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Research Article

Performance Evaluation of Improved Banana (*Musa* Spp.) Varieties in Kaffa Zone, South Western Ethiopia

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Abstract

Background and Objective: The lack of suitable varieties that exhibit consistently high yields is the major factor among several production constraints contributing to the low productivity of bananas in the South Western area. The objective of this study was to identify high-yielding and disease-resistant varieties in the study area. **Materials and Methods:** Seven improved banana varieties and one local cultivar (control) were used in a randomized complete block design with three replications under rain-fed conditions on loam soil from the 2015-2018 cropping season. Data on phenology, growth, fruit yield and yield component traits were collected in the first and second crop cycles and analyzed using SAS software version 9.0. **Results:** The combined analysis of variance revealed a significant difference for varieties and cropping cycle (year) in most of the phenology, growth, fruit yield and yield component traits. However, the difference was not significant for the interaction effect, so the overall mean was used to estimate the performance of the crop over the years. The correlation analysis indicates a positive significant relationship between yield and most of the phenology, growth and yield component characteristics. The varieties, namely Poyo (38.14 t ha⁻¹) and William-1 (33.37 t ha⁻¹), were found to be the most promising for commercial production, with a 40-29.85% yield that is higher than that of the local cultivar. **Conclusion:** Therefore, these cultivars can be used to boost banana production and productivity in the test area and areas with similar agro-ecologies, but more research is needed in the surrounding zones to see if this remarkable result can be sustained.

Key words: Banana varieties, growth characters, phenology, fruit yield, yield components, performance, correlation

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Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Banana (*Musa paradisiaca* var. *sapientium*) is one of the most important tropical fruits and evolved in the humid tropical regions of South East Asia with India as one of its centres of origin¹. Plantains and bananas are the world's second-largest fruit crop, with an annual production of 145 million metric tons² and the fourth most important global food commodity in terms of the gross value of production after rice, wheat and maize³.

Africa is the world's third-largest producer of banana. The fact that banana produces fruit throughout the year adds to their importance as a crop contributing to food security in Africa. More than 70 million people in 15 Sub-Saharan African countries rely on bananas for a livelihood and a source of food. East African highland bananas are believed to have been introduced by Austronesian-speaking peoples who colonized the Indian ocean islands, particularly Madagascar, before reaching the East African shores. The region has been recognized as a secondary centre of *Musa* diversity due to the presence of a large number of typical East African highland banana cultivars⁴. Bananas are also a staple food and a good source of income for East and Central Africa⁵.

Banana has been cultivated as a garden plant in Ethiopia for several years. Southern, Oromia and Amhara regions are the major banana-producing regions in the country⁶. In Ethiopia, banana is produced throughout the country wherever there's adequate rainfall or irrigation opportunity. According to the Central Statistical Authority, around 107,890.60 hectares of land were under fruit crop cultivation in 2016. Of which banana accounts for 58.59% of the total fruit crop area and contributed about 67.94% of the total fruit crop production with the average productivity of 8.52 t ha⁻¹ in 2015/16 Meher cropping season. The status indicates bananas would be the leading fruit crop in the country. Banana production coverage in the study area (Kaffa zone) is estimated to be 2623.00 ha and obtained about 12777.36 tons of fruit yield annually with average productivity of 4.87 t ha⁻¹ in 2015/16 cropping season. The productivity of a crop in the area is dropped by half of the national productivity mainly due to using unimproved and hardly adaptability tested cultivars.

