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‘NAROBAN 6’ (‘NARITA 17’): A Conventionally Bred ‘Matooke’ Hybrid for East African Banana Consumers

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Cooking bananas (matooke) are an important staple crop in Uganda with an annual per capita consumption of 250 to 400 kg, which is the highest in the world (International Network for the Improvement of Banana and Plantain 2001). Despite the importance of matooke in Uganda, the current productivity is less than 30% of the potential of 60 to 70 $t \cdot ha^{-1} \cdot yr^{-1}$ (Tushemereirwe 2001). This is largely attributed to declining soil fertility, drought, lack of high-yielding cultivars, scarcity of clean planting materials, and pests and diseases. Farmers manage some of these constraints through cultural methods, and many are effective at keeping pest and disease pressures below threshold levels. However, the use of host plant resistance is the most effective and durable option for the management of the banana constraints.

Genetic improvement of bananas in Uganda was initiated by the National Agricultural Research Organization (NARO) and International Institute of Tropical Agriculture (IITA) in the early 1990s using medium-term and long-term breeding strategies. With the medium-term strategy, banana hybrids were introduced in Uganda from international breeding programs such as Fundación Hondureña de Investigación Agrícola and International Network for the Improvement of Bananas and Plantain (now Alliance of Bioversity and CIAT) and evaluated to determine the agronomic performance, pest and disease resistance, and consumer acceptability. Introduced cultivars were then released as KABANAs 1 to 5. Although these cultivars were high-yielding, resistant to pests and diseases, especially *Fusarium wilt* and black Sigatoka, they did not fully meet consumer requirements. Consequently, NARO and IITA focused on improving triploid East African highland bananas for yield, disease resistance, and pest resistance. These East African highland bananas were evaluated for male and female fertility, which resulted in the identification of female-fertile clones (Batte et al. 2019; Ssebuliba et al. 2005). These were crossed with a wild diploid (‘Calcutta 4’) to generate synthetic tetraploids with matooke attributes in their background. The synthetic tetraploids were further crossed with improved diploids to generate secondary triploid hybrids that were evaluated to determine agronomic, disease, and pest resistance (Pillay et al. 2004). The products of these efforts are at various levels of development and evaluation. Some of the products of the early crosses were ‘KABANA 6H’ and ‘KABANA 7H’, which were both released in Uganda in 2010 (Nowakunda et al. 2015), ‘KABANA 6H’, which was released in Tanzania in 2022 as ‘TARIBAN4’ (Madalla et al. 2022), and ‘NAROBAN 1’, ‘NAROBAN 2’, ‘NAROBAN 3’, and ‘NAROBAN 4’, which were released in Uganda in 2017 (Tumuhimbise et al. 2018). However, ‘NAROBAN 5’ was released in Uganda in 2018 (Tumuhimbise et al. 2019), and ‘NAROBAN 6’ was released in 2025.

The objective of this work was to report the development and evaluation process of ‘NAROBAN 6’ and traits considered for its release to the banana farming community in Uganda.

Materials and Methods

‘NAROBAN 6’ was developed through hybridization of different *Musa* spp., and its parents were selected based on their relative importance for bunch yield, bunch shape and size, and relative resistance to black Sigatoka, weevils, and nematodes. To develop ‘NAROBAN 6’, a land race ‘Entukura’ was crossed with a wild banana (‘Calcutta 4’) to generate a tetraploid 1438K-1, which was further crossed with a diploid 9719-7 (Table 1). This process resulted in a secondary triploid that was coded as 13573S-1. Together with other clones, ‘NAROBAN 6’ was among more than 250 banana hybrids that resulted from the hybridization work at NARO (Kawanda, lat. 00°25′N, long. 32°32′E) and IITA (Sendusu station, lat. 1°00′N, long. 32°00′E) that were first evaluated in the early evaluation trials (EETs) from 2010 to 2014 at Sendusu.

The hybrids developed from the different cross combinations were used in an early evaluation trial (EET) at IITA Sendusu station Namulonge. In the EET, the hybrids were not replicated because one copy of genotype was generated through tissue culture. Additionally, in the EET, an augmented trial design was used and enough checks of previously released hybrid ‘KABANA 6H’ and locally preferred ‘Mbwazirume’ were ensured. To ensure that there was a unform level of inoculum among the test genotypes, ‘Mbwazirume’, which is a cultivar susceptible to black Sigatoka, was planted as spreader between rows among the hybrids. In the EET, hybrids were evaluated for traits such as black Sigatoka resistance and bunch size, among others, for more than two production cycles. Based on the EET results, 11 hybrids were selected.

