PERFORMANCE OF NARITA BANANA HYBRIDS IN THE PRELIMINARY YIELD TRIAL, UGANDA

By

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Executive summary

Banana is an important food and income generating crop for the majority of smallholder farmers in Uganda. Its perennial nature coupled with an all-year-round fruiting character makes it an ideal crop for household incomes, food and nutrition security. Despite these benefits, banana has suffered from pests (banana weevils and nematodes), diseases (*Fusarium* wilt, bacterial wilt and black Sigatoka) and more recently, drought stress. This has culminated into low banana yields.

The Ugandan National Agricultural Research Organization (NARO) and the International Institute of Tropical Agriculture (IITA) jointly developed secondary triploid banana hybrids for food and juice herein referred to as NARITA hybrids. These hybrids were developed by crossing the triploid female fertile East African Highland Banana (EAHB) cultivars with a wild diploid (Calcutta 4). Selection was done focusing largely on yield, resistance to black Sigatoka, and orientation of bunches. The selected tetraploid hybrids were then crossed with improved diploids and the resulting secondary triploid hybrids were selected during the early evaluation trials and evaluated during the preliminary yield trials.

This report presents the results of 25 NARITA hybrids (18 for food and seven for juice) that were evaluated at Namulonge in central Uganda out of the 27 NARITA hybrids existing. The mean squares in the combined analysis of variance were significant for 13 traits (including bunch weight) out of the 17 traits assessed, indicating that the hybrids were significantly different for bunch weight and most other traits assessed, and that by hybridizing among these hybrids genetic advance would be achieved for most traits. This also revealed the potential for selection and improvement of these hybrids for most of the traits assessed. Bunch weight ranged from 9.3 kg for NARITA 19 to 28.4 kg for NARITA 24, with an overall mean of 18.3 kg. Fifty two per cent of the hybrid genotypes produced a bunch weight that was greater than the overall mean bunch weight, whereas 96% of the hybrids had a bunch weight greater than the bunch weight of the local check (Mbwazirume). Similarly, the NARITA hybrids evaluated were better than this local check for most of the other traits evaluated.

The limitation of averaging data for two hybrid cycle numbers, as well as the use of small plots for the results presented in this report is acknowledged. It is therefore recommended that NARITA hybrids in future be evaluated in larger and replicated multi-location trials to ascertain their actual performance, adaptability and stability in comparison with the local EAHB cultivars. Nevertheless, based on the preliminary results of these hybrids, potential high yielding banana varieties combining resistance to black Sigatoka and farmer-preferred quality traits exist within this NARITA population.

1.0 Introduction

Banana (*Musa* spp.) occupies the largest cultivated area among staple food crops in Uganda, with more than 75% of all farmers growing it (NARO, 2001). It is an indispensable part of life in the country, with the annual per capita consumption of ~250kg, the highest in the world. Its perennial nature coupled with an all-year-round fruiting character, makes it an ideal crop for household incomes, food and nutrition security. The crop has increasingly become an important source of income for the resource poor farmers (Karamura et al., 1998) and the main staple food for urban consumers (Van Asten et al., 2005). Despite these benefits, banana has faced major challenges of pests (banana weevils and nematodes), diseases (*Fusarium* wilt, bacterial wilt, and black Sigatoka) (Tushemereirwe et al., 2003) and more recently, drought stress. These challenges have culminated in the decline of banana supply as a result of declining yields. Indeed, these challenges have reduced banana yield by 30 to 60%.

Recognizing the importance of banana amidst all these challenges, the National Agricultural Research Organization (NARO) and International Institute for Tropical Agriculture (IITA) in Uganda are jointly engaged in banana breeding. One of the key breeding strategies used by NARO and IITA is performing the following controlled crosses: diploids x diploids, triploids x diploids and tetraploids x diploids to generate improved banana populations from which superior hybrids in terms of bunch yield, resistance to pests and diseases, and fruit quality traits are selected and evaluated for subsequent national release. The objective of this study therefore, was to examine the performance of NARO-IITA-generated banana hybrids herein referred to as NARITAs for agronomic and disease resistance traits so that the best hybrids could be selected for further breeding activities in Uganda and testing in Uganda and Tanzania.

2.0 Materials and methods

The 25 NARITA hybrids evaluated (Table 1) were developed by crossing cooking bananas of the East African highland banana (EAHB) subgroup and a wild diploid (Calcutta 4). The full pedigree of the hybrids is shown (Appendix 1). Eighteen of these NARITA hybrids were secondary triploids for food and seven for juice. The trial was established at Namulonge, located in central Uganda at 32°36'E and 0°31'N, 1134 meters above sea level. Each hybrid in the field was planted in one line with 10 plants or mats. The plots were originally used as a demonstration plot of promising hybrids, and as such these hybrids were planted at different times in 2010 with subsequent gap fillings. The plots were given basic management practices (Tushemereirwe et al., 2003).

Table 1: Twenty five NARITA hybrids planted in 2010 and evaluated for two cycles at IITA-Namulonge station, Uganda

S/N	Hybrid† code	Hybrid usage	Mat units survived till June 2014 (%)
1.	NARITA 23	Food	100
2.	NARITA 18	Food	90
3.	NARITA 7	Food	100
4.	NARITA 22	Food	100
5.	NARITA 8	Juice	100
6.	NARITA 14	Food	90
7.	NARITA 4	Food	100
8.	NARITA 21	Juice	90
9.	NARITA 9	Juice	90
10.	NARITA 12	Food	90
11.	NARITA 11	Food	90
12.	NARITA 26	Food	90
13.	NARITA 15	Food	100
14.	NARITA 10	Juice	80
15.	NARITA 1	Food	100
16.	NARITA 13	Juice	80
17.	NARITA 3	Juice	60
18.	NARITA 25	Food	60
19.	NARITA 24	Food	40
20.	NARITA 2	Food	70
21.	NARITA 20	Food	60
22.	NARITA 19	Food	80
23.	NARITA 17	Food	30
24.	NARITA 16	Juice	40
25.	NARITA 5	Food	40

†NARITAs are ordered from the highest to the lowest based on bunch yield (kg ha^{-1}) (see Table 5)

At planting, 20kg of well decomposed cow dung manure was applied in the planting hole of 0.5 m deep and 0.6 m wide. Plants were spaced 3 m between lines and 2 m between plants of the same line. The planting materials were suckers obtained from early evaluation trials at Namulonge-IITA station. These were subjected to hot water treatment before planting. Mulching was done every year and weeds were controlled regularly by spraying agro-sate (Glyphosate). De-suckering was regularly done at flowering of the mother plant to maintain the appropriate plant density and ensure that the number of bunch bearing plants was maintained at a level which reduces competition for water, light and nutrients; i.e. three plants (mother, daughter and granddaughter) were maintained. In cases where the number of suckers was more than what was required on a mat, they were uprooted for seed multiplication to establish other experiments and for indexing.

During the crop growth and at harvest, data were collected as described by Carlier et al. (2002), Orjeda (2000) and Barekye (2009) for three cycles on the following traits: bunch weight (kg), number of hands on a bunch, number of fruit fingers, fruit finger length (cm), fruit finger circumference (cm), number of functional leaves at flowering and at harvest, youngest leaf spotted at flowering and at harvest, plant height at flowering (cm), plant girth at flowering (cm), height of tallest sucker at flowering and at harvest, number of maiden suckers at flowering, number of sword suckers at flowering, number of peeper suckers at flowering, and days to bunch maturity.

Flowering date was recorded as the date when the inflorescence was shooting. On the same date, the height of the flowered plant was measured from the ground level to the point where the last leaf emerged from the pseudostem. Plant girth was determined as the circumference of the pseudostem of the flowering plant at 1 m above ground. The number of functional leaves at flowering was determined by direct counting. Youngest leaf spotted at flowering was determined by recording the leaf number of the first leaf showing black Sigatoka symptoms, counting from the youngest leaf moving outwards to the older leaves. The height of tallest sucker at flowering was obtained by measuring the height of the tallest sucker from the ground level to a point where the last two leaves emerged from the pseudostem. The number of maiden suckers at flowering was determined by counting all suckers above 1.5 m in height and having broad leaves. The number of sword suckers at flowering was determined by counting all suckers that were between 0.5 and 1.5 m in height and having at least two fully formed leaves, usually sword-shaped. The number of peeper suckers at flowering was determined by counting all the suckers that had just emerged from the soil and with leaves that had just begun to form, usually below 0.5 m in height.

Harvesting was done when at least one fruit finger of the first hand on a bunch began to ripen and the date recorded. Days to bunch maturity were therefore recorded as the number of days between flowering and harvesting dates. Bunch weight was obtained by weighing the harvested bunch using a weighing scale. The number of hands on a bunch was obtained by counting the hands on a bunch, while the number of fruits on a bunch was obtained by counting the number of fruit fingers on a bunch. Fruit finger length was obtained by measuring the length of one middle finger from each hand on a bunch and the average length calculated. Fruit finger circumference was obtained by measuring the length around the middle finger of each hand on a bunch and the average circumference calculated. The number of leaves at harvest was obtained by direct counting of the functional leaves. The youngest leaf spotted at harvest was determined by recording the leaf number of the first leaf showing black Sigatoka symptoms, counting from the youngest leaf moving outwards to the older leaves. Height of tallest sucker at harvest was obtained by measuring the distance from the ground level to a point where the last two leaves emerged from the pseudostem. Bunch yield (kg ha^{-1}) was estimated from bunch weight (kg $plant^{-1}$) and percentage mat survival per genotype as:

Bunch yield (kg ha^{-1}) = bunch weight (kg $plant^{-1}$) x number of plants[1] ha^{-1} x % mat survival.

Data were collected for three cycle numbers; however, only data for two cycles[2], 1 and 2 were subjected to analysis of variance using GenStat 14 (Payne et al., 2011). The means across two crop cycles were separated using least significance differences (LSD) at 5% significance level.

3.0 Results

3.1 Variation of traits

The analysis of variance for 17 traits of 25 NARITA hybrids showed significant differences for: bunch weight, number of hands on a bunch, fruit finger circumference, fruit finger length, plant height and girth at flowering, number of functional leaves at harvest and height of tallest sucker at harvest, ($P<0.001$); number of fruit fingers, days to bunch maturity and youngest leaf spotted at harvest ($P<0.01$); and number of functional leaves at flowering and height of the tallest sucker at flowering ($P<0.05$) (Table 2). Coefficient of variation ranged from as low as 4.3% for fruit finger circumference to as high as 37.3% for the number of maiden suckers.

Table 2: Combined analysis of variance for 17 traits of 25 NARITA banana hybrids evaluated at Namulonge-IITA station in Uganda (Degrees of freedom = 24)

TRAITS	Mean Squares	F-Prob.	CV (%)
Bunch weight (kg)	38.8	***	17.0
Number of hands	3.1	***	7.4
Number of fruit fingers	1324.8	**	15.5
Fruit finger circumference (cm)	1.3	***	4.3
Fruit finger length (cm)	9.0	***	6.5
Days to bunch maturity	578.3	**	9.1
Plant height at flowering (cm)	1877.3	***	5.8
Plant girth at flowering (cm)	58.4	***	4.7
Number of functional leaves at flowering (cm)	2.8	*	11.4
Number of functional leaves at harvest (cm)	4.8	***	33.0
Height of tallest sucker at flowering	2066.9	*	12.0
Height of tallest sucker at harvest	3488.3	***	7.5
Number of maiden suckers at flowering	1.0	NS	37.3
Number of peeper suckers at flowering	0.8	NS	32.7
Sword suckers at flowering	1.0	NS	14.7
Youngest leaf spotted at flowering	7.7	NS	30.2
Youngest leaf spotted at harvest	1.7	**	13.8

CV (%) = coefficient of variation; *, **, *** significant at 0.05, 0.01, and 0.001 probability level, respectively and NS= non-significant.

[1] The number of plants ha^{-1} considering a spacing of 2 x 3 m is 1667.
[2] The analysis of three cycles is in process and will be communicated later.

3.2 Contribution of plant traits to hybrid variation

Principal components analysis (PCA) of all the traits assessed revealed that the first three principal components (PCs) explained 58.3% of the total variation and had eigenvalues greater than two (Table 3). The PC1 alone accounted for 28.7% of the total variation, mostly contributed by bunch yield related traits *viz.* bunch weight, number of hands and fruit fingers on a bunch. Plant girth had the highest contribution to PC1. The PC2 accounted for 16.6% of the total variation and all the key traits contributing to it were plant growth related *viz.* height of tallest sucker at flowering and at harvest, number of maiden suckers, plant height at flowering and youngest leaf spotted at flowering. Height of tallest sucker at flowering had the highest contribution to PC2. The PC3 accounted for 13% of total variation, which was largely contributed also by bunch yield related traits *viz.* bunch weight, days to bunch maturity, number of fruit fingers and number of hands. Youngest leaf spotted at harvest also had a major contribution to PC3, with the highest contribution registered by the number of fruit fingers.

Table 3: Principal component scores, eigenvalues and proportions of total and cumulative variances for 17 traits of 25 banana hybrid averaged across two cycles

	Principal components						
TRAITS	**PC1**	**PC2**	**PC3**	**PC4**	**PC5**	**PC6**	**PC7**
Bunch weight (kg)	0.33	0.08	0.31	0.11	0.23	0.16	0.15
Number of hands	0.33	0.02	-0.30	-0.24	-0.07	-0.29	0.07
Number of fruit fingers	0.31	0.07	-0.41	-0.18	0.09	-0.16	0.13
Fruit finger circumference (cm)	0.27	-0.25	0.17	-0.09	0.00	0.23	0.21
Fruit finger length (cm)	0.01	0.03	-0.13	0.52	0.46	0.42	0.05
Days to bunch maturity	-0.03	0.05	-0.38	0.20	0.37	-0.34	-0.47
Plant height at flowering (cm)	0.35	0.31	0.08	0.05	-0.11	0.07	0.03
Plant girth at flowering (cm)	0.39	0.17	-0.04	0.06	-0.09	0.21	0.15
Number of functional leaves at flowering	0.25	-0.30	0.16	0.20	0.01	-0.00	-0.16
Number of functional leaves at harvest	0.29	-0.10	0.27	-0.28	0.21	0.08	-0.46
Height of tallest sucker at flowering	0.24	0.44	0.18	0.05	-0.04	0.13	-0.07
Height of tallest sucker at harvest	0.14	0.35	0.19	0.14	0.01	-0.47	0.15
Number of maiden suckers at flowering	-0.02	0.34	0.37	0.27	0.16	-0.16	-0.01
Number of peeper suckers at flowering	-0.16	0.30	0.02	-0.32	0.39	0.08	-0.01
Sword suckers at flowering	-0.16	0.07	0.08	-0.39	0.48	0.04	0.44
Youngest leaf spotted at flowering	0.08	-0.34	0.19	0.28	0.20	-0.43	0.41
Youngest leaf spotted at harvest	0.24	-0.25	0.33	-0.20	0.28	-0.11	-0.20
Eigen root	**4.89**	**2.83**	**2.21**	**1.49**	**1.37**	**1.09**	**0.68**
Percentage variation	**28.7**	**16.6**	**13.0**	**8.7**	**8.1**	**6.4**	**4.0**
Cumulative percentage variation	**28.7**	**45.3**	**58.3**	**67**	**75.1**	**81.5**	**85.5**

PC= principal component

3.3 Mean performance of NARITA hybrids for the key selected traits averaged across two crop cycles

Based on PCA results (Table 3), the means of the traits that had major contribution to PCs 1-3 were further discussed in detail. Graphical presentation of mean performance for all traits of all hybrids arranged from highest to the lowest or lowest to the highest values were also presented (Appendices 2-18). A local check (Mbwazirume) was not included in the NARITA trial and analysis of variance, but for comparison purposes, its performance data were extracted from other trials conducted in a similar setup and conditions in Uganda and are presented (Table 4).

