YIELD AND TUBER QUALITY IMPROVEMENT IN TARO RAISED FROM TRUE SEEDS

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Taro (*Colocasia esculenta* (L.) Schott)

- Indo- Malayan origin
- Belongs to the monocotyledonous family Araceae
- Herbaceous, 0.5-1.5 m tall
  Peltate leaves
- Enlarged starchy underground stems (corms) with primary ,secondary and tertiary branches (cormels)
- Vegetative propagation

- Ranks 14th among staple vegetable crops of the world
- 10.64 million tons produced globally from 1.83 million ha. with an average productivity of 5.81 t/ha (FAO, 2005)
- Staple food in several South Pacific Countries and in West Africa
- Popular all over India as a vegetable

Taro improvement program at the CTCRI

(a) Gene Bank

- Total accessions – 436
- Field gene bank, in vitro conservation, characterization and cataloguing
- Cytological screening – diploids & triploids identified
- Evaluation trials and identification for desirable types
- Flowering frequency assessed & breeding barriers identified
- Triploids – Higher yield, sterile
- Diploids – fertile
- Released five superior clonal selections
- Molecular characterization in progress

(b) Intervarietal Hybridization

- Fertile diploids identified
- Floral biology studied
- Hybridization technique standardized
- True seed production achieved
- A superior hybrid selection released

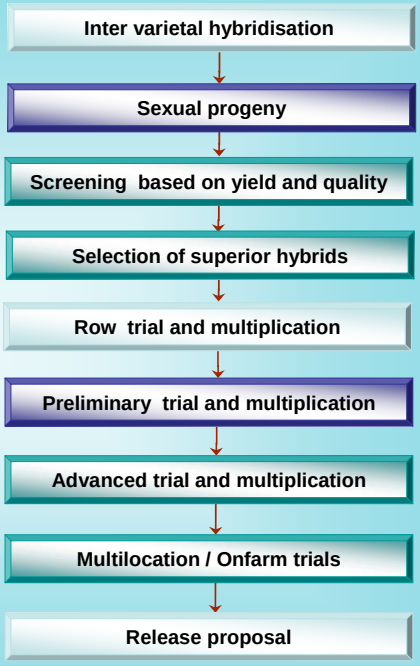
Breeding barriers

- Erratic and seasonal flowering
- Very low flowering frequency
- Non-synchrony
- Occurrence of sterile triploids
- Protogyny

Objective

- Production and evaluation of true seed progeny and identification of superior selections based on yield and quality

Breeding methodology :



Mature bud

Pollination

Fruit bunch

Seeds

Seedlings

Field evaluation

- No seed dormancy
- Seedlings raised inside the glass house
- Transplanted to field 2-3 months after germination
- 10,898 seedlings
- Seedling Evaluation done
- Wide spectrum of genetic variability generated
- 10-15 % showed wild characters
- Selections carried over to clonal evaluation

Recombinant breeding enabled to enhance the genetic variability for :

- **Plant type**
- **Yield**
- **Cooking quality**
- **Longer shelf – life**
- **Leaf blight tolerance and**
- **Flower productivity**

➢ **1214 hybrids are being evaluated**

- **Height : 50 – 60 cm**
- **Duration : 4.5 – 5months**
- **Cormal yield : 15.0 t / ha**
- **Longer shelf – life (50 – 60 days)**

- **Profuse tillering**
- **Stoloniferous**
- **Yield 5.0 – 7.5 t / ha**
- **TLB tolerent**

- Vigorous growth
- Open sheath
- 6 – 7 months
- > 16.0 t / ha
- Shelf – life (70 days)

- Erect plant type
- More plant / plot
- Yield 14 – 15.5 t / ha
- TLB tolerent

- Ornamental type.
- Low yield
- Fertile, seed setting

- Profuse flowering
- Highly fertile
- OP seed set

Tuber variations

Yield > 16.0 t / ha

- Stoloniferous

Eddoe

Dasheen

Intermediate

Cormel Yield of hybrid Selections (AVT-I)

Sl. No.	Lines Tested	Yield (t/ha)
1	4 – 3	22.2
2	4 – 6	17.0
3	4 – 10	21.8
4	5 – 6	19.2
5	9 – 5	17.5
6	16 – 3	18.2
7	23 – 2	17.6
8	Sree Kiran	17.2
	CD (5%)	2.911

