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By

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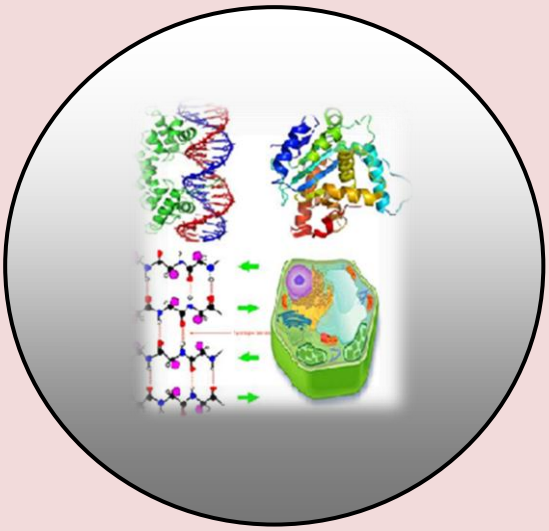

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RESEARCH PAPER

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Evaluation of Introduced and Land-race Banana Varieties for Yield and Yield Component under Jimma Condition South-West Ethiopia

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ABSTRACT

The experiment was conducted by using nine (9) banana varieties that were introduced and land-race with one improved check. The field experiment was laid out in a randomized complete block design (RCBD) with three replications. The combination of two round/Cycle yield and yield component variables were analyzed using the GLM procedure of SAS Statistical Software Version 9.1. Effects were considered significant in all statistical calculations if the P-values were < 0.05. Means were separated using Fisher's Least Significant Difference (LSD) test. The analyzed two-cycle harvest combined data resulted in a significant difference in plant height, leaf number, fruit diameter, and fruit length (p<0.05). There was no significant difference in stem girth, bunch weight, number of hands, number of fingers per hand, marketable fruit number per bunch, marketable fruit weight ton per hectare, unmarketable fruit weight ton per hectare, and total fruit weight per hectare. The highest significant difference in plant height was recorded by the Chinese dwarf variety with 208.46cm. It was statistical parity with the varieties Ladyfinger (197.48 cm), Paracidoalery (185.27 cm), William hybrid (194.02 cm), Ambo-2 (181.75 cm), Ambo-3 (199.26), Dinke-1 (201.92), and Dinke-2 (201.75). The least was recorded by Ambowha-selle with 160.01cm. The highest significant different leaf number was recorded by the Dinke-1 variety with a mean of 9.33. It was statistical parity with the varieties Ambowha-selle with 8.33. The least was recorded by Dinke-1 with a mean of 6.34. The highest significant difference in fruit girth (thickness) was recorded by the Dinke-1 variety with a mean of 6.15 cm. It was statistical parity with the variety Ambo-2 with a mean of 5.60 cm. The least was recorded by Ladyfinger with a mean of 5.04 cm which was statistical parity with all evaluated except Dinke-1 variety. The same as fruit girth, the highest significant difference in fruit length was recorded by the Dinke-1 variety with a mean of 18.47 cm.

The least was recorded by Ladyfinger with a mean of 13.97 cm which was statistical parity with all evaluated except Dinke-1 variety. In terms of yield, yield component, and quality across locations the two varieties (Dinke-1 and Ladyfinger) are recommended for release.
Keywords: Total finger weight ton per hectare, Fruit girth, Fruit length and Finger number per bunch.

INTRODUCTION

The present-day, dessert banana (Musa spp.) is amongst the most important food crops in the world and historically evolved in the humid tropical regions of South East Asia with India as one of its centers of origin. The Spanish and Portuguese are also recognized for introducing it to the Americas in the 16th century. It is also believed as bananas are introduced to the African continent in the prehistoric era [Crane et al., 206]. Banana represents the world's second-largest fruit crop with an annual production of 129,906,098 metric tons [Food and Agricultural Organization, 2010]. It ranks as the fourth most important global food market commodity after rice, wheat, and maize in terms of the gross value of production [Montpellier France. 1922, Woldu et al., 2015]. About 70 million people are estimated to depend on banana fruit for a large proportion of their daily carbohydrate intake [Swennen and Wilson, 1983]. Banana is the major staple food in developing countries. Latin America and the Caribbean are the leading suppliers to the world market. Ecuador is the leading producer in Latin and Dominican being the largest in the Caribbean. For Asian exporters, mainly the Philippines were the leading exporter in the region and the second-largest supplier globally which supplied 2.7 million tonnes of banana to the market [Woldu et al., 2015].