Genotypes often interact with the environment in unpredictable ways⁷, therefore testing genotypes across locations and/or years to assess their adaptability and stability performance before making a recommendation is critical. Like other agricultural commodities fruit production particularly banana production faces several biotic and abiotic constraints and poor provision of production technologies. Even though

banana improvement began in the country in the early 1970s, only a few varieties, including Dwarf Cavendish, Poyo, Giant Cavendish and Ducasse Hybrid, were recommended for cultivation⁶. However, these and other recently improved banana cultivars have not been tested and introduced for fruit yield and other characteristics under Kaffa conditions. As a result, farmers produce considerably lower fruit yields from locally cultivated varieties with inferior fruit quality. In a resource-poor production system, productive varieties that are high-yielding and resistant to pests and diseases are playing a significant role in increasing productivity. Therefore, this study was conducted to select varieties that are high-yielding and disease-resistant to increase the production and productivity of bananas in the study areas and the areas with similar agroecology.

MATERIALS AND METHODS

Description of the study area: The experiment was conducted at Bonga Agricultural Research Center on-station (Kayekela) in Southwestern Ethiopia during the 2014-2017 cropping season under rainfed conditions. Kayekela is located 7 km away from Bonga town on the way to Jimma. Bonga is the capital city of the Kaffa zone and is located at 440-kilometre Southwest of Addis Ababa and 105 kilometres south of Jimma. The site is geographically located at N 07°19'23" latitude and 01E 036°13'47" longitude with an altitude of 1723 meters above sea level. The long-term weather data of the centre revealed that the maximum and minimum monthly average temperature of the area is. Years of weather data from the centre show that the maximum average temperature of the area is 26.02°C and the minimum average temperature is 9.4°C, with an average annual rainfall of 1274.67 mm and a mean monthly rainfall of 121.72 mm. The rainfall distribution in pick rainy months (March to November) was 117-305 mm, respectively, in the area. The soil of the area is characterized by loam soil according to Bonga Agricultural Research Center's natural resource unit.

Treatments and experimental design: The experimental field was first cleared, ploughed and divided into three blocks and each block containing 7 rows and each row was considered as a plot. Seven improved banana varieties were selected among the available varieties in the country, based on their yield and adaptation record and planted along with one local check (Table 1) using Randomized Complete Block Design (RCBD) with three replications. The spacing between plant and row was 2.5 and 2.5 m respectively and a total of ten banana plants per plot.

Table 1: Description of the varieties

Varieties	Genomic groups	Yield (t ha ⁻¹)	Altitude	Year of release
Poyo	AAA	48.2	700-1800	2006
Williams-1	AAA	55.6	700-1800	2006
Grand nain	AAA	43.6	700-1800	2006
Butuzua	AAA	39.1	700-1800	2006
Giant cavendish	AAA	37.2	700-1800	2006
Robusta	AAA	39.5	700-1800	2006
Ducase hybrid	ABB	26.1	700-1800	2006
Local	-	-	-	-

Source: Alemaw G., 2011

Data collection: A total of 12 quantitative characteristics (phenology, growth, fruit yield and yield components) data were collected in the course of the study period. Phenological parameters such as days to flowering and days to maturity, growth parameters including pseudostem height, pseudostem circumference, number of leaves, leaf length and leaf diameter and fruit yield and yield component parameters (number of hands per bunch, number of fingers per hand, fruit weight, finger length and finger diameter) were collected. All the measurements were recorded throughout the growing periods and determined using the average of five randomly selected banana plants.

Statistical analysis: Analysis of variance for phenology, growth, yield and yield component characters were employed for each year. The homogeneity of error variance test was carried out using a Levene's homogeneity of variance test method⁸ and variances were considered homogeneous if the f-value is < p-value. Based on the competition error variance was homogeneous for all traits and the data were combined to obtain the estimates of the environment (year), cultivars and cultivar × year interaction. All the analysis was done by using the GLM procedure of SAS software package 9.2. Treatment means were compared using LSD at p0.05 level.

