectively having dry pod range of 3,758.1kg/ha due to difference in varieties. Similarly, at Areka the highest fresh pod yield (35,999kg/ha) was recorded by treatment 10 whereas the lowest yield (15,329kg/ha) was observed by treatments 7 and 9, respectively. The highest dry pod yield (5,269.4kg/ha) recorded by treatments 13 and the lowest (1098.7kg/ha) was scored for treatment 11. Fruit quality showed significant difference among genotypes. The highest fruit length (146.45 cm) was recorded for treatment 1 and that of the highest width (73.99 cm) was recorded for treatment 11 followed by (73.80 cm) treatment 12. The result revealed that some introduced genotypes performed better than local ones in terms of yield and quality. Therefore, varieties (treatments 2,3,4,10,12, 13) are selected ones and must be promoted. Further, some varieties which performed best in specific location need to be tested across locations and seasons.

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Introduction

The genus *Capsicum* belongs to the family Solanaceae. Within the genus *Capsicum*, five species are commonly recognized as domesticated: *Capsicum annuum*, *C. baccatum*, *C. chinense*, *C. frutescens* and *C. pubescens* while approximately 20 wild species have been documented (Peter, 2012).

While the genus Capsicum is believed to have originated in Bolivia Peru, and Ecuador, Archaeological data, phytogeography and genetic analyses have led researchers to suggest that *Capsicum annuum* was initially domesticated in Mexico or northern, south and central America (Raghavan, 2007; Russo, 2012).

Hot pepper (*Capsicum spp*.) is grown worldwide both as spice and as a vegetable crop. Capsicum peppers are the most common crop in the countries of the tropics and subtropics with *Capsicum annuum* L. by far the most widespread species (Berke, 2002; Bostland and Votava, 2000). Hot peppers are better adapted to warm humid climate, while worm and dry weather enhances fruit maturity. An optimum day temperature for hot pepper is ranging from 20 to 30°C and the night temperatures ranging from 15 to 20°C. Hot pepper is found to be grown successfully as a rainfed crop in areas receiving an annual rainfall of 850-1200 mm.

FAO reported that there were 1.83 million hectares of peppers grown. The average yield in 2008 was 16.1 t ha−1, with total production estimated at 2.94 million metric tons. The major pepper producing nations in terms of volume are India, Ethiopia, Myanmar, China, Peru, Thailand, Pakistan, Bangladesh, Indonesia, Mexico, and Sri Lanka (Peter, 2012).

The history of pepper in Ethiopia is perhaps the most ancient than the history of any other vegetable products (EEPA, 2003). Ethiopians have strong attachment to dark red pepper which has high value principally for its high pungency. The fine powdered pungent product is an indispensable flavoring and coloring ingredient in the common traditional sauce 'wot' whereas; the green pod is consumed as a vegetable with other food items and it also has an important role in the national economy (Poulos, 1993; MoARD, 2007). The nutritional value of hot pepper merits special attention, because it is a rich source of vitamin A, C and E. Both hot and sweet peppers contain more vitamin C than any other vegetable crops (Poulos, 1993).

Capsicum is grown in most part of the county. The central (Eastern and Southern Shoa), Western, North Western (Wellega, Gojjam) and the Northern part of the country are the potential capsicum producing areas in the country. It is an important cash crop today on average 79% of pepper production is for market in SNNPRS (CSA, 2003). It is a crop of high value in both domestic and export market. Since it is a commercial and industrial crop, it generates employment to urban and rural workers (Roukens, 2005). In Wolaitazone (area) it is basically grown for income generation and household consumption. It is high value crop in area of Wolaita such as Shanto, Humboabala, Damote Woyde and Bele.

Fruit yield as well as quality improvement efforts continue to be the major objective of pepper improvement programme. Productivity of pepper can be increased by cultivating new genotypes. So area based screening for improving the productivity of this crop is an important step to increase the production (Bonsu *et al*., 2003; Datta and Jana, 2004; Amit *et al*., 2014).

Despite the crop's importance in terms of yield and income generation, its production and productivity is challenged by many factors such as limited research works, lack of improved varieties, poor agronomic practices (including population density, fertilizer rates), biotic and abiotic stresses (Alemu and Ermias, 2000; Bonsu *et al*., 2003). Thus, the current study was designed to fill at least one and other related gaps in pepper production and productivity namely variety selection for yield and quality. Therefore, the current research was conducted with the objectives to test adaptability and identify the best performing pepper variety under Wolaita conditions; and to select pepper varieties for fresh and dry pod yield and quality.