Selections from EETs were evaluated in a preliminary yield trial, national performance

Table 1. Pedigrees of selected NARITA hybrids that underwent on-farm testing between 2021 and 2024.

Name	Code	Female parent (4×)	Male parent (2×)	Pedigree of the female parent
NARITA 4	9187S-8	660K-1	9128-3	Enzirabahima × Calcutta 4
NAROBAN 6	13573S-1	1438K-1	9719-7	Entukura × Calcutta 4
NARITA 18	14539S-4	365K-1	660K-1	Kabucuragye × Calcutta 4
NARITA 22	19798S-2	917K-2	9128-3	Enzirabahima × Calcutta 4
NARITA 24	HB	Unknown	Unknown	Unknown

Source: Tushemereirwe et al. 2014.
NARITA = National Agricultural Research Organization (NARO) and International Institute of Tropical Agriculture (IITA).

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Table 2. Characteristics of representative sites of national performance trials of banana hybrids.

Location	Coordinates (lat., long.)	Elevation (m.a.s.l.)	Avg rainfall (mm)	Temp. range (°C)	Major site attributes
Kawanda, Wakiso	00°25′N, 32°32E	1,329	1,280	14–30	High pressure for weevils, nematodes, and black Sigatoka
Bulindi	1°28′N, 31°26′E	1,230	1,371	15–30	Lack of improved banana cultivars Low incidences of black Sigatoka, weevils, and nematodes
Mbarara	00°36′S, 30° 39′E	1,147	1,200	17–30	High pressure for black Sigatoka Moderate pressure for weevils and nematodes Lack of improved banana cultivars
Ikulwe	00°33′N, 33° 45′E	1,080	1,347	16.7–30.6	High pressure for weevils, nematodes, and black Sigatoka Low access to improved banana cultivars Declining soil fertility

m.a.s.l. = meters above sea level.

trials, and on-farm trials. The experiments were performed using a randomized complete block design with varying plot sizes depending on the trial. The preliminary yield trial was established at IITA-Sendusu. The experiment was performed using a randomized complete block design with five plants replicated two times in each plot. For the national performance trials (NPTs), four research stations were selected from four agro-ecological zones (Table 2). The trials were established in Dec 2021. The on-farm trials were planted in five districts from the major regions of the country representing some of the target banana environments. These districts were Nakaseke district, Bugiri district, Hoima district, Mayuge district, and Sheema district. In each district, four on-farm trials were established in Dec 2021. The cultivars planted for on-farm evaluations included 'NARITA 4', 'NAROBAN 6', 'NARITA 18', 'NARITA 22', and 'NARITA 24', and 'Mbwazirume' (landrace) and 'NAROBAN 5' (last released matooke hybrid) were used as local checks. The experiment included a randomized complete block design with three replications and five plants per replication for each genotype.

Trial sites. The locations and features of the trial sites for NPTs are summarized in Table 2. Basic management practices were used for the plots (Tushemereirwe et al. 2003). At planting, 20 kg of well decomposed cow dung manure was applied in the planting hole with a depth of 0.5 m and width of 0.6 m. Plants were spaced 3 m between rows and 2 m between plants of the same row. Mulching was conducted every year, and weeds were controlled by spraying agro-sate (glyphosate). De-suckering was performed at flowering of the mother plants to maintain the plant density and ensure that the number of bunch-bearing plants was maintained at a level that reduced competition for water, light, and nutrients; specifically, three plants (mother, daughter, and granddaughter) were maintained. Harvesting was performed when at least one fruit finger of the first hand on a bunch began to ripen. The harvest date was recorded.