RESULTS AND DISCUSSION

Phenology, growth, yield and yield component characters:

The combined analysis of variance revealed a non-significant cultivar × cropping cycle (year) interaction at $p \leq 0.05$ for all the characters tested, the means of the varieties over the years reflect the performance of each year, suggesting the consistent performance of the varieties over the years and their ability to sustain a reasonable amount of yield regularly. The varieties superior for a trait in one year could also be superior in performance in another year and the reverse is true for the varieties inferior in these traits. The relative ranks of the varieties have not changed over the years (Table 2). The occurrence of this trend might be attributable to the similar

level of expression of genes that regulate the characteristics throughout all testing years. Such ability of crop varieties to perform consistently over years has long been appreciated by farmers and thus, it would be preferred by farmers to cultivate over years with consistently high yield. Binalfew⁹ investigated eleven improved banana varieties for phenology, growth, yield and yield component characteristics over four years under Ethiopian conditions, demonstrating the ability of banana cultivars to perform consistently over years. However, the traits that exhibited substantial interaction effects in the prior trial, such as days from flowering to harvest, fruit diameter and pseudostem girth at harvest, might be attributable to differences in the extent of seasonal variation and the tendency of traits responding to the temporal variation that appeared in the experimental locations and during the experimentation.

The difference in cropping cycle (years) was highly significant ($p \leq 0.05$) for phenology (days to flowering and days to maturity) and growth parameters (pseudostem height), indicating that temporal variation of climatic factors influences those traits, whereas pseudostem circumference, number of leaves, leaf length and leaf diameter were unaffected. The difference due to the cropping cycle was also not significant for yield and all yield component traits except the number of hands per bunch, which showed a highly significant difference over the years. The difference attributed to the number of hands per bunch might be due to the high influence of climatic factors. However, the absence of significant differences attributed to those traits might be due to the presence of low response of the traits to attributed temporal variations of the climatic factors over the years (Table 2). Nomura *et al.*¹⁰ discovered a considerable variance in banana cultivar yield and other growth characteristics depending on the cropping cycle. Similarly, Gaidashova *et al.*¹¹ reported that the cropping cycle influenced all evaluated growth and yield characteristics except the number of days from flowering to maturity. Furthermore, Binalfew⁹ revealed considerable variation in the majority of the studied traits. The disparity in fruit production and other associated features

Table 2: Mean square values for crop phenology, growth, yield and yield components of eight banana cultivars at Bonga from 2015-2018

SV	DF	DTF	DTM	PsH (m)	PsC (cm)	NL	LL
Year (Yr)	1	9520.33**	32059.17***	3776.49**	22.69 ^{ns}	0.53 ^{ns}	20.08 ^{ns}
Rep/Yr	4	250.58	343.23	154.69	10.73	3.88	5.62
Variety (Var)	7	2158.08***	2658.28***	9264.20**	8.85*	7.77 ^{ns}	403.08 ^{ns}
VarxYr	7	80.90 ^{ns}	101.24 ^{ns}	628.38 ^{ns}	2.24 ^{ns}	3.71 ^{ns}	116.92 ^{ns}
Error	28	283.87	389.19	839.36	5.81	2.75	77.27
		LD	NHPB	FNPB	FL(cm)	FD(cm)	FY (t ha ⁻¹)
Year (Yr)	1	11.04 ^{ns}	277.88**	20.80 ^{ns}	0.34 ^{ns}	0.01 ^{ns}	80.82 ^{ns}
Rep/Yr	4	9.00	0.29	120.71	1.05	0.02	55.93
Variety (Var)	7	21.36 ^{ns}	3.78*	2267.42**	9.48***	0.04*	293.73***
Var x Yr	7	6.26 ^{ns}	1.08 ^{ns}	200.19 ^{ns}	0.47 ^{ns}	0.01 ^{ns}	21.61 ^{ns}
Error	28	3.81	1.01	352.08	1.51	0.03	19.81

*, ** and *** indicate significance at $p \leq 0.05$, $p < 0.01$ and $p < 0.001$, respectively and 'ns' indicates non-significant, SV: Source of variation, DTF: Days to flowering, DTM: Days to maturity, PsH: Pseudostem height, PsC: Pseudostem circumference, NL: Number of leaf, LL: Leaf length, LD: Leaf diameter, NHPB: Number of hands per bunch, FNPB: Fingers number per bunch, FL: Finger length, FD: Finger diameter and FY: Fruit yield

attributed to this study and the aforementioned authors could be linked to differences in the temporal fluctuation of environmental variables that manifested in the test sites (Table 2).

