Performance Evaluation of Banana Varieties, through Farmer’s Participatory Selection

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ABSTRACT

In many developing countries of rural areas, banana plays a significant role as source of economic growth, income, food security and nutrition. Seven dessert Banana cultivars were evaluated at West Hararghe, Mechara. The analysis of variance indicate that there were highly significant ($p < .001$) difference of all morphological traits except fruit diameter and fruit length. The highest yield ton ha$^{-1}$ was recorded for variety of Giant Cavendish (11.83 ton ha$^{-1}$) but statistically on par with Robusta (10.67 ton ha$^{-1}$) and Williams $−1$ (10 ton ha$^{-1}$) and farmers in the study areas prefer Giant Cavendish, Robusta and Williams-I for yield and different morphological traits. These varieties also have the highest number of leaves as well as pseudo stem girth and plant height. Therefore, the varieties viz., Giant Cavendish, Williams-I and Robusta are highly recommended to the society of west Hararghe zone. For future work, we recommended to conduct studies on nutritional quality leaves as feed for animals and fruit quality.

KEYWORDS

Adaptation; farmers preference; traits; yield

Introduction

In many developing countries of rural areas, banana plays a significant role as source of economic growth, income, food security and nutrition. But the production and consumption of banana are subject to underestimation owing to extensive cultivation on small household plots, the available information nevertheless indicates that their importance in global food supply has increased significantly in recent decades (FAO, 2020a).

Bananas rank as a leading crop in world agricultural production and trade. In response to fast population growth in producing countries as well as expanding global import demand, the crop has been rapidly increased the production and trade volumes in recent decades. The average global banana production rose from 69 million tonnes in 2000–2002 to 116 million tonnes in 2017–2019, at an approximate value of 31 billion USD. The main driver of the expansion in production has been the increasing consumption requirements of rising populations in producing countries. Accordingly, most of the global production increase has taken place in top producers that are also top consumers, such as Brazil, Philippines and, in particular, India and China (FAO, 2020b).

Banana is one of the important fruit crops used both as staple and dessert. In some East and Central African countries for example, banana is a staple or co-stable food. As a result these communities, unlike the cereal producing ones, do not suffer from food shortage. Similarly, in Southern and South Western Ethiopia, though population density is considerably high, people are not seriously affected by drought as those in Northern and Eastern Ethiopia mainly due to the use of ‘Enset’ (a relative of banana), banana, roots and tubers (Gebre-Mariam, 1999).

In the highlands of East Africa, consumption of banana reaches 250 kg/head per year, the highest consumption rate in the world. In West Africa, plantain and desert bananas contribute up to 25% of...
the carbohydrate intake of 60 million people. Banana fruits are similar to potato in consumption but contains more potassium than other plant species, protein contents is 1% and starch content is 11–20%. Starch content reduces to 2% during ripening while sugar content rises up to 20%. The starch content at full ripeness is always much higher in plantains than dessert bananas; the opposite is true for their sugar content. Banana is a source of potassium, magnesium, copper, manganese, and vitamin C, but low in iron and vitamin A (Wall, 2006). Green fruits of plantains and cooking bananas are boiled, peeled eaten as such or mashed and misted with spices, fish and other foods. Ripened yellow, unpeeled plantain fruits can be roasted while peeled ones are sliced and fried in palm oil. Over ripe plantain and cooking bananas can be eaten raw. When dessert bananas are in the yellow ripening stages, they are soft and sweet and are eaten fresh. In times of famine, green dessert bananas are boiled and eaten. Beer bananas are mainly used for the production of alcoholic drinks. Leaf sheaths of old pseudo-stem are torn in ribbons, which are used as rope. Baskets are carried on the back in strings of such rope worn around the fore head. Cut leaves are used as an umbrella. Food is often wrapped in banana leaves. In some areas, leaves are still used as roofing materials. Pseudo stems and leaves are occasionally fed to pigs and cattle after harvest. However, banana varieties available at the hands of farmers in the major growing areas are low yield, poor quality and susceptible to diseases which have been under production for many years (Yoseph et al., 2014).

