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Release of Two Orange-fleshed Sweetpotato Cultivars, 'SPK004' ('Kakamega') and 'Ejumula', in Uganda

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Two orange-fleshed landrace sweetpotato [*Ipomoea batatas* L. (Lam.)] cultivars named 'SPK004' ('Kakamega') and 'Ejumula' were approved for release by the Ugandan Plant Variety Release Committee in Apr. 2004 (Mwanga et al., 2004a). This is the third lot of sweetpotato cultivars to be officially released by the sweetpotato program in Uganda, the first two being released in 1995 and 1999 (Mwanga et al., 2003). 'Ejumula' and 'SPK004' are Ugandan and Kenyan landrace germplasm, respectively, selected from a batch of 25 orange-fleshed sweetpotato (OFSP) clones of different origins (Table 1). Both cultivars have good storage root shapes if grown in light soils, high dry matter content, and excellent consumer acceptance, especially among children and women. The cultivars have low to moderate levels of field resistance to sweetpotato virus disease (SPVD) and Alternaria blight (Tables 2 and 3) and high storage root yields compared with the average national root yield of 4 t·ha^{-1} (International Potato Center, 1999). The release of these two cultivars provides consumers and farmers with high-quality sweetpotatoes of orange flesh for combating vitamin A deficiency in the country (Mwanga et al., 2004a, 2004b).

Origin

The two landrace cultivars were designated 'SPK004' ('Kakamega') and 'Ejumula' during laboratory and field evaluations at the National Crops Resources Research Institute (NaCRRI), Namulonge, Uganda. These two landraces were selected from a set of 25 OFSP clones assembled in 2001, and the set consisted of 1) five landrace cultivars [a) 'Ejumula' was collected from Aterai village, Wera Sub-county, Amuria County, Katakwi District (Abidin, 2001, 2004); b) 'SPK004' was introduced as pathogen-tested mini cuttings from the Seed Unit of the International Potato Center (CIP), Muguga, Kenya; and c) three other local OFSP Ugandan landraces ('Sudan' collected from Luwero, 'Kala' from Soroti, and 'Mahuri' from Kabarole)]; 2) one OFSP breeding line (Sowola-6) from the sweetpotato program in Uganda; and 3) 19 OFSP clones introduced from CIP, Lima, Peru, in Feb. 2001 (Table 1) (Mwanga et al., 2004a). The pedigrees of 'Ejumula' and 'SPK004' are not known but they are assumed to be chance seedlings selected by farmers. By the time of the official release, the two cultivars were spreading quickly through farmer–to-farmer exchange or purchase of planting materials and promotions by nongovernment organizations, schools, farmer groups, and government departments

Table 1. Batch of orange-fleshed sweetpotato clones introduced as in vitro pathogen-tested plantlets (IPTP) from the International Potato Center (CIP, 1998) and local landraces from Kenya and Uganda from which SPK004 (Kakamega) and Ejumula were selected during evaluations, 2001 to 2004 (Mwanga et al., 2004a).

CIP code	Name of clone	Origin	Introduced/starting material/status
440189	Tainung No. 64	CIP, Peru	IPTP
420009	Japon Tresmesino	CIP, Peru	IPTP
440016	Excel	CIP, Peru	IPTP
440060	TIB 4	CIP, Peru	IPTP
420027	Zapallo	CIP, Peru	IPTP
187017.1	Salyboro	CIP, Peru	IPTP
440140	Kandee	CIP, Peru	IPTP
440005	W-151	CIP, Peru	IPTP
440215	Tainung No. 65	CIP, Peru	IPTP
420005	Nemanete	CIP, Peru	IPTP
440112	Centenial	CIP, Peru	IPTP
556638	Jewel	CIP, Peru	IPTP
440288	VSP 4	CIP, Peru	IPTP
420014	Jonathan	CIP, Peru	IPTP
440031	Jewel	CIP, Peru	IPTP
440141	Julian	CIP, Peru	IPTP
440293	BP-SP-2	CIP, Peru	IPTP
440018	W-223	CIP, Peru	IPTP
440090	CN 317	North Carolina State University	IPTP
Not applicable	SPK 004	CIP, Muguga, Kenya	Vegetative pathogen tested minicuttings/landrace
Not applicable	Sudan	Uganda (Luwero District)	Stem cuttings/landrace
Not applicable	Ejumula	Uganda (Katakwi District)	Stem cuttings/landrace
Not applicable	Kala	Uganda (Soroti District)	Stem cuttings/landrace
Not applicable	Mahuri	Uganda (Kabarole District)	Stem cuttings/landrace
Not applicable	Sowola-6	Uganda (Sweetpotato Program)	Stem cuttings/breeding line

