



Orange Sweetpotato (OSP)

Maria Andrade (CIP)

DEVELOPMENT

Target Micronutrient		Vitamin A	
Target Countries		Uganda (HarvestPlus), Southern Africa (CIP)	
Baseline (parts per million, ppm)		2 ppm	
Target Increment		30 ppm	
Target Level in Crop		32 ppm	
Nutrition Factors		Original Assumption	Measured/ Revised ¹
Sweetpotato Consumption, grams/day (fresh weight)	Women	200 g/d	200 g/d
	Children	100 g/d	75 g/d
β-carotene Retention (%)		50%	75% (boiled)
β-carotene Absorption (%)		8%	7%
Absorbed Vitamin A as % of EAR		50%	>90%
Releases			
Full Target Varieties	41–97 ppm	Uganda: 2004, 2007 <i>See chart below for additional releases</i>	

¹Uganda

Breeding to Date: Sweetpotato is widely consumed in Sub-Saharan Africa (1). Conventionally bred OSP with vitamin A was the first biofortified crop released by HarvestPlus and its partners. Plant breeders have produced several OSP varieties with provitamin A content of 30–100 ppm, well exceeding the target level of 32 ppm. Analytical methods for sweetpotato were developed; in orange and salmon-fleshed sweetpotatoes, high-performance liquid chromatography (HPLC) and spectrophotometric screening resulted in similar quantifications of β-carotene (2).

Breeding research in Uganda is conducted by the National Crops Resources Research Institute (NaCRRI) with the support of the International Potato Center (CIP). Breeding for provitamin A OSP at both NaCRRI and CIP has assumed full operational scale. The full breeding pipeline consists of both locally developed germplasm and introductions from CIP. NaCRRI is engaged in testing biofortified candidate varieties and provides other technical support with regard to seed systems. As the provitamin A trait is mainstreamed in breeding populations, ongoing OSP breeding concentrates on tolerance to biotic and abiotic stress tolerance while maintaining/enhancing provitamin A levels. HarvestPlus coordinates with NaCRRI and CIP to ensure a continuous flow of improved varieties for Uganda.

In addition to the two landraces (Ejumula and Kakamega), which were identified and released prior to the start of the HarvestPlus activities in Uganda, two OSP varieties with the full provitamin A target were released in 2007. In 2013, two clones (SPKOO4/2006/1136 and NAS7/2006/292) were pre-released.

Future Releases: New OSP varieties are subject to both on-station and multi-location treatment as part of the release process. These will be further taken for on-farm trials with farmers participating in the project so that palatability and acceptance tests can be conducted before releasing and bulking of vines.

Biofortified varieties are now being introduced in many parts of Africa and South America, as well as China. In 2009, CIP launched its Sweetpotato for Profit and Health Initiative (SPHI), which seeks to deliver OSP in Africa to reach 10 million households by 2020. Eight Sub-Saharan African countries have released 46 improved sweetpotato varieties since 2009, of which 31 are OSP. Helen Keller International (HKI) has integrated biofortification into its programs to combat vitamin A deficiency, promoting OSP through nutrition education coupled with homestead food production.

Highlights:

- OSP is a widely supported intervention throughout Sub-Saharan Africa, and farmers are adopting OSP varieties.

Challenges:

- Dry matter content for OSP varieties is somewhat low compared to local preference.

1. Woolfe, JA. 1992. *Sweet potato: An untapped food source*. Cambridge, UK: Cambridge University Press
2. Kimura, M; et al. 2007. Screening and HPLC methods for carotenoids in sweetpotato, cassava and maize for plant breeding trials. *Food Chemistry* 100(4):1734–1746.

Released Varieties

Variety Name	Mean Yield (tons/hectare)	Dry Matter (%)	Beta-carotene (µg/100g fresh weight)	Release Country
Amelia	17.3	32.1	5000	Mozambique
Ana Akwanire	25	29.0	5500	Malawi
Bela	25.9	27.5	8390	Mozambique
Coromex	15.3	22.7	11030	Mozambique
Carrot C	15.0	33.0	12390–14370	Not released but grown in Tanzania
Chiwoko	20.0	34	11030	Tabled for release in Zambia
Cecilia	18.3	26.7	6010	Mozambique
Cn-1424-9	20	27	11030	Mozambique
Cn-1448-49	15.7	22.7	4470–4920	Mozambique
Delvia	23.4	32.8	5540	Mozambique
Ejumula	14.7	33.0	7760–14370	Released in Uganda, Madagascar, Mozambique and Tanzania; near release in Kenya and Rwanda
Erica	16.7	25.6	10160	Mozambique
Esther	18.6	29.6	4920	Mozambique
Gaba Gaba	6.5	23.9	11030	Mozambique
Impilo	31.1	21.4	2978–7034	South Africa
Ininda	22.2	29.3	5310	Mozambique
Irene	19.6	28.8	8300	Mozambique
Jane	21.2	29.2	5590	Mozambique
Japon Tresmesino Selecto	14.5	21.6	3760–7230	Mozambique
Jewel	21	28	11030	Mozambique
Kadyaubwerere	35	31.1	8900	Malawi
Kakamega Spk004	16.5	32	376–3760	Uganda, Kenya, Rwanda and Tanzania
Kandee	14.5	25.3	11030	Mozambique
Kaphulira	35	30	3200	Malawi
Kenspot-3	18.7	32.5	1380	Kenya
Kenspot-4	17.1	30.4	3960	Kenya
Kenspot-5	14.8	25.9	5490	Kenya
Khano	24.5	18.2	11987–15565	South Africa
Kiegea Kbh2001/261	13	25–30	7310	Tanzania
K566632	15–20	25–26	700–800	Near release in Kenya
Lourdes	18.3	25.8	9940	Mozambique
Lo-323	13.6	21	5490	Mozambique
Matayakbh2001/261	13	25–30	7310	Tanzania
Mathuthu	25	29	2900	Malawi
Mayai	10	32.5	11030	Grown by farmers in Zanzibar Island and coastal Tanzania
Melinda	27.1	23.6	5710	Mozambique
Namanga	19.3	27	8390	Mozambique
Naspot 8	20	32.5	2878	Uganda
Naspot 9	16.5	30.1	11030	Uganda
Naspot 10	16	30.5	11030	Uganda
Naspot 12	20	30	7230	Uganda
Naspot 13	18	28	11030	Uganda
Olympia	25.5	31	TBD	Tabled for release in Zambia
Persistente MGCL01	5	37	11030	Mozambique
Resisto	15.8	24	24900	Mozambique, South Africa, Madagascar
Rw11-2560	20	21	10500	Rwanda

Rw11-2910	20	31.1	410	Rwanda
Sumaia	21.6	25.2	7700	Mozambique
Tainung 64	15	23	3760–7230	Mozambique
Tio Joe	20	26.7	10320	Mozambique
Twatasha	20	31	TBD	Tabled for release in Zambia
Umuspo/1	63.6	39.3	700.14	Nigeria
Umuspo/3(Mother's Delight)	31.4	28.7	2993	Nigeria
W-119	19.5	25	8806–12978	South Africa
W151	18	28	10500–14370	Promising in Kenya
Zambezi	15.1	28.5	10900	Zambia and Madagascar
Zondeni	8–16	30–32	9000	Malawi
199062.1 Cri-Bohye In Ghana	22	31	3760–7230	Mozambique, Madagascar, and Ghana

