MOLECULAR DIVERSITY IN THE LOCAL CULTIVARS OF COLACASIA AND XANTHOSOMA

Santha V. Pillai & Sree Lekha S.

Central Tuber Crops Research Institute
Thiruvananthapuram 695017

Field View of Colocasia & Xanthosoma

Introduction

- **Colocasia** and **Xanthosoma** species are popular tuber crops in India.
- Germplasm collection at central Tuber Crops Research Institute, Trivandrum: **Colocasia**-437; **Xanthosoma**-67
- **Colocasia** shows wide variability in morphology and economical characters.
- In the **Xanthosoma** collection variability is limited.
- Two distinct species of **Xanthosoma,** based mainly on shoot colour.
- ***X. Sagittifolium*** **(green) and** ***X. Violaceum*** **(violet).**
- **Colocasia** shoot colour varies from green to purple with lot of their combinations.

Materials and Methods

- **Colocasia-** 45 accessions from the germplasm at **CTCRI**
- **Xanthosoma-** 15 accessions
- **X. Sagittifolium-** tall plant type, spreading, Pink margin-on the petiole, Long tubers, Round tubers & Big corm with very few cormels.
- **X.Violaceum**-Tall plant type, Short spreading, Stolon type, Oblong tuber type, Big corm with less cormels

continued …

Colocasia- Field View

Colocasia-green Plant

Colocasia-Purple Plant

Colocasia -Wild Plant

Colocasia- Round Tuber

Colocasia-Oblong Tubers

Colocasia- Wild (Tubers)

Colocasia-Banda-Plant

Taro-Banda

Colocasia-Banda-Tuber

Taro-banda

Xanthosoma sagittifolium(green)

...

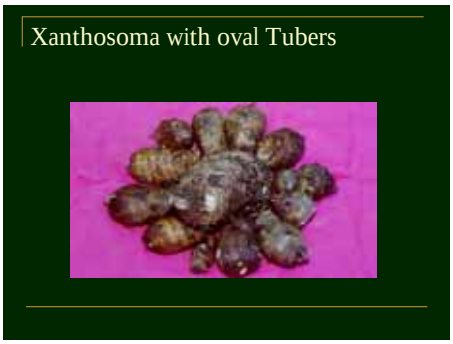
Xanthosoma sagittifolium(Tuber)

Xanthosoma sagittifolium(Big corm)

Xanthosoma-green

X.Sagittifolium (Pink Margin on Petiole)

X.sagittifolium(Oval Tubers))



X.violaceum - Plant

X.violaceum-Tuber

Methods

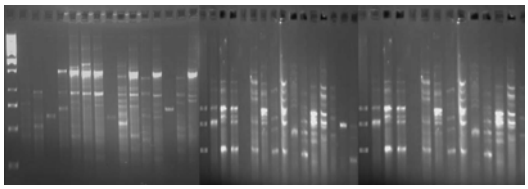
- DNA extracted from leaf tissue –standard protocols-modifications
- DNA was amplified using Random primers
- Bands were seperated on 1.5% Agarose
- The image was captured on a Gel Doc Equipment (Syngene)
- Gel was scored for presence(1) or absence(0) of a specific band
- Score table analyzed for Similarity Index.
- Dendrogram constructed using the software NTSYS-PC version 2.0e
- The genetic distance between each variety was assessed.
- Clusters with highly related accessions were identified.

Results

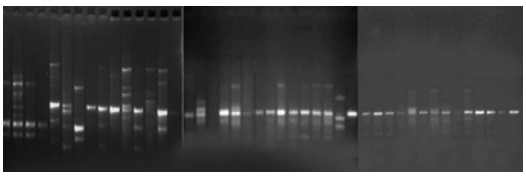
- **Colocasia**
- Distinct banding pattern was obtained for 3 primers
- The number of DNA fragments per primer per variety varied from 2 to 12 (fig.)
- The similarity index between pairs of varieties varied from 51 to 100.
- Wide variability was noticed for the accessions.
- In the Dendrogram, 45 varieties were grouped into 5 clusters.
- Number of accessions in each cluster varied from 4 to 14

Continued …

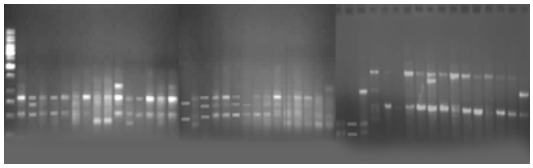
DNA banding pattern of primer no. 1 for 45 varieties of Colocasia
Lane 1-1Kb ladder