Mean bunch weight (BWT) ranged from 9.3 kg for NARITA 19 to 28.4 kg for NARITA 24, with an overall mean of 18.3 kg (Table 4). Fifty two per cent of the hybrids had a mean BWT greater than the overall mean BWT, whereas 96% of the hybrids had a mean BWT greater than for the local check (Mbwazirume) (11.0 kg). The order of NARITAs for mean BWT is not the same order as for other traits (Table 4). Graphical presentation of mean BWT results showed a continuous variation among the hybrids evaluated (Appendix 2).

Mean number of hands (NH) on a bunch ranged from 5.9 for NARITA 19 to 11.2 for NARITA 23, with an overall mean of 8.7. Sixty four per cent of the evaluated hybrids had NH greater than the overall mean, and 44% of the genotypes were better than Mbwazirume for this trait. The order of NARITAs for NH is not the same order as for other traits (Table 4). Graphically, NH showed variability and dropped sharply among hybrids (Appendix 3).

Number of fruit fingers (NF) ranged from 91.3 for NARITA 19 to 204.7 for NARITA 24, with an overall mean of 145.3. Sixty four per cent of the evaluated hybrids had NF greater than the overall mean, whereas 72% of the hybrids were better than Mbwazirume for the trait. The order of NARITAs for NF is not the same order as for other traits (Table 4). Graphically, there was a gradual decline in NF among the genotypes evaluated (Appendix 4).

Days to bunch maturity (DTM) mean ranged from as low as 113.4 days for NARITA 5 to as high as 194.4 days for NARITA 11, with an overall mean of 145.5 days. Fourty per cent of the hybrids evaluated had lower than the overall mean for DTM and only 4% of the hybrids had bunch maturity period lower than for Mbwazirume. The order of NARITAs for DTM is not the same order as for other traits (Table 4). Graphical presentation of DTM results showed that a majority of the hybrids were in the same maturity group of 130 – 160 days (Appendix 7).

Mean plant height at flowering (PHF) ranged from 365 cm for NARITA 1 to 252.8 cm for NARITA 19, with an overall mean of 304.5 cm. Fourty four per cent of the evaluated hybrids had PHF lower than overall mean and only 12% of these hybrids had PHF lower than for Mbwazirume (local check). The order of NARITAs for PHF is not the same order as for other traits (Table 4). Graphically, PHF differed slightly among the test hybrids, thus there was a gradual decrease in plant height from the tallest to the shortest hybrids (Appendix 8).

Mean plant girth at flowering (PG) ranged from 35.1 cm for NARITA 19 to 57.7 cm for NARITA 8, with an overall mean of 49.1 cm. Fourty four per cent of the evaluated hybrids had PG greater than the overall mean, while only 24% of the hybrids had PG greater than for the local check (Mbwazirume). The order of NARITAs for PG is not the same order as for other traits (Table 4). Graphical presentation of PG results showed that plants did not vary so much in girth. There were slight differences in PG thus; a gradual decline among hybrids for the trait was evident (Appendix 9).

Mean number of functional leaves at flowering (NFLF) ranged from 8.0 for NARITA 10 to 12.5 for NARITA 5 with the overall mean of 9.8 and 36% of the hybrids had a mean NSLF greater than the overall mean. The order of NARITAs for NSLF is not the same order as for other traits (Table 4). Eighty eight per cent of the evaluated hybrids were better than the check cultivar (Mbwazirume) for NSLF (Appendix 10).

Other traits that contributed most to the total variability of the hybrids according to PCA results were: height of tallest sucker at flowering and at harvest, number of maiden and peeper suckers, and youngest leaf spotted at flowering.

Mean height of tallest sucker at flowering (HTSF) ranged from 167.5 cm for NARITA 17 to 317.6 cm for NARITA 26 with the overall mean of 242.8 cm, whereas height of tallest sucker at harvest (HTSH) ranged from 144.2 cm for NARITA 18 to 358.1cm for NARITA 1 with the overall mean of 290.0 cm. Fourty per cent of the hybrids evaluated had a mean HTSF greater than the overall mean for the HTSF, whereas 52% of the hybrids had a mean HTSH greater than the overall mean HTSH. The order of NARITAs for height of tallest sucker at flowering and at harvest is not the same order as for other traits (Table 4).

Mean number of maiden suckers (MA) ranged from 0.5 for NARITA 18 to 3.4 for NARITA 19 with the overall mean of 2, whereas number of peeper suckers (PE) ranged from 1.3 for NARITA 23 to

3.6 for NARITA 4 with the overall mean of 2.3. Fourty four per cent of the hybrids had mean number of MA greater than the overall mean for MA, whereas 36% of the hybrids had mean number of PE greater than the overall mean for PE. The order of NARITAs for number of MA and PE is not the same order as for other traits (Table 4).

The youngest leaf spotted at flowering (YLSF) was highest for NARITA 5 and NARITA 18 (10.3) and lowest for NARITA 10 (1.2). Fifty two per cent of the hybrids had YLSF higher than the overall mean (8.1), and all the hybrids were better than Mbwazirume for this trait. Graphical presentation of YLSF showed a continuous variation among the hybrids evaluated (Appendix 17). The order of NARITAs for YLSF is not the same order as for other traits (Table 4).

The youngest leaf spotted at harvest (YLSH) was similarly highest for NARITA 5 (5.1) and lowest for NARITA 9 (1.3). Fourty four per cent of the hybrids had YLSH higher than the overall mean (2.8). Graphical presentation of YLSH showed a generally steady gradual decrease in values from NARITA 5 to NARITA 9 in YLSH (Appendix 18). The order of NARITAs for YLSH is not the same order as for other traits (Table 4).

Table 4: Mean performance of 17 traits of 25 NARITA hybrids evaluated at Namulonge-IITA station in Uganda across two banana cycles

	TRAITS																
HYBRIDS†	**BWT**	**NH**	**NF**	**FC**	**FL**	**DTM**	**PHF**	**PG**	**NFLF**	**NFLH**	**HTSF**	**HTSH**	**MA**	**PE**	**SW**	**YLSF**	**YLSH**
NARITA 23	23.2	**11.2**	177.0	**13.7**	16.3	132.3	336.2	57.5	11.0	4.9	257.6	311.2	1.6	**1.3**	1.7	8.9	3.8
NARITA 18	25.1	8.8	157.8	13.0	19.0	137.3	286.2	56.8	11.8	4.0	199.2	**144.2**	**0.5**	1.8	1.6	**10.3**	3.2
NARITA 7	20.9	8.6	145.4	13.3	18.4	122.5	346.4	54.5	10.0	4.5	260.6	322.5	2.3	1.9	1.7	8.2	3.1
NARITA 22	20.6	7.8	129.2	12.4	20.6	151.4	309.1	50.4	11.3	5.2	255.6	308.4	3.0	1.7	1.2	9.2	3.8
NARITA 8	20.1	8.8	146.9	12.7	18.8	136.2	358.0	**57.7**	9.5	3.4	292.5	347.8	2.5	2.2	2.0	8.2	2.7
NARITA 14	22.3	9.2	162.5	11.8	20.5	167.9	277.4	42.9	11.5	5.2	228.8	275.0	1.8	1.8	**1.1**	10.1	4.7
NARITA 4	19.3	8.0	159.7	11.9	18.5	149.4	280.2	46.9	9.6	4.1	234.6	263.6	1.9	**3.6**	**3.5**	8.4	3.1
NARITA 21	19.7	9.5	151.6	12.7	18.2	154.6	300.4	48.9	10.9	4.1	261.3	332.4	3.3	2.9	**3.5**	8.9	3.1
NARITA 9	18.8	7.8	126.2	13.0	20.4	167.6	290.0	50.9	9.8	2.3	225.8	268.3	1.6	1.3	2.6	6.6	**1.3**
NARITA 12	17.7	8.6	156.2	11.1	20.4	148.6	311.2	46.3	9.0	2.6	240.0	304.1	1.9	2.6	2.3	7.1	2.3
NARITA 11	17.6	8.6	161.2	11.1	19.8	**194.4**	310.1	47.1	8.9	2.5	251.9	292.2	2.2	3.1	2.3	6.8	2.1
NARITA 26	16.4	8.3	131.7	11.7	18.1	141.4	359.0	50.0	9.2	3.2	**317.6**	334.4	2.7	2.2	2.2	7.6	2.2
NARITA 15	14.2	7.5	113.9	12.3	17.2	121.5	290.6	44.1	9.8	2.4	226.1	287.6	1.8	1.6	2.2	7.7	2.1
NARITA 10	17.3	9.1	176.3	11.8	17.3	155.4	288.3	50.4	**8.0**	**0.3**	233.3	278.3	1.9	2.7	2.3	**5.9**	2.0
NARITA 1	13.6	9.6	147.2	11.1	16.3	154.2	**365.0**	56.6	9.9	3.9	311.1	**358.1**	2.4	2.1	1.7	9.6	3.4
NARITA 13	15.6	8.8	134.5	11.8	18.2	145.6	287.1	43.6	8.3	1.1	233.6	258.9	2.2	2.9	2.9	6.5	1.7
NARITA 3	19.6	7.7	126.8	12.5	21.6	149.3	293.1	45.5	9.3	5.8	228.1	269.4	2.1	2.8	**3.5**	8.3	4.1
NARITA 25	19.3	9.8	156.1	12.6	17.9	147.7	260.8	44.3	8.5	3.8	215.0	248.8	1.5	2.1	1.4	7.0	2.7
NARITA 24	**28.4**	11.1	**204.7**	12.0	18.2	149.0	320.7	55.0	9.6	2.4	258.3	316.7	1.3	2.3	1.2	7.1	2.0
NARITA 2	13.4	8.3	134.3	11.0	16.7	130.3	314.4	46.1	8.9	3.2	255.0	293.9	1.9	3.4	2.7	8.5	3.6
NARITA 20	13.8	8.8	141.7	11.4	15.7	147.9	288.1	48.5	10.4	3.6	234.4	305.3	1.6	2.0	1.5	8.8	2.3
NARITA 19	**9.3**	**5.9**	**91.3**	12.0	**14.0**	133.8	**252.8**	**35.1**	8.5	2.2	230.6	260.0	**3.4**	2.2	2.0	6.7	1.8
NARITA 17	24.3	10.4	179.2	12.5	17.7	156.0	293.8	49.5	9.6	4.6	**167.5**	304.4	0.6	1.9	**1.1**	8.0	2.8
NARITA 16	14.6	6.0	97.5	**10.7**	**23.4**	130.0	265.0	47.0	8.3	1.0	216.2	282.5	2.3	3.0	2.3	6.7	1.5
NARITA 5	12.7	8.7	123.6	13.3	15.2	**113.4**	327.3	52.7	**12.5**	**6.9**	235.0	282.5	1.7	2.0	1.9	**10.3**	**5.1**
MEAN	**18.3**	**8.7**	**145.3**	**12.1**	**18.3**	**145.5**	**304.5**	**49.1**	**9.8**	**3.5**	**242.8**	**290.0**	**2.0**	**2.3**	**2.1**	**8.1**	**2.8**
$LSD_{0.05}$	**6.4**	**1.3**	**46.5**	**1.1**	**2.5**	**27.4**	**36.1**	**2.3**	**2.3**	**2.4**	**60.2**	**44.7**	**1.5**	**1.5**	**1.6**	**4.1**	**1.5**
MBWAZIRUME§	**11.0**	**6.5**	**130.2**	**12.5**	**15.2**	**115.0**	**273.9**	**52.8**	**8.4**	**2.9**	**-**	**-**	**-**	**-**	**-**	**4.0**	**-**

†NARITAs are ordered from the highest to the lowest based on bunch yield (kg ha^{-1}) (see Table 5); BWT= bunch weight (kg); DTM= days to bunch maturity; FC= fruit finger circumference (cm); FL= fruit finger length (cm); HTSF= height of tallest sucker at flowering (cm); HTSH= height of tallest sucker at harvest (cm); MA= number of maiden suckers; NF= number of fruit fingers; NH= number of hands; NSLF= number of functional leaves at flowering; NSLF= number of functional leaves at harvest; PE= number of peeper suckers; PG= plant girth at flowering (cm); PHF=plant height at flowering (cm); SW= sword suckers; YLSF= youngest leaf spotted at flowering, YLSH= youngest leaf spotted at harvest; $LSD_{0.05}$= least significance difference at 5%; MBWAZIRUME§ = is a local check whose values were obtained from other experiments and were not included in any analysis .

3.4 Mean performance of NARITA hybrids, East African Highland banana parental genotypes and check cultivar

The estimates of bunch yield (kg ha^{-1}) for the NARITA hybrids, some EAHB parental genotypes that appeared in the pedigrees of NARITA hybrids, and check cultivar (Mbwazirume) were determined (Table 5). The highest bunch yield (38674.4 kg ha^{-1}) for the hybrids was recorded for NARITA 23 and the lowest (8468.4 kg ha^{-1}) for NARITA 5. For parental genotypes, the highest bunch yield (15220.4 kg ha^{-1}) was recorded for Nfuuka and the lowest (7498.5 kg ha^{-1}) for Entukura. Eighty per cent of the NARITA hybrids were better than the best parental genotype (Nfuuka) for bunch yield (kg ha^{-1}). The top four NARITA hybrids for bunch yield (NARITA 23, NARITA 18, NARITA 7 and NARITA 22) are food type.

Table 5: Estimates of bunch yield derived from the bunch weight and percentage survival of banana mats

HYBRIDS†	Bunch weight (kg)	% Survival	Yield (kg ha^{-1})
NARITA 23	23.2	100	38674.4
NARITA 18	25.1	90	37657.5
NARITA 7	20.9	100	34840.3
NARITA 22	20.6	100	34340.2
NARITA 8	20.1	100	33506.7
NARITA 14	22.3	90	33456.7
NARITA 4	19.3	100	32173.1
NARITA 21	19.7	90	29555.9
NARITA 9	18.8	90	28205.6
NARITA 12	17.7	90	26555.3
NARITA 11	17.6	90	26405.3
NARITA 26	16.4	90	24604.9
NARITA 15	14.2	100	23671.4
NARITA 10	17.3	80	23071.3
NARITA 1	13.6	100	22671.2
NARITA 13	15.6	80	20804.2
NARITA 3	19.6	60	19603.9
NARITA 25	19.3	60	19303.9
NARITA 24	28.4	40	18937.1
NARITA 2	13.4	70	15636.5
NARITA 20	13.8	60	13802.8
NARITA 19	9.3	80	12402.5
NARITA 17	24.3	30	12152.4
NARITA 16	14.6	40	9735.3
NARITA 5	12.7	40	8468.4
PARENTS‡			
NFUUKA	11.3	80.8	15220.4
KAZIRAKWE	9.1	92.7	14062.3
ENYERU	8.7	97.9	12748.0
ENZIRABAHIMA	8.6	87.9	11555.0
KABUCURAGYE	8.3	56.2	7775.9
ENTUKURA	6.3	71.4	7498.5
NAKAWERE	8.0	-	-
CHECK (MBWAZIRUME§)	**11.0**	**60.2**	**11038.9**

Hybrids**†** = NARITA hybrids are ordered based on their respective yield performance (kg ha^{-1}; highest to lowest); ‡ = East African Highland banana parental genotypes which appeared in the pedigree of NARITA hybrids and whose data were obtained from other experiments; MBWAZIRUME§ = is a local check whose values were obtained from other experiments.

