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Summary of progress on orange-fleshed sweetpotato research and development in Ethiopia

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Abstract. Vitamin A deficiency (VAD) remains an important public health problem in developing countries like Ethiopia. Orange fleshed sweetpotato varieties have high contents of β-carotenoid and potentially can reduce the effects of vitamin A deficiency. To this effect, vitamin A for Africa (VITAA) was initiated. A planning work shop on "Combating VAD using OFSP" was held from which a production and promotion of OFSP against VAD" was developed. Other OFSP clones were undergoing preliminary yield trials. Out of these clones, clones like TIS-8250 (34.07t/ha) and Zapallo (33.35t/ha) were superior to the local check koka-12 (25.42t/ha). Activities to popularise OFSP varieties have also been undertaken through bazaar, workshop, public media and other extension means and have resulted in high demand for more OFSP cuttings.

Introduction

Ethiopia has 70 million people and is third most populous country in Africa. Sweetpotato is one of the most important crop for at least 20 million Ethiopians. The total area under sweetpotato in Ethiopia is 75000ha with an average productivity 8t/ha. White fleshed sweet potato is a staple food for 13 million people in the Southern Regional State.

Vitamin A deficiency (VAD) remains an important public health problem in Ethiopia just as in other developing countries. World Health Organization (WHO, 1982) classified Ethiopia as a nation where VAD was a public health and which could become worse due to recurring drought and hunger. International agencies active in micronutrient deficiencies have advocated three different strategies to eliminate the VAD problems. These include dietary diversification, dietary supplementation and food fortification. The long term approach is the safest and most sustainable way of combating the problem in rural areas of developing countries where chronic deficiencies are common. This approach emphasises the consumption of vitamin A (VA) sufficient quantities of beta-carotene and VA rich food stuffs.

Even in years when food is plenty, the traditional food habit, of depending on cereals coupled with poverty does not allow the poor majority to get Vitamin-A rich foods. Moreover the limited infrastructure and inaccessibility does not allow the rural poor access Vitamin A capsules. As a result, infant and maternal mortality and night blindness are some of the commonest health problems in Ethiopia.

Due to these problems, the Ethiopian Sweet Potato Research and Development Program based at Awassa Agricultural Research Center in collaboration with CIP/PRAPACE launched breeding programme for Vitamin-A rich orange fleshed sweet potato (OFSP).

In fact before targeting to breed for Vitamin-A rich sweet potato against VAD, Ethiopia released two yellow/orange fleshed sweet potato varieties from local collections in the year 1987 and 1997 for root yield i.e. Koka-12 and AJAC-1 or Guntute with total root yield 25.4 and 35.35 t/ha, respectively. These varieties were not well adopted due to

their texture (moisty) and color. Even the case was not known for researchers at tha time.

Accomplishments

In the year 2001 a total of twenty OFSP clones were introduced from CIP-Nairobi and planted for open quarantine inspection and observation at Awassa Agricultural Research Center (AARC) in non-replicated observation plots. Thereafter, these clones were grouped based on maturity periods and planted in different agro-ecologies to observe them more closely.

Out of 20 clones, one clone (440201) was easily maturing (4 months) and had root yields of 10.17t/ha. Nine clones (187017.1, 56638, 440001, 440186, 420009, 440185, 440131, 440163, 440093) were medium maturing (5 months) with total root yield 5.57,5.39,4.72, 5.06, 4.56, 4.92,3.06, 2.44 and 2.24 t/ha, respectively. The remaining 10 clones were late maturing (Table 1). Destructive sampling indicated that the early maturing clones could initiate and bulk before three months after planting. These can therefore fit in the short moisture areas. The yields of these materials were however very low because the trial was affected by drought (Table 4).

In 2001 participatory evaluation of OFSP clones was initiated. A total of 17 clones (Table 2) selected from existing germplasm based on flesh color was planted at Awassa, Wonago and Areka in a RCBD with three replications. A total of 12 clones were selected from this trial and planted again in 2002 following a similar design. In the 3rd year, the trial was repeated with an additional location, Chanomille. In both cases, agronomic and taste preference data was collected.