Materials and methods

Description of the study area

The experiment was conducted at two different locations in Wolaita zone Southern Ethiopia. One is Wolaita Sodo University (WSU) horticulture nursery site and the other is at Areka (Dubo farmer's field) in Boloso sore woreda, Wolaita zone. Wolaita Sodo site is located in 06°50'00" N latitude and 37°45'07" E longitude having an altitude of 1882 mas. It receives an annual average rain fall of 1212mm. Areka site is located in latitude of 07° 05" 814' North and 037° 40" 917' East longitude. It has an altitude of 1720 masl. The soil texture is sandy loam with pH of 5.9. The area receives average annual rainfall of about 1460 mm and it has mean minimum and maximum temperatures of 16°C and 27°C, respectively.

Experimental Treatments and Design

Treatments

Fifteen pepper varieties (listed 1-15 below) were introduced from Asian Vegetable Research and Development Center (AVRDC) and 4 released varieties (listed 16-19 below) were collected from Melkasa Agricultural Research Center. Hence, a total of 19 pepper varieties were used as treatments and arranged according to the following order:

1. Avpp9905 2. Avpp9813 3. Avpp0105 4. Avpp0206
5. Avpp0303 6. Avpp0409 7. Avpp0411 8. Avpp0512
9. Avpp0514 10. Avpp9807 11. Avpp0402 12. Avpp0504
13. Avpp59328 14. Avpp1108 15. Avpp1109
16. M.elkazala 17. Melkaawaze 18. Marako.fana
19. Melkashote

Experimental Design

The experiment was laid out in RCBD with three replications using spacing of 70 X30 cm between rows and plants, respectively. A continuous plot having size of 1.4m X 1.5m was used containing two rows per plot and five plants per row with a total of 10 plants per plot.

Data Collection

The following vegetative and yield data were recorded: Plant height (cm), Canopy width(cm), Stem diameter (cm), Branch number per plant, Fruit number per plant, Fruit diameter (mm), Fruit length (mm), Seed number per fruit, Fresh fruit weight (gm), Fruit skin thickness (mm), Fresh fruit yield (kg/ha), and Fruit dry weight(kg/ha).

Data analysis

ANOVA for individual locations was performed following standard procedure stated by Gomez and Gomez (1984) using SAS software; Mean separation was done using LSD at 5% probability level of significance.

Results and discussion

The result revealed that there was statistically significant difference among genotypes in all the tested parameters at both tested locations (Table 1 and 2).

When the treatments (varieties) considered, there are introduced varieties which performed well and out yielded the locally released varieties from Melkasa agricultural research center. At Areka, about seven varieties (treatments) namely treatments 2, 3, 6, 10, 11, 12 and 13 performed better than the released varieties. The highest fresh fruit yield (35999kg/ha) was observed by treatment 10 (variety Avpp 9807) followed by treatment 12 (variety Avpp 0504) (35854 kg/ha) whereas the lowest yield (15329kg/ha) was recorded by treatment (variety) 7. Among released varieties, Treatment 16 (Melkazala) performed (19195kg/ha) relatively better than other released varieties but still inferior as compared to other introduced varieties. The variation in fresh fruit yield showed the difference of 20670 kg/ha at Areka due to the difference in varieties (Table 3). The result is in line with the findings of Juroszek and Tsai (2009) who reported that during the hot-wet season, high total (44.6–55.7 t/ha) and marketable yields (36.9–45.6 t/ha) were achieved under organic farming conditions in the open field and during the cool-dry season, the total (25.4–45.7 t/ha) and marketable yields (21.1–37.8 t/ha) was recorded for six pepper lines tested at Taiwan-Asia. In the case of dry pod yield, there are promising varieties which performed better than the overall mean values include treatments 2, 4, 10, 13, 14, 15, 16, 17, 18 and 19.

The highest dry pod (fruit) yield (5269.4kg) was obtained by variety 13 (introduced) followed by (4963.6kg/ha) by variety 16 (Melkazala, released). On the other hand, the lowest dry fruit yield (1048.7kg/ha) was observed by variety 11. Similar to fresh weight, dry weight has also shown a huge range (4220.7 kg/ha) that calls for a critical look for variety selection in order to exploit the existing potential and to maximize production and productivity. There are five introduced varieties which are comparatively better performed in dry weight and those released ones are again competent enough though the highest record was obtained by introduced one (Table 3). This result agrees with the result obtained by (Omotayo *et al.*, 2014). They reported that sweet bell fruit pepper variety Z105 showed best fruit yield (5086.7 kg/ha) and again that of long cayenne pepper varieties tested showed the highest (4151.7 kg/ha) and the least (1128.4kg/ha).

