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Report

National Performance Trials for Kenya: Release of Massai and Camello forage grasses

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Introduction

Stakeholders National Variety Release Committee meeting was held at Kenya Plant Health Inspectorate service (KEPHIS) headquarters on 7th June 2025. This was to receive performance and recommendations for release of varieties assessed during National Performance Trials (NPT).

The NPT were conducted to evaluate a range of forages including ***Urochloa* spp (Okapi, Mestizo, Camello) and *Megathyrus* spp (Massai, CIAT 16044, CIAT 688).** The *Urochloa* spp varieties were compared against already released varieties such as Cayman, Cobra and Mulato II while the *Megathyrsus* varieties were checked against themselves. Other *Urochloa* spp varieties submitted by other organizations were SABIA (Interplant) and SB001 (Simlaw). The aim was to identify suitable candidates for national release to support livestock production through improved forage availability in Kenya. After 2-year evaluation varieties are released based on either of five release criteria:

Release criteria for varieties:

- **Criteria1**: - varieties yielding statistically (P=0.05) better than the mean yield of the checks in combined two-year analysis qualifies automatically for release.
- **Criteria 2**: - varieties yielding statistically (P=0.05) similar to mean yield of checks in combined two-year analysis must have 10% and above numerical yield (for maize except in late kit) and 5% and above (for other crop species and maize late kit) numerical yield advantage over the mean of checks in combined two-year analysis and a declared and confirmed special attribute to be recommended for release.
- **Criteria 3**: - Varieties of crop species where none is officially released and yielding statistically (P=0.05) similar to mean yield of all the candidates and 5% above numerical yield advantage over mean of the candidates in the combined two-year analysis will be recommended for release.
- **Criteria 4**: Objective discretion of the NPTC on a case-by-case basis while considering national socio-economic importance, food and nutritional security.
- **Criteria 5:** A variety that has been officially released in any country within the regional economic blocs to which Kenya is a member and the applicant has provided data leading to the release of the plant variety in that other country shall undergo performance trial for at least one season in similar agro ecological zones.

Results from national performance trials (*Megathyrsus maximus*)

Massai's yield was statistically similar (P = 0.05) to the mean yield of all candidate entries in the group. Massai had yield advantage >5% compared to the mean yield of all candidate varieties across the two-year, multi-location trials (Table 1).

Table 1. Dry matter yield of *Megathyrsus* spp varieties submitted for Npt across 3 sites.

					SITE									
					KAMBI MAWE		KIBOKO		LANET		MARIGAT		MEAN	
EXP_NAME	SOURCE	TEST STATUS	NPT YRS	DUS YRS	FRESH WEIGHT (t/ha)	DRY WGT (t/ha)	FRESH WEIGHT (t/ha)	DRY WGT (t/ha)	FRESH WEIGHT (t/ha)	DRY WGT (t/ha)	FRESH WEIGHT (t/ha)	DRY WGT (t/ha)	FRESH WEIGHT (t/ha)	WGT (t/ha)
MAASAI	CIAT	CANDIDATE	2	2	27.20	9.00	8.33	2.57	25.20	7.74	55.33	20.29	29.02	9.90
MK1	KALRO	CANDIDATE	2	2	15.27	5.21	25.80	7.37	24.07	6.45	43.03	15.88	27.04	8.73
16044	CIAT	CANDIDATE	2	2	11.08	4.03	4.73	2.08	26.20	7.30	46.22	17.26	22.06	7.67
MK6	KALRO	CANDIDATE	2	2	15.32	5.78	15.03	4.83	19.95	5.62	30.97	11.36	20.32	6.90
688	CIAT	CANDIDATE	2	2	5.20	1.76	13.17	3.95	14.97	3.62	22.07	8.28	13.85	4.40
ZZ1MEA	MEAN				15.79	5.48	13.41	4.34	22.36	6.23	39.52	14.61	22.46	7.52
ZZ2PV	P-VALUE				0.20	0.29	0.06	0.16	0.02	0.00	0.15	0.16	0.11	0.09
ZZ3CV	CV(%)				58.21	61.20	55.41	52.67	13.95	13.67	38.31	38.51	34.42	34.08
ZZ4R2	R2				0.54	0.48	0.64	0.58	0.81	0.88	0.56	0.55	0.79	0.84
ZZ5LSD	LSD(5%)				17.74	6.48	14.00	4.41	6.02	1.64	28.51	10.60	11.91	3.95

Massai exhibited special agronomic traits including Excellent regrowth and persistence after harvesting, adaptability to diverse agro-ecological conditions, high dry matter production and good nutritional quality (Table 3).