3.5 Correlation among key agronomic and disease traits

Banana cycle number had positive and significant correlation with plant height at flowering, plant girth and height of the tallest sucker at flowering ($P<0.001$); bunch weight and number of functional leaves at harvest ($P<0.01$); and number of hands and number of maiden suckers ($P<0.05$) (Table 6). Bunch weight had positive and significant correlation with number of hands ($P<0.001$), plant girth at flowering ($P<0.001$), fruit finger circumference ($P<0.001$), fruit finger length ($P<0.01$), plant height at flowering ($P<0.001$), number of functional leaves at harvest ($P<0.01$) and youngest leaf spotted at harvest ($P<0.01$). However, bunch weight had a negative and significant correlation with the number of sword and peeper suckers ($P<0.05$). Youngest leaf spotted at flowering had positive and significant correlation with fruit finger circumference ($P<0.05$), number of functional leaves at flowering ($P<0.001$) and youngest leaf spotted at harvest. There was, however, a negative and significant correlation between youngest leaf spotted at flowering and number of number of peeper suckers ($P<0.01$) and height of tallest sucker at flowering ($P<0.05$). Youngest leaf spotted at harvest had positive and significant correlation with: fruit finger circumference, number of functional leaves at flowering, number of functional leaves at harvest ($P<0.001$); and bunch weight ($P<0.05$). Youngest leaf spotted at harvest, however, had a negative and significant correlation with number of number of peeper suckers ($P<0.01$).

Table 6: Correlation among banana traits evaluated at the preliminary yield evaluation stage of banana breeding at Namulonge-IITA station, Uganda

TRAITS	CLE	BWT	NH	NF	FL	FC	NFLF	YLSF	PHF	PG	HTSF	MA	SW	PE	DTM	NFLH	YLSH	HTSH
CLE	1.00																	
BWT	0.39**	1.00																
NH	0.28*	0.61***	1.00															
NF	-0.03	-0.20	-0.41**	1.00														
FL	0.17	0.39**	-0.19	0.03	1.00													
FC	0.22	0.42***	0.26*	-0.13	-0.08	1.00												
NFLF	0.10	0.35**	0.23	-0.04	0.05	0.43***	1.00											
YLSF	-0.15	0.15	0.02	0.08	0.09	0.26*	0.49***	1.00										
PHF	0.74***	0.38**	0.47***	-0.20	0.04	0.19	0.21	-0.15	1.00									
PG	0.66***	0.59***	0.58***	-0.20	0.11	0.35**	0.36**	-0.07	0.85***	1.00								
HTSF	0.74***	0.17	0.21	-0.12	0.05	0.10	0.02	-0.30*	0.83***	0.64***	1.00							
MA	0.29*	-0.19	-0.28*	0.25*	0.08	-0.08	-0.06	-0.02	0.25*	0.06	0.55***	1.00						
SW	-0.18	-0.29*	-0.24	-0.01	-0.01	-0.13	-0.27*	-0.11	-0.21	-0.27*	-0.07	0.03	1.00					
PE	-0.10	-0.26*	-0.26*	-0.03	0.03	-0.36**	-0.51***	-0.39**	-0.15	-0.24*	0.11	0.28*	0.44***	1.00				
DTM	-0.12	0.21	0.10	-0.13	0.25*	-0.29*	-0.10	-0.04	-0.13	-0.12	-0.13	-0.04	-0.02	0.07	1.00			
NFLH	0.34**	0.32**	0.31**	-0.25*	-0.09	0.49***	0.48***	0.11	0.41**	0.39**	0.32*	-0.01	-0.07	-0.14	-0.18	1.00		
YLSH	0.18	0.25*	0.22	-0.15	-0.06	0.53***	0.48***	0.46***	0.19	0.21	0.05	-0.03	-0.05	-0.26*	-0.18	0.81***	1.00	
HTSH	0.21	-0.01	0.21	-0.05	0.01	-0.16	-0.08	0.07	0.54***	0.33*	0.52***	0.36**	-0.06	0.07	0.00	0.13	0.09	1.00

CLE= cycle number; BWT= bunch weight (kg); DTM= days to bunch maturity; FC= fruit finger circumference (cm); FL= fruit finger length (cm); HTSF= height of tallest sucker at flowering (cm); HTSH= height of tallest sucker at harvest (cm); MA= number of maiden suckers; NF= number of fruit fingers; NH= number of hands; NFLF= number of functional leaves at flowering; NFLH= number of functional leaves at harvest; PE= number of peeper suckers; PG= plant girth at flowering (cm); PHF=plant height at flowering (cm); SW= sword suckers; YLSF= youngest leaf spotted at flowering, YLSH= youngest leaf spotted at harvest; *, **, *** significant at 0.05, 0.01, and 0.001 probability level, respectively.

4.0 Discussion, conclusions and recommendations

This report presents and discusses the results of 25 of 27 NARITA banana hybrids existing. The yield of the 25 NARITA hybrids ranged from 8468.4 to 38674.4 kg ha^{-1} while the bunch yield of their counterpart EAHB parental genotypes ranged from 7498.5 to 15220.4 t ha^{-1}. Seventy two per cent of the NARITA hybrids evaluated had a bunch weight greater than 14.7 kg[3] and were also better than Mbwazirume (local check) that had a mean bunch weight of 11.0 kg, implying that a majority of the hybrids qualified for selection at the preliminary yield trial stage. Similarly, for each of the 17 traits assessed a majority of the hybrids scored highly and were better than Mbwazirume and could be selected for advanced yield trials. However, these NARITA hybrids in future need to be assessed for organoleptic attributes and ranked based on consumer acceptability in combination with yield and growth behaviour.

The mean squares in the combined analysis of variance for 17 traits were significant for most traits including bunch weight, indicating that the hybrids evaluated were significantly different for bunch weight and most other traits evaluated, and that by further hybridizing among them genetic advance would be achieved for most traits. This also revealed a potential for selection and improvement of these hybrids for most of the traits assessed.

The PCA results revealed that the first three PCs explained 58.3% of the total variation. It was also revealed that most of the variation in PC1 was contributed by bunch yield related traits *viz.* bunch weight, number of fruit fingers and number of hands on a bunch, which are the most important factors defining the traits to consider in selecting high yielding banana genotypes.

High bunch weight, one of the most important traits breeders and farmers normally select for, was highly and positively correlated with the number of hands, plant girth, fruit finger circumference, fruit finger length, plant height at flowering, number of functional leaves at flowering and youngest leaf spotted at harvest. Hence these parameters can be used to estimate yields when bunches are lost due to wind damage and theft.

Based on phenotypic correlation analysis, it was evident that bunch weight and other key traits were significantly influenced by harvest cycle number. It is therefore probable that the cycle two

[3] The cut-off bunch weight in this report is 14.7 kg. This is derived from 11.3 kg (maximum bunch weight for the EAHB cultivar (Nfuuka; Table 5) + (11.3 kg x 30%). Thirty per cent is the current desired NARO-IITA yield increase.

results were better than the cycle one results, especially for bunch weight and plant growth parameters such as plant girth and height.

Remark

We acknowledge that there was a limitation of averaging data for two hybrid cycles as well as the use of unblocked trials in this study. Another limitation is the lack of results on cycle duration and a good control. Therefore we emphasize that NARITAs need further evaluations. For that matter, we recommended multi-location evaluation of these hybrids in larger plots that are moreover replicated/ blocked and also that the resulting data for each harvest cycle to be analyzed separately.

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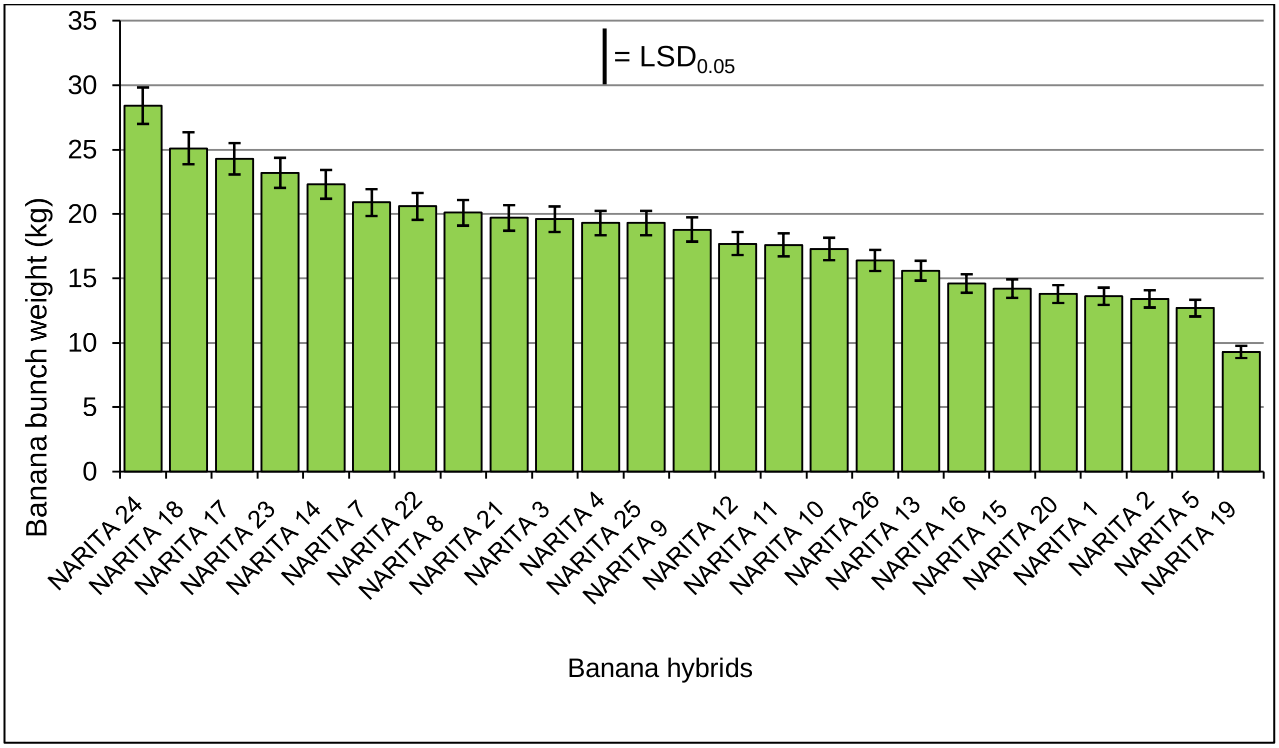
APPENDICES 1-18

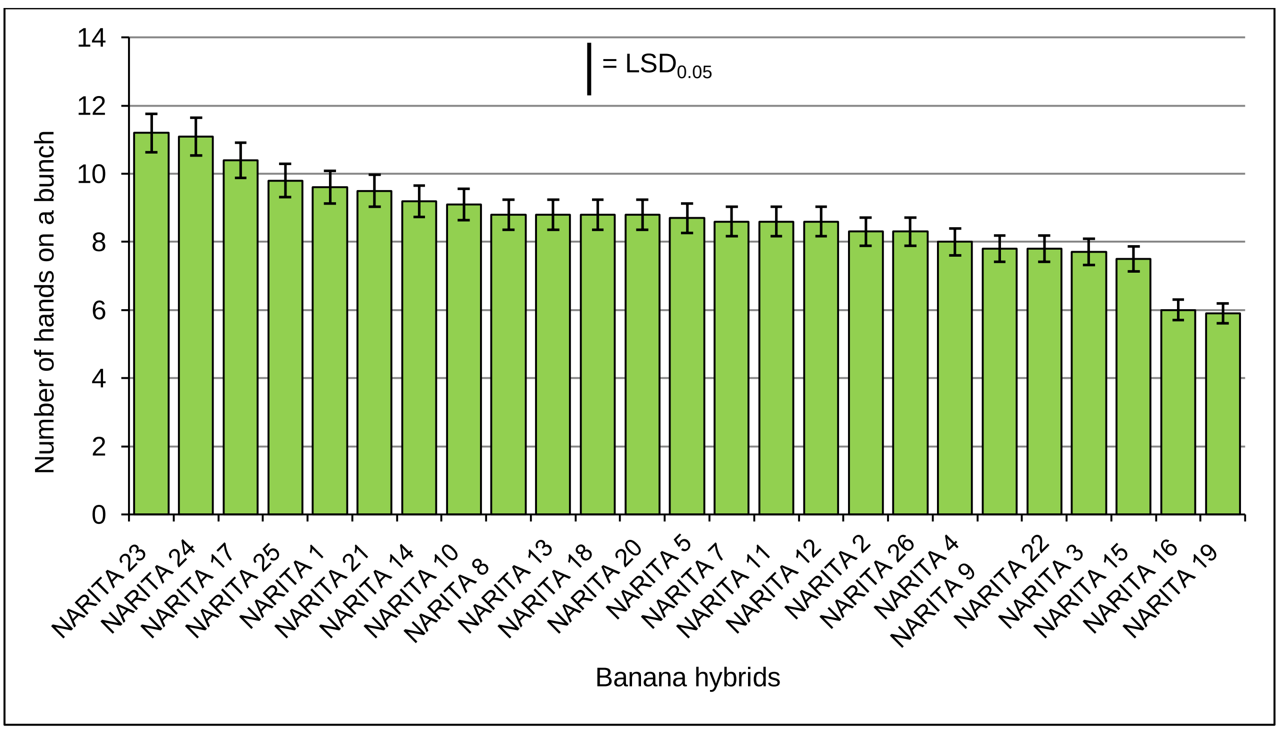
Appendix 1: Pedigree of NARITA hybrids evaluated for two cycles at IITA-Namulonge station, Uganda