Among the OFSP high pro vitamin-A clones tested in 2001, Guntute and TIS 8250 resulted in 20.6 and 19.26t/ha root yield, respectively. The highest yield (23.4t/ha) was obtained from a white fleshed variety Damota. For this reason, it was not considered for promotion. In 2002, the highest root yield

Table 1: Orange fleshed Sweet potato clones introduced from Kenya and their maturity group.

S.N.	Clone	CIP No.	Total root yield/ha			Maturity class
			4th month	5th month	6th month	
1	Narunmitang	440201	10.17	1.11	0.89	Early
2	Salyboro	187017.1	4.56	5.57	4.83	Medium
3	Jewel	56638	1.90	5.39	5.18	Medium
4	Resisto	440001	4.27	4.72	2.11	Medium
5	Tainunq No 15	440186	2.27	5.06	3.89	Medium
6	Japon Tresmesino	420009	4.00	4.56	4.17	Medium
7	Lo-323	440185	0.67	4.92	1.44	Medium
8	Naveto	440131	1.17	3.06	1.33	Medium
9	Mugande	440163	1.09	2.44	1.67	Medium
10	NC - 1560	440093	1.67	2.22	1.11	Medium
11	VSP -	440288	2.67	3.44	6.91	Late
12	IITA-TIS-3290	440067	14.82	6.83	93.21	Late
13	Zapallo	420027	3.1	6.88	12.50	Late
14	Julian	440141	0.22	0.83	1.28	Late
15	Mugaba	440034	1.50	2.78	3.61	Late
16	Tanzania	440166	1.22	2.44	2.06	Late
17	Santo Amaro	400011	0.94	3.11	4.56	Late
18	Nemanate	420005	0.39	2.06	2.44	Late
19	Kemb 37	440170	1.39	2.78	4.39	Late
20	Taonung No 15	440186	2.60	5.79	7.68	Late

Table 2: Participatory evaluation of orange-fleshed sweet potato clones for high provitamin-A total root yield (t/ha).

	Treatments	Year 1				Year 2		
		Awassa	Chano mille	Areka	Mean	Awassa	Wonago	Mean
1	TIB 11(02)	3.86	5.79	7.40	5.68	-	-	
2	CN 1108-13	11.81	3.24	6.98	7.34	-	-	
3	AIS 35-2	4.32	1.93	7.68	4.64	-	-	
4	TIS 5125 (112)	13.81	1.27	-	7.54	-	-	
5	TIS 8250	9.80	29.78	18.24	19.26	19.14	44.00	34.07
6	Guntutier	19.37	27.08	15.43	20.62	7.02	32.02	19.52
7	TIS 1487(20)	12.50	4.39	8.06	8.32	-	-	-
8	Dancota	13.04	36.38	20.79	23.40	8.26	37.58	22.92
9	192009 V	17.75	6.17	9.64	11.19	-	-	-
10	192040 II	5.02	10.49	3.97	6.49	-	-	-
11	Koka-12	15.59	19.75	1.56	12.3	11.03	39.81	25.42
12	Zapallo	6.94	15.97	15.04	12.65	15.51	44.52	30.02
13	397	-	0.46	0.29	0.38	-	-	-
14	192054 VI	20.45	20.50	6.75	15.9	-	-	-
15	192054 IV	12.96	16.20	4.55	11.24	18.44	26.24	23.34
16	Bellela	14.28	21.84	9.56	15.23	6.21	39.74	22.97
17	Local check	18.21	-	14.27	6.29	8.49	32.41	20.90
18	Kemb-10	-	-	-	-	10.88	28.32	19.60
19	Lo -323	-	-	-	-	15.97	29.09	22.30
20	Tainunz No 15	-	-	-	-	9.61	24.00	16.80
21	Japon Tresmesino	-	-	-	-	15.16	26.23	20.74

Table 3: Total root yield (t/ha) of combined analysis of participatory evaluation of orange-fleshed sweet potato clones for high provitamin-A.