Ethiopia has suitable and miscellaneous agro-ecology for production and cultivation of different tropical and subtropical fruits. Currently, avocado, mango, orange, banana and papaya are the major types of fruits that are grown in Ethiopia but the production of these fruit is very fragmented (Teklay et al., 2016). Among all fruits, banana covers about 56.79% of the total fruit area in Ethiopia; in terms of production volume, on average about half million ton of banana was produced per year in Ethiopia. Based on the level of banana production, Southern Nations, Nationalities and Peoples Region ranks first followed by Oromia, Amhara and Benishangul-Gumuz in Ethiopia (CSA, 2018). Different scholar reports that banana is an economic important fruit crop in Ethiopia (Alelu, 2017; Amen and Desalegn, 2018; Benyam and Abatneh, 2019). The production potential of banana in Ethiopia is still untouched due to different production and market related problems. The study of Zinabu et al. (2019) indicated that the shortage of improved varieties, pests and diseases, producers’ dependence on local varieties for many years, poor agronomic practices, poor postharvest management, and poor market information system. Out of them, lack of improved varieties is the critical problem for banana production. Smallholder West Hararghe farmers were cultivating the local cultivar of banana which is low in yield around their homesteads. Although, it is an important crop in west Hararghe, a number of factors constrained productivity of the crop in the target area. This is associated with the lack of improved varieties that have been appreciated as one of the primary sources of lower banana production in the target areas. However, banana varieties available at the hands of farmers in the major growing areas are low yielded, poor quality and susceptible to diseases which have been under production for many years. Hence, the need to introduce improved banana varieties to the target area is crucial for banana production and productivity. Therefore, this study is aimed at and initiated to select best performing banana varieties for West Hararghe, Eastern Ethiopia.

**Materials and Methods**

**Description of the Study Area**

The field experiment was conducted at Mechara Agricultural Research Center (McARC) on station during 2015–2018 cropping season. McARC is found at an altitude of 1700 m.a.s.l at 40° 19’ North latitude and 08° 35’ East longitude. The major soil type of the center is sandy clay with reddish color (McARC, 2018). McARC is located at Daro Lebu, which is one of the districts of West Hararghe Zone, Oromia Regional State of Ethiopia and 12% of its area lies in the highland, 44% in the mid-high land and 44% in the low land agro ecological zones (Figure 1). The rainfall in this area is usually erratic; there is also rainfall variability in the onset and cessation of the main rainfall (Figure 2). Farming
Figure 1. Map of the study area (Mechara agricultural research center).

Figure 2. Climatic data of the long term average from 2013–2019 at West Hararghe, Mechara research station.
systems of Daro Lebu district constitute complex production units involving a diversity of interdependent mixed cropping and livestock activities. The area is predominantly cereal producing with sorghum and maize as staple food crops; the major annual crops grown include sorghum, maize, groundnut, sweet potato, wheat, common beans and barley. In addition, the major cash crops, like chat and coffee, have a long-standing tradition in the district (Kinde et al., 2015)

**Experimental Treatments and Design**

Seven dessert Banana varieties (Butuzua, Dwarf Cavendish, Giant Cavendish, Grande Naine, Poyo, Robusta and Willimas-I) were collected from Melkasa Agricultural Research center and evaluated for agronomic and yield characteristics at Mechara Agricultural research center. The trial was established using randomized complete block design with three replication. Nine plants were maintained on each plot with the spacing of 2.5M between the rows and 2.5M within rows, giving a planting density of 1600 plants per hectare. Each plot and block was separated by 1 M and 1.5 M respectively. The plot size was 7.5 M X 7.5 M = 56.25 M²

**Management of Experimental Plants**

For these experiment flat topography, well drained, deep and fertile soil with high water holding capacity was used for the experiment. Before planting the experimental area plowed three times to remove unwanted weeds and debris. Rectangular row planting with 2.5 M between the rows and 2.5 M within rows, giving a planting density of 1600 plants per hectare was used for the study. Hole was prepared three months before planting at 60 cm diameter and 60 cm depth. The suckers of introduced banana varieties were put in the pits, the pits was prepared in 60 cm depth and 60 cm width three months before planting. De-suckering was carried out to remove unwanted suckers and only one sucker was permitted to grow in one pit. All-important agronomic practices and management with full packages was followed as per recommendation pertinent for each variety (Gebre-Mariam, 1999).