Name	Hybrid code	Female parent	Male parent	Pedigrees for the female parents	Pedigrees for the male parents
NARITA 23	21086S-1	Kazirakwe	7197-2	Unknown	(SH3362 X Long Tavoy), SH3362 (SH3217 X SH3142), SH3217(SH2095 X SH2766), SH2095 [(Sinwobogi X Tjau lagada) X (wild malaccensis X Guyod)], SH2766 [Tjau lagada X (wild malaccensis X Guyod)], SH3142 (Intermating Pisang JariBuaya)
NARITA 18	14539S-4	365K-1	660K-1	(Kabucuragye X Calcutta 4)	(Enzirabahima X Calcutta 4)
NARITA 7	12419S-13	1201K-1	SH3217	(Nakawere X Calcutta 4)	(SH2095 X SH2766), SH2095[(Sinwobogi X Tjau lagada) X (wild malaccensis X Guyod)], SH2766 [Tjau lagada X (wild malaccensis X Guyod)]
NARITA 22	19798S-2	917K-2	9128-3	(Enzirabahima X Calcutta 4)	(Tjau lagada X Pisang lilin)
NARITA 8	12468S-18	917K-2	SH3217	(Enzirabahima X Calcutta 4)	(SH2095 X SH2766), SH2095[(Sinwobogi X Tjau lagada) X (wild malaccensis X Guyod)], SH2766 [Tjau lagada X (wild malaccensis X Guyod)]
NARITA 14	12949S-2	917K-2	7197-2	(Enzirabahima X Calcutta 4)	(SH3362 X Long Tavoy), SH3362 (SH3217 X SH3142), SH3217(SH2095 X SH2766), SH2095[(Sinwobogi X Tjau lagada) X (wild malaccensis X Guyod)], SH2766 [Tjau lagada X (wild malaccensis X Guyod)], SH3142 (Intermating Pisang JariBuaya)
NARITA 4	9187S-8	660K-1	9128-3	(Enzirabahima X Calcutta 4)	(Tjau Lagada X Pisang Lilin)
NARITA 21	17503S-3	1201K-1	7197-2	(Nakawere X Calcutta 4)	(SH3362 X Long Tavoy), SH3362 (SH3217 X SH3142), SH3217(SH2095 X SH2766), SH2095[(Sinwobogi X Tjau lagada) X (wild malaccensis X Guyod)], SH2766 [Tjau lagada X (wild malaccensis X Guyod)], SH3142 (Intermating Pisang JariBuaya)
NARITA 9	12468S-6	917K-2	SH3217	(Enzirabahima X Calcutta 4)	(SH2095 X SH2766), SH2095[(Sinwobogi X Tjau lagada) X (wild malaccensis X Guyod)], SH2766 [Tjau lagada X (wild malaccensis X Guyod)]
NARITA 12	12479S-13	1201K-1	9128-3	(Nakawere X Calcutta 4)	(Tjau lagada X Pisang lilin)
NARITA 11	12479S-1	1201K-1	9128-3	(Nakawere X Calcutta 4)	(Tjau lagada X Pisang lilin)
NARITA 26	HJ	Unknown	Unknown	Unknown	Unknown
NARITA 15	13284S-1	660K-1	9128-3	(Enzirabahima X Calcutta 4)	(Tjau lagada X Pisang lilin)
NARITA 10	12477S-13	917K-2	SH3217	(Enzirabahima X Calcutta 4)	(SH2095 X SH2766), SH2095[(Sinwobogi X Tjau lagada) X (wild malaccensis X Guyod)], SH2766 [Tjau lagada X (wild malaccensis X Guyod)]
NARITA 1	7798S-2	917K-2	9128-3	(Enzirabahima X Calcutta 4)	(Tjau Lagada X Pisang Lilin)
NARITA 13	12618S-1	1201K-1	SH3362	(Nakawere X Calcutta 4)	(SH3217 X SH3142), SH3217(SH2095 X SH2766), SH2095[(Sinwobogi X Tjau lagada) X (wild malaccensis X Guyod)], SH2766 [Tjau lagada X (wild malaccensis X Guyod)], SH3142 (Intermating Pisang JariBuaya)

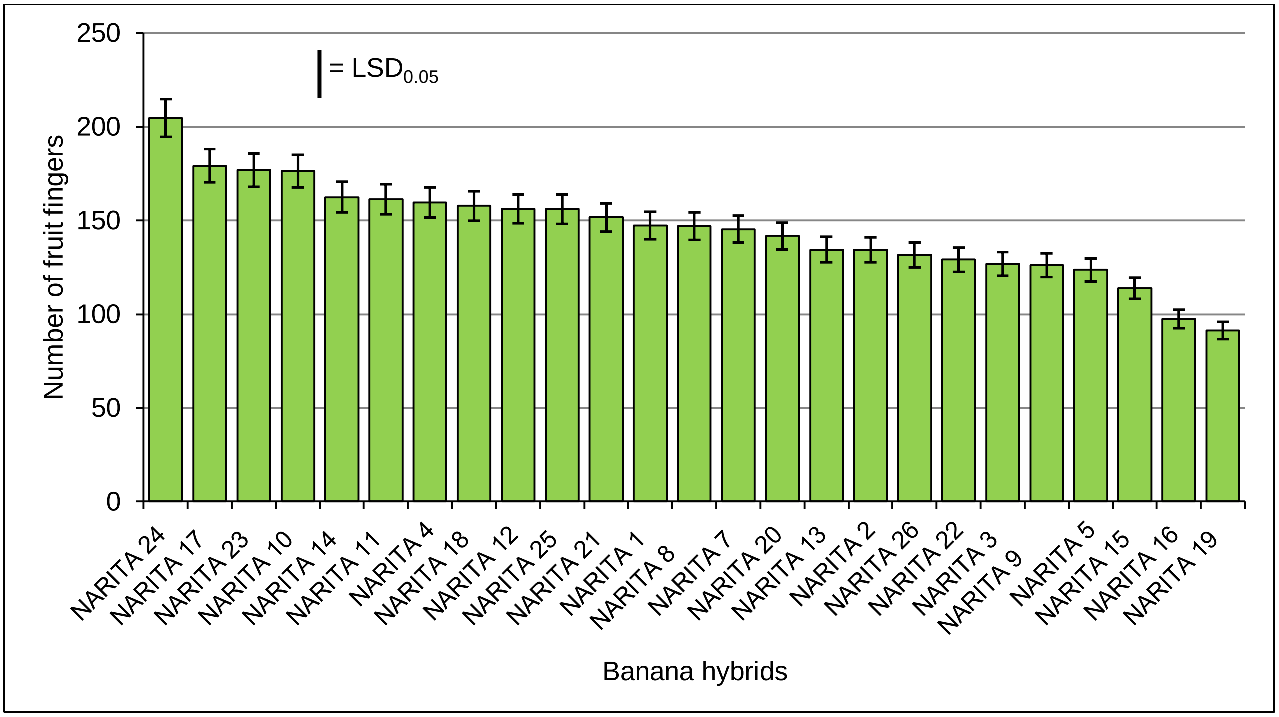
NARITA 3	9494S-10	917K-2	SH3362	(Enzirabahima X Calcutta 4)	(SH3217 X SH3142), SH3217(SH2095 X SH2766), SH2095[(Sinwobogi X Tjau Lagada) X (wild malaccensis X Guyod)], SH2766 [Tjau Lagada X (wild malaccensis X Guyod)], SH3142 (Intermating Pisang Jari Buaya)
NARITA 25	HX	Unknown	Unknown	Unknown	Unknown
NARITA 24	HB	Unknown	Unknown	Unknown	Unknown
NARITA 2	9750S-13	401k-1	9128-3	(Entukura X Calcutta 4)	(Tjau Lagada X Pisang Lilin)
NARITA 20	16457S-2	Entukura	365K-1	Unknown	(Kabucuragye X Calcutta 4)
NARITA 19	16242S-1	1201K-1	8075-7	(Nakawere X Calcutta 4)	(SH3362 X Calcutta 4), SH3362 (SH3217 X SH3142), SH3217 (SH2095 X SH2766), SH2095[(Sinwobogi X Tjau lagada) X (wild malaccensis X Guyod)], SH2766 [Tjau lagada X (wild malaccensis X Guyod)], SH3142 (Intermating Pisang JariBuaya).
NARITA 17	13573S-1	1438K-1	9719-7	(Entukura X Calcutta 4)	(madang X Calcutta 4)
NARITA 16	135225S-5	917K-2	SH3362	(Enzirabahima X Calcutta 4)	(SH3217 X SH3142), SH3217(SH2095 X SH2766), SH2095[(Sinwobogi X Tjau lagada) X (wild malaccensis X Guyod)], SH2766 [Tjau lagada X (wild malaccensis X Guyod)], SH3142 (Intermating Pisang JariBuaya)
NARITA 5	8386S-19	917K-2	SH3217	(Enzirabahima X Calcutta 4)	(SH2095 X SH2766), SH2095[(Sinwobogi X Tjau Lagada) X (wild malaccensis X Guyod)], SH2766 [Tjau Lagada X (wild malaccensis X Guyod)]
NARITA 6	11274S-3	222K-1	9128-3	(Nfuuka X Calcutta 4)	(Tjau Lagada X Pisang Lilin)
NARITA 27	9518S-12	222K-1	SH 3362	(Nfuuka X Calcutta 4)	(SH3217 X SH3142), SH3217(SH2095 X SH2766), SH2095[(Sinwobogi X Tjau Lagada) X (wild malaccensis X Guyod)], SH2766 [Tjau Lagada X (wild malaccensis X Guyod)], SH3142 (Intermating Pisang Jari Buaya)



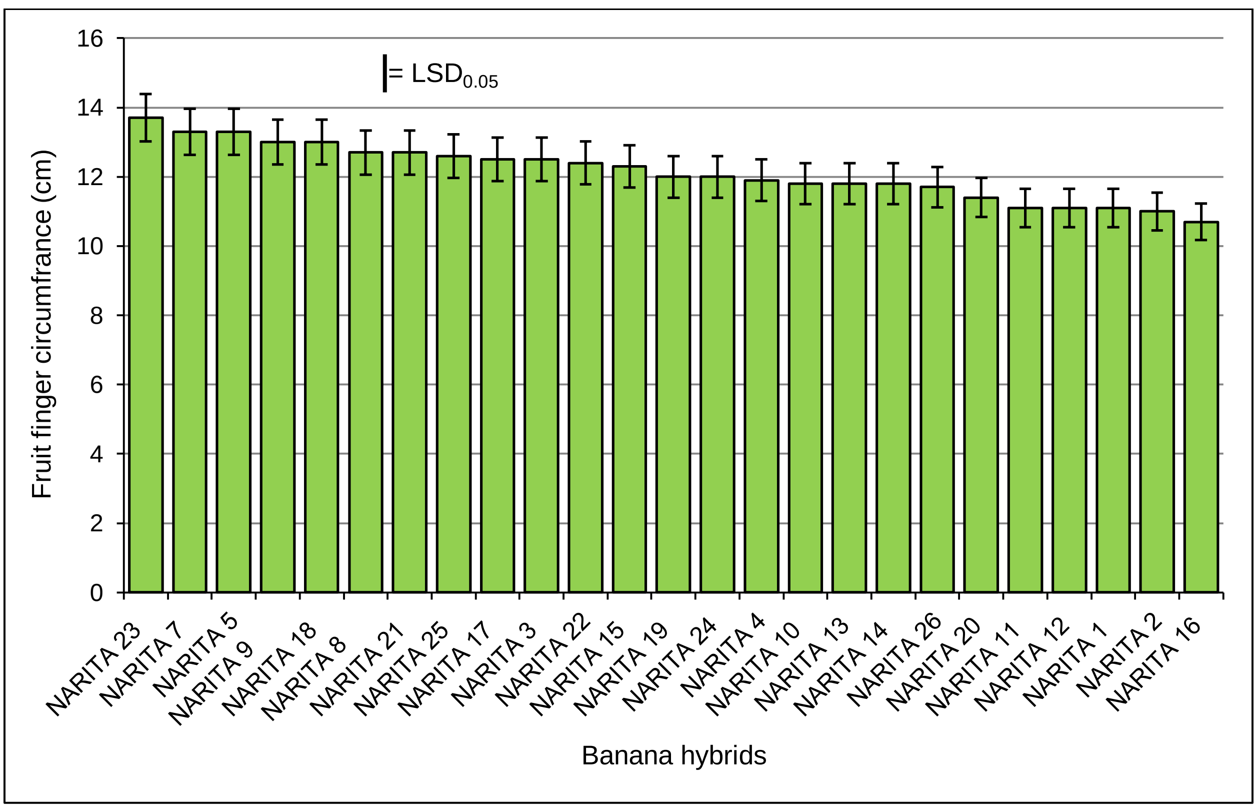
Appendix 2: Mean performance of 25 NARITA hybrids evaluated at Namulonge-IITA station in Uganda for banana bunch weight (kg).



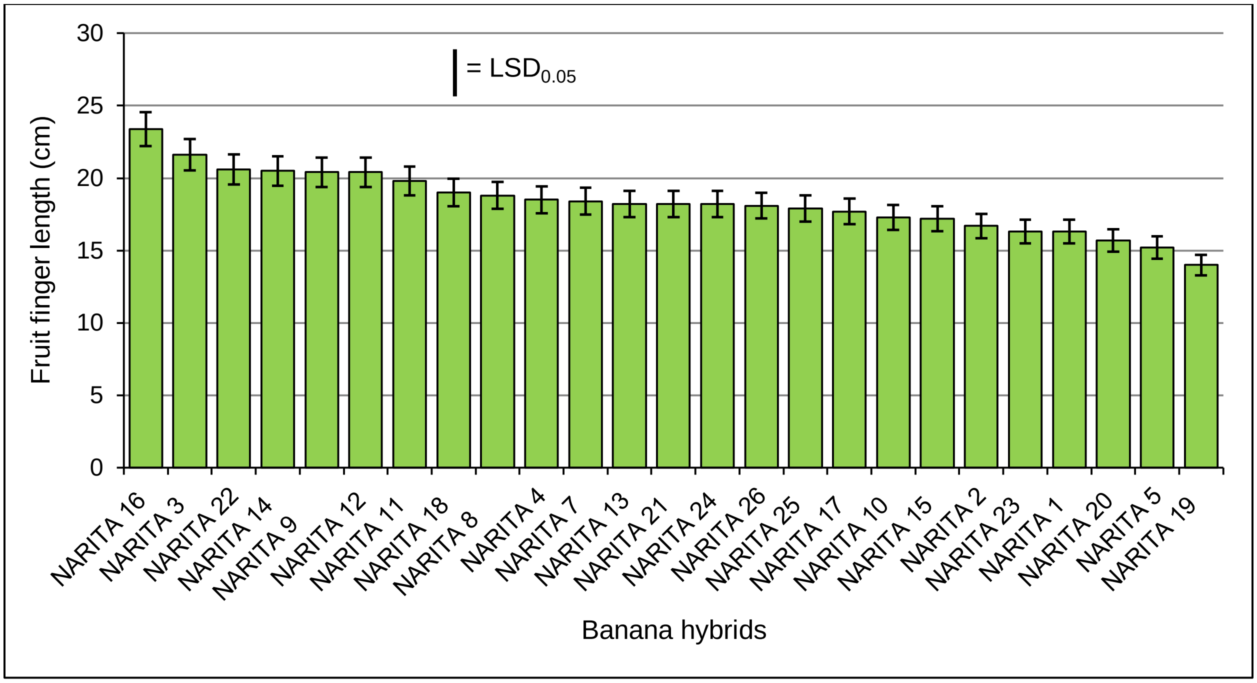
Appendix 3: Mean performance of 25 NARITA hybrids evaluated at Namulonge-IITA station in Uganda for the number of hands on a bunch.