Release Justification for Massai

Massai was released since it was statistically (P = 0.05) similar to the mean yield of all the candidates and 5% above numerical yield advantage over the mean of the candidates in the combined two-year analysis.

Massai met requirements under Criteria 3:

- >5% numerical yield advantage over candidate means
- Strong agronomic performance with high tolerance to semi-arid conditions.

Table 1: Cumulative dry matter yields of *Megathyrsus* spp varieties.

					YIELD(t/ha)								
		VARIETY STATUS			CUMM FRESH WGT MEAN	% ABOVE MEAN OF CANDIDATES -CUMM FRESH WGT	% ABOVE MEAN OF CANDIDATES - CUMM DY WGT	CONT-RAST FRESH WGT	CONT-RAST DRY WGT	CUMM DRY WGT MEAN	CMULATIVE YIELD(t/ha) FRESH WGT	CMULATIVE YIELD(t/ha) DRY WGT	
EXP_NAME	SOURCE	TEST STATUS	NPT YRS	DUS YRS									RUST
EXP_NAME	SOURCE	TEST_STATUS	NPTYRS	DUSYRS	A00	P_MOC	P_MOC_1	CNRST	CNRST_1	A00_1	CA00	CA00_1	A02
MAASAI	CIAT	CANDIDATE	2	0	29.0	28.2	30.0	0.0	0.0	9.9	29.0	9.9	1.2
MK1	KALRO	CANDIDATE	2	0	27.0	19.5	14.7	0.0	0.0	8.7	27.0	8.7	1.0
16044	CIAT	CANDIDATE	2	0	22.1	-2.6	2.2	0.0	0.0	7.8	22.1	7.7	1.1
MK6	KALRO	CANDIDATE	2	0	20.4	-9.8	-9.1	0.1	0.0	6.9	20.3	6.9	1.0
688	CIAT	CANDIDATE	2	0	14.6	-35.3	-37.8	0.6	0.0	4.7	13.9	4.4	1.0
ZZ1MEA	MEAN				22.6					7.6	22.5	7.5	1.1
ZZ2PV	P-VALUE				0.0					0.0	0.1	0.1	0.5
ZZ3CV	CV(%)				27.4					26.7	34.4	34.1	16.1
ZZ4R2	R2				0.8					0.8	0.8	0.8	0.5
ZZ5LSD	LSD(5%)				8.7					2.9	11.9	3.9	0.3

	MEAN ESTIMATES			
	MEAN	LOWER	UPPER	UPPER LSD
MEAN OF CANDIDATES - CUMM FRESH WGT	22.64	10.89	34.39	31.32
MEAN OF CANDIDATES -CUMM DRY WGT	7.61	2.92	12.30	12.30

	Varieties superior to mean checks
	Varieties similar to mean checks
	Varieties inferior to mean checks

Table 2. Nutritional quality of varieties.

SITE	ENT	SOURCE	EXP NAME	TEST_STATUS	ENERGY(M	PROTEIN(%	FIBRE(%)	FAT(%)	TOTAL ASH	STARCH(%	ACID DETE	NEUTRAL	SUGARS(%	DIGESTAB	DRY MATTER(%)
KAMBI MAWE	1	ERSU	KALRO KIBOKO	CANDIDATE	5.4	3.9	32.2	<0.20	9.8	<0.10	42.9	61.7	1.4	40.5	89.2
KAMBI MAWE	2	MK1	KALRO KIBOKO	CANDIDATE	5.5	4.4	32.3	< 0.20	10.4	< 0.10	45.4	60	1.95	41	90.8
KAMBI MAWE	3	MK6	KALRO KIBOKO	CANDIDATE	4.4	3.92	32.8	< 0.20	10	< 0.10	44.3	68.8	< 0.50	34.5	89.0
KAMBI MAWE	4	16044	CIAT	CANDIDATE	4.8	4.25	33.3	< 0.20	11	< 0.10	44.8	66.1	< 0.50	37.3	88.1
KAMBI MAWE	5	688	CIAT	CANDIDATE	4.9	14.7	32.8	< 0.20	13.5	< 0.10	44.7	66.1	0.66	37.5	89.2
KAMBI MAWE	6	MASSAI	CIAT	CANDIDATE	5.4	6.07	32.4	< 0.20	11.3	< 0.10	43	61.4	1.42	40.6	88

Results *Urochloa* spp varieties

Camello's average dry matter yield across all trial sites was statistically different (p=0.05) to the mean yield of the standard check varieties (Camello recorded a numerical yield advantage exceeding 5% over the mean yield of the check varieties in the combined two-year analysis (Table 4). Moreover, Camello demonstrated high drought tolerance and strong persistence under low-input conditions. This trait was consistent across locations, particularly in drier agro-ecological zones, making it a valuable forage variety for climate-resilient livestock systems.