Banana produces fruit throughout the cycle and adds to its importance as a food security crop in Africa and is estimated to meet more than a quarter of the food energy requirements in the continent [Robinson et al., 1996]. It is a primary food and cash crop for income generations for over 30 million people in East Africa as well as central Africa [Viljoen, 2008]. Banana is a source of potassium, magnesium, copper, manganese, fiber, Vitamin C, and B6, but is low in iron and vitamin A. It is also believed as bananas help to fight depression, kidney cancer, and diabetes [Wall, 2006, Dodo, 2014]. Uganda is Africa's largest producer while Rwanda and Burundi are the second and third largest producers in East Africa, respectively [Food and Agriculture Organization of the United Nations website, 2009].

In Ethiopia, modern banana production was started at the beginning of this century with the establishment of state farms and different plantations such as large-scale sugarcane plantations. The production system of the crop is mainly composed of small plantations in home gardens; medium-sized plantations; and relatively large plantations [Bezuneh, 1973]. The export business of bananas in Ethiopia dates back to 1961 where the country started at about 5000 tonnes and increased to 60,000 tonnes by the cycle 1972. In 1975 the total production of bananas in the country has reached about 100,000 tonnes [Bezuneh, 1973, Berhe et al., 2008]. In Ethiopia, in terms of consumption and production, among the horticultural crops of the country, the dessert banana is the leading fruit crop. The current survey results show that fruit crops grown by the private peasant holders cover only a small token area and production in the country. About 116,284.63 hectares of land are under fruit crops in Ethiopia.

Bananas contributed about 57.95% of the fruit crop area followed by avocadoes that contributed 17.98% of the area. More than 8,436,238.66 quintals of fruits were produced in the country. Bananas, Mangoes Avocados, Papayas, and Oranges took up 63.94, 12.49%, 12.39 %, 6.16%, and 3.52% of the fruit production, respectively, as shown in Ethiopia. About 3,426,798 farmers participate in banana production with 67,387.20 hectares of land. From these hectares of land, 5,394,426.48 quintals of production were reported. It was also estimated that the productivity of 80.05 qui/ha. It was also accounted to be 57.95% in terms of Area distribution and 63.94 % in terms of yield production distribution [Central Statistical Agency, 2020]. It varies from region to region in terms of farmers' participation, area, and yield production. Accordingly, the southern region of Ethiopia is the leading and followed by the Oromia region and Amhara regions with an area of 47,197.73; 16,461.73, and 1,436.00 hectares of land respectively. The actual yields are less than 40 t $ha^{-1}cycle^{-1}$ at farmers level [Wairegi and van Asten, 2011], whereas, the potential yield of banana is greater than 70 t $ha^{-1}cycle^{-1}$ at the research level [Van Asten et al., 2003]. The poor productivity of bananas has been attributed to many biophysical factors such as lack of improved varieties pest, disease and poor extension [Gold et al., 1999]. It is one of the most important cash and income generation crops in Ethiopia, However, for many years; several problems tend to occurred which against the production of this crop in the country. Among these; the lack of improved varieties is the critical problem for bananas. There had no trend of using improved banana varieties in the existing production system so that it was the number one problem in the study areas. Therefore, there is a need to introduce improved banana varieties to the study area is crucial for banana production and productivity.

Therefore, this study was aimed to select the best performing banana varieties to the target area.