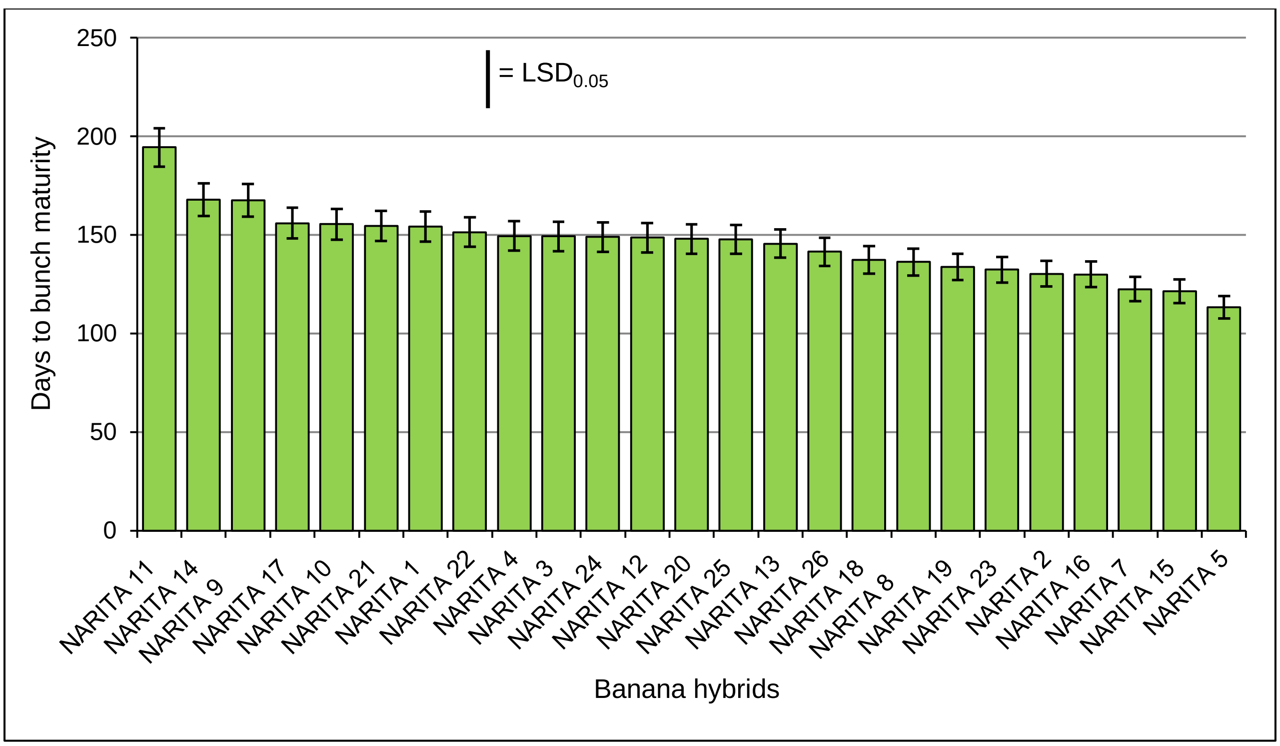
Appendix 4: Mean performance of 25 NARITA hybrids evaluated at Namulonge-IITA station in Uganda for the number of fruit fingers.



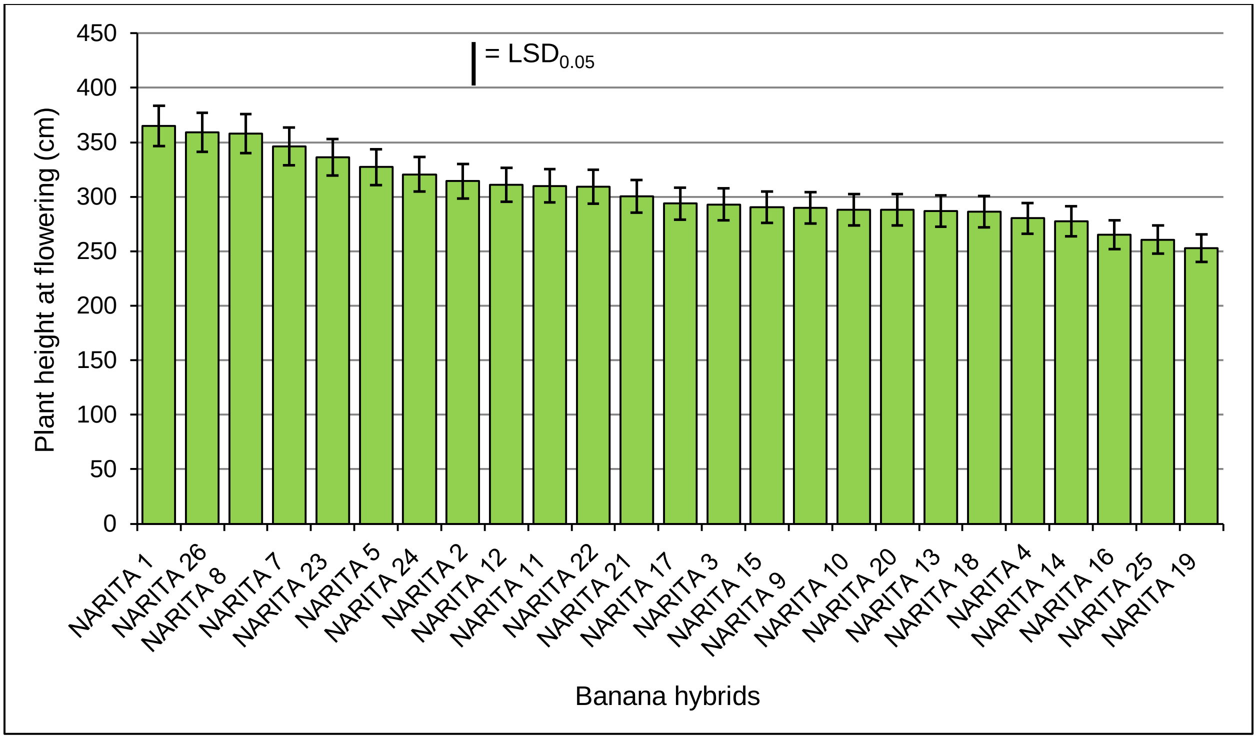
Appendix 5: Mean performance of 25 NARITA hybrids evaluated at Namulonge-IITA station in Uganda for the fruit finger circumference (cm).



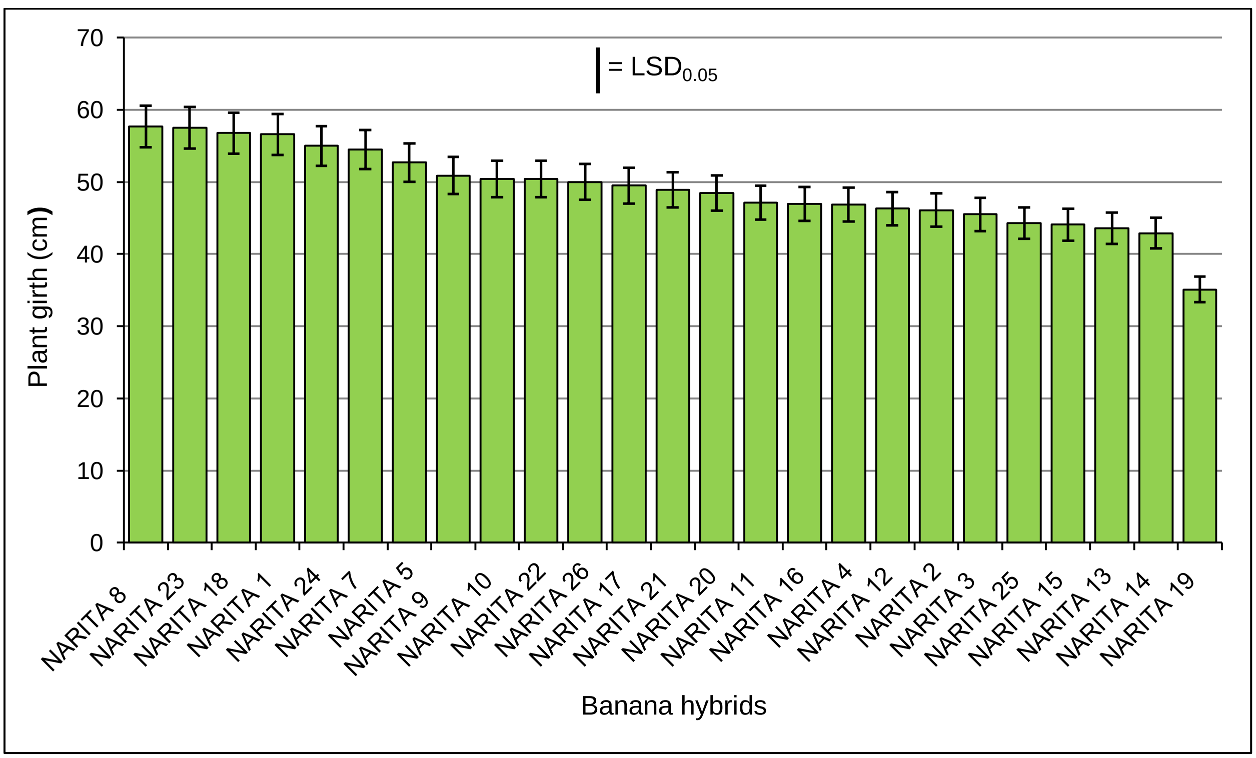
Appendix 6: Mean performance of 25 NARITA hybrids evaluated at Namulonge-IITA station in Uganda for the fruit finger length (cm).



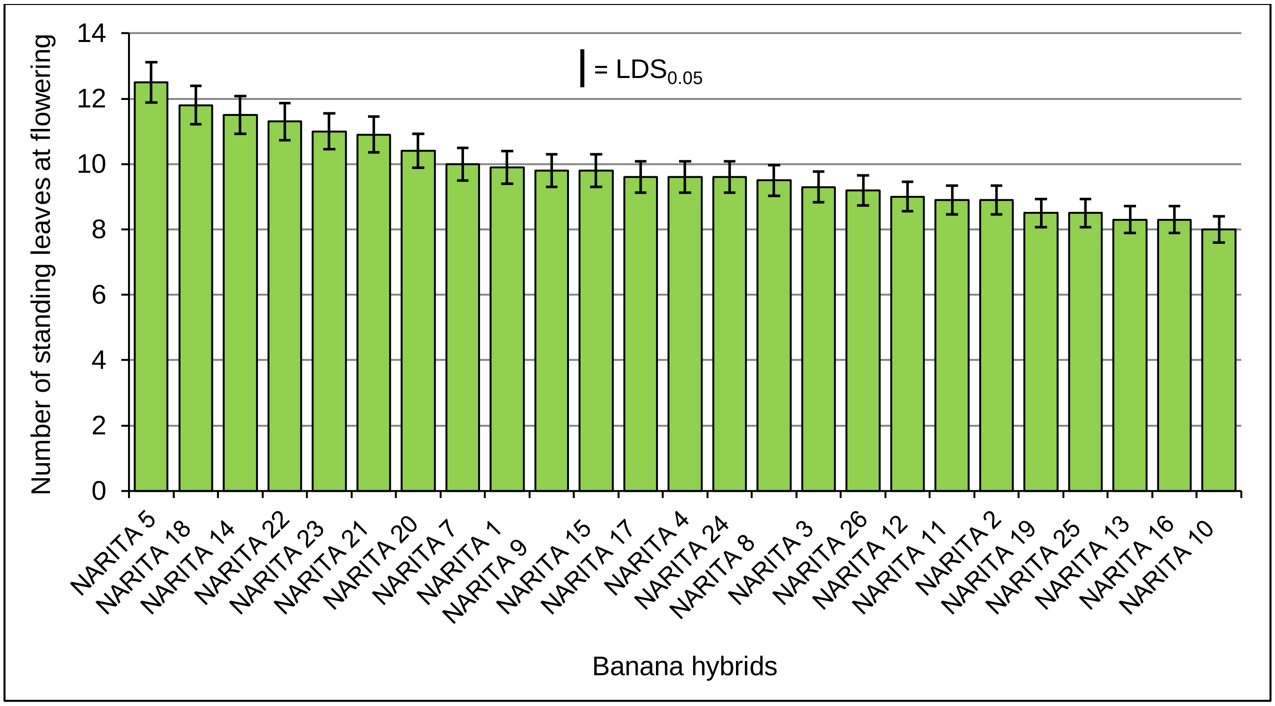
Appendix 7: Mean performance of 25 NARITA hybrids evaluated at Namulonge-IITA station in Uganda for days to bunch maturity.



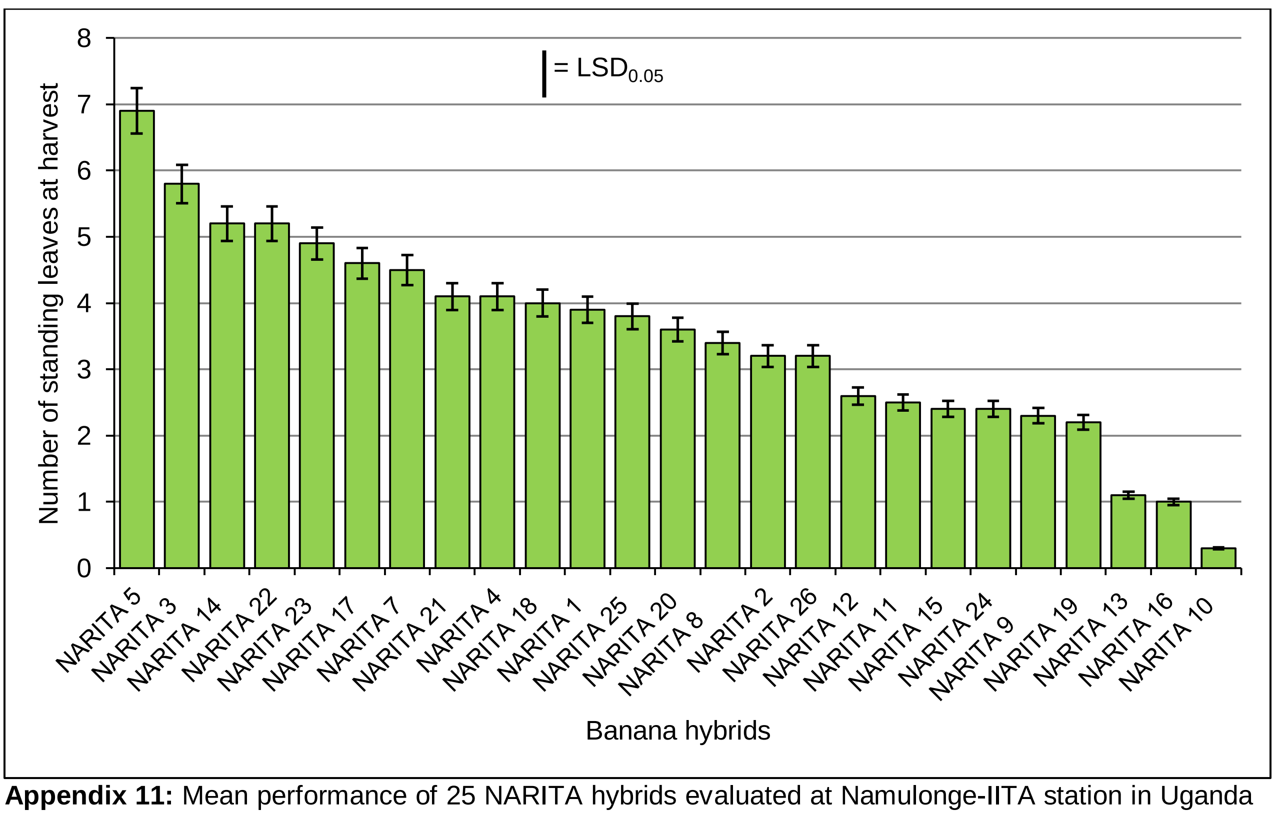
Appendix 8: Mean performance of 25 NARITA hybrids evaluated at Namulonge-IITA station in Uganda for plant height at flowering (cm).