During crop growth and at harvest, data of the different traits were collected as described by Orjeda (2000), Carlier et al. (2002), and Barekye (2009) for at least two cycles. Damage by black Sigatoka in matooke hybrids was assessed using the method developed by Carlier et al. (2002). The assessment of the genotypes for nematode resistance was performed according to Dochez (2004); however, for weevils, assessments were performed according to Gold et al. (1998). Data regarding the organoleptic traits (taste, aroma, mouth feel, color, and overall acceptability) of cooked mashed food were collected using a hedonic scale of 1 to 6 (1 = dislike very much; 2 = dislike; 3 = like fairly; 4 = like; 5 = like very much; 6 = like extremely). Overall, 118 participants were involved in organoleptic tastes. For distinctiveness, uniformity and stability observations of morphological characters of 'NAROBAN 5' and 'NAROBAN 6' were compared and recorded.

Data analysis. Data collected from the preliminary yield trial, NPT, and on-farm trials were analyzed using GenStat 14 (Payne et al. 2011). Data from the NPT were subjected to an analysis of variance to determine if the evaluated traits were statistically significant. The significant means of the traits were compared using least significance differences at the 5% significance level. A ranking GGE biplot was generated to assess the performance and interaction patterns of the genotypes and sites. Based on the ranking GGE biplot, genotypes with broad or specific adaptation to target agro-ecologies or sites for bunch yield were identified. On-farm trial data regarding sensory attributes across the four farms within a district were pooled, and mean scores for color, aroma, taste, mouth feel, and overall acceptability per district were

Table 3. Mean performance of NARITA hybrids evaluated at Namulonge-IITA station using a preliminary yield trial across two cropping cycles.

Hybrid	Bunch wt (kg)	Plant girth (cm)	Youngest leaf spotted	Hybrid	Bunch wt (kg)	Plant girth (cm)	Youngest leaf spotted
NARITA 13	15.6	43.6	6.1	NARITA 23	23.2	57.5	8.2
NARITA 7	20.9	54.5	8.2	NARITA 18	25.1	56.8	5.0
NARITA 8	20.1	57.7	6.9	NARITA 22	20.6	50.4	9.3
NARITA 4	19.3	46.9	6.6	NARITA 14	22.3	42.9	7.8
NARITA 9	18.8	50.9	5.8	NARITA 21	19.7	48.9	8.4
NARITA 11	17.6	47.1	7.1	NARITA 12	17.7	46.3	7.1
NARITA 15	14.2	44.1	7.7	NARITA 26	16.4	50.0	6.4
NARITA 1	13.6	56.6	2.1	NARITA 10	17.3	50.4	6.2
NARITA 25	19.3	44.3	5.5	NARITA 3	19.6	45.5	6.8
NARITA 2	13.4	46.1	1.2	NARITA 24	28.4	55.0	6.3
NARITA 19	9.3	35.1	6.3	NARITA 20	13.8	48.5	8.2
NARITA 16	14.6	47.0	5.3	NAROBAN 6	24.3	49.5	7.8
NARITA 5	12.7	52.7	10.3	Mbwazirume	11.0	52.8	4.0
Mean	18.3	49.1	6.7		18.3	49.1	6.7
LSD (0.05)	6.4	2.3	4.1		6.4	2.3	4.1

LSD (0.05) = least significance difference at 5%; Mbwazirume = a local check; NARITA = National Agricultural Research Organization (NARO) and International Institute of Tropical Agriculture (IITA).

Table 4. Results of the analysis of variance of bunch weight (kg), days to harvest, and youngest leaf spotted for different sites where bananas genotypes were evaluated using a national performance trial.

		Mean squares		
Source	df	Bunch weight (kg)	Days to harvest	Youngest leaf spotted
Rep	2	36.6	274.3	0.3
Location	3	1623.0*	142.5	10.8*
Genotype	15	352.7*	3297.7*	24.6*
Location × genotype	16	55.7	208.9	2.5
Error	192	33.9	114.8	2.7
Total	228			
CV (%)		24.8	7.9	11.5

*Values are significantly different at $P = 0.05$. *CV* = coefficient of variation; df = degrees of freedom.

Table 5. Bunch weight (kg) means of banana genotypes tested in national performance trials at sites in Bulindi, Mbarara, Ikulwe, and Kawanda in Uganda.