MATERIALS AND METHODS

Description of the Study Area

The experiment was conducted at Jimma Agricultural Research Center from June 2014 to December 2016 which was for thirty (30) months that represented the two-round/cycle harvest. It is located 366 km south-west of Finfinne (Addis Ababa). It is geographically located at latitude 7^{o} 46' N and longitude 36^{o} 47'E having an altitude of 1750 meters above sea level. The soil of the study area is Nitisol which is dominant with a pH of 5.3 [Paulos Dubale, 1994]. The area receives an average annuals rainfall of 1622.43 mm and average maximum and minimum temperatures of 24.2°C and 11.9°C respectively and average maximum relative humidity of 67.43% [Jimma Agricultural Research Center (JARC), 2018].

Treatments and Experimental Design

The experiment was conducted by using nine (9) banana varieties that were introduced and land-race with one improved check. The experiment was conducted from June 2014 to December 2016 which was for thirty (30) months that represented the two-round /cycle harvest. Each round/cycle harvest took fifteen months. The first round harvest took 15 months. The field experiment was laid out in a randomized complete block design (RCBD) with three replications. Ten banana plants were used on a single plot basis by using the square planting method to make a unit plot area in the spacing of 2.5 m between rows and 2.5 m between plants making a gross plot area of 62.5 m^2 for each variety.

Data Collected

Plant Height: Plant height was measured from below to the end of fruits using 50-meter tape from the outer to end of hands of the bunch at the mid of flowering date.

Pseudostem Circumference: the pseudostem girth was measured using 50 tap meters from the bottom above the soil to the fruit stalk at the mid of the flowering date.

Leaf Number per Plant: Plant Height in Centimeter: Plant height was measured from below to the end of fruits using 50-meter tape from the outer to end of hands of a bunch

Leaf Number per Plant: Leaf number per plant was counted from green photosynthetic leave.

Bunch Weight per Plant in Kilogram: was measured by balance.

Hand Number per Bunch: hand number per bunch was counted from each matured bunch.

Finger/Fruit Number per Hand: Finger number per hand was counted from matured hand on a bunch.

Marketable Fruit Number per Bunch: Marketable fruit number from each matured hand on the bunch

Fruit Girth in Centimeter: fruit girth was measured at the center of the matured fruits using a digital caliper

Fruit Length in Centimeter: fruit length was measured at the center of the matured fruits using a ruler

Marketable Fruit Weight Ton per Hectare: was measured by balance

Unmarketable Fruit Weight Ton per Hectare: was measured by balance

Total Fruit Weight Ton per Hectare: was calculated from the sum of marketable and unmarketable fruit weight ton per hectare

Statistical Analysis

Analysis of variance was performed using the GLM procedure of SAS Statistical Software Version 9.1 (SAS, 2007). Effects were considered significant in all statistical calculations if the P-values were < 0.05. Means were separated using Fisher's Least Significant Difference (LSD) test.

RESULTS AND DISCUSSIONS

Two-Cycle Harvest Combined Mean Yield and Yield Component of Banana Varieties Evaluated for under Jimma Condition, South-West Ethiopia

The two-cycle combined experiment has resulted in a significant difference in plant height, leaf number, fruit diameter, and fruit length ($p<0.05$). There were no significant differences in stem girth, bunch weight, number of hands, number of fingers per hand, marketable fruit number per bunch, marketable fruit weight ton per hectare, unmarketable fruit weight ton per hectare, and total fruit weight per hectare. A similar result was reported by Tigabu et al. [2015] on some of the yield components like pseudostem height was significantly ($P<0.001$) affected by varieties while; pseudostem circumference was not significantly affected by varieties.

Plant Height in Centimeter

The highest significant difference in plant height was recorded by the Chinese dwarf variety with 208.46 cm. It was statistical parity with the varieties Ladyfinger (197.48 cm), Paracidoalery (185.27 cm), William hybrid (194.02 cm), Ambo-2(181.75 cm), Ambo-3(199.26), Dinke-1(201.92), and Dinke-2(201.75). The least was recorded by Ambowha-selle with 160.01cm Table 1.