**Data Collection**

**Phenological Parameters**

Days from flowering to harvesting by counting the days taken from the day flowering to harvesting from entire plot.

**Growth Parameters**

Plant height was measured from the base of the plant to the top of the plant and girth of pseudo stem at harvest was measured around the circumference using meter tape. Number of leaves per plant at harvest was counted in each plant at the time of harvest.

**Yield and Yield Components**

Mean Bunch weight (kg) was weighed using field balance after taking the bunch from the banana plant. Hands per bunch was recorded after counting hands in each bunch. Mean fruit weight per bunch (kg) was measured using field balance after taking the fruit from the bunch. Mean hand weight (kg) was measured using field balance after taking the entire hands from bunch. Mean number of fingers per hand was taken by counting each finger from bunch and divided by the number of hands. Average weight of single fruit (gm) was measured by sensitive balance by separating all fingers from a hand, weighted and divided to the number of fingers counted in each hand. Fruit yield per hectare was obtained by multiplying number of fruits produced in a hectare by the mean weight of fingers and converted to ton per hectare. Finger length and finger diameter were measured in centimeter using
ruler taking randomly selected 10 fingers from each bunch obtained from each plant in each replication.

**Farmer’s Participation**

Agronomic performance of banana varieties and the preference of farmers toward for the varieties were collected through farmers’ research groups. The farmers’ research group were the combination of 98 bananas producer households from the Woreda. The preference of farmers was collected and ranked by % frequency of selection. Average yield potential of local variety of farmers was recorded for farmers score and the average of local variety yield in ton per hectare was taken.

**Data Analysis**

Analysis of variance and correlation among the traits were carried out using PROC GLM and PROC CORR procedure of SAS software, respectively.

**Result and Discussion**

Analysis of variance result for phenological, yield and yield component traits of improved banana varieties are presented in Table 1. The result showed that there is highly significant ($P < .01$) variation due to varieties for all collected traits except for mean hand weight, fruit length and fruit diameter which were non-significant. The mean values of seven dessert banana varieties for growth traits and fruit yield and yield components are presented in Tables 2 and 3, respectively.

**Phenological Parameter**

The study revealed that all the phenological parameter were found highly significant ($P < .01$). The longest days from flowering to harvesting were recorded in Grande Naine (147 days) but statistically on par with Dwarf Cavendish and the lowest was recorded at Butuzua variety (135). This might be due to the genome of banana varieties and the response of the varieties for the environments. Heslop-Harrison and Schwarzacher (2007) indicated that the Musa germplasm in the worldwide has different morphological variation and genome constitutions. The current study was in agreement with the study of Wassu et al. (2014). Phenological parameters of banana were highly significantly influenced by different banana varieties. Yoseph et al. (2014) reported that days to flowering and days to maturity were significantly influenced by banana varieties and Binalfew and Damtew (2015) where also reported morphological traits were influenced by banana genome.

| Table 1. Mean squares from analysis variance of improved Banana varieties at Mechara West Hararghe, Ethiopia. |
|---------------------------------------------------------------|
| Traits | Rep (2) | Variety (6) | Residual (12) | CV (%) |
|---------------------------------------------------------------|
| Days from flowering to harvesting | 2.48 | 105.21 aa | 2.25 | 1.10 |
| Plant height (cm) | 11.62 | 3549.60 aa | 18.17 | 2.00 |
| Number leaves at harvest | 1.33 | 9.87 aa | 1.94 | 13.70 |
| Girth of pseudo stem at harvest (cm) | 5.76 | 46.10 aa | 2.43 | 2.80 |
| Mean Bunch weight (kg) | 0.75 | 12.72 aa | 0.34 | 4.90 |
| Mean Hands per bunch | 0.05 | 2.54 aa | 0.49 | 10.80 |
| Mean Fruit weight per bunch (kg) | 0.10 | 13.66 aa | 0.26 | 4.50 |
| Mean hand weight (kg) | 0.05 | 2.54 aa | 0.49 | 16.00 |
| Mean number of fingers per hand | 0.57 | 11.54 aa | 1.51 | 11.30 |
| Number fruit per bunch | 18.14 | 1115.98 aa | 44.03 | 8.60 |
| Average weight of single fruit (gm) | 116.33 | 370.86 aa | 2.83 | 1.20 |
| Fruit length (cm) | 1.76 | 1.66 ns | 1.31 | 6.70 |
| Fruit Diameter (cm) | 1.76 | 0.41 ns | 0.48 | 18.50 |
| yield (ton ha $^{-1}$) | 0.73 | 26.16 | 1.14 | 13.00 |