	Location				
Genotype	Bulindi	Ikulwe	Kawanda	Mbarara	Genotype mean
NARITA 18	28.6	17.2	28.7	36.7	27.8
NARITA 24	26.0	14.3	29.8	33.8	26.0
NAROBAN 6	32.5	17.0	23.2	29.6	25.6
NARITA 22	22.9	15.6		35.3	24.6
NARITA 4	23.0	13.4	25.3	32.0	23.4
NAROBAN 5	14.9	10.6	18.1	22.9	16.6
Mbwazirume	12.0	8.9	11.6	12.4	11.2
LSD	4.8	5.2	4.7	5.3	4.9
Site mean	23	13.9	22.8	30	

Mbwazirume is a land race that was used as local check against hybrids.
LSD = least significance difference.

calculated. Additionally, 'NAROBAN 6' was compared with the previously released banana hybrid 'NAROBAN 5' to determine distinguishing morphological features. These included pseudostem aspects, color of the leaf midrib, male rachis appearance, and fruit apex.

Results and Discussion

Bunch weights (kg) of evaluated genotypes from preliminary yield trials ranged from 9.3 kg to 28.4 kg (Table 3). The matooke hybrids 'NAROBAN 6', 'NARITA 3', 'NARITA 4', 'NARITA 7', 'NARITA 9', 'NARITA 18', 'NARITA 21', 'NARITA 22', and 'NARITA 23' had significantly higher bunch weights than that of the local check 'Mbwazirume', which had a bunch weight of 11 kg. 'NARITA 24' had the highest bunch weight (28.4 kg), followed by 'NARITA 18' (25.1 kg), 'NAROBAN 6' (24.3 kg), 'NARITA 23' (23.2 kg), 'NARITA 7' (20.9 kg), and 'NARITA 4' (19.3 kg), which were statistically different from that of the local check ('Mbwazirume') (Table 3).

Regarding black Sigatoka that was assessed by considering the youngest leaf spotted at flowering, most of the hybrids were more tolerant than the local check to black Sigatoka. 'NARITA 5' expressed the highest resistance based on youngest leaf spotted (10.3). Other genotypes that expressed high tolerance to black Sigatoka were 'NARITA 22' (9.3), 'NARITA 21' (8.4), 'NARITA 23' (8.2), and 'NARITA 7' (8.2) compared with that of 'Mbwazirume' (4.0) as the local check. One of the indicators of plant vigor is the measure of plant girth at 100 cm from the ground. 'NARITA 8' was the strongest, with a girth of 57.7 cm, followed by 'NARITA 27', 'NARITA 18', 'NARITA 24', and 'NARITA 7', with girths of 57.5 cm, 56.5 cm, 55 cm, and 54 cm respectively. Based on yield (bunch weight), plant vigor, and tolerance to black Sigatoka (Tushemereirwe et al. 2014), 'NARITA 4', 'NAROBAN 6', 'NAROBAN 18', 'NAROBAN 22', and 'NAROBAN 24' were selected for on-farm trials and NPTs that were run concurrently to allow timely release of matooke hybrids.

Table 4 shows the results of the analysis of variance of bunch weight, days to maturity, and youngest leaf spotted of different genotypes evaluated in NPTs at different sites. The results indicated that bunch weight and youngest leaf spotted were significantly different among the test locations. However, genotypes behaved significantly different in terms of bunch weight, days to maturity, and youngest leaf spotted. This confirmed that the test environments differed in terms of disease pressure and environmental conditions such as soil conditions and temperature as well as others that significantly influenced genotype performance. Results of NPTs (Tables 5 and 6) indicated that 'NARITA 18' had the highest bunch weight (27.8 kg), followed by 'NAROBAN 6' (25.6 kg). Two genotypes, 'NARITA 18' and 'NARITA 24', outperformed the last released matooke hybrid ('NAROBAN 6') in terms of bunch weight; however, 'NAROBAN 6' required relatively more days than the local check 'Mbwazirume' to mature (Table 6). It will be important to promote materials with different maturity periods because bananas are continuously harvested. This will ensure food availability at different times of season. Figure 1 shows a GGE ranking biplot using bunch weight across four environments (Kawanda, Bulindi, Mbarara, and Ikulwe) that explains 98.38% of the total variation. 'NAROBAN 6' was more stable across all environments. However, 'NAROBAN 6' performed the best at the Bulindi site (Fig. 1 and Table 5). The stability and better performance of 'NAROBAN 6' were reasons for its presentation for official release in Uganda.