Table 3. Dry matter yields of *Urochloa* spp varieties across four sites.

					SITE											
					BUKURA		HOMABAY		KAGURU		LANET		MTWAPA		MEAN	
EXP_NAME	SOURCE	TEST STATUS	NPT YRS	DUS YRS	WEIGHT (t/ha)	DRY WGT (t/ha)	WEIGHT (t/ha)	DRY WGT (t/ha)	FRESH WEIGHT (t/ha)	DRY WGT (t/ha)	WEIGHT (t/ha)	DRY WGT (t/ha)	WEIGHT (t/ha)	WGT (t/ha)	FRESH WEIGHT (t/ha)	DRY WGT (t/ha)
CAMELLO	CIAT	CANDIDATE	2	0	18.84	7.43	21.00	4.95	21.88	6.17	17.27	5.98			19.75	6.13
MESTIZO	CIAT	CANDIDATE	2	0	16.83	6.52	26.90	5.38	20.39	5.24	16.67	5.53			20.19	5.67
TALISMAN	CIAT	CANDIDATE	2	0	16.11	6.84	18.27	3.82	23.09	5.78	18.00	5.89			18.87	5.58
CAYMAN	ADVANTAGE	CHECK	2	2	18.65	6.45	27.92	5.43	29.20	6.17	25.27	7.64			25.26	6.42
COBRA	ADVANTAGE	CHECK	2	2	17.80	6.24	25.07	5.45	27.42	6.17	18.15	5.49			22.11	5.84
MULATO II	ADVANTAGE	CHECK	2	2	10.96	4.51	17.28	3.78	15.16	3.52	14.00	4.25			14.35	4.01
ZZ2PV	P-VALUE				0.00	0.00	0.01	0.05	0.00	0.00	0.00	0.00			0.00	0.00
ZZ3CV	CV(%)				14.56	15.44	22.81	26.83	17.21	17.70	10.06	10.62			12.13	10.39
ZZ4R2	R2				0.69	0.57	0.53	0.38	0.69	0.63	0.84	0.78			0.83	0.81
ZZ5LSD	LSD(5%)				3.87	1.60	8.63	2.09	6.29	1.56	3.02	1.01			3.55	0.85
	Site written off															

According to the official NPT release criteria Camello was released under **Criteria 2:***"Varieties yielding statistically (P=0.05) similar to mean yield of checks in combined two-year analysis must have ≥5% numerical yield advantage (for non-maize crops) over the mean of checks in combined analysis and a declared and confirmed special attribute to be recommended for release."*

Table 4. Cumulative dry matter of *Urochloa* spp varieties.

					YIELD(t/ha)						CMULATIVE YIELD(t/ha)	
		VARIETY STATUS			FRESH WGT MEAN	% ABOVE MEAN OF CHECKS - CUMM FRESH WGT	% ABOVE MEAN OF CHECKS - CUMM DRY WGT	CONTRAST FRESH WGT	CONTRAST DRY WGT	DRY WGT MEAN	FRESH WGT	DRY WGT
EXP_NAME	SOURCE	TEST STATUS	NPT YRS	DUS YRS								
EXP_NAME	SOURCE	TEST_STATUS	NPTYR	DUSYRS	A00	P_MOC	P_MOC_1	CNRST	CNRST_1	A00_1	CA00	CA00_
MESTIZO	CIAT	CANDIDATE	2	0	5.83	-1.84	4.53	0.91	0.32	1.68	20.19	5.67
CAMELLO	CIAT	CANDIDATE	2	0	5.68	-4.01	13.08	0.76	0.03	1.80	19.75	6.13
TALISMAN	CIAT	CANDIDATE	2	0	5.42	-8.29	2.92	0.31	0.54	1.64	18.87	5.58
CAYMAN	ADVANTAGE	CHECK	2	2	7.00					1.85	25.26	6.42
COBRA	ADVANTAGE	CHECK	2	2	6.16					1.66	22.11	5.84
MULATO II	ADVANTAGE	CHECK	2	2	4.21					1.23	14.35	4.01
ZZ2PV	P-VALUE				0.00					0.00	0.00	0.00
ZZ3CV	CV(%)				20.10					19.63	12.13	10.39
ZZ4R2	R2				0.82					0.81	0.83	0.81
ZZ5LSD	LSD(5%)				1.60					0.44	3.55	0.85