*aSignificant at $P < .05$, ** highly significant $P < .01$, Numbers in parentheses indicates degrees of freedom. Rep = replication, CV (%) = coefficient of variation in percent.
Table 2. Mean of phenological and growth parameters of improved banana varieties at Mecha, West Hararghe.

| Varieties       | Days from flowering to harvesting | Plant height (cm) | Girth of pseudo stem at harvest (cm) | Number of leaves at harvest |
|-----------------|----------------------------------|-------------------|--------------------------------------|-----------------------------|
| 1 Butuzua       | 135 c                             | 239.67b           | 50d                                  | 8b                          |
| 2 Giant Cavendish | 138.7b                           | 240.67b           | 58ab                                 | 12ab                        |
| 3 Dwarf Cavendish | 146.7a                           | 151d              | 62a                                  | 13a                         |
| 4 Grande Naine  | 147a                             | 204.33 c          | 58.33ab                              | 9ab                         |
| 5 Poyo          | 134bc                            | 254.33a           | 57bc                                 | 8.67ab                      |
| 6 Robusta       | 133.3bc                          | 215.67 c          | 53 cd                                | 10.3ab                      |
| 7 Williams-I    | 135bc                            | 206 c             | 55bc                                 | 10.3ab                      |
| Mean            | 138.5                            | 216.0             | 56.19                                | 10.18                       |
| Significance    | aa                               | aa                | aa                                   | aa                          |
| CV (%)          | 1.1                              | 2                 | 2.8                                  | 13.7                        |

aSignificant at P < .05, ** highly significant P < .01, CV (%) = coefficient of variation in percent Means in columns followed by the same letter (s) are not significantly different at 5% level of significance.

Poyo variety was higher in plant height than other varieties and lowest value was recorded in Dwarf Cavendish (Table 2). The varieties under Cavendish group (Giant Cavendish, Dwarf Cavendish and Grande Naine) were recorded the highest girth of pseudo stem at harvest by associating with other varieties. All varieties were statistical on par with number of leaves at harvest except Butuzua variety which is low in number of leaves compare to other varieties. It confirms with the report of Alemu and Dangew (2008) Dwarf Cavendish has short plant height.

Yield and Yield Component Parameters

The ANOVA point toward that the yield and yield component parameters were highly significant (P < .01) due to mean bunch weight, mean hands per bunch, mean fruit weight per bunch, mean number of fingers per hand, number fruit per bunch, average weight of single fruit, yield in ton ha⁻¹. The highest and lowest bunch weight (kg) were recorded for a variety of Giant Cavendish and William-I (13.67 kg) and Dwarf Cavendish (7.67 kg), respectively. But, the highest yield were statistical at par among the variety Poyo and Robusta. The analysis of variance indicates that all varieties were statistically on par on the parameters mean hands per bunch except to Dwarf Cavendish which recorded lowest mean hands per bunch. Mean fruit weight per bunch (kg); the highest was recorded for the variety of Williams-I(13.13 kg), Giant Cavendish (13.17 kg) and Robusta (12.13 kg) as well as the lowest was recorded for variety of Dwarf Cavendish (6.8 7 kg). Giant Cavendish variety were the highest numbers of fingers per hand (14.33), Number of fruits per bunch (112) and average weight of single fruit (150 gm). The highest yield in ton ha⁻¹ was recorded for variety Giant Cavendish (11.83 ton ha⁻¹), which is statistically at par with Robusta (10.67 ton ha⁻¹) and Williams-I (10 ton ha⁻¹). The lowest yield was recorded by the variety of Dwarf Cavendish (3.37 ton ha⁻¹). Non-significant difference was recorded for the parameters of fruit length, fruit diameter and mean hand weight (Tables 1 and 3). Yield of banana was significantly influenced by cultivars (Binalfew and Damtew, 2015; Wassu et al., 2014; Yoseph et al., 2014) and this might be due to the adaptability difference and the genome of the varieties.