Cormel Yield of Hybrid Selections (AVT-II)

Sl. No.	Lines Tested	Yield (t/ha)
1	3 – 01	16. 2
2	4 – 01	13.5
3	2 3 – 02	19.0
4	30 – 02	16.2
5	31 – 02	9.7
6	35 – 02	18.6
7	73 – 02	12.6
8	160 – 02	19.9
9	Sree Kiran	16.9
10	Sree Rashmi	14.2
	CD (5%)	3.001

- **Five superior hybrids viz. 4-3, 4-10, 23-02, 35-02, 160-02 are being tested in onfarm / multilocation trials in Kerala. They posses higher yield (> 18.6 t / ha), good cooking quality and longer shelf – life**

An improved taro hybrid released during 2004

- Intervarietal hybridization(C-303 x C-384)
- True seed production (2160 seeds)
- 1860 seedling progeny (86.1%)
  - Seedling evaluation
  - 192 1st clonal selections (10.3%) based on yield (>250g/plant) and quality (non-acrid)
  - Row trial and selection of 21 clones (2nd clonal, > 400 g/plant)
- RRT with 21 second clonal progeny
- PYT with 8 superior hybrids (3rd clonal, >450 g/plant)

- AVT with 4 hybrids (H-4, H-35, 12-23 and H-13) for three seasons in CTCRI farm (1999 – 2001)

- OFT at 12 locations in three districts of Kerala (2001 – 2003)

Yield performance of taro

(Pooled mean, 2001-2003)

Entries	Cormel yield (t ha^{-1})
H- 4	16.06
H-35	12.91
12-23	12.49
H-13	17.78
Local	09.74
CD (0.05)	3.111

- H–13 was released by the Kerala State Seed Sub–Committee for variety release under the name 'Sree Kiran' during 2004
- First hybrid variety of taro released in India

Sree Kiran

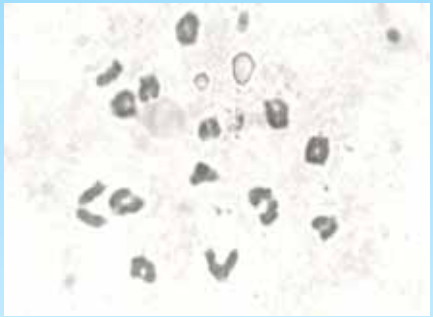
Shoot characters

Plant type : Semi erect, medium tall (70-80 cm)

Petiole colour : Green (top) Greenish brown (middle) Brownish green (base)

Leaves : Broad, droopy with undulate purple margin

Flowering nature : Moderate



2n=28

- **Highly fertile**

Tuber characters

- Corm shape : Oval
- Cormel shape : Round to oval
- Outer skin colour : Light brown
- Cormel flesh colour : White
- Mean cormel yield : 17.0 t ha^{-1}
- Duration : 190-210 days
- Shelf-life : 65-75 days
- Starch (%) : 18.0
- Sugar (%) : 1.03
- Protein (%) : 2.5

- Cooked well within 20 minutes, Soft, Non-sticky texture
- No excess mucilaginous or slimy mouth feel
- No off flavor, White, non – sweet.

Inference:

- Although taro is propagated asexually, it can also flower and set seed.
- Wide genetic variability among the hybrid progeny
- Direct selection from crossings between two cultivars is useful when selection is directed at one or a few genetically controlled characters
- Several hundreds of F_1 hybrids produced have been evaluated and the best one was released for general cultivation in Kerala under the name 'Sree Kiran'
- Popularization of this superior hybrid may enhance the competitive position of taro in traditional cropping system.
- Several selections are in the advanced stage of evaluation
- Genetic improvement for flower productivity achieved

- Prospects of taro breeding in India are encouraging
- Genetic improvement is becoming more sophisticated and the number of traits which need to be improved is increasing
- International collaboration among taro breeders is to be established

Future thrust :

- Assess and characterize genetic resources using molecular markers
- Identification of a core sample of available collections to breeders
- Intensive breeding programme for resistance against leaf blight
- International co-operation among breeders and procedure for germplasm exchange


Thank You