Phylogenetic relationships of the genus *Curcuma* L. based on cytogenetical and molecular inferences

Judith Mary Lamo, M.Sc., DBTBI, North-Eastern Hill University, Shillong 793022

Satyawada Rama Rao, Ph.D., DBTBI, North-Eastern Hill University, Shillong 793022

The genus *Curcuma* L. of the family Zingiberaceae, is pantropical in distribution and comprises of three subgenera viz. *C.* subg. *Curcuma, C.* subg. *Hitcheniopsis* and *C.* subg. *Ecomatae.* Of the three subgenera, the subgenus *Curcuma* (Baker) K. Schum., contains highly complex polyploid taxa with overlapping morphological characters which contributed to taxonomic perplexity in the genus *Curcuma*. A combination of classical and molecular cytogenetics as well as molecular approaches, are essential for detailed scrutiny particularly polyploid complexes which may offer a reasonable taxonomic concept. To resolve some of these issues, fifteen species belonging to the *Curcuma* subg. *Curcuma* were taken up for cytogenetical (viz. chromosome count, male meiosis and heterochromatin banding pattern) and sequence targeted (viz. nrITS and cpDNA) studies.

Mitotic study in root-tip cells, could resolved the species into three groups with 2n = 42 (*C. amada, C. aromatica, C. comosa, C. haritha, C. mangga* and *C. montana*), 2n = 63 (*C. aeruginosa, C. caesia, C. latifolia, C. longa, C. leucorrhiza, C. sylvatica, C. zanthorrhiza* and *C. zedoaria*) and 2n = 105 (*C. raktakanta*) with male meiotic analysis showing a varying degree of chromosome association(s) suggesting the genus might have been affected by inter-specific crosses and thus confirming their allopolyploid nature.

For phylogenetic investigation, a total of 27 *Curcuma* species which included 15 species collected exclusively from India and the remaining 12 world species retrieved from GenBank, were taken up for detailed analysis with *Alpinia galangal* and *Globba substrigosa* as outgroups. The studies could successfully resolve the species with respect to their infrageneric groups and could deduce some of the taxonomic discrepancy related to the genus *Curcuma*.

C. comosa, *C. montana* and *C. latifolia* with similar morphological and floral traits demonstrated a close phylogenetic relationship. *C. sylvatica* was considered a variant derived from *C. amada* due to the mango-like aroma of the rhizome, etc. However, in light of our cytogenetical data on chromosome count and male meiosis we rule out the possibility of *C. sylvatica* (2n = 63) being a variant of *C. amada* (2n = 42).

In depth scrutiny of the species within the *Curcuma* clade based on morphology, cytology and molecular parameters could resolve the identity of some closely resembling *Curcuma* species when there is confusion with respect to their identity. Moreover a close relationship between species within the *Curcuma* clade suggested that hybridization and subsequent chromosome doubling has played an important role in species diversification of *Curcuma.*

Recent Publications

1. Lamo, J.M. and Rao, S.R. 2014. Chromosome counts in two species of *Curcuma* Linnaeus (Zingiberaceae) from North-East India. Pleione 8 (2):435-438.

2. **Lamo, J.M.**, Wahlang, D.R. and **Rao, S.R.** 2016. Comparative Analysis of Heterochromatin Distribution Pattern in Wild and Cultivated Species of Curcuma L. Med Aromat Plants S3:006. doi:10.4172/2167- 0412.S3-006

3. **Lamo, J.M**., Devi, S.P., Devi, K.M., Shamurailatpam, A. and **Rao, S.R.** 2016. Heterochromatin distribution in aid of understanding plant species interrelationships. Electronic Journal of Biology 12(4):426-427.

4. **Lamo, J.M.** and **Rao, S.R.** 2017. Chromosome counts in wild and cultivated *Curcuma* Linn. Cytologia 82(2):1-4.



Ms. Judith Mary Lamo is a Research Scholar at the Department of biotechnology and Bioinformatics, North-Eastern Hill University, Shillong. She completed her M.Sc. programme in Biotechnology from North-Eastern Hill University, Shillong. Her field of interest includes cellular and molecular cytogenetics, biodiversity assessment and phylogenetic analysis in *Curcuma.*

E-mail: srrao22@yahoo.com