Correlation Analysis

The Pearson correlation coefficient (Table 4) showed that the characters, plant height (0.57), mean fruit weight per bunch (0.832), mean number of fingers per hand (0.604), number of fruits per bunch (0.716) and average weight of single fruit (0.556) were positively correlated to yield at (P < .001). Fruit diameter were negatively (P < .001) correlated to Girth of pseudo stem at harvest (−0.924), fruit weight
Table 3. Mean of yield and yield component parameter of improved banana varieties at Mechara, West Hararghe.

| S. N | Variety       | Mean Bunch weight (kg) | Mean Hands per bunch | Mean Fruit weight per bunch (kg) | Mean hand weight (kg) | Mean number of fingers per hand | Number fruit per bunch | Average weight of single fruit (gm) | Fruit length (cm) | Fruit diameter (cm) | Yield (ton ha\(^{-1}\)) |
|------|---------------|------------------------|----------------------|---------------------------------|----------------------|---------------------------------|-----------------------|-------------------------------------|------------------|----------------------|----------------------|
| 1    | Butuzua      | 11.70b                 | 5.67ab               | 11.37b                          | 1.89                 | 11.00bc                         | 66.00d                | 122e                                | 16.00            | 3.67                 | 8.17bc               |
| 2    | Dwarf Cavendish | 7.67 c               | 5.00b                | 6.87 c                           | 1.35                 | 8.67d                           | 51.30e                | 131d                                | 18.00            | 4.33                 | 3.37e                |
| 3    | Giant Cavendish | 13.67a              | 7.30a                | 13.17a                          | 1.79                 | 14.33a                          | 112.0a                | 150a                                | 16.67            | 3.33                 | 11.83a               |
| 4    | Grande naine  | 11.33b                 | 6.30ab               | 11.43b                          | 1.79                 | 12.00b                          | 80.00bc               | 146b                                | 16.67            | 3.33                 | 8.00bc               |
| 5    | Poyo          | 12.00ab                | 6.30ab               | 10.97b                          | 1.70                 | 9.33 cd                         | 67.30d                | 123e                                | 17.33            | 4.00                 | 5.67d                |
| 6    | Robusta       | 12.87ab                | 7.30a                | 12.13ab                         | 1.66                 | 9.33 cd                         | 73.70 cd              | 130d                                | 18.03            | 3.67                 | 10.67a               |
| 7    | Williams -I   | 13.67a                 | 7.30a                | 13.13a                          | 1.79                 | 11.33bc                         | 87.70b                | 142 c                               | 17.00            | 4.00                 | 10.00ab              |
| Mean |               | 11.8                   | 6.5                  | 11.30                           | 1.71                 | 10.86                           | 76.86                 | 134.76                              | 17.10            | 3.76                 | 8.24                 |
| CV (%) |            | 4.90                   | 10.80                | 4.50                             | 16.00                | 11.30                           | 8.60                  | 1.20                               | 6.70             | 18.50                | 13.00                |

** ** ** NS ** ** NS NS **
Table 4. Correlation among different characters of banana varieties at Mechara, West Hararghe.

| variables | DFH  | PH   | NLH  | PG   | BW   | HPB  | FWB  | MHW  | MNFH | NFPB | SFWT | FL   | FD   | YLD  |
|-----------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| DFH       | 1    |      |      |      |      |      |      |      |      |      |      |      |      |      |
| PH        |      | 1    |      |      |      |      |      |      |      |      |      |      |      |      |
| NLH       |      |      | 1    |      |      |      |      |      |      |      |      |      |      |      |
| PG        |      |      |      | 1    |      |      |      |      |      |      |      |      |      |      |
| BW        |      |      |      |      | 1    |      |      |      |      |      |      |      |      |      |
| HPB       |      |      |      |      |      | 1    |      |      |      |      |      |      |      |      |
| FWB       |      |      |      |      |      |      | 1    |      |      |      |      |      |      |      |
| MHW       |      |      |      |      |      |      |      | 1    |      |      |      |      |      |      |
| MNFH      |      |      |      |      |      |      |      |      | 1    |      |      |      |      |      |
| NFPB      |      |      |      |      |      |      |      |      |      | 1    |      |      |      |      |
| SFWT      |      |      |      |      |      |      |      |      |      |      | 1    |      |      |      |
| FL        |      |      |      |      |      |      |      |      |      |      |      | 1    |      |      |
| FD        |      |      |      |      |      |      |      |      |      |      |      |      | 1    |      |
| YLD       |      |      |      |      |      |      |      |      |      |      |      |      |      | 1    |
### Table 5. Farmers selection based on morphological and yield traits.