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Table 2. Morphological descriptors of two sweetpotato cultivars [Kakamega (SPK004) and Ejumula] released in Uganda in Apr. 2004.[z]

Descriptor	Cultivar		Local control
	Kakamega (SPK004)	Ejumula	(Dimbuka)
Plant type	Spreading	Spreading	Spreading
	Vine pigmentation		
Predominant color	Green	Green	Green
Secondary color	Absent	Absent	Absent
	Mature leaf shape		
General outline	Lobed	Lobed	Triangular
Lobe type	Deep	Moderate	No lateral lobes
Lobe number	5	3	1
Shape of central lobe	Elliptic	Semi-elliptic	Triangular
	Abaxial leaf vein		
Pigmentation	Green	Green	Green
	Foliage color		
Mature leaf color	Green	Green	Green
Immature leaf color	Green	Green	Green
Petiole pigmentation	Green and pigmented close to the leaf	Green	Green
	Storage root		
Shape	Long, irregular or curved	Long, irregular or curved	Long, irregular or curved
Surface defects	Many lenticels, few shallow constrictions	Many lenticels, few shallow constrictions	Shallow longitudinal grooves
	Skin color		
Predominant	Purple–red	Cream	Cream
Intensity	Pale	Intermediate	Intermediate
Secondary	Cream	Absent	Absent
	Flesh color		
Predominant	Orange	Orange	Cream
Secondary	Yellow	Absent	Absent
	Flowering		
Flowering habit	Moderate	Sparse	Sparse
	Seed set		
Seed capsule set	Sparse	Sparse	Sparse

[z]Selected descriptors according to International Potato Center, Asian Vegetable Research and Development Center, and International Board for Plant Genetic Resources (1991).

and had already reached 28 districts in Uganda (Apac, Arua, Bundibugyo, Entebbe, Gulu, Iganga, Jinja, Kabale, Kabarole, Kampala, Kamuli, Katachwi, Kayunga, Kibale, Kumi, Lira, Luwero, Masaka, Masindi, Mbale, Mbarara, Mpigi, Mukono, Ntungamo, Palisa, Soroti, Tororo, and Wakiso) (Mwanga et al., 2004a).

In communities that have had interventions to promote OFSP, there has been significant uptake of these cultivars. On average, OFSP has increased from 3.2% in 2004 to 22.4% of total production in 2006 in intervention communities. The frequency of farmers that produce OFSP increased from 21.7% in 2004 to 64.3% in 2006. Similarly, the frequency of farm households that consume OFSP increased from 25% to 69% (Yanggen and Nagujja, 2006).

Description and Performance

Main standard morphological descriptors [International Potato Center (CIP), Asian Vegetable Research and Development Center, and International Board for Plant Genetic Resources, 1991] of the two cultivars are listed in Table 2. Important quality attributes, disease and insect pest reactions, and agronomic traits are presented in Table 3. Both cultivars have spreading vines and vigorous growth with dense foliage that suppresses aggressive weeds. The flower color in both cultivars is the same, pale purple limb with purple throat. Flowering is moderate in 'SPK004' and sparse in 'Ejumula', whereas capsule formation and seed set are sparse in both cultivars, enabling crosses to generate breeding populations under NaCRRI conditions without special treatment.

Both cultivars have high root dry matter content (greater than 30%) and a dry texture with a sweet taste when cooked. Flesh color ranges from light orange (orange with yellow patches) in 'SPK004' to deep orange in 'Ejumula' with intensity varying according to age of roots, location, agroclimatic factors such as soil type, and season (wet/dry).