Days to flowering, days to maturity and pseudostem height showed very significantly ($p \leq 0.05$) variations among the varieties, suggesting the availability of sufficient genetic variability among the varieties that can be exploited to select high yielding and disease resistant types. This is consistent with Tekle *et al.*¹², who found a very significant difference in days to flowering, days to maturity and pseudostem height between eleven improved banana cultivars and one local control at Jinka, Ethiopia. Binalfew⁹ demonstrated a highly significant variation in pseudostem height and circumference among the eleven improved banana varieties evaluated. However, non-significant variations in the number of leaves per plant, leaf length and leaf diameter among banana varieties imply that there is limited genetic variability among the studied varieties for the traits (Table 2).

The differences among banana varieties were also highly significant ($p \leq 0.05$) for fruit yield and yield components traits such as average finger number per bunch and finger length and significantly ($p \leq 0.05$) different for the number of hands per bunch (Table 2). Similarly, variations in average finger number per bunch, finger length, number of hands per bunch, finger diameter and fruit production were reported on eleven banana varieties⁹. Furthermore, Tekle *et al.*¹² and Nomura *et al.*¹⁰ found a substantial variation in fruit yield and most yield-related characteristics among banana varieties tested.

For pseudostem circumference and finger diameter, there was no significant difference between varieties in individual year analysis, however, this difference was significant in the combined analysis (Table 2). The VarxYr interaction of this trait was very small and had more degrees of freedom than the

error mean square at individual year (28 vs 14 df). This rendered the small differences between genotypes statistically significant in the combined analysis.

Mean performance of banana varieties in respect of various characteristics

Mean performance of banana varieties in terms of phenology and growth characteristics: The mean performance of banana varieties over two years has been presented in Table 3. Local cultivar (355) and Ducasse hybrid (345) had the longest days To flowering (DTF), whereas Williams-1 (305.33), Grain Nain (305.33) and Poyo (322.00) flowered early. The varieties Robusta, Giant Cavendish and Butuzua exhibited medium maturity in this area (Table 3). In terms of yield, such cultivars surpassed both late and medium maturing types. The yield advantage of early blooming cultivars might be due to the efficient use of resources available early in the growing season. The local cultivar (572) had the longest days to maturity (DM), followed by Ducasse hybrid (571.33) and Robusta (538.08), while Grain Nain (493.42) and Williams-1 (482.75) matured early. Giant Cavendish, Butuzua and Poyo were found to be of medium maturity type among the varieties tested. Early to middle matured varieties gave higher yields than late-maturing varieties. The reason for this group's yield advantage is analogous to that of days to flowering (Table 3).

Ducasse hybrid (384.60 cm) and local cultivar (357.53 cm) had the largest pseudostem height (PsH), while Grain Nain (251.87 cm) and Williams-1 had the shortest pseudostem height (PsH) (301.57 cm). Giant cavendish, Butuzua and Poyo were among the varieties with medium plant height. The varieties with a medium to short plant height yield more fruit than those with a long plant height, showing that such cultivars promote flower and fruit development over vegetative growth. The widest pseudostem diameter (PsC)

Table 3: The mean values of crop phenology, growth, yield and yield components of eight banana cultivars at Bonga from 2015 to 2018