Table 7 shows the rates of corm damage by weevils on different banana hybrids according to on-farm trials at different sites. Genotypes 'NAROBAN 5', 'NARITA 18', 'NARITA 24', 'NAROBAN 6', 'NARITA 22', and 'NARITA 4' were more resistant

Table 6. Overall mean of youngest leaf spotted and days to harvest for different banana genotypes in national performance trials across different sites.

Genotype	Youngest leaf spotted	Days to harvest
NAROBAN 5	9.2	164
NAROBAN 6	8.4	138
NARITA 22	—	128
NARITA 24	7.7	144
NARITA 4	9.6	142
Mbazirume (land race)	4.0	112
LSD	3.6	21

LSD = least significance difference.

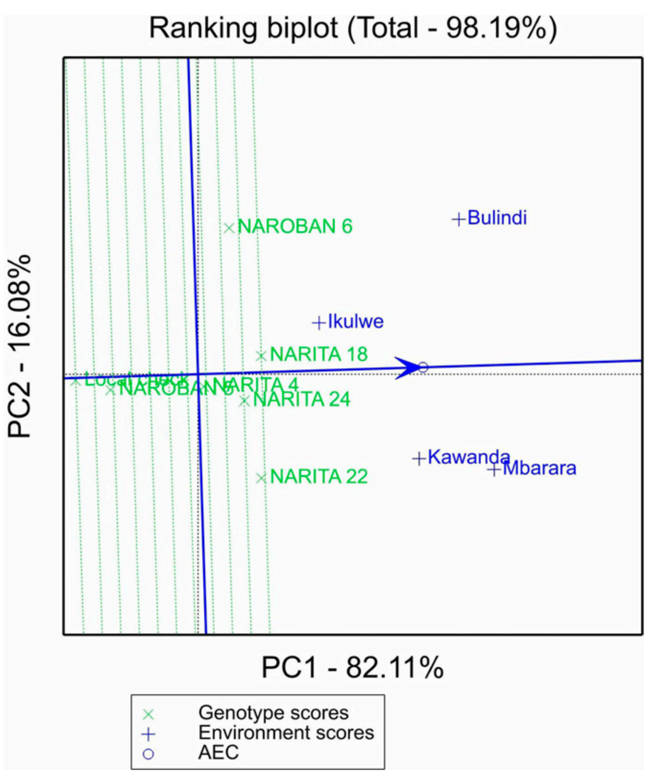

Fig. 1. GGE ranking biplot using bunch weight across four environments.

Table 7. Overall corm damage rates by weevils on different banana hybrids according to on-farm testing at different sites.

	Districts in Uganda					
Banana genotype	Bugiri	Hoima	Mayuge	Nakaseke	Sheema	Overall mean
NAROBAN 5	2.5	1.3	1.5	3.9	2.2	2.3
NARITA 18	3.9	4.2	3.9	–	–	4.0
NARITA 22	6.7	4.8	6.5	2.7	5.8	5.3
NAROBAN 6	4.3	5.7	6.7	6.2	5.0	5.6
NARITA 24	7.9	3.9	–	–	4.9	5.6
NARITA 4	6.2	6.9	9.3	3.7	3.5	5.9
Mbwazirume	10.3	8.1	15.2	11.7	8.0	10.7
Site mean	5.8	4.9	7.2	5.6	4.9	5.6
LSD	3.9	3.5	4.2	4.1	3.7	4.1

LSD = least significance difference.

than the local check 'Mbwazirume' to weevil damage. It was not surprising that the local check had the highest overall corm damage (10.7%) across the different districts. Overall, Mayuge district had above average weevil damage, indicating that, among the sites, the genotypes experienced more banana weevil pressure.