Similarly, the highest pseudostem height of (3.711) and (2.543) was obtained from the local check and improved banana varieties Poyo respectively, and the least pseudostem height of (1.534) was recorded from the Dwarf Cavendish [Tigabu et al., 2015].

Pseudostem Girth in Centimeter

The highest pseudostem girth was recorded by the William-9 (15.53 cm) which was used as the standard check variety. However, it was statistical parity with all varieties evaluated. Inversely to the plant height, the least pseudostem was recorded by the variety Chinese dwarf with 12.54 cm Table 1. Closely to this, Tigabu et al. [2015] reported that, the maximum pseudostem circumference of (45.677) and (41.12) were recorded from the improved banana varieties Giant Cavendish and Poyo respectively and the minimum pseudostem circumference (32.654) was noted from the local check. According to the above findings, the local check varieties had resulted in greater days to maturity and pseudostem height than the rest improved varieties [Tigabu et al., 2015].

Leaf Number

The highest leaf number was recorded by the Dinke-1 variety with a mean of 9.33. It was statistical parity with the varieties Ambowha-selle with 8.33. The least was recorded by Dinke-1 with a mean of 6.34 (Table 1).

Bunch Weight per Plant in Kilogram

There were no significant differences between all evaluated varieties in bunch weight per plant. However the highest bunch weight was recorded by the Ambowha-selle with a mean of 26.65 kg and the least was recorded by Dinke -1 with a mean of 19.79 kg (Table 1). This least record was inversely the leaf number. In line with this, Mehadi et al. [2016] reported that the maximum yield/plant (30.64 kg/plant) was obtained from the variety Robusta followed by Grandnain (28.72) and Dwarf Cavendish (25.03) while the lowest yield (7.69 kg/plant) was obtained from local Variety.

Hand Number per Bunch

There were no significant differences between all evaluated varieties in hand number per bunch. However, the highest hand number per bunch t was recorded by the variety Ambowha-selle with a mean of 15.93 and the least was recorded by William-9 (14.95) which is the standard check one (Table 1). Closely to this result, Zewdu et al. [2016] reported that the minimum and a maximum number of hands per bunch (16 and 23) were recorded by Giant Cavendish with an average of 19 per bunch. Similarly, the study conducted by Mohammed et al. [2015] indicates that the highest mean numbers of hands per bunch were recorded from William I and Giant Cavendish varieties. The other researcher also reported similarly that, the maximum number of hands per bunch of (7.145) was recorded for the improved banana variety Dwarf Cavendish and the minimum number of hands per bunch of (4.132) was recorded for the local check [Tigabu et al., 2015]. Yoseph et al [2014] also indicated that the maximum number of hands per bunch was recorded for the improved banana variety Pisang and the minimum number of hands per bunch was recorded for the local check.

Finger Number per Hands

In finger numbers per hand, there was no significant difference between all evaluated varieties. However, the highest finger number per hand was recorded by the variety Ladyfinger with a mean of 38.87 and the least was recorded by Ambowha-selle with a mean of 27.02 (Table 1).

In line with this, the maximum number of fingers per hand of (81.120), (80.213) and (78.231) were recorded for the improved banana varieties Dwarf Cavendish, Giant Cavendish, and Poyo, respectively and the minimum number of fingers per hand of (28.001) was noted for the local check [Tigabu et al., 2015]. Yoseph et al. [2014] also indicated that the maximum number of hands per bunch was recorded for the improved banana variety Pisang and the minimum number of hands per bunch was recorded for the local check.