Table 1. ANOVA for 19 Pepper varieties tasted at Areka (Dubo) location, 2014/15.

SV	Df	Mean Square values											
		Ph	Cw	Sd	Bn	Fn	Fd	Fl	Sn	Fwt	Tick	Yld	Dwt
Rep	2	7.34	7.26	277.9	0.56	437.18	5.03	99.74	105.19	6623972.09	0.003	27578946	2631292.61
Trt	18	313.75**	162.35**	46.91**	2.8**	1061.2**	1077.47**	2034.34**	2385.58**	4017568.35**	4.98**	115551058**	2935068.45**
Error	36	18.34	16.88	13.34	0.64	201.86	7.99	118.17	121.92	1345942.5	0.06	31161137	1225822.2
CV		10.0	11.1	11.25	16.86	38.68	11.47	10.67	11.05	39.55	9.35	27.72	44.24
LSD		7.09	6.8	6.04	1.32	23.53	4.68	18.0	18.28	1221.1	0.39	9243.8	1833.4

*= statistically Significant at 5% Probability; **= statistically Significant at 1% Probability.

SV= sources of variation; Rep= Replication; Df= Degree of freedom; Trt= Treatments; CV= Coefficient of variation; LSD= least significant difference; Ph=plant height(cm); Cw= Canopy width (cm); Sd= stem diameter(cm); Bn= Branch number per plant; Fn= Fruit number per plant; Fd= average fruit diameter(mm); Fl= average fruit length(mm); Sn= Seed number per fruit; Tick= fruit flesh thickness (mm); Yld=fresh fruit yield(kg/ha); and Dwt= Fruit/pod dry weight(kg/ha).

Table 2. ANOVA for 19 Pepper varieties tasted at Wolaita Sodo location, 2014/15.

SV	Df	Mean Square values											
		Ph	Cw	Sd	Bn	Fn	Fd	Fl	Sn	Fwt	Tick	Yld	Dwt
Rep	2	111.9	379.43	265.1	6.87	611.97	7.49	12.32	317.43	1506303.28	0.16	46888945.9	554081.09
Trt	18	314.9	137.89	46.34	2.86	736.36	841.49	2246.48	3482.07	6387346.06	3.59	40291004	2154548.1
Error	36	34.5	25.88	13.09	0.77	138.78	3.25	109.75	269.72	567165.39	0.106	18017150	409866.12
CV		12.17	13.73	11.25	17.15	43.5	8.17	9.65	23.81	39.82	15.14	29.06	31.28
LSD		9.72	8.42	5.97	1.46	19.51	2.98	17.35	27.2	1247.1	0.54	728.9	1060.1

*= statistically Significant at 5% Probability; **= statistically Significant at 1% Probability.

SV= sources of variation; Rep= Replication; Df= Degree of freedom; Trt= Treatments; CV= Coefficient of variation; LSD= least significant difference; Ph=plant height(cm); Cw= Canopy width (cm); Sd= stem diameter(cm); Bn= Branch number per plant; Fn= Fruit number per plant; Fd= average fruit diameter(mm); Fl= average fruit length(mm); Sn= Seed number per fruit; Tick= fruit flesh thickness (mm); Yld=fresh fruit yield(kg/ha); and Dwt = Fruit/pod dry weight(kg/ha).

At Wolaita Sodo the result revealed more or less similar result. There are about 9 varieties performed higher than the total average mean out of which 8 are introduced and one is the released variety. The highest fresh fruit yield (22173 kg/ha) was recorded by variety 2 and the lowest (9432 kg/ha) was recorded by variety 7.

The top five high yielders in terms of fresh fruit yield in respective descending order include varieties 2, 3, 4, 8 and 10 with corresponding fresh fruit yield of 22173, 19955, 19488, 18735 and 17322 kg/ha; respectively. There was a yield range of 12741 kg/ha observed due to the difference in varieties.

Table 3. Mean values of traits studied for 19 pepper varieties tested at Areka, 2014/15.