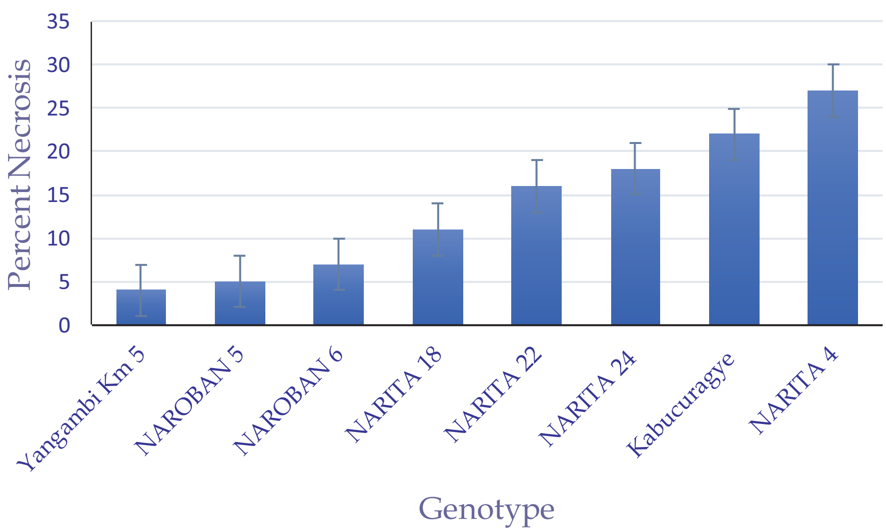

Fig. 2. Percentage mean root necrosis (**A**) and nematode species densities 100 g^{-1} roots (**B**) of respective banana genotypes.

Table 8. Mean scores of sensory attributes of matooke hybrids according to on-farm testing in the Bugiri, Mayuge, Hoima, Sheema, and Nakaseke districts (N = 118).

	Sensory parameter					
Genotype name	Color	Aroma	Taste	Mouthfeel/ smoothness	Texture (feel/touch)	Overall acceptability
NAROBAN 6	4.54	4.44	4.28	4.66	4.55	4.64
NARITA22	3.65	3.73	3.69	3.89	3.87	3.99
NARITA4	3.60	3.61	3.49	3.38	3.37	3.57
NARITA18	3.62	3.69	3.86	3.93	3.96	3.89
NARITA24	3.83	4.38	4.18	3.97	3.98	4.06
NAROBAN 5	4.69	4.53	4.54	4.57	4.50	4.74
Mbwazirume	5.56	5.14	5.27	5.22	5.16	5.39

The results of an on-station preliminary yield trial that was inoculated with 1000 *Radopholus similis* per mat 3 months after planting are shown in Fig. 2. 'Yangambi Km 5', which was used as a resistant check for *Radopholus similis*, had a root necrosis index less than 4%. The recently released hybrid 'NAROBAN 5' and the new hybrid 'NAROBAN 6' also showed resistance to *Radopholus similis*. However, other hybrids such as 'NARITA 4' and the land races 'Nakawere' and 'Kabucuragye' were similarly susceptible to *Radopholus similis* (Fig. 2). Based on the agreed matooke target product profiles, any materials with a root necrosis index less than 5 is considered good in terms of the nematode response. Therefore, hybrid 'NAROBAN 6' performed better than the local checks in terms of the nematode response.

Participatory on-farm sensory tasting. A participatory on-farm sensory evaluation was performed in Bugiri, Hoima, Sheema, and Nakaseke districts. The results were pooled together to consider the overall performance of the matooke hybrids (Table 8). Across different districts, in terms of food color, 'NAROBAN 6' and 'NAROBAN 5' (a previously released matooke hybrid) were close to the preferred land race 'Mbwazirume'. The food color scores for 'NAROBAN 6', 'NAROBAN 5', and the land race were 4.54, 4.69, and 5.56, respectively. The scores for food taste also exhibited the same trend, with scores of 4.28, 4.54, and 5.27 for 'NAROBAN 6', 'NAROBAN 5', and the local check 'Mbwazirume', respectively. For overall acceptability, 'NAROBAN 6', 'NAROBAN 5', and the local check had scores of 4.64, 4.74, and 5.39, respectively. Based on the defined target product profiles, any material with scores higher than 4 for overall acceptability was considered acceptable. Therefore, based on the results of sensory parameter scores and consumer feedback, the food quality of 'NAROBAN 6' was acceptable to the banana consumers in Uganda.

Distinctiveness, uniformity, and stability of 'NAROBAN 6' and 'NAROBAN 5'. 'NAROBAN 6' and the previously released check 'NAROBAN 5' had the following distinguishing features: pseudostem aspect (circumference at 100 cm); pigmentation of the pseudostem; pigmentation of the underlying pseudostem; blotches color; color of midrib dorsal surface; male rachis appearance; and fruit apex (Table 9). Therefore, because of its distinctiveness, uniformity, and stability data,

Table 9. Distinguishing features of NAROBAN 6 and NAROBAN 5 as the check.