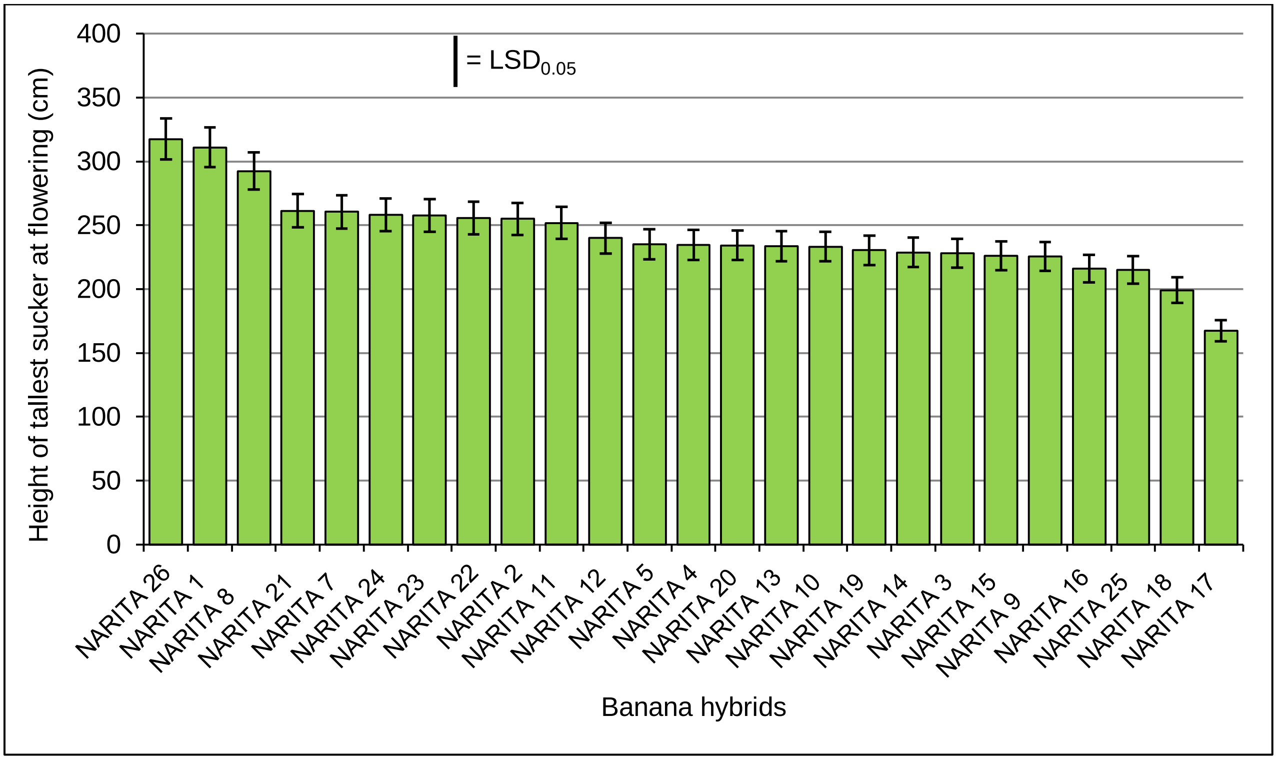
Appendix 9: Mean performance of 25 NARITA hybrids evaluated at Namulonge-IITA station in Uganda for plant girth (cm).



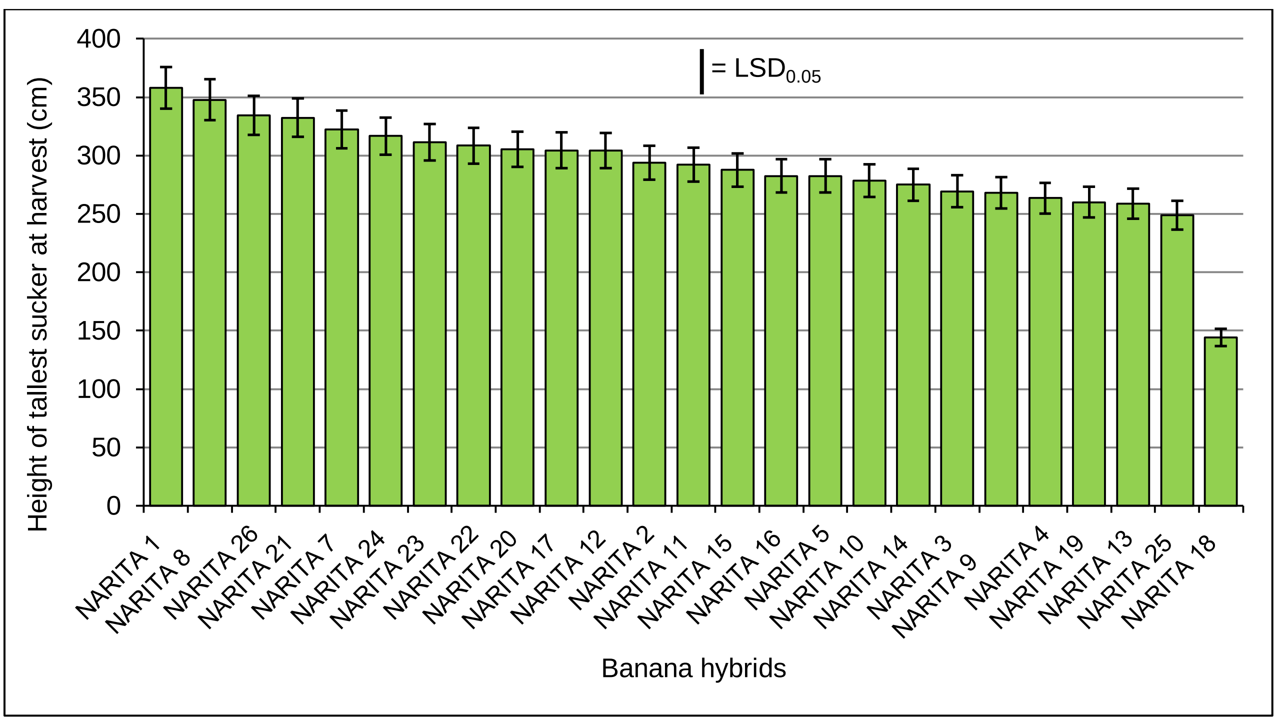
Appendix 10: Mean performance of 25 NARITA hybrids evaluated at Namulonge-IITA station in Uganda for the number of standing leaves at flowering.



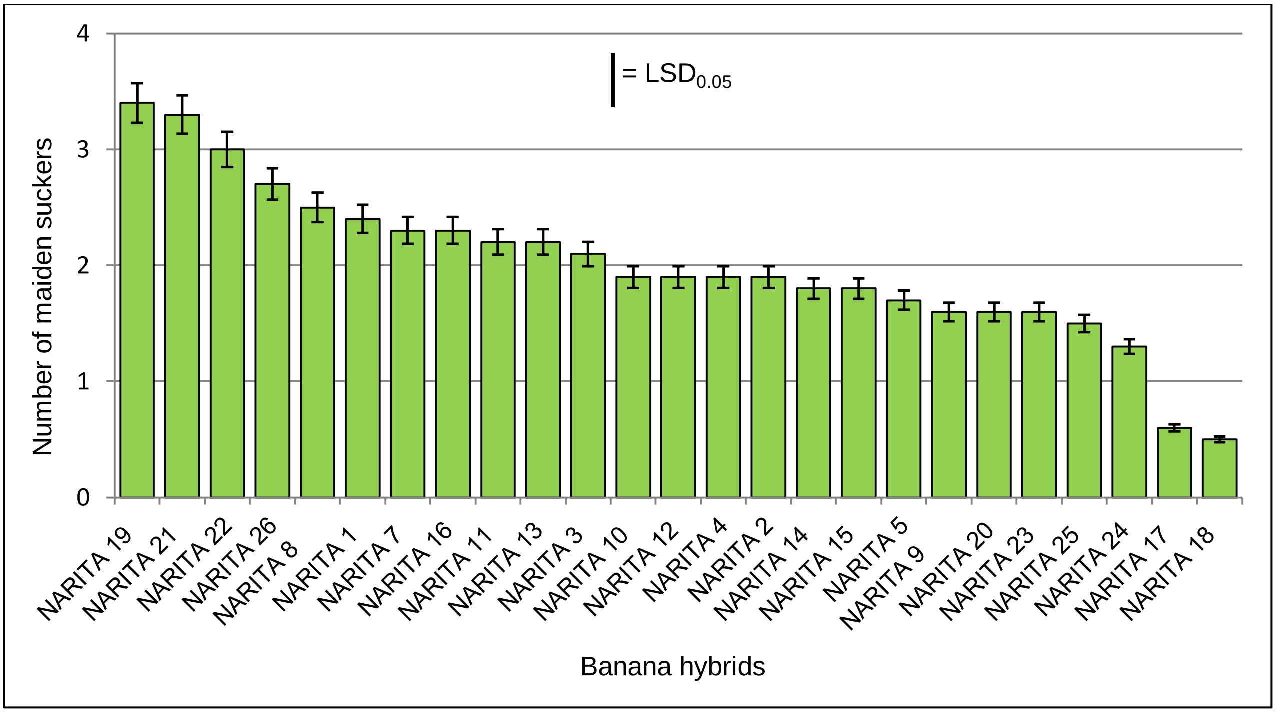
Appendix 11: Mean performance of 25 NARITA hybrids evaluated at Namulonge-IITA station in Uganda for the number of standing leaves at harvest.



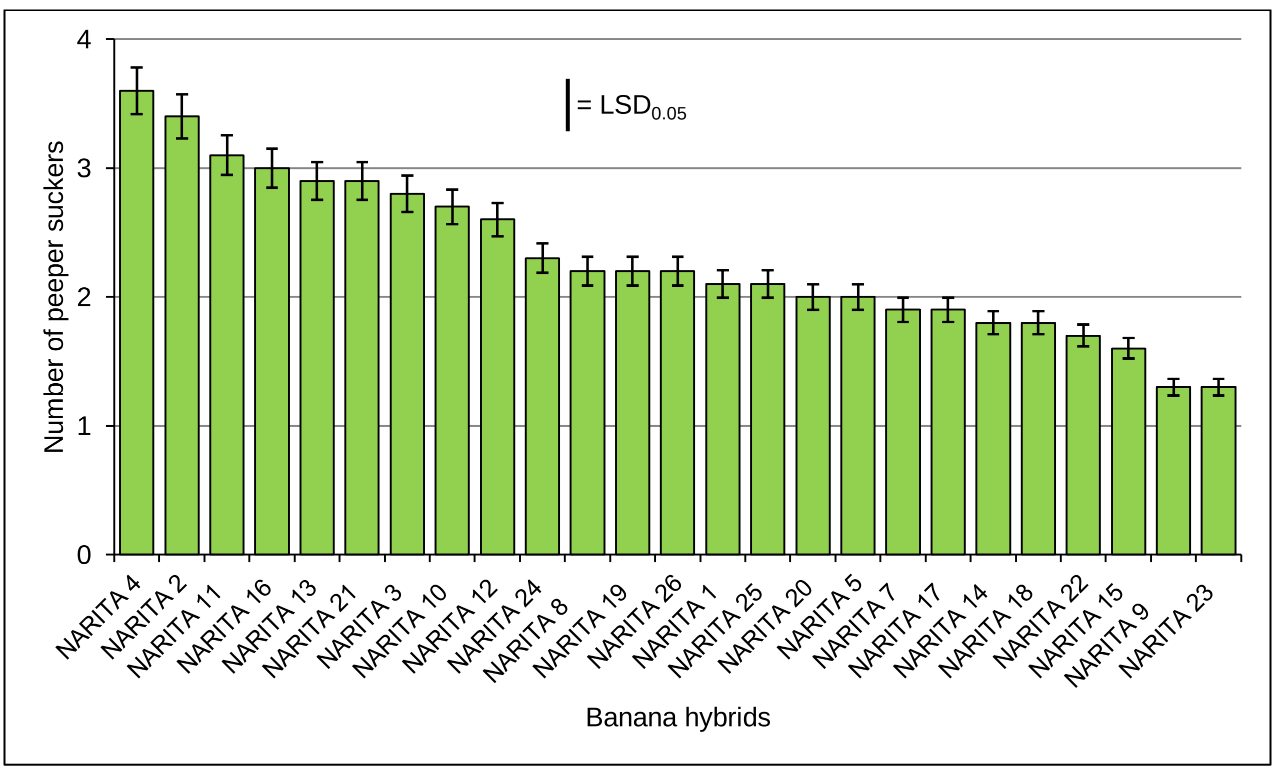
Appendix 12: Mean performance of 25 NARITA hybrids evaluated at Namulonge-IITA station in Uganda for height of tallest sucker at flowering (cm).



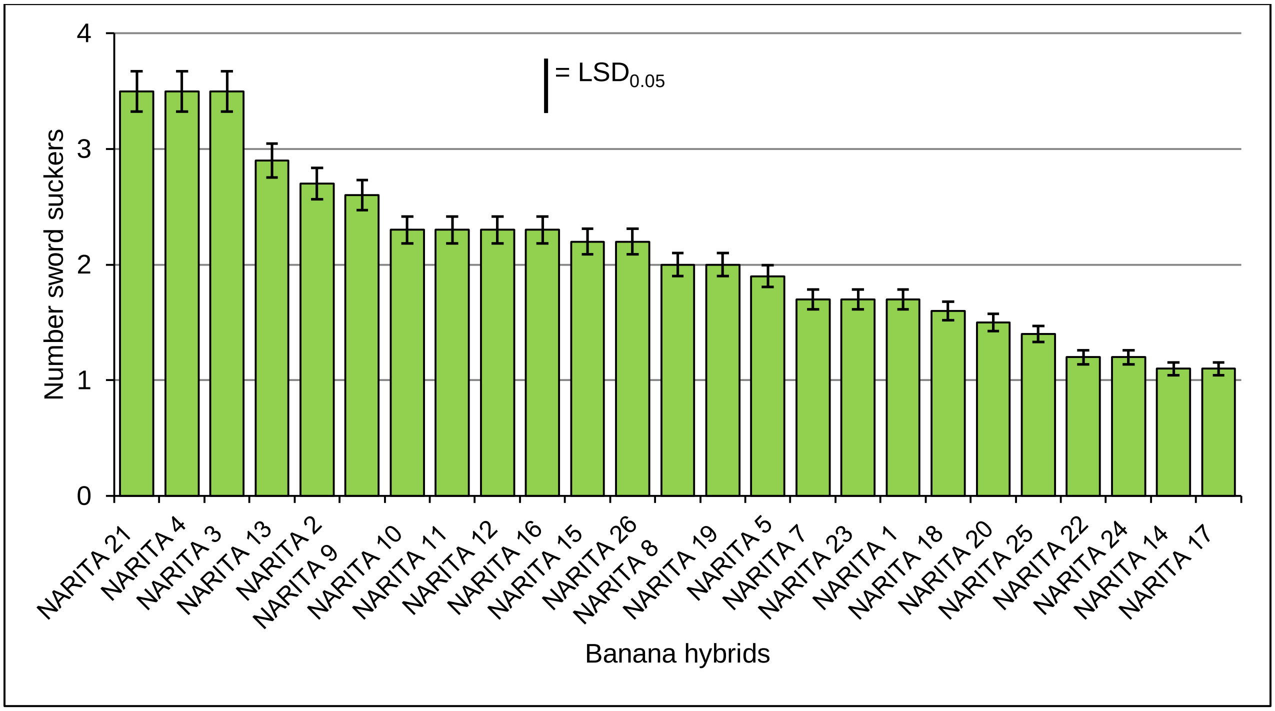
Appendix 13: Mean performance of 25 NARITA hybrids evaluated at Namulonge-IITA station in Uganda for height of tallest sucker at harvest (cm).