Marketable Finger Number per Bunch

In marketable finger number per bunch, there was no significant difference between all evaluated varieties. However, the highest marketable fruit number per bunch was recorded by the variety Ambowha-selle with a mean of 123.43 which was in line to hand number per bunch and bunch weight. The least was recorded by William-9 variety the standard check one with a mean of 93.02 (Table 1). Higher fruit (finger) number than this experiment was reported by Mehadi et al [2016] with Dwarf Cavendish with the highest number of fruits per bunch (156) followed by Robusta (155) and Grandnain (147). The more closely results to this experiment were reported by Zewdu et al. [2016] indicated that, the higher number of fruits per bunch recorded by Giant Cavendish as compared to William I, Robusta, and local check varieties. Similarly, a study conducted by Tesfa and Mekias [2015] revealed that the highest mean number of fruits per bunch were obtained from Giant Cavendish and William I varieties next to Dwarf Cavendish varieties. Again similarly Assefa et al. [2020] reported the highest number of fingers per bunch (90.33) was recorded for Jiant Cavendish followed by Dwarf Cavendish varieties whereas the minimum number of fingers per bunch (55.67) was obtained from the Poyo variety. Inversely to these results and confirmations, Mohammed *et al*. [2015] reported that local collections were recorded higher finger yield per hectare than introduced banana varieties. This may be due to environmental conditions of the study area which possess low altitude.

Fruit/Finger Girth in Centimeter

The highest significant difference in fruit girth (thickness) was recorded by the Dinke-1 variety with a mean of 6.15cm. It was statistical parity with the variety Ambo-2 with a mean of 5.60cm. The least was recorded by Ladyfinger with a mean of 5.04cm which was statistical parity with all evaluated except Dinke-1 variety (Table 1).

Fruit/Finger Length in Centimeter

The same as fruit girth, the highest significant difference in fruit length was recorded by the Dinke-1 variety with a mean of 18.47cm. The least was recorded by Ladyfinger with a mean of 13.97 cm which was statistical parity with all evaluated except Dinke-1 variety (Table 1). Similarly, Assefa et al. [2016] reported the average length of randomly sampled fingers showed that the longest finger (12.38 cm) was obtained from the Jiant Cavendish variety whereas the shortest finger length (9.89 cm) was recorded from local variety.

Marketable Fruit/Finger Weight Ton per Hectare

In marketable fruit weight ton per hectare, there was no significant difference between all evaluated varieties. However, the highest marketable fruit number per bunch was recorded by the variety William hybrid with a mean of 39.33 ton ha^{-1}, and the least was recorded by Ambo-3 variety with a mean of 30.33 ton ha^{-1} (Table 1). Similarly, Zewdu et al. [2016] reported that, the average mean weight of Giant Cavendish accounted 22.41kg per bunch/ 35.86 ton ha^{-1} was higher as compared to William I accounted 18.63kg per bunch/ 29.8 ton ha^{-1}.

Table 1. Combined mean yield and yield component banana varieties evaluated for two round/Cycle harvest under Jimma condition Southwest Ethiopia.