	Comparison results	
Characteristic	NAROBAN 6	NAROBAN 5
Pseudostem aspect (circumference, 100 cm)	Slender	Normal
Pigmentation of the pseudostem	Extensive blotches	Moderate
Pigmentation of the underlying pseudostem	Purple	Weak purple
Color of the blotches	Dark brown	Black
Color of the midrib dorsal surface	Pink purple	Green
Male rachis appearance	Neutral flowers on a few hands, the rest is bare	Bare
Fruit apex	Lengthy and pointed	Blunt tip
Pulp color at maturity	Light green	Green

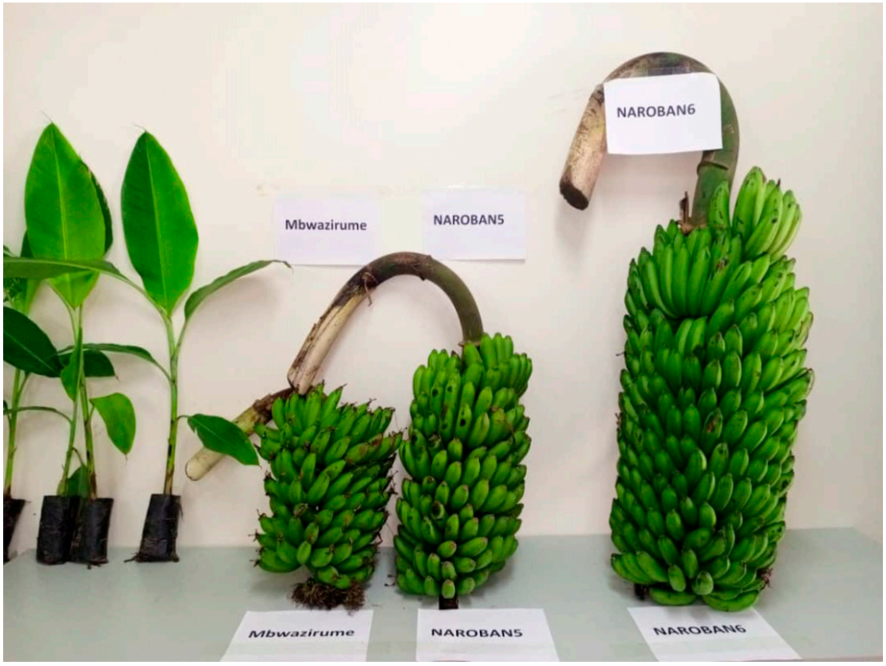

Fig. 3. Land race 'Mbwazirume', previously released matooke hybrid 'NAROBAN 5' and a new released matooke hybrid 'NAROBAN 6'.

'NAROBAN 6' was released by the Ugandan National Variety Release Committee in Mar 2025. Figure 3 shows a comparison of the banana bunches of the local check 'Mbwazirume', 'NAROBAN 5', and 'NAROBAN 6'.

Currently, the new planting materials are being bulked-up in the NARO tissue culture laboratory at Kawanda. Later, the materials will be provided to private tissue culture laboratories and farmer cooperatives involved in banana seed multiplication for further dissemination.

References Cited

Barekye A. 2009. Breeding investigations for black Sigatoka resistance and associated traits in diploids, tetraploids and the triploid progenies of bananas in Uganda (PhD Thesis). University of KwaZulu-Natal, Pietermaritzburg, South Africa.

Batte M, Swennen R, Uwimana B, Akech V, Brown A, Tumuhimbise R, Hovmalm HP, Geleta M, Ortiz R. 2019. Crossbreeding East African highland bananas: Lessons learnt relevant to the botany of the crop after 21 years of genetic enhancement. Front Plant Sci. 10:81. https://doi.org/10.3389/fpls.2019.00081.

Carlier J, Waele DD, Escalant JV. 2002. Global evaluation of Musa germplasm for resistance to Fusarium wilt, Mycosphaerella leaf spot diseases and nematodes. In depth evaluation. International Network for the Improvement of Bananas and Plantain Technical Guidelines No. 6.

Dochez C. 2004. Breeding for resistance to *Radopholus similis* in East African Highland bananas (*Musa* spp.) (PhD Thesis). Katholieke University Leuven, Belgium.