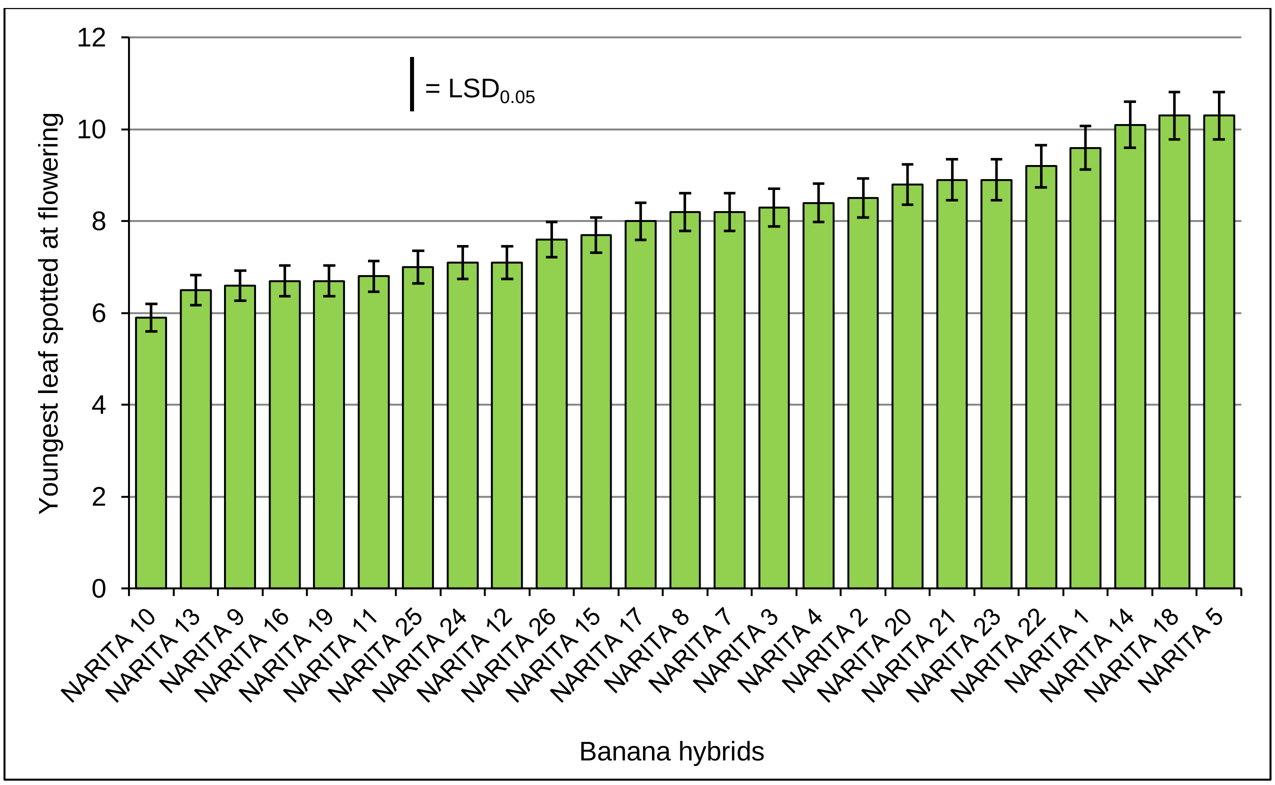
Appendix 14: Mean performance of 25 NARITA hybrids evaluated at Namulonge-IITA station in Uganda for the number of maiden suckers.



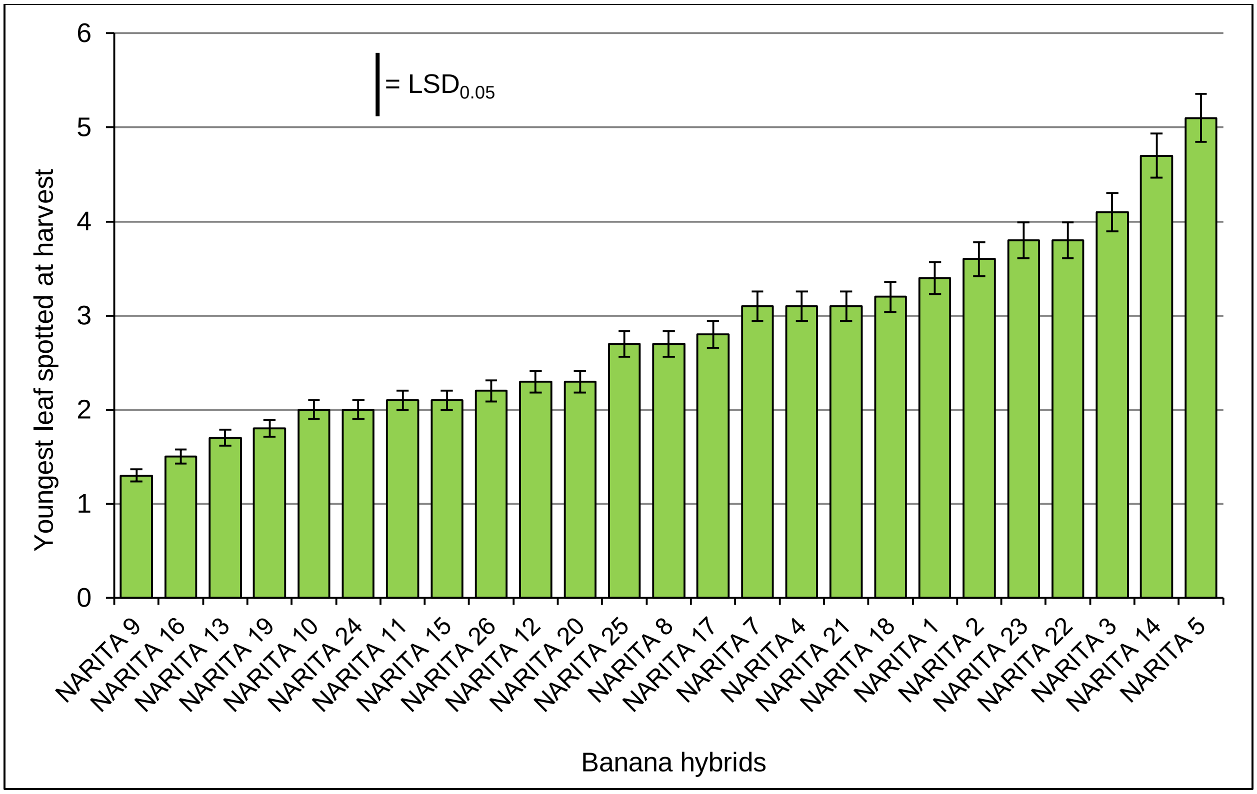
Appendix 15: Mean performance of 25 NARITA hybrids evaluated at Namulonge-IITA station in Uganda for the number of peeper suckers.



Appendix 16: Mean performance of 25 NARITA hybrids evaluated at Namulonge-IITA station in Uganda for the number of sword suckers.

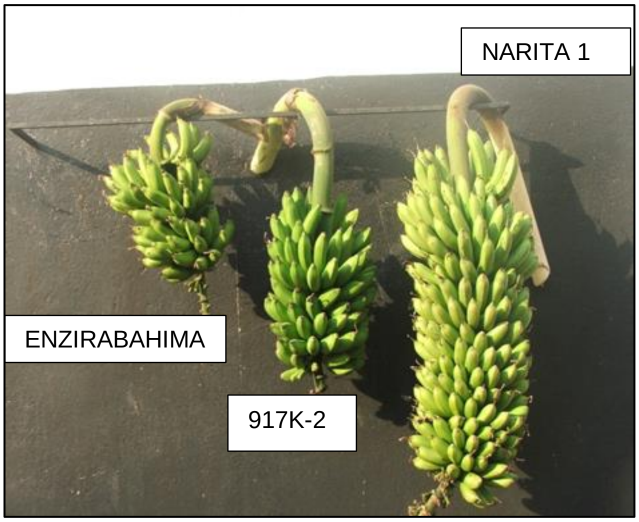


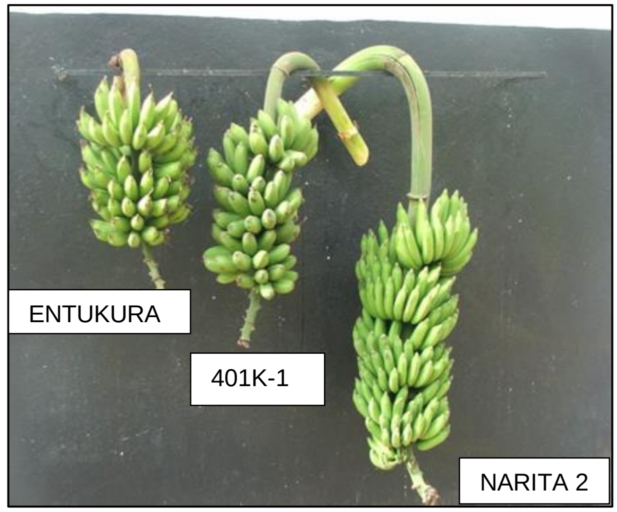
Appendix 17: Mean performance of 25 NARITA hybrids evaluated at Namulonge-IITA station in Uganda for the youngest leaf spotted at flowering.

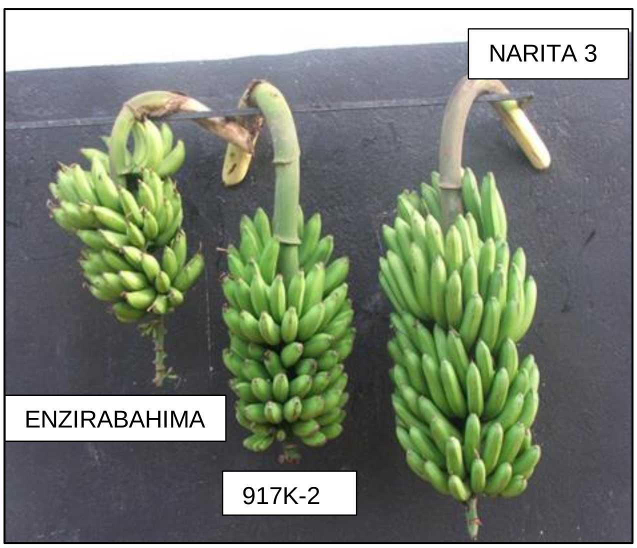


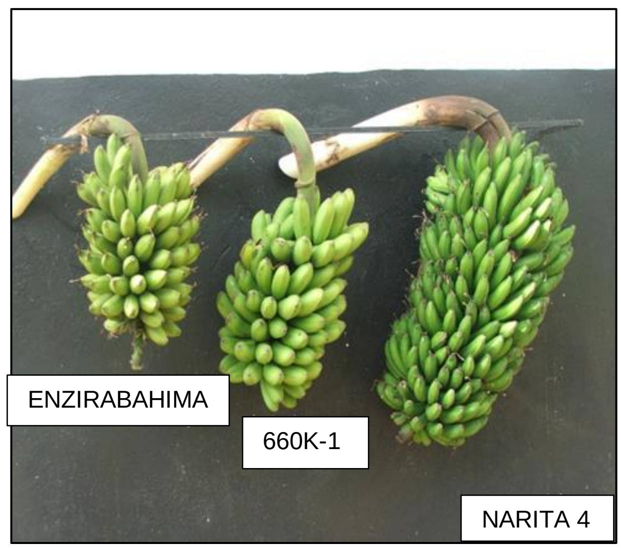
Appendix 18: Mean performance of 25 NARITA hybrids evaluated at Namulonge-IITA station in Uganda for the youngest leaf spotted at harvest.

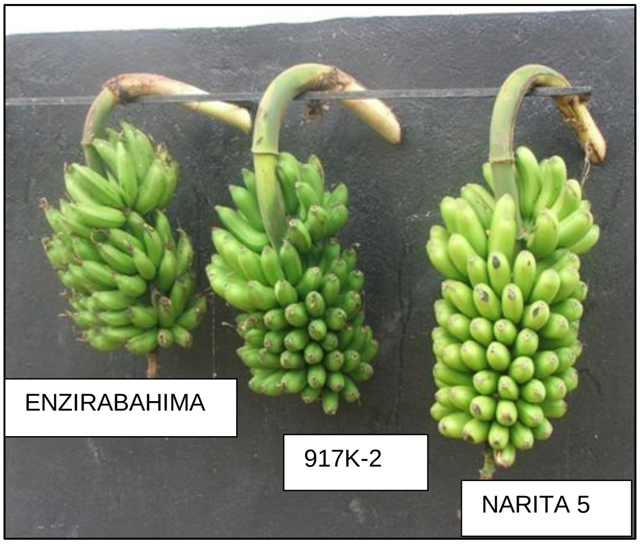
APPENDIX 19: NARITA banana hybrids and some of their progenitors