Treat	PH cm	PSg cm	Leaf No	BWt Kg	HNB	FNH	MFNPB	FG cm	FL cm	MFW ton ha^{-1}	UnMFW ton ha^{-1}	TFW ton ha^{-1}
Lady finger	197.48^{ab}	13.42^{ab}	6.99^{c}	20.34^{a}	15.29^{a}	38.87^{a}	102.25^{ab}	5.04^{b}	13.97^{b}	31.98^{bc}	2.64^{a}	34.62^{bc}
Paracidoalery	185.27^{abc}	13.22^{ab}	6.98^{c}	23.02^{a}	15.88^{a}	36.92^{a}	97.87^{ab}	5.39^{b}	14.27^{b}	33.54^{abc}	2.88^{a}	36.42^{abc}
Chinese dwarf	208.46^{a}	12.54^{b}	6.96^{c}	22.43^{a}	15.71^{a}	31.84^{ab}	114.19^{ab}	5.21^{b}	14.39^{b}	33.55^{abc}	2.60^{a}	36.15^{abc}
William hybrid	194.02^{ab}	14.97^{ab}	7.11^{bc}	25.78^{a}	15.40^{a}	36.26^{a}	121.92^{a}	5.38^{b}	14.75^{b}	39.33^{a}	2.77^{a}	42.09^{a}
Ambo-2	181.75^{abc}	14.11^{ab}	6.87^{c}	23.93^{a}	15.48^{a}	27.50^{b}	94.38^{b}	5.60^{ab}	14.06^{b}	37.44^{ab}	3.00^{a}	40.44^{ab}
Ambo -3	199.26^{ab}	13.21^{ab}	7.00^{c}	20.35^{a}	15.04^{a}	32.88^{ab}	93.09^{b}	5.21^{B}	13.80^{b}	30.33^{c}	2.51^{a}	32.84^{c}
Williams 9(check)	176.43^{bc}	15.53^{a}	6.60^{c}	22.55^{a}	14.95^{a}	33.10^{ab}	93.02^{b}	5.10^{B}	14.83^{b}	32.04^{bc}	2.53^{a}	34.57^{bc}
Ambowhaselle-3	160.01^{c}	13.32^{ab}	8.83^{ab}	26.65^{a}	15.93^{a}	27.02^{b}	123.43^{a}	5.34^{B}	15.50^{b}	31.25^{bc}	2.75^{a}	34.01^{bc}
Dinke-1	201.92^{ab}	13.66^{ab}	9.33^{a}	19.79^{a}	14.96^{a}	34.07^{ab}	97.80^{ab}	6.15^{A}	18.47^{a}	31.73^{bc}	2.78^{a}	34.51^{bc}
Dinke-2	201.75^{ab}	13.23^{ab}	6.34^{c}	25.69^{a}	15.04^{a}	36.31	98.11^{ab}	5.28^{B}	15.10^{b}	32.63^{abc}	2.87^{a}	35.50^{abc}
Mean	190.64	13.72	7.30	23.05	15.37	33.48	103.61	5.37	14.91	33.38	2.73	36.11
cv	13.09	16.72	20.69	29.81	9.28	22.27	21.79	9.58	14.99	17.25	26.40	16.16
LSD	29.16	2.68	1.77	8.03	1.67	8.71	26.39	0.60	2.61	6.73	0.84	6.82

**** Means followed by the same letter in the same column were not significantly different.***
**** PH = Plant height; PSg = Pseudostem girth; cm = centimeter; Kg = kilogram; ton ha^{-1} = ton per hectare; No = Number;***
**** BWt =Bunch weight; HNB =Hand number per bunch; FNH=Finger number per hand; MFNPB =Marketable fruit/finger number per bunch;***
**** FG = Fruit/finger girth (thickness); FL=Fruit/finger length; MFW=Marketable fruit/finger weight; UnMFW =Unmarketable fruit/finger weight;***
**** TFW= Total fruit/finger weight***

Robusta accounted 16.24 kg per bunch/25.98 ton ha^{-1} on and local check accounted 12.09 kg per bunch/19.34 ton ha^{-1} on experimental farmers filed. Again, the study conducted by Yoseph et al. [2014] indicates that the highest fruit weights were recorded under Dwarf Cavendish and Giant Cavendish.

Assefa et al. [2020] also reported that the maximum weight of bunch per plant was recorded for Dwarf Cavendish variety followed by Jiant Cavendish and Grand Nain. However, the minimum average weight of bunch per plant was obtained from Poyo variety and Local which inline to or equal to yield ton per hectare from Dwarf Cavendish (106.77 qt ha^{-1}) followed by Jiant Cavendish (97.78 qt ha^{-1}).

Unmarketable Fruit/Finger Weight Ton per Hectare

In unmarketable fruit weight ton per hectare, there was no significant differences between all evaluated varieties. However, the highest unmarketable fruit number per bunch was recorded by the variety Ambo-2 with a mean of 3 ton ha^{-1}, and the least was recorded by Ambo-3 variety with a mean of 2.51 ton ha^{-1} (Table 1).