Primer no-2



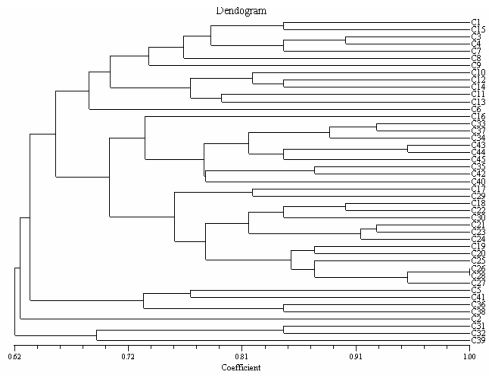
Primer no-3



Similarity Index Table

	C1	C2	C3	C4	C5	C6	C7
C1	1.00000						
C2	0.6666667	1.0000000					
C3	0.7948718	0.7692308	1.0000000				
C4	0.7948718	0.6666667	0.8974359	1.0000000			
C5	0.7435897	0.6666667	0.6410256	0.6410256	1.0000000		
C6	0.6153846	0.5897436	0.6666667	0.7692308	0.5128205	1.0000000	
C7	0.7435897	0.6666667	0.8461538	0.8461538	0.6410256	0.6666667	1.0000000

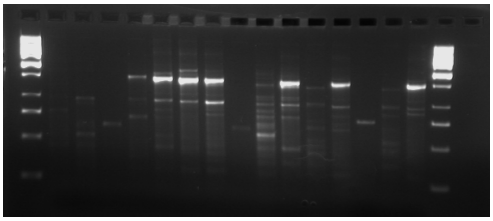
Dendrogram of 45 varieties of Colocasia



Results

- **Xanthosoma**
- **The species Sagittifolium and violaceum showed distinct banding pattern**
- **Variability within the species was limited**

DNA banding pattern in Xanthosoma based on RAPD primer-1
Lane 1-8 X.sagittifolium, 9-15 X.violaceum



Discussion

- This study could quantify the genetic similarity between 45 accessions of Colocasia.
- Crosses between genetically distant parents are expected to yield wide variability in the hybrid progeny.
- As such, this information can be utilized for recombination breeding.
- Wide variability was noticed in the accessions studied.
- North Eastern region of India is believed to be the centre of origin of Colocasia.
- Some of the accessions in the study are collected from this region. (Santha Pillai *et al.* (2000)
- Crossing of popular varieties of xanthosoma with those having more number of tubers/good tuber shape can give better recombinants.

Future strategies

- The study will be extended to more accessions with more proven RAPD primers reported by Irwin *et. al*(1998)
- The SSR markers identified by Noyer *et. al* (2002) also will be used.
- Attempt will be made to identify molecular markers for leaf blight resistance and also for acrid free varieties.

References

- Irwin, S. V. , P. Kaufusi, K. Banks, R. dela pena and J.J. cho,1998.Molecular characterization of taro (Colocasia esculanta) using RAPD markers Euphytica 99:183-189
- Kuruvilla, K. M and A. Singh, 1981. Karyotypic and electrophoretic studies on taro and its origin. Euphytica 30:405-413
- Lebot, V. and K. M. Aradhya, 1991. Isozyme variation in taro (colocasia esculenta (L1.)Schott)from Asia and Oceania. Euphytica 56:55-66
- Santha V. Pillai, P. Gethakrishnan Nair and P. K. Thankamma Pillai.(1999) Genetics and breeding of Taro: A Review. J. Root Crops 25: (1) 1-7.
- Santha V. Pillai, P. Gethakrishnan Nair and P. K. Thankamma Pillai.(2000) Collecting taro and other tuber crops from NEH region of India. Indian J. Pl. Genet. Resources 13(2):159-162
- Tashinori Ochiai, Viet Xuan Ngugen, Makatop Tahara and Hiramichi Yoshino,(2001) Geographical differentiation of Asian taro, Colocasia esculenta (L) Schott, detected by RAPD and isozyme analysis, Euphytica 122:219-234.
- Thankamma Pillai, P. K., Lekshmi, K. R and Sheele, M. N. 1995. Correlation and path analysis in taro. J. Root crops, 21(2): 86-89

THANK YOU