Varieties	DTF	DTM	PsH (cm)	PsC (cm)	NHPB	FNPB	FL (cm)	FD (cm)	FY (t ha ⁻¹)
Poyo	322.00 ^c	512.08 ^c	314.57 ^{cd}	76.80 ^{ab}	9.40 ^a	139.00 ^a	15.27 ^a	3.44 ^{ab}	38.14 ^a
Williams-1	305.33 ^d	482.75 ^d	301.47 ^d	76.30 ^{ab}	8.93 ^{ab}	134.00 ^a	14.00 ^{ab}	3.40 ^{bc}	33.37 ^{ab}
Giant cavendish	326.67 ^{bc}	520.75 ^c	327.13 ^{bcd}	76.93 ^{ab}	8.93 ^{ab}	125.33 ^{ab}	14.77 ^{ab}	3.40 ^{bc}	31.60 ^b
Grain nain	305.33 ^d	493.42 ^d	251.87 ^e	77.56 ^a	8.47 ^{abc}	121.33 ^{abc}	14.27 ^{bc}	3.29 ^{cd}	29.26 ^{bc}
Ducasse hybrid	345.33 ^a	571.33 ^a	384.60 ^a	77.13 ^a	8.00 ^{abc}	111.33 ^{bcd}	12.80 ^d	3.34 ^{bcd}	25.23 ^{cd}
Robusta	334.33 ^b	538.08 ^b	338.21 ^{bc}	76.77 ^{ab}	7.97 ^{bc}	103.67 ^{dc}	13.70 ^{cd}	3.31 ^{cd}	24.53 ^{cd}
Butuzua	325.00 ^{bc}	514.33 ^c	322.13 ^{cd}	74.93 ^{cb}	7.27 ^{cd}	96.67 ^{de}	13.67 ^{cd}	3.27 ^d	21.65 ^{de}
Local	355.00 ^a	572.00 ^a	357.53 ^{ab}	74.00 ^c	6.23 ^d	82.00 ^e	11.20 ^e	3.53 ^a	16.23 ^e
Mean	328.46	525.59	324.69	76.3	8.18	114.17	13.71	3.37	27.5
LSD	12.28	13.74	34.22	2.05	1.42	19.32	0.93	0.12	6.35
CV (%)	5.13	3.75	8.92	3.16	12.27	16.44	8.97	5	16.19

Means with the same letters within the columns are not significantly different at $p \leq 0.05$, DTF: Days to flowering, DTM: Days to maturity, PsH: Pseudostem height, PsC: Pseudostem circumference, NHPB: Number of hands per bunch, FNPB: Fingers number per bunch, FL: Finger length, FD: Finger diameter and FY: Fruit yield

was recorded on variety Grain Nain (77.57 cm), though variety Grain Nain, Ducasse hybrid, Giant Cavendish, Poyo, Robusta and Williams-1 were statistically not significant, while the smallest pseudostem diameter was recorded on local (74.00 cm) and butuzua (74.94 cm) (Table 3).

Mean performance of banana varieties for bunch characters and fruit yield:

The greatest number of hands per bunch (NHPB) exhibited in variety Poyo (9.40), even though Poyo, Williams-1 (8.93), Giant cavendish (8.93), Grain Nain (8.47) and Ducasse hybrid (8.00) were statistically not significantly different, these varieties also had high fruit yield. The smallest number of hands per bunch was recorded on the local cultivar (6.23), resulting in a low fruit yield. The robusta variety gave a bunch with an average number of hands (Table 3). Variety Poyo had the greatest finger number per bunch (FNPB) (139.00), however, it was statistically not significantly different from Williams-1 (134.00), Giant cavendish (125.33) and Grain Nain (121.33), while local cultivar had the fewest (mean value of 82.00). Ducasse hybrid and robusta showed the medium number of fingers per bunch in the test location (Table 3). In a study conducted at Jinka, the improved banana varieties had the most hands and fingers per bunch¹². The difference in rank between this study and the previous one shows how different varieties adapt to different environments.