Total Fruit/Finger Weight Ton per Hectare

The same to marketable fruit weight ton ha^{-1}, there was no significant difference in total fruit weight ton ha^{-1} between all evaluated varieties. However, the highest marketable fruit number per bunch was recorded by the variety William hybrid with a mean of 42.09 ton ha^{-1} which was in line to marketable fruit weight ton ha^{-1} and the least was recorded by Ambo-3 variety with a mean of 32.84 ton ha^{-1} which was also in line to marketable fruit weight ton ha^{-1} (Table 1). Closely to this experiment, the maximum bunch yields of (43.211 ton ha^{-1}), (40.212 ton ha^{-1} and 33.211 ton ha^{-1}) were recorded from the improved banana varieties Dwarf Cavendish, Giant Cavendish, and Poyo, respectively, and the minimum bunch yield of (17.324 ton ha^{-1}) was noted from the local check [Tigabu et al., 2015]. Similarly Assefa et al. [2020] reported that, maximum yield was recorded from Dwarf Cavendish (10.67 ton ha^{-1}) followed by Jiant Cavendish (9.78 ton ha^{-1}) whereas the lowest yield was obtained from Local and Poyo variety. This is in line with Yoseph et al. [2014] report who indicated the maximum number of hands per bunch was recorded for the improved banana variety Pisang and the minimum number of hands per bunch was recorded for the local check and the maximum number of fingers per hands were recorded for the improved banana varieties Dwarf Cavendish, Giant Cavendish and Poyo and the minimum number of fingers per hand was noted for the local check.

Mean Yield and Yield Component Banana Varieties Evaluated For Two Round/Cycle Harvest under Jimma Condition South-West Ethiopia

Each two-cycle mean yield and yield component of data were analyzed and resulted in a highly significant difference in bunch weight, the number of hands per plant, fruit girth(thickness), marketable fruit weight ton ha^{-1}, unmarketable fruit weight ton ha^{-1}, total fruit weight ton ha^{-1} ($P< 0.01$), and leaf number per plant ($P< 0.05$) (Table 2). There were no significant differences in plant height, pseudostem girth, number of fingers per hand, number of marketable fingers per bunches, and fruit length (Table 2).

Plant Height in Centimeter

Plant height was no significant difference in the evaluation of each cycle which is 190.64 cm (Table 2). This shows that plant height governed by more genetic under normal environmental which are not varies significantly.

Pseudostem Girth (thickness) in Centimeter

The same as Plant height, pseudostem girth (thickness) was no significant difference in the evaluation of each cycle which is 13.72 cm (Table 2). This shows that the pseudostem girth (thickness) is governed by more genetic under normal environmental which are not varies significantly.

Leaf Number per Plant

The leaf numbers resulted in a significant difference in the second cycle (7.98) evaluation (Table 2). This may be due to environmental variations as a result the leaves may not affect by frost and other causes.

Bunch Weight per Plant in Kilogram

The bunch weights resulted in the highest significant difference in the second cycle (26.93kg) evaluation (Table 2). This may be due to environmental variations as a result favored the weight of the bunch.

Hand Number per Bunch

The numbers of hands per bunch resulted in the highest significant difference in the second cycle (21.20) evaluation (Table 2). This was in line with the bunch weights plant and maybe due to environmental variations which favored the number of hand bunch

Finger Number per Hands

The finger numbers per hand was not a significant difference in the evaluation of each cycle which is 33.48 (Table 2). This shows that the number of fingers per hand may be governed by more genetic in a normal environment which does not vary significantly.

Table 2. Mean yield and yield component banana varieties evaluated for two round/Cycle under Jimma condition southwest Ethiopia.

Round /Cycle	PH cm	PSg cm	Leaf No	BWt Kg	HNB	FNH	MFNPB	FG cm	FL cm	MFW ton ha^{-1}	UnMFW ton ha^{-1}	TFW ton ha^{-1}
1	190.64[a]	13.72[a]	6.62[b]	19.17[b]	9.54[b]	33.48[a]	103.91[a]	4.17[b]	14.90[a]	25.62[b]	3.89[a]	29.51[b]
2	190.64[a]	13.72[a]	7.98[a]	26.93[a]	21.20[a]	33.48[a]	103.30[a]	6.57[a]	14.93[a]	41.14[a]	1.58[b]	42.72[a]
Mean	190.64	13.72	7.30	23.05	15.37	33.48	103.61	5.37	14.91	33.38	2.73	36.11
Cv	13.09	16.72	20.69	29.81	9.28	22.27	21.79	9.58	14.99	17.25	26.40	16.16
LSD	13.04	1.20	0.790	3.59	0.75	3.90	11.80	0.27	1.17	3.01	0.38	3.05

