Selection of sweet potato lines for high starch and fodder yield

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Sweet potato status in India

- Major tuber crops
- Grow in all conditions except temperate and humid subtropics
- Growing in a area 0.4 million ha producing 1.17 million ton roots with a productivity of 8.3 t/ha.

Utilization

- Limited to human consumption
- Harvested vines and damaged tubers are fed to cattle
- Industrial utilization nil

Objectives

Development of varieties

- For high starch and quality.
- For high fodder yield

Evaluation of varieties for industrial use

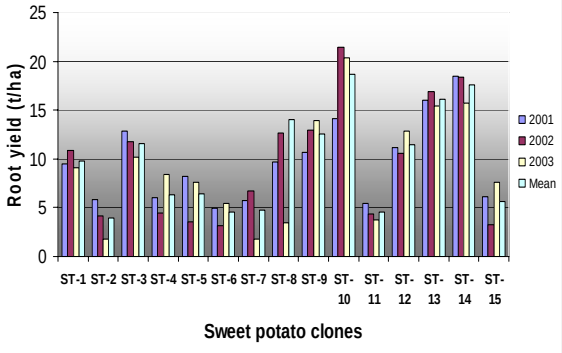
Selection of material

- Evaluation of polycross seeds
- Identified 15 clones based on high dry matter, carotene content, anthocyanin content besides root yield.
- Out of 15 clones, 7 clones selected for further evaluation

Tuber yield and quality

- 15 clones evaluated for 3 years (Fig. 1)
- Yield ranged from 3.9-18.63 t/ha.
- Maximum yield was recorded by ST10
- ST 13 was dark, purple flesh containing high anthocyanin of 85 mg per 100 g tubers
- The vine of ST 13 had 49 mg/100 g anthocyanin
- ST 14 had high carotenoid of 10400 IU

Fig. 1. Performance of selected clones for root yield



Dry matter, starch, sugar and extractable starch

- Most of the clones posses high dry matter content
- Chemical starch content and extractable starch showed good values
- Starch content almost follows the dry matter content for most of the clones
- ST 10 showed very good prospects for commercial exploitation in view of high starch content and high extractability
- ST 13 had high starch with high anthocyanin indicating that it can find use in industry

Table 1 Comparison of dry matter, sugar,starch and extractable starch of sweet potato clones

Clones	Dry matter (%)		Sugar (%)		Starch (%)		Starch extractable (%)	
	2004	2005	2004	2005.	2004	2005	2004	2005
ST1	32.42	29.12	1.86	3.3	24.31	23.2	21.2	24.0
ST3	28.10	30.46	1.72	2.7	23.12	27.7	16.8	20.0
ST5	30.30	26.94	1.09	2.0	20.04	18.01	18.5	16.5
ST10	32.20	31.34	1.56	4.4	23.5	23.9	20.5	22.8
ST12	32.90	29.58	1.51	2.4	23.9	22.2	21.0	20.4
ST13	36.00	33.30	1.52	2.7	27.27	29.6	19.8	22.8
ST14	27.20	27.60	1.61	2.8	19.23	20.2	14.8	18.8

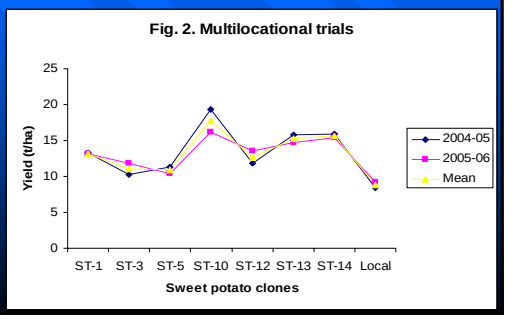
Rheological properties of extractable starch

- Most of the clones had excellent viscosity properties. In fact many of them exceeded that of cassava or controlled sweet potato variety.
- Some of the clones had high viscosity merely up to 4700 cP compared to 3000 for local cultivars.
- ST13 having high anthocyanin also had very high viscosity. This clone promises as both food and in starch production with good starch quality.