The largest finger length (FL) was recorded on variety Poyo (15.27 cm) followed by Giant cavendish (14.77 cm), whereas the smallest finger length was recorded on local cultivar with the mean value of 11.20 cm. The medium finger length was scored on variety Robusta (13.70 cm) and Butuzua (13.67 cm) (Table 3). Fruit yield was greater in varieties with the longest fruit finger length, showing the importance of characteristics in determining fruit yield. The widest finger diameter (FD) was recorded on the local cultivar (3.53 cm) and variety Poyo (3.44 cm), whereas the smallest finger diameter was recorded on variety Butuzua

(3.27). Medium finger diameter was attributed to Ducasse hybrid (3.34 cm) and Robusta (3.31 cm) (Table 3).

The highest mean fruit yield (FY) was recorded by variety Poyo (38.14 t ha⁻¹) and Williams-1 (33.37 t ha⁻¹), these varieties also had the highest mean value in most of the attributes evaluated. Williams-1 (55.6) and Poyo (48.2), on the other hand, showed a rank change when compared to initial yield⁷, demonstrating the importance of evaluating varieties in a specific location. The low yield in this experiment compared to the theoretical yield released might be attributed to climatic factors that appeared at the test site and season. Williams-1 was the second-highest yielding variety, however the differences between Williams-1, Giant cavendish (31.60 t ha⁻¹) and Grain Nain (29.26 t ha⁻¹) were not statistically significant and they performed better in most of the characteristics tested. Grain Nain (29.26 t ha⁻¹), Ducasse hybrid (25.23 t ha⁻¹) and Robusta (24.53 t ha⁻¹) gave medium fruit yield, while the lowest mean fruit yield was observed in Butuzua and local cultivar (21.65 t ha⁻¹) and (16.23 t ha⁻¹), respectively (Table 3). The superior varieties, Poyo and Williams-1, exhibited a fruit yield advantage of 40-29.85% over the local cultivar, respectively. The higher yield obtained in most improved banana varieties is attributed to improved phenology, growth and yield component characteristics, indicating the improved banana varieties' potential over the local cultivar.

This allows selecting varieties with superior yields and tolerance to biotic and abiotic stress. This is consistent with the findings of Tekle *et al.*¹², who found that improved banana varieties exceeded local cultivars in terms of yield and yield-related characteristics in a study in Jinka, Ethiopia, where 10 improved banana varieties were compared to one local cultivar. Shaibu *et al.*¹³ have also reported superior fruit yield performance of improved banana and plantain varieties over the local cultivar tested in Nigeria.

Table 4: Correlation among phenology, growth, yield and yield component traits of eight banana cultivars

	DTM	PsH	PsC	NL	LL	LD	NHPB	NFPB	FL	FD	FY
DTM											
PsH	0.66***										
PsC	-0.37*	-0.23 ^{ns}									
NL	-0.21 ^{ns}	-0.11 ^{ns}	0.04 ^{ns}								
LL	-0.39**	-0.21 ^{ns}	0.19 ^{ns}	0.39**							
LD	-0.42**	-0.48***	0.15 ^{ns}	0.29*	0.31*						
NHPB	-0.56***	-0.30*	0.28 ^{ns}	0.45**	0.59***	0.36*					
NFPB	-0.42**	-0.36*	0.32*	0.40**	0.52***	0.17 ^{ns}	0.58***				
FL	-0.37*	-0.33*	0.17 ^{ns}	0.31*	0.48***	0.21 ^{ns}	0.42**	0.46**			
FD	0.22 ^{ns}	0.14 ^{ns}	0.22 ^{ns}	0.02 ^{ns}	0.02 ^{ns}	0.21 ^{ns}	-0.25 ^{ns}	-0.14 ^{ns}	-0.12 ^{ns}		
FY	-0.43**	-0.34 ^{ns}	0.44**	0.51***	0.58***	0.41**	0.67***	0.55***	0.51***	0.07 ^{ns}	