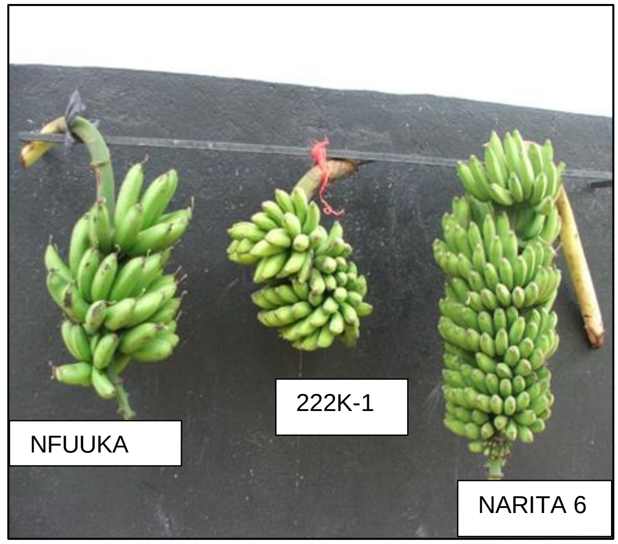


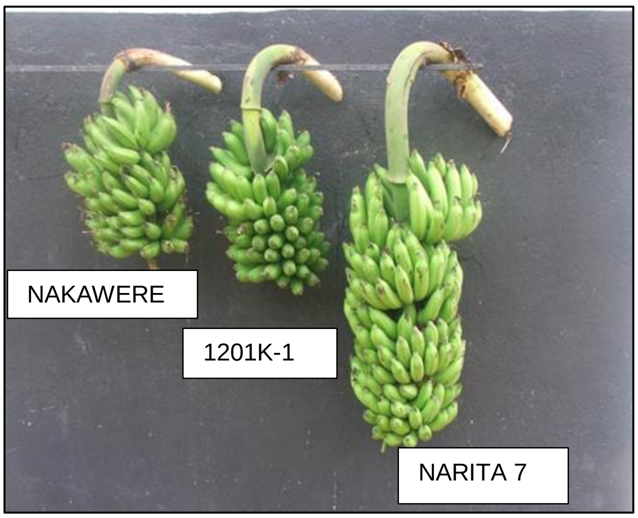


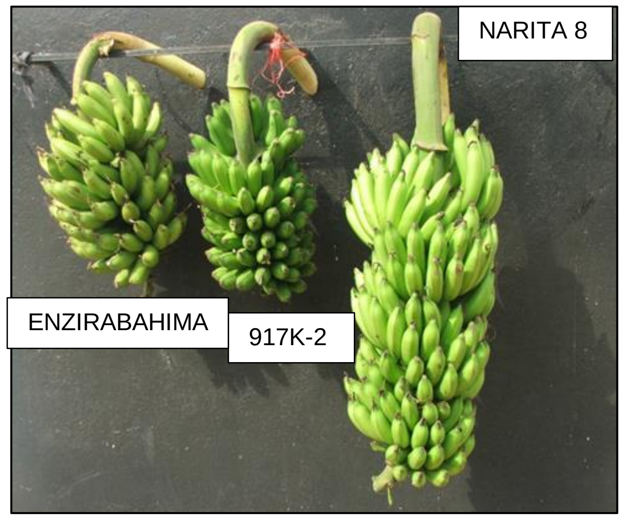


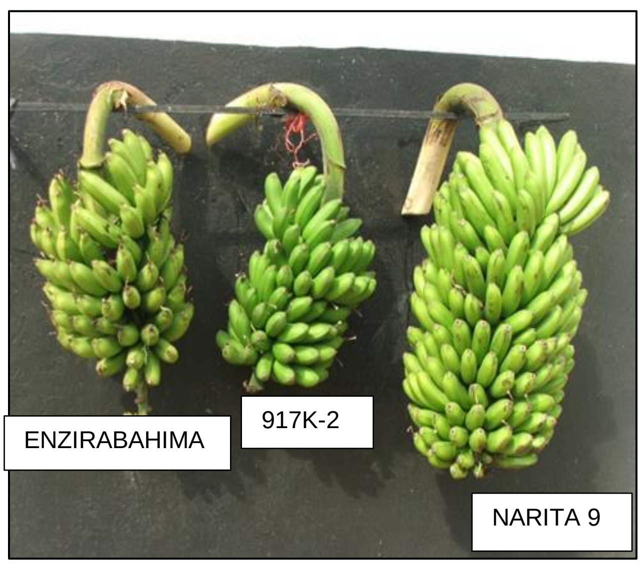


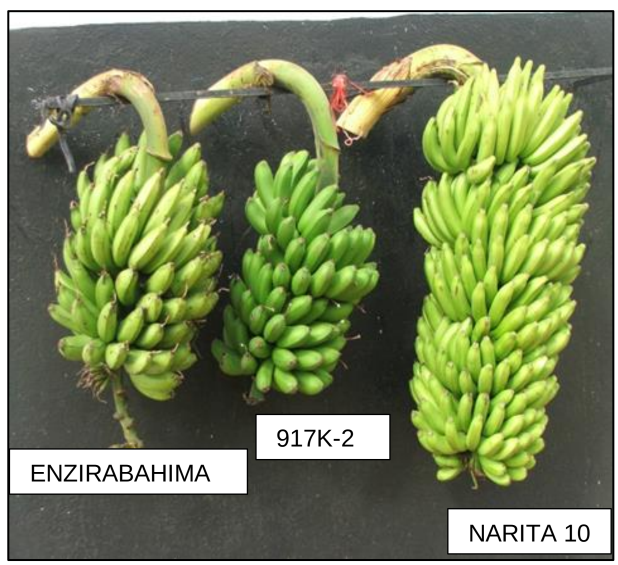

ENZIRABAHIMA
917K-2
NARITA 5

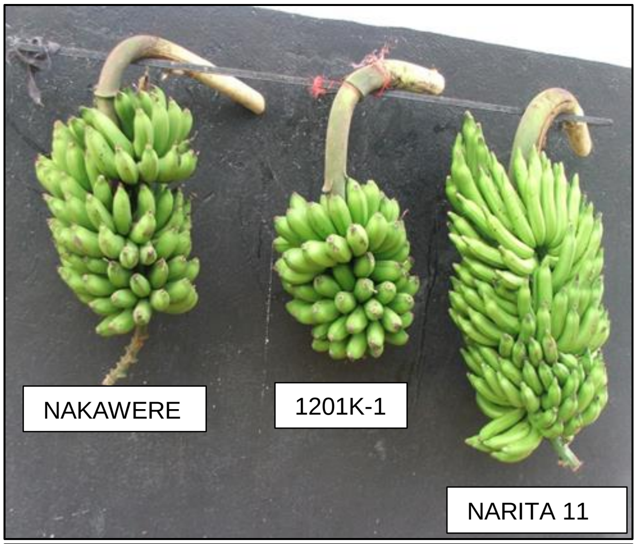

NFUUKA
222K-1
NARITA 6

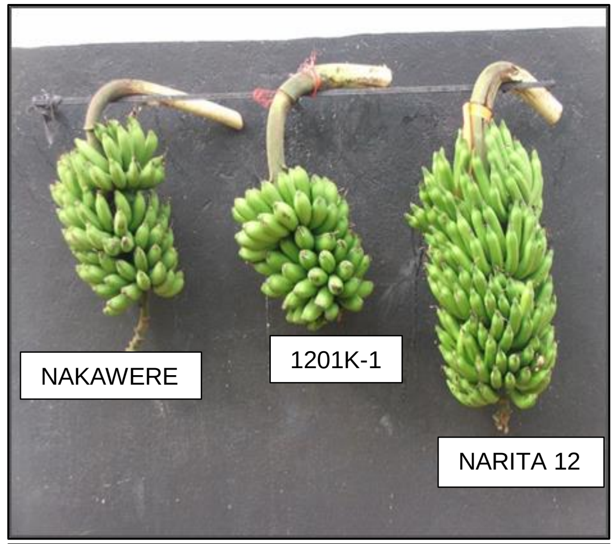

NAKAWERE
1201K-1
NARITA 7

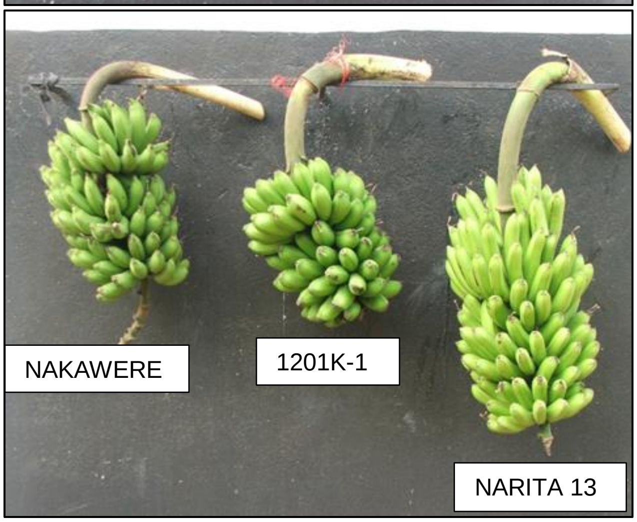

NARITA 8
ENZIRABAHIMA
917K-2

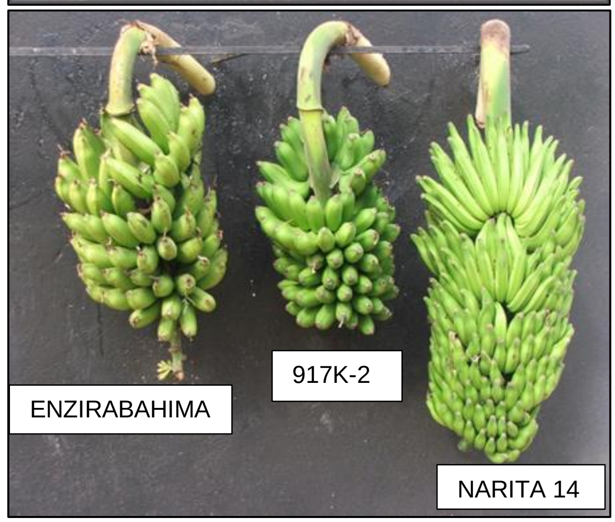

ENZIRABAHIMA
917K-2
NARITA 9

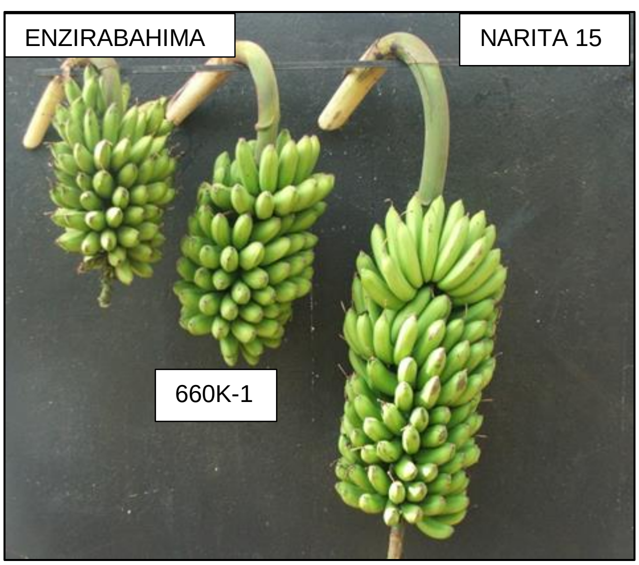

917K-2
ENZIRABAHIMA
NARITA 10


NAKAWERE
1201K-1
NARITA 11

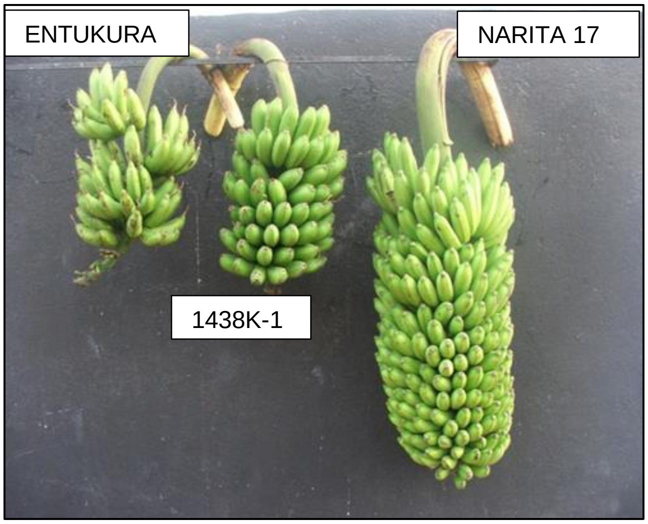

NAKAWERE
1201K-1
NARITA 12


NAKAWERE
1201K-1
NARITA 13

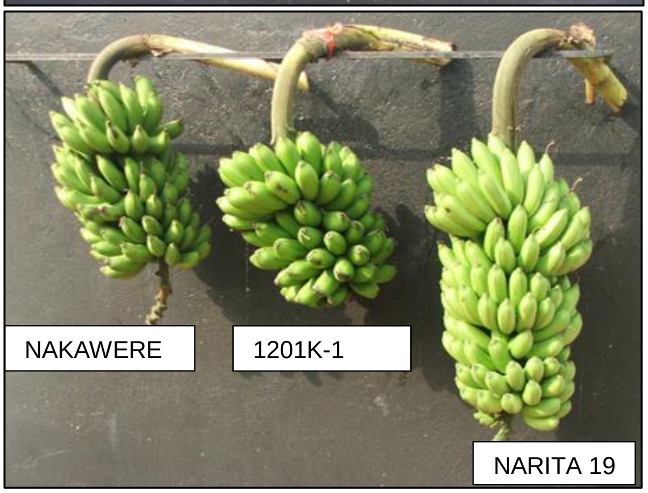

ENZIRABAHIMA
917K-2
NARITA 14

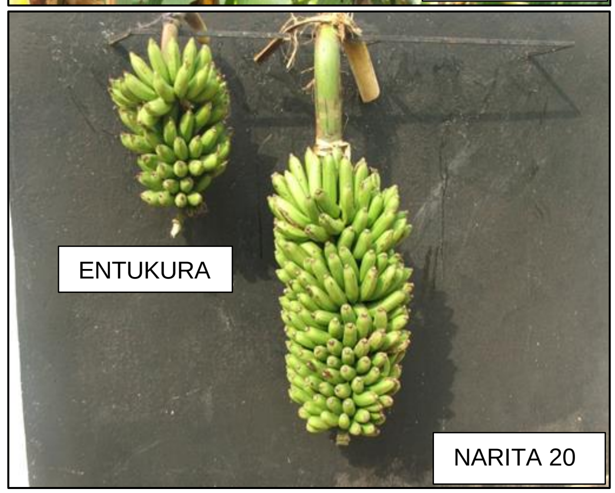

ENZIRABAHIMA
NARITA 15
660K-1

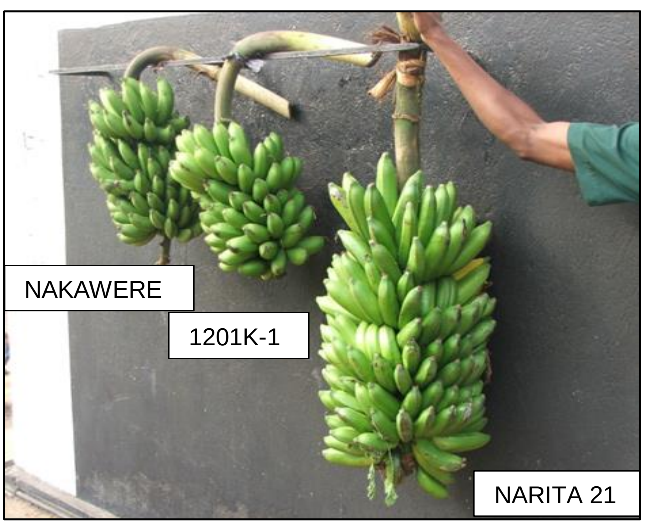

NARITA 16

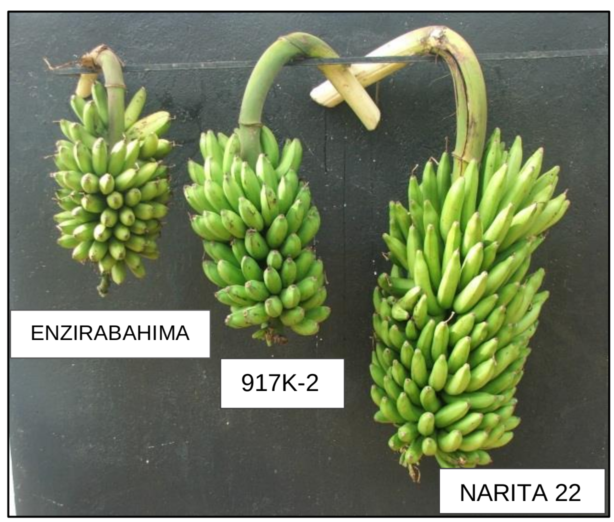

ENTUKURA
NARITA 17
1438K-1

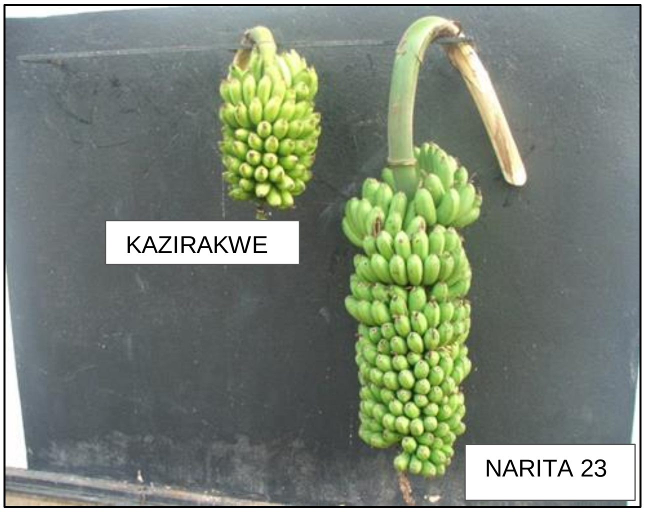

NARITA 18


NAKAWERE
1201K-1
NARITA 19


ENTUKURA
NARITA 20


NAKAWERE
1201K-1
NARITA 21


ENZIRABAHIMA
917K-2
NARITA 22



KAZIRAKWE

NARITA 23

NARITA 24

NARITA 25

NARITA 26