Table 2. Rheological properties of extracted starch

Variety	Peak Visc. (cP)	Trough Visc (cP)	Breakd own (cP)	Final visc (cP)	Setbha ck (cP)	Peak time	Gel temp. C
ST 10	4110	2160	1940	3031	871	4.3	70.7
ST 13	4729	2637	2092	3838	1201	3.8	68.65
ST 14	4560	2380	2180	3534	1154	4.08	70.2
ST 1	3548	2098	1450	2898	800	4.27	68.70
ST 5	3374	2305	1069	3250	945	4.27	67.80
ST 3	3336	2030	1306	3112	1182	4.17	67.85
ST 12	3584	2013	1571	3087	1034	4.33	71.85

Multilocational trial of selected sweet potato clones



Evaluation of clones for fodder

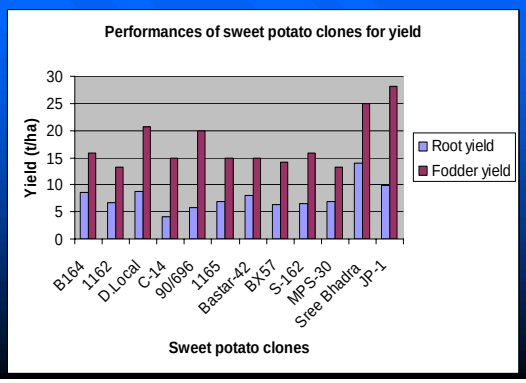
Selection of materials

- 12 clones selected from germless were evaluated for both root and fodder yield
- Foliage was cut at 60, 90 and 120 days after planting

Root and fodder yield

- Tuber yield ranged from 4.03-13.90 t/ha
- Fodder yield ranged from 13.28-28.22 t/ha
- Based on yield 5 clones were selected for further evaluation

Fig. 3. Performance of sweet potato clones for root and fodder yield



Root and fodder yield of 5 selected clones

Clones	Fodder yield (t/ha)	Root yield (t/ha)
Shree Bhadra	29.88	17.39
BX167	20.75	12.78
D. Local	19.09	15.07
90/696	19.92	9.98
JP-1	31.54	15.43

Proximate composition of selected sweet potato foliage

- Proximate composition of leaves and leaves plus vines of these lines were analyzed for dry matter, organic matter, crude protein, ether extract, ash, crude protein, crude fibre and gross energy

Table 4. Proximate composition of foliage of selected sweet potato clones

Particulars	Dry matter %	Organic Matter %	Crude Protein %	Ether Extract %	Ash %	Crude Fibre %	GE Cal/g
Shree Bhadra Leaves	11.72	88.39	12.66	2.04	11.61	12.83	4264.16
Sree Bhadra Leaves + Vines	11.91	89.65	11.99	2.78	10.35	19.20	4212.60
SP-1 Leaves	14.46	88.95	15.27	2.66	11.05	12.96	4281.67
SP-1Leaves + Vine	14.60	90.33	11.62	2.41	9.67	18.92	4283.15
Bx 164 Leaves	12.95	87.37	15.11	2.61	12.63	14.40	4251.49
Bx 164 Leaves + Vines	13.76	88.82	14.32	2.77	11.18	17.07	4379.24
90/696 Leaves	15.55	90.87	14.49	1.17	9.13	12.35	4447.75
90/696 Leaves + Leaves	14.92	91.06	12.46	1.48	8.94	18.70	4445.35
D-Local leaves	13.06	87.27	17.46	2.32	12.73	12.52	4283.82
D-Local Leaves + Vines	12.53	88.03	15.23	2.49	11.97	20.03	4318.11

Conclusion

- Clones selected for high starch posses good viscosity as well as easy and good extractibility
- Since the extractibility is good and the colour of the starch is also good in most cases, it can serve and useful alternative to cassava starch
- ST 10 which has high starch and extractibility has good prospects for commercial exploitation
- ST13 good in anthocyanin with high viscosity has promise as both as food and in starch production
- ST 14 has high carotene and starch content – good for table purpose.
- The proximate analysis of foliage of selected clones showed good promises in view of quality which can be serve as good source of fodder for animal