| S.N | Parameters to be tested | Variety       | Frequency | %    | Rank |
|-----|-------------------------|---------------|-----------|------|------|
| a   | Morphological traits    | Giant Cavendish | 34        | 34.69| 1<sup>st</sup> |
|     |                         | Grande Naine  | 9         | 9.18 | 5<sup>th</sup> |
|     |                         | Poyo          | 10        | 10.2 | 4<sup>th</sup> |
|     |                         | Robusta       | 21        | 21.42| 3<sup>rd</sup> |
|     |                         | Williams -I   | 24        | 24.48| 2<sup>nd</sup> |
|     | Total Number of Farmers |              | 98        | 100  |      |
| b   | Plant height            | Butuzua       | 18        | 18.36| 2<sup>nd</sup> |
|     |                         | Giant Cavendish| 22        | 22.45| 1<sup>st</sup> |
|     |                         | Grande Naine  | 17        | 17.35| 3<sup>rd</sup> |
|     |                         | Poyo          | 12        | 12.25| 6<sup>th</sup> |
|     |                         | Robusta       | 15        | 15.31| 4<sup>th</sup> |
|     |                         | Williams -I   | 14        | 14.28| 5<sup>th</sup> |
|     | Total Number of Farmers |              | 98        | 100  |      |
| c   | Leaf structure          | Butuzua       | 7         | 7.14 | 7<sup>th</sup> |
|     |                         | Giant Cavendish| 19        | 19.38| 2<sup>nd</sup> |
|     |                         | Dwarf Cavendish| 21        | 21.43| 1<sup>st</sup> |
|     |                         | Grand Naine   | 9         | 9.18 | 6<sup>th</sup> |
|     |                         | Poyo          | 10        | 10.2 | 5<sup>th</sup> |
|     |                         | Robusta       | 15        | 15.32| 4<sup>th</sup> |
|     |                         | Williams -I   | 17        | 17.35| 3<sup>rd</sup> |
|     | Total Number of Farmers |              | 98        | 100  |      |
| d   | Bunch Length            | Butuzua       | 15        | 15.3 | 4<sup>th</sup> |
|     |                         | Giant Cavendish| 22        | 22.45| 1<sup>st</sup> |
|     |                         | Grande Naine  | 10        | 10.2 | 5<sup>th</sup> |
|     |                         | Poyo          | 10        | 10.2 | 6<sup>th</sup> |
|     |                         | Robusta       | 20        | 20.4 | 3<sup>rd</sup> |
|     |                         | Williams -I   | 21        | 21.45| 2<sup>nd</sup> |
|     | Total number of farmers |              | 98        | 100  |      |
| e   | Number of fingers per bunch | Giant Cavendish | 30    | 30.61| 1<sup>st</sup> |
|     |                         | Grande Naine  | 20        | 20.41| 4<sup>th</sup> |
|     |                         | Robusta       | 22        | 22.45| 3<sup>rd</sup> |
|     |                         | Williams -I   | 26        | 26.53| 2<sup>nd</sup> |
|     | Total number of farmers |              | 98        | 100  |      |
| f   | Finger length           | Butuzua       | 3         | 3.06 |      |
|     |                         | Giant Cavendish| 27        | 27.55| 1<sup>st</sup> |
|     |                         | Grande Naine  | 21        | 21.42| 3<sup>rd</sup> |
|     |                         | Poyo          | 4         | 4.1  | 5<sup>th</sup> |
|     |                         | Robusta       | 22        | 22.45| 2<sup>nd</sup> |
|     |                         | Williams -I   | 21        | 21.42| 3<sup>rd</sup> |
|     | Total Number of Farmers |              | 98        | 100  |      |
| g   | Sweetness               | Butuzua       | 10        | 10.2 |      |
|     |                         | Giant Cavendish| 21        | 21.43| 1<sup>st</sup> |
|     |                         | Dwarf Cavendish| 10        | 10.2 | 5<sup>th</sup> |
|     |                         | Grande Naine  | 12        | 12.24| 4<sup>th</sup> |
|     |                         | Poyo          | 10        | 10.2 | 5<sup>th</sup> |
|     |                         | Robusta       | 17        | 17.37| 3<sup>rd</sup> |
|     |                         | Williams -I   | 18        | 18.36| 2<sup>nd</sup> |
|     | Total Number of Farmers |              | 98        | 100  |      |
| h   | Disease tolerance       | Butuzua       | 12        | 12.24| 5<sup>th</sup> |
|     |                         | Giant Cavendish| 15        | 15.31| 3<sup>rd</sup> |
|     |                         | Dwarf Cavendish| 9         | 9.18 | 7<sup>th</sup> |
|     |                         | Grande Naine  | 15        | 15.31| 3<sup>rd</sup> |
|     |                         | Poyo          | 10        | 10.2 | 6<sup>th</sup> |
|     |                         | Robusta       | 18        | 18.37| 2<sup>nd</sup> |
|     |                         | Williams -I   | 19        | 19.38| 1<sup>st</sup> |
|     | Total Number of Farmers |              | 98        | 100  |      |
| i   | Over all Farmers preference | Butuzua       | 10        | 10.2 | 5<sup>th</sup> |
|     |                         | Giant Cavendish| 22        | 22.45| 1<sup>st</sup> |
|     |                         | Grande Naine  | 15        | 15.31| 4<sup>th</sup> |
|     |                         | Poyo          | 10        | 10.2 | 5<sup>th</sup> |
|     |                         | Robusta       | 20        | 20.4 | 3<sup>rd</sup> |
|     |                         | Williams -I   | 21        | 21.44| 2<sup>nd</sup> |
|     | Total Number of Farmers |              | 98        | 100  |      |
per bunch (−0.479), number of fingers per hand (−0.733), Number of fruits per bunch (−0.645) and weight of single fruit (−0.804).