	MEAN ESTIMATES						
	MEAN	LOWER	UPPER	UPPER LSD	MEAN	CUMM	
MEAN OF CHECKS - FRESH WGT	5.79	4.44	7.15	7.40	20.57		
MEAN OF CHECKS - DRY WGT	1.58	1.21	1.95	2.01	5.42		

	Varieties superior to mean checks
	Varieties similar to mean checks
	Varieties inferior to mean checks

Table 5. Nutritional quality of *Urochloa* spp varieties.

SITE	EXP_NAME	SOURCE	TEST_STATUS	E (MJ/Kg)	Protein (%)	Fibre (%)	Fat (%)	Ash (%)	Starch (%)	ADF (%)	NDF (%)	Sugar (%)	NCGD (%)	DM (%)
LANET	MULATO II	ADVANTAGE	CHECK	7.10	3.56	22.5	1.02	11.2	< 0.10	35.6	48.3	3.62	48.4	89.8
LANET	TALISMAN	CIAT	CANDIDATE	6.70	9.41	24.0	< 0.20	13.2	< 0.10	36.9	51.4	1.43	47.6	89.3
LANET	CAMELLO	CIAT	CANDIDATE	6.10	6.79	28.1	< 0.20	11.9	< 0.10	39.2	57.7	1.10	44.2	89.7
LANET	MESTIZO	CIAT	CANDIDATE	6.70	7.33	25.3	0.23	13.1	< 0.10	37.2	52.7	1.71	47.5	89.1

DUS Evaluation

KEPHIS uses guidelines by UPOV test guide to evaluate *Urochloa* varieties under DUS. DUS was conducted in Nakuru, lanet which is about 1,901 m above sea level. Lanet typically receives about 128.55 millimetres (5.06 inches) of precipitation and has 240.08 rainy days (65.78% of the time) annually. The district's yearly temperature is 20.32ºC (68.58ºF) and it is -2.18% lower than Kenya's averages. Lanet, Nakuru falls within the Lower Highland Zone (LH3) in the agro-ecological zones (AEZ) classification of Kenya.

Arising Issues During Dus Evaluation.

- Poor germination of some varieties which was linked to the quality of seeds provided by breeders. There were discussions on the need to provide germination test results from a reputable lab as proof of viability of seeds.
- Simlaw *Brachiaria* appeared to be a completely different crop as the intended crop. The crop in the DUS field was Rhodes grass instead of *Brachiaria* hence raising issues of seed mix-up during submission of samples.
- KEPHIS team urged breeders to be careful on the seed sample they deliver to KEPHIS avoiding mix-up which may have financial implications to the breeder as they will be forced to bear costs of a repeat season.
- *Brachiaria* Camello, appeared to be the most distinct variety. According to the KEPHIS team they could easily tell it apart due to its bright and hairless leaves.
- As much as the morphology of Talisman was described to the KEPHIS team, it was important for them to understand its ability to do well under shady conditions and a good option for silvo and agro-pastoral systems.
- The registration of Mestizo should be followed through by discussions between CIAT team and KEPHIS. Now, KEPHIS indicated that the current policy doesn't allow the registration of composites but allows composites at commercialization level. Furthermore, it was noted that it would be difficult to access the DUS of individual varieties that make up the blend. Their advice was to individually evaluate the varieties, in this case GP3207 and GP3025 since Mulato II is already a registered variety. The second option is to provide evidence of farmer use and report farmer uptake and adoption as a way of justifying commercialization of the blended hybrids.
- The KEPHIS team evaluated several site characteristics including trial security, timeliness in planting, entry and trial stand giving each a score and overall verdict on whether to continue with the site or not. In this case the DUS trial site was fit.

Ultimately, Massai and Camello passed the Distinctive, uniformity and stability tests done by KEPHIS. This is an important factor that is considered before any variety is released. During the release the maintainer of variety must be identified and acknowledged in records. In the case of Camello and Massai, Papalotla group of companies was listed as the variety maintainer.

KEPHIS and other breeders during DUS evaluation in Lanet, Nakuru

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