Gold CS, Night G, Speijer PR, Abera AMK, Rukazambuga NDTM. 1998. Infestation levels of banana weevil, *Cosmopolites sordidus* Germar, in banana plants established from treated propagules in Uganda. African Entomology. 6:253–263.

International Network for the Improvement of Banana and Plantain. 2001. Banana food and wealth. International Network for the Improvement of Banana and Plantain, Montpellier, France.

Madalla NA, Massawe C, Shimwela M, Mbongo D, Kindimba G, Kubiriba J, Arinaitwe I, Nowakunda K, Namanya P, Tumuhimbise R, Okurut AW, Saria A, Ngomuo M, Swennen R, Brown AF, Batte M, Carpentier S, Van den Bergh I, Crichton R, Marimo P, Weltzien E, Ortiz R. 2022. TARIBAN1, TARIBAN2, TARIBAN3, and TARIBAN4 'Matooke' Cooking Banana Cultivars for the Great Lakes Region of Africa. HortScience. 57(12):1588–1592. https://doi.org/10.21273/HORTSCI16854-22.

Nowakunda K, Barekye A, Ssali R, Namaganda J, Tushemereirwe W, Nabulya G, Erima R, Akankwasa K, Hilman E, Batte M, Karamura D. 2015. Kiwangaazi (syn 'KABANA 6H') black Sigatoka, nematode and banana weevil tolerant 'Matooke' hybrid banana released in Uganda. HortScience. 50(4):621–623. https://doi.org/10.21273/HORTSCI.50.4.621.

Orjeda G. 2000. Evaluating bananas. International Network for the Improvement of Banana and Plantain, Montpelier, France.

Payne RW, Murray DA, Harding SA. 2011. An introduction to the GenStat command language (14th ed). VSN International, Hemel Hempstead, UK.

Pillay M, Ssebuliba R, Hartman J, Vuylsteke D, Talengera D, Tushemereirwe W. 2004. Conventional breeding strategies to enhance the sustainability of Musa biodiversity conservation for endemic cultivars. Afr Crop Sci J. 12(1): 63–69. https://doi.org/10.4314/acsj.v12i1.27663.

Ssebuliba R, Rubaihayo P, Tenkouano A, Makumbi D, Talengera D, Magambo M. 2005. Genetic diversity amongst East African highland banana for female fertility. Afr Crop Sci J. 13(1):13–26. https://doi.org/10.4314/acsj.v13i1.27616.

Tumuhimbise R, Barekye A, Kubiriba J, Akankwasa K, Arinaitwe IK, Karamura D, Tushemereirwe WK. 2018. New high-yield cooking banana cultivars with multiple resistances to pests and diseases ('NAROBan1', 'NAROBan2', 'NAROBan3', and 'NAROBan4') released in Uganda. HortScience. 53(9):1387–1389. https://doi.org/10.21273/HORTSCI13207-18.

Tumuhimbise R, Buregyeya H, Kubiriba J, Tushemereirwe WK, Barekye A, Tendo RS, Namagembe B, Muhangi S, Kazigye F, Talengera D, Tindamanyire J, Akankwasa K, Nabulya G, Namaganda J, William W, Kushaba A, Namuddu M, Oyesigye N, Namanya P, Arinaitwe IK, Waniale A, Karamura D, Karamura E. 2019. "NABIO808" (Syn. 'NAROBAN5'): A tasty cooking banana cultivar with resistance to pests and diseases. Crop Breed Appl Biotechnol. 19(4):491–495. https://doi.org/10.1590/1984-70332019v19n4c71.

Tushemereirwe WK. 2001. A century of banana research and development in Uganda, 1898-1998. Uganda Journal of Agricultural Sciences. 6(1):27–36.

Tushemereirwe W, Kangire A, Smith J, Ssekiwoko F, Nakyanzi M, Kataama D, Musiitwa C, Karyaija R. 2003. An outbreak of bacterial wilt on banana in Uganda. Infomusa. 12(2):6–8.

Tushemereirwe W, Batte M, Nyine M, Tumuhimbise R, Barekye A, Ssali T, Kubiriba J, Swennen R. 2014. Performance of NARITA banana hybrids in the preliminary yield trial, Uganda. National Agricultural Research Organization (NARO) and International Institute of Tropical Agriculture (IITA).