NS = non-significant * Significant at P < .05, ** highly significant P < .01, CV (%) = coefficient of variation in percent Means in columns followed by the same letter (s) are not significantly different at 5% level of significance.

Significance at P < 0.05; **Significance at P< 0.001; Days from flowering to harvesting (DFH), Plant height (PH), Number leaves at harvest (NLH), Girth of pseudo stem at harvest (PG), Mean Hands per bunch (HPB), Mean Fruit weight per bunch (kg) (BW), Mean hand weight (kg) (MHW), Mean number of fingers per hand (MNFH), Number fruits per bunch (NFPB), Average weight of single fruit (gm) (SFWT), Fruit length (cm) (FL), Fruit diameter (cm) (FD), yield in ton ha−1(YLD)

**Farmers Preference and Selection**

Farmers were selecting the varieties depending on different morphological and yield trait. Generally, the farmers of the study area ranked the Giant Cavendish as 1st, Williams-I 2nd, and poyo 3rd in overall farmers’ preference (Table 5). The result is found similar with the finding of Asfaw et al. (2016) and Seifu Gebre-Mariam (1999) the highest farmers preference of varieties when compared to local variety. Also Gold. et al. (2002) reported the farmers was setting different parameters for selection of Musa cultivars.

**Conclusion and Recommendation**

In the current study, Giant Cavendish, Williams-I and Robusta varieties highly preferred due to different traits by the farmers of West Hararghe zone. In addition, these have varieties recorded the highest yield in tons per hectare with insignificant among themselves. Farmers of West Hararghe zone were inclined to prefer the tallest banana varieties, for using the banana stem and leaves for different purposes as animal feed and as for covering Chat. Thus, varieties with the highest number leaves as well as the pseudo stem girth and plant height. Therefore, the varieties of Giant Cavendish, Williams-I and Robusta are highly recommended to the society of West Hararghe zone. For future work, it is recommended to go studies for nutritional quality of leaves for feed for animals as well as fruit quality and for human consumption.

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