Trt	Ph	Cw	Sd	Bn	Fn	Fd	Fl	Sn	Fw	Tic	Yld	Dw
1	36.64ghij	50.58ab	35.60ab	5.08abcde	19.52fg	19.75def	146.45a	135.61b	2500.8bcd	2.45de	16075c	2196.4cde
2	48.14cde	41.25cd	34.71abcd	5.42abcd	47.21bcde	17.61defg	96.68def	90.82efg	3328bcd	2.38de	19333bc	2775.2bcde
3	35.89ghij	30.5fg	29.46cdef	4.22defg	27.0efg	14.55gih	118.72bc	90.63efg	3273bcd	1.66hij	21969bc	2251.8bcde
4	44.83def	41.0cd	29.54cdef	4.67bcdef	76.67a	13.71gih	101.78cde	80.17fgh	2885.4bcd	2.21ef	18403bc	2577.3bcde
5	37.58ghi	31.95fg	28.97def	5.58abc	26.07efg	22.27cd	109.53cd	75.42gh	1820.6cd	2.38de	15630c	1646cde
6	41.79efg	34.56def	35.73ab	4.33cdefg	33.68def	21.66cde	119.2bc	70.83h	3476.9bc	2.99c	20800bc	1771.9cde
7	31.67ij	29.95fg	24.00f	3.78efgh	26.68efg	14.19hig	131.63ab	76.17gh	1550.5d	2.12efhg	15329c	1746cde
8	34.83ghij	30.75fg	32.33bcde	5.92ab	67.83ab	13.95fgh	138.08a	64.33h	2612.6bcd	2.72cd	18426bc	1662.1cde
9	32.25ij	34.56def	28.11ef	6.33a	34.06def	17.33efg	111.45cd	93.7efg	2423.5bcd	1.97fgh	15349c	2149.4cde
10	49.25cd	38.83de	36.56ab	5.0bcdef	18.33fg	46.23b	113.58cd	131.5bc	6694.3a	5.18b	35999a	2951.2bcd
11	38.55fghi	33.33efg	39.89a	3.08gh	7.97g	73.99a	50.67h	174.58a	3729bc	4.96b	21680bc	1098.7e
12	29.67j	26.67g	34.58abcd	2.83h	8.33g	73.80a	53.62h	77.67fgh	3927.8b	5.63a	35854a	1249.5ed
13	41.83efg	30.78fg	32.33bcde	5.51abcd	40.76cdef	9.99i	53.16gh	91.18efg	3170.9bcd	1.33kj	25657b	5269.4a
14	33.56hij	30.19fg	34.22abcd	3.81efgh	32.50def	16.49fgh	105.47cde	116.88cd	2172.7bcd	1.56ij	16737bc	3063.8bcd
15	40.17fgh	41.08cd	25.67f	5.50abcd	52.02bcd	13.89ghi	80.58fg	94.5ef	1513.5d	0.99k	15487c	2888.4bcde
16	57.79ab	36.69def	32.89bcde	5.46abcd	40.61cdef	19.38def	108.12cd	106.47de	3106.3bcd	1.79ghi	19195bc	4063.7ab
17	62.75a	53.19a	33.82bcde	4.67bcdef	53.13bcd	19.42def	97.73def	119.92bcd	3139.3bcd	2.10efg	18107bc	3137.6bc
18	51.28ab	46.02bc	35.12abc	3.71fgh	27.27efg	25.46c	98.69de	128.84bc	2587.5bcd	2.14efg	16947bc	2532.4bcde
19	54.94bc	41.25cd	33.28bcde	5.15abcd	58.17abc	12.6hi	89.95ef	79.3fgh	1826cd	2.18efg	15605c	2510.6bcde

Note: means with the same letter are statistically non-significant.

In fruit dry weight 8 varieties performed better than mean values include varieties 2, 3, 4, 13, 14, 15, 17, and 18 out of which variety 13 scored the highest (4404.3 kg/ha). The lowest dry pod yield (646.2kg/ha) was recorded for variety 11 (Table 4). The location dry pod yield variation ranged 3758.1 kg/ha due to the difference in varieties that reveals variety selection is critical for production, productivity and economic return as well. This result agrees to the result reported by Sintayehu (2011). He found that Melkaawaze has yielded 15.66 t/ha and 3.09 t/ha fresh and dry pod yield, respectively under Jimma condition.

Table 4. Mean values of traits studied for 19 pepper varieties tested at Wolaita Sodo, 2014/15.