Mwanga et al. (2004a, 2004b) have presented the data for official release of 'SPK004' and 'Ejumula' in Uganda. Details of the release information include descriptions of pedigree, cultivar, test site, materials and methods, planting materials, on-station and on-farm trials, planting and harvesting dates, pest and disease evaluation procedures, farmer selection, acceptability evaluation, experimental designs, stability analysis, dry matter determination, beta-carotene determination by spectrophotometry and high-performance liquid chromatography, corresponding results, and cultivar maintenance.

The following description is a summary of the release data.

The released cultivars were tested for eight seasons on-station and on-farm during 2001 to 2003 in replicated, standard multilocation yield trials in: 1) the warm, subhumid short grasslands where weevils and drought are important; 2) the warm, moist, tall grasslands where viruses are severe; and 3) the cool, moist, southwestern highlands where Alternaria stem blight and low soil fertility problems are widespread. A total of 10 multilocational on-station and 14 on-farm trials were conducted under rainfed conditions (Mwanga et al., 2004a). The cultivars were routinely evaluated for resistance to SPVD, Alternaria stem blight, and sweetpotato weevils, *Cylas puncticollis* (Boheman) and *C. brunneus* (Fabricius) (Table 3). Classifications of the relative resistance to disease and weevil damage were based on field evaluation under natural disease pressure and weevil populations with the level of infection varying from low to high depending on agroecology. Storage root dry matter content, root yield, taste, and desirable agronomic attributes (e.g., earliness, root size, shape and stability of root traits) were also evaluated (Table 3). 'SPK004' has moderate field resistance to SPVD, whereas 'Ejumula' is susceptible to the devastating disease at NaCRRI where high natural SPVD inoculum pressure is prevalent. Both cultivars are susceptible to sweetpotato weevils, but 'SPK004' is less susceptible than 'Ejumula' under field conditions. Both cultivars are highly susceptible to the pests in no-choice tests under laboratory conditions. Both cultivars, however, are potentially valuable as sources of beta-carotene in a high dry matter content background, and they have already been distributed by CIP to several countries in sub-Saharan Africa. These cultivars are expected to perform well in agroecologies with low to moderate SPVD pressure and with well-distributed rainfall for at least 3 months during growth.

Availability

The cultivars are maintained as pathogen-tested plants in the screenhouse at the Kenya Quarantine Station, Muguga, and are maintained in the field by NaCRRI in Uganda. Requests for these cultivars should be addressed to: Seed Unit, CIP, P.O. Box 25171, Nairobi, Kenya. Requests for planting materials within Uganda should be directed

Table 3. Selected agronomic, disease and insect pest reaction, and quality attributes of two orange-fleshed sweetpotato cultivars released in Uganda in Apr. 2004.

Attribute	Cultivar		
	Kakamega (SPK004)	Ejumula	Dimbuka (local control)
Dry matter (%)	33.2	34.2	30.8
Cooked texture	Dry	Dry	Somewhat dry
Sweetness	Moderately sweet	Sweet	Moderate
Field reaction to weevils[z]	S	S	S
Field reaction to SPVD[z y]	MR	S	S
Field reaction to Alternaria stem blight[z]	MR	MR	MR
Maturity (days)	Medium (120–150)	Medium (120–150)	Medium (120–150)
Mean and (range[x]) of storage root yields in various yield trials (t·ha)	14.9 (3.7–35.5)	18.8 (2.0–31.7)	19.7 (4.9–45.8)
Mean storage root dry matter (DM) yield (t·ha)	4.9	6.4	6.1
Mean storage root DM yield (% of local control)	80	105	100
Beta-carotene content (µg/100 g)[w]	376–3760	954–27698	24–32

[z]Susceptible (S) = considerable damage or numbers present to severe damage or very high numbers present, respectively.
Moderately resistant (MR) = moderate damage or moderate numbers present (resistant = no apparent damage or no insects present)
[y]SPVD = sweetpotato virus disease.
[x]The wide variation in yield is attributed to variation in environmental factors such as erratic rain during some seasons and differences in soil types in the different agroecologies.
[w]The wide variation in provitamin A (beta-carotene) content is attributed various factors such as different methods used in its determination, age of the sampled roots, different ways of handling root samples before processing, and agroclimatic factors [e.g. different soil types, time of sampling (wet/dry season)].

to: Sweetpotato Program, NaCRRI, P.O. Box 7084, Kampala.

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