**** Means followed by the same letter in the same column were not significantly different.***

**** PH = Plant height; PSg = Pseudostem girth; cm = centimeter; Kg = kilogram; ton ha^{-1} = ton per hectare; No = Number;***

**** BWt =Bunch weight; HNB =Hand number per bunch; FNH=Finger number per hand; MFNPB =Marketable fruit/finger number per bunch;***

**** FG = Fruit/finger girth (thickness); FL=Fruit/finger length; MFW=Marketable fruit/finger weight; UnMFW =Unmarketable fruit/finger weight;***

**** TFW= Total fruit/finger weight***

Marketable Fruit Number per Bunch

The same as finger numbers per hand, marketable finger numbers per bunch was not a significant difference in the evaluation of each cycle (Table 2). This shows that the number of marketable fingers per hand may be governed by more genetic under normal environmental which are not varies significantly.

Fruit Diameter in Centimeter

The fruit girth resulted in the highest significant difference in the second cycle (6.57 cm) evaluation (Table 2). This is in line with the bunch weight per plant

Fruit Length in Centimeter

The fruit length was not a significant difference in the evaluation of each cycle which is 13.72 cm (Table 2). This shows that the fruit length is governed by more genetic under normal environmental which are not varies significantly.

Marketable Fruit Weight Ton per Hectare

The marketable fruit/finger weights tons per hectare resulted in the highest significant difference in the second cycle (41.14) evaluation (Table 2). This was in line with the bunch weights per plant, several hands per bunch, and fruit girth.

Unmarketable Fruit Weight Ton per Hectare

The unmarketable fruit weight tons per hectare resulted in the highest significant difference in the first cycle (3.89) evaluation which was inverse to marketable fruit weight ton per hectare (Table 2). This was in line with the bunch weights per plant, the number of hands per bunch, and fruit girth.

Total Fruit Weight Ton per Hectare

The total fruit weights tons per hectare resulted in the highest significant difference in the second cycle (42.72) evaluation (Table 2). This was in line with the bunch weights per plant, the number of hands per bunch, fruit girth, and marketable fruit ton per hectares.

SUMMARY AND CONCLUSIONS

Banana is now a major food crop in Africa estimated to meet more than a quarter of the food energy requirements in the continent Banana is a primary food and cash crop for over 30 million people in East Africa. It is a staple food and a good source of income for several African countries especially East and Central Africa. In Ethiopia, in terms of consumption and production, among the horticultural crops in the country, dessert banana is the leading fruit crop. Accordingly, the southern region of Ethiopia is the leading and followed by the Oromia region and Amhara regions. It is one of the most important cash and income generation crops in Ethiopia, however, many problems had happened against the production of this crop in the country. Among these; the lack of improved varieties is the critical problem for bananas. There had no trend of using improved banana varieties in the existing production system, which is the number one problem in the study areas. As a result, the experiment was conducted using nine (9) introduced banana varieties and one improved check. The two-cycle combined experiment resulted in a significant difference in plant height, leaf number, fruit diameter, and fruit length ($p<0.05$). The highest significant difference in fruit girth (thickness) was recorded by the Dinke-1 variety with a mean of 6.15 cm. The least was recorded by Ladyfinger with a mean of 5.04 cm which was statistical parity with all evaluated except Dinke-1 variety.

Also, the highest significant difference in fruit length was recorded by the Dinke-1 variety with a mean of 18.47 cm. The least was recorded by Ladyfinger with a mean of 13.97 cm which was statistical parity with all evaluated except Dinke-1 variety. In terms of yield, yield component, and quality across locations the two varieties (Dinke 1 and Lady Fingers) are recommended for release.

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