Sr. No	Treatments	Marketable yield (tone/ha)	Total yield (tone/ha)
1	Zapallo	9.183BC	33.35A
2	Kemb-10	8.063BC	19.60B
3	Lo-323	7.060C	22.53B
4	TIS-8250	16.70A	34.07A
5	192054-IV	11.65ABC	22.34B
6	Bellela	13.50AB	22.98B
7	Tainung No.15	6.713C	16.08B
8	Japon Tresmesino	9.530BC	20.70B
9	Koka-12	1506A	25.42AB
10	Damota	11.98ABC	22.92B
11	Guntutie	8.835ABC	19.52B
12	Local check	11.15ABC	20.45B
13	C V	45.46	33.88
14	LSD	5.734	9.209
15	Grand mean	10.853	23.389

*Treatments followed by the same letter has no significant difference (Dulcan's multiple range).

Table 4: Orange-fleshed varieties sweetpotato germplasm having high dry matter, high beta- carotene content shipped to Ethiopia in September 2003.

S.N.	CIP No.	Origin	DM%	Skin color	Flesh color
1	199004.2	CIP breeding line	36	Red	Light orange
2	199005.11	CIP breeding line	26	Pink	Intermediate Orange
3	199015.14	CIP breeding line	25	Yellow	Intermediate Orange
4	199024.1	CIP breeding line	26	Cream	Light Orange
5	199024.2	CIP breeding line	26	Red	Light Orange
6	199026.1	CIP breeding line	26	Red	Light Orange
7	199027.3	CIP breeding line	26	Red	Light Orange
8	99034.1	CIP breeding line	34	Red	Dark Orange
9	199062.1	CIP breeding line	31	Orange	Intermediate Orange
10	440203	Korean Cultivar	28	-	Light Orange
11	440443	Chinese Cultivar	28	Yellow	Light Orange

was obtained from TIS 8250 and Zapallo 34.07 and 30.02t/ha, respectively. These yields were above the best standard check of the year i.e., koka-12 (25.4t/ha). In this trial all varieties yielded above 16.0t/ha, a very encouraging yield, moreover, in a short growing period.

From these, the best clones will be subjected to caroteniod content tests from which the most outstanding will be considered for release.

From the participatory variety trial combined analysis for two years, TIS-8250 and Zapallo (34.07 and 33.35t/ha, respectively) were outstanding (Table 3). Their yields were above the standard checks (koka-12 and Guntute).

In 2003, Awassa Agricultural Research Center introduced 40 virus indexed OFSP clones from CIP-Kenya (Table 4). Out of these 37 clones established well and are being observed.

Alongside these trials, was the sensitisation of farmers about OFSP and their nutritional advantages. In 1987, AARC released two OFSP from the local collection Koka-12 yielded 25.24 t/ha while AJA-I or Guntute yielded 35.35 t/ha. On the basis of this high yield, these varieties were released. Unfortunately, consumers did not adopt them due to their yellow flesh and moist texture. Recently, however, it was realized that high beta-carotinoid content. Due to the awareness created for their richness in Vitamin-A, a total of 97,000 cuttings of these varieties have been multiplied and distributed on the request of researchers, NGOs and farmers.

A semi-national planning workshop for production and promotion of OFSP was held in the Southern and Oromiya states in March 2002. From this workshop, a project document has been developed and submitted to VITTA.

Future plans

- A workshop to sensitise and identify partners was planned for December 2003 for policy makers and other SHs.
- More awareness activities to create demand of OFSP through radio, TV, workshops, leaflet, field days, etc. have been planned
- Strengthening contact with VITTA networks.
- Multiplication and distribution of released varieties for users.
- Evaluating the recently acquired clones.
- Bringing post harvest & marketing aspects at the fore front

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