Trt	Ph	Cw	Sd	Bn	Fn	Fd	Fl	Sn	Fwt	Tick	Yld	Dwt
1	50def	43.33bc	35.61ab	5.55bcde	10.77f	18.43d	171.31a	156.67a	590.7cd	2.16cd	11993cdef	1451.2efg
2	54.67cde	39.55bcdef	34.72abcd	7.34a	45.75b	15.08efg	100.35f	41.33hij	2914a	1.84def	22173a	2954.1b
3	49.22def	33.33defghi	29.45def	6.22abc	33.50bcde	13.23fghi	110.59ef	89.67cd	2316.5ab	1.55efgh	19955ab	2540.7bcd
4	49.56def	33.89defghi	29.55cdef	4.56defg	45.29b	11.18h	98.22f	66.33defgh	2238.3ab	1.74def	19488ab	2848.4b
5	43.17fg	32.17efghi	29.11def	4.5defg	22.51cdef	20.07d	135.15bc	60efghi	2054.5ab	1.66defg	15115bcdef	1730.9cdef
6	43.5fg	31.17fghi	35.67ab	3.72g	27.8bcde	17.62de	128.64bcd	29.67j	2573.5ab	2.64c	15642abcdef	1315.5efg
7	41.67fgh	31.33fghi	24.0f	4.67defg	9.66f	14.20fgh	144b	40hij	664cd	1.95de	9432f	1293.1efg
8	32.78h	25.78i	32.33bcde	4.37defg	36.78bcd	13.52fgh	115.45def	37ij	2325ab	1.83def	18735abc	2032.2bcdef
9	41.78fgh	40.89bcd	28.11ef	6.67ab	18.9def	15.29ef	118.02cde	42.67hij	1573.9bcd	1.84def	11244def	1668.8defg
10	38.67gh	30.11ghi	36.56ab	4.44defg	10.32f	37.33b	115.22def	93cd	2582.8ab	3.33b	17322abcd	1590.4defg
11	38.67gh	28.22hi	39.89a	4.17efg	10.21f	65.23a	59.25g	109bc	2648.6ab	5.07a	11921cdef	646.2g
12	39.13gh	35.22cdefgh	33.45bcde	4.22defg	9.25f	67.31a	63.16g	30j	2165.3ab	4.73a	13768bcdef	1000.6fg
13	56.22cd	40.45bcde	32.33bcde	5.45bcdef	66.62a	10.34i	64.09g	70.67defg	1496.7bcd	1.08h	16877abcde	4404.3a
14	41.11fgh	37.33bcdef	34.22abcd	5.11cdefg	31.18bcde	15.37ef	111.06ef	60.33efghi	1746.4abc	1.31fgh	12962bcdef	2313.2bcde
15	46.0efg	38.44bcdefg	25.67f	5.67bcd	18.69def	10.41i	103.48ef	46.33ghij	507d	1.19gh	10058f	2276.1bcde
16	71.0a	40.44bcde	32.89abcde	5.44bcdef	23.26cdef	18.86d	120.17cde	87cde	1658.8bcd	1.75def	11691def	1940.3bcdef
17	68.44ab	52.99a	33.78bcde	5.0cdefg	37.13bcd	17.36de	100.1f	77.67def	2475.6ab	1.58efgh	15420abcdef	2783.4bc
18	60.55bc	44.44ab	35.45abc	3.99fg	16.37ef	25.23c	99.25f	122b	1815.2abc	2.05de	12365cdef	2141.1bcde
19	50.78def	44.89ab	33.11bcde	6.33abc	40.5bc	12.28ghi	104.04ef	51fghij	1589bcd	1.53efgh	11328def	1954.2bcdef

Note: means with the same letter are statistically non-significant.

As far as fruit quality is concerned, at Areka varieties 1,3,6,7 and 8 recorded high fruit length with the highest value 146.45 mm by treatment 1 and that of the lowest (50.67 mm) by treatment 11 showing range of 95.78mm due to variation in genotypes. The highest fruit diameter and flesh/pericarp thickness was observed by treatments 11 and 12. The highest fruit diameter (73.99mm) was recorded for treatment