P is significant at *: $p \leq 0.05$, **: $p \leq 0.01$, ***: $p \leq 0.001$, while it is non significant (ns) at $p > 0.05$, DTF: Days to flowering, DTM: Days to maturity, PsH: Pseudostem height, PsC: Pseudostem circumference, NL: Number of leaf, LL: Leaf length, LD: Leaf diameter, NHPB: Number of hands per bunch, NFPB: Fingers number per bunch, FL: Finger length, FD: Finger diameter and FY: Fruit yield

Correlation between yield and phenology, growth and yield component traits:

The average fruit yield was positively and significantly correlated with pseudostem circumference ($r = 0.44^{**}$), leaf number ($r = 0.51^{**}$), leaf length ($r = 0.58^{***}$), leaf diameter ($r = 0.41^{**}$), number of hands per bunch (0.67^{***}), fingers number per bunch (0.55^{**}) and finger length ($r = 0.51^{***}$), implying that these traits play a significant role in banana variety fruit yield. The varieties superior in these characteristics had relatively larger or comparable mean performance in banana fruit yield. This is consistent with the findings of Baiyeri *et al.*¹⁴, who revealed a strong relationship between fruit yield and most phenology, growth and yield component characteristics. Binalfew⁹ demonstrated a relation between fruit yield and pseudostem circumference, number of leaves, number of hands per bunch, number of fingers per bunch and finger length. The relationship between fruit yield and finger diameter was positive but not significant, whereas the relationship between days to maturity ($r = -0.43^{**}$) and pseudostem height (-0.34^{*}) was negative and significant (Table 4).

Characters of growth such as the number of leaves, leaf length and leaf diameter were shown to be positively and significantly correlated. Similarly, phenology and growth characteristics, such as days to maturity and pseudostem height ($r = 0.66^{***}$), showed a positive and significant correlation. The relationship between days to maturity and pseudostem circumference ($r = -0.37^{*}$), leaf length ($r = -0.39^{*}$) and leaf diameter ($r = -0.42^{***}$) is, nevertheless, negative and significant. There was also a negative and significant correlation between pseudostem height and leaf diameter ($r = -0.48^{***}$). The number of leaves, leaf length and leaf diameter were all positively and non-significantly correlated with pseudostem circumference, while pseudostem height was negatively and non-significantly correlated with pseudostem circumference, number of leaves and leaf length (Table 4).

The number of hands per bunch, finger number per bunch and finger length were all positively and significantly correlated with each other as well as with pseudostem circumference, leaf number and leaf length. However, days to maturity and pseudostem height were negatively and significantly correlated with yield component traits (Table 4). Finger diameter did not correlate with any of the traits tested in the experiment, indicating that it made a minor contribution to the other traits.

CONCLUSION

In this study, banana varieties showed substantial variability in phenology, growth, yield and yield component attributes tested over years, which could be used to choose varieties with higher fruit yields. The variability of growing years (cropping cycle) was also a significant effect in the majority of the attributes studied. However, they had no significant effect on the performance of varieties, resulting in inconsistent performance over seasons. In general, varieties Poyo and Williams-1 were found to be the best among the tested varieties, with high mean yields of 38.14 and 33.37 t ha⁻¹, respectively. Therefore, these varieties could be recommended for the test area and areas with comparable agroecology. The following activity should be the demonstration and popularization of the selected banana varieties to small-scale farmers and commercial banana producers in the test area and the neighbouring area.

SIGNIFICANCE STATEMENT

This study reveals the performance of improved banana varieties tested over years in South-Western Ethiopia, where farmers rely on local cultivars for production. Among the evaluated banana varieties, the study identified significantly performing banana varieties that can boost production and

productivity in the area. This analysis will help academics to identify a critical area for enhancing the traditional banana production system through several research studies. It is also critical to provide farmers with improved planting material to boost productivity in the area and other neighbouring areas. Finally, this information can help agricultural experts and development agents in disseminating the selected varieties to growers.

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