11 and that of the lowest (9.9mm) was recorded by treatment 13. Similarly, highest flesh thickness (5.63mm) was recorded for treatment 12 and the lowest (0.99mm) for treatment 15 (Table 3). At Wolaita sodo, fruit length, width and skin/flesh thickness again followed more or less similar trend to that of Areka. The longest (171.31mm) fruit was observed for treatment 1 with the lowest (59.25mm) for treatment 11 having range of 112.06 mm. Varieties/treatments 11 & 12 are the high scorers in case of fruit diameter and flesh thickness. The highest and lowest (67.31 mm, 10.34 mm) fruit diameter was recorded for 12 and 13, respectively. Again that of flesh thickness was high (5.07mm) for treatment 11 and lowest (1.08mm) for treatment 13 (Table 4). The above results are in agreement with the findings of Sileshi (2014). He reported that fruit length of 15.65 cm and fruit diameter of 2.77cm was recorded for variety Marakofana under Jimma conditions.

Combined mean analysis revealed that most of introduced varieties were superior in both fresh fruit, dry yield and fruit quality. The top five high fresh fruit yielders include varieties 10, 12, 13, 3, 2 and 4 with their respective fresh fruit yield 26656, 24811, 21267, 20962, and 20753, whereas the lowest yield recorded was 12381 kg/ha for variety 7. The highest dry weight yield recorded was 4836.9 kg/ha for variety 13 whereas the lowest (872.5kg/ha) for variety 11. Among the top five high dry weight yielders three (13, 2, & 4) are introduced and two (16 & 17) are released varieties (Fig 1). Moreover, there are genotypes (treatments 2, 3, 4, 8 & 17) which gave consistently good yield in both locations which imply that these varieties will be further evaluated for wider adaptation for yield stability. On contrary to this, there are some varieties (treatment 6, 10, 12, 13 & 16) shown great yield fluctuations in tested locations. therefore, these genotypes will be recommended for specific locations (Fig. 1). This result is inconformity with the findings of variety evaluation at Jimma area in which the highest marketable dry yield (1927 kg/ha) and total dry yield (2180 kg/ha) was observed (Sileshi *et al.*, 2014). Again the findings of Nkansah *et al.*, (2011) indicated that among 11 pepper varieties tested in Ghana, highest yield of 30.8 t ha^{-1} and the lowest 14.2 t/ha was recorded in the forest condition.

The overall performance indicated that there are introduced varieties which performed/adapted well under Wolaita condition in terms of fresh and dry pod yield and qualities. Varieties such as 10 (Avpp 9807), 12 (Avpp 0504), 13 (Avpp 59328), 3 (Avpp 0105), 2 (Avpp 9813) and 4 (Avpp 0206) are among the superior introduced genotypes in fresh pod yield at the tested locations. In the case of dry weight, varieties 2 (Avpp 9813), 4 (Avpp 0206), 13 (Avpp 59328), 14 (Avpp 1108), 15 (Avpp 1109) and 17 (M. Awaze) are among the top well performed out of which the first 4 are introduced ones. There are varieties which performed better consistently at both locations while others showed yield fluctuation. When fruit qualities are concerned, varieties such as 1, 3, 5, 7 and 8 are selected in terms of fruit length while varieties 11 and 12 are among best selected for fruit diameter and flesh/pericarp thickness. The promising average fruit weight was also recorded for varieties 2, 3, 10, 11, 12 and 14 among others.

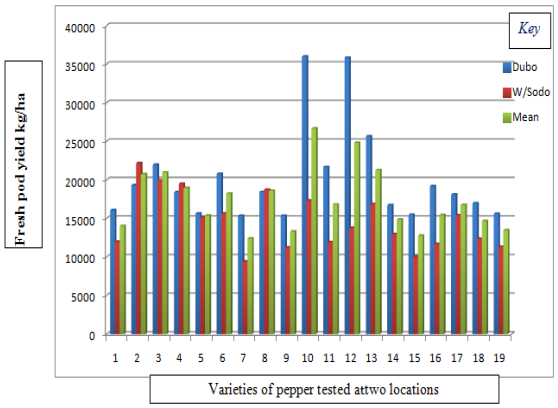

Fig. 1. Mean performance of total fresh fruit yield (kg/ha) for 19 pepper genotypes grown at two locations, Wolaita zone, 2014/15.

Therefore, it can be generalized that variety introduction is very important in boosting production and productivity. The result also shown that there are potential introduced varieties that will give an option for farmers for fresh, dry pod and quality. Again, it is very important to identify varieties for fresh and dry pod for specific market purpose. Moreover, diversifying the germplasm base for production in specific and general purpose, location and quality is a great advantage to adapt the changing climate and its consequence.

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