

Wild Curcumas as Genetic Resources with Medicinal Importance

JUDITH MARY LAMO & SATYAWADA RAMA RAO

Abstract

Curcuma, an important member of family Zingiberaceae is mainly distinguished by the characters of rhizome, position of spike, presence or absence of anther spur, etc. Morphological characters are known to be important keys for species identification and systematics. Some important morphological characters, distribution and economic importance of three wild *Curcuma* species, viz., *C. montana*, *C. rakatakanta* and *C. sylvatica* are presented here.

Keywords: *Curcuma*, Morphology, Distribution

Introduction

The genus *Curcuma* of Zingiberaceae consists of about 120 wild, semi-wild and cultivated species of commercial as well as economical importance. It is widely distributed throughout south and southeast Asia, while a few species have been reported from China, Australia, New Guinea and the South Pacific Islands (Sasikumar, 2005; Maknoi, 2006; Škornièková *et al.*, 2008; Velayudhan, 2012; Chen *et al.*, 2013). The highest diversity is concentrated in India and Thailand (Škornièková *et al.*, 2007) with about 40 species in each country. *Curcuma* species are perennial rhizomatous herbs which are easily recognised by their characteristic position of the spike inflorescence (Škornièková and Sabu, 2002). In the following sections, morphological variations, distribution and economic importance of some wild *Curuma* species are discussed.

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1. *Curcuma montana* Roxb.

Morphological description

Rhizome is pale yellow, bitter in taste and camphoraceous. Leaf sheath is purple. Leaves are oblong-lanceolate, green and glabrous. Inflorescence is either lateral or terminal. Coma bracts are white with light purple streaks towards the top (Figs. 1a–c). Fertile bracts are green and are fused at the base on which a cincinnus of flowers are borne. Corolla is white and the labellum is yellow. Presence of anther spurs.

Distribution

C. montana is distributed in the Indian subcontinent and is found in Kerala, Karnataka, Chennai, Andhra Pradesh, Eastern Himalayas and north-eastern region.

Economic importance

The juice of *C. Montana* mixed with *Kaempferia galanga* is used to facilitate delivery in women during child birth (Koh *et al.*, 2009). The rhizome is boiled in water along with the roots and leaves of *Acorus calamus*, and about 1-2 teaspoon of this decoction is given to expecting mothers (Hynniewta and Kumar, 2010).

2. *Curcuma raktakanta* Mangaly & M. Sabu

Morphological description

Rhizome is pale yellow, camphoraceous and slightly bitter. The sessile tubers are finger-shaped, branched and elongate. Leaves are oblong-lanceolate, green and glabrous above and pubescent below. Leaf sheath is reddish-purple. Inflorescence is lateral. Coma bracts are deep pink (Figs. 1d–f). Fertile bracts are green with a pink tip. Corolla tube is light pink and labellum is light yellow with a median dark yellow band. Presence of anther spurs. Fruiting is not known.

Distribution

C. raktakanta is mainly distributed in Bangladesh, Cambodia, China, India, Java, Malaya, Myanmar and Thailand. In India, it is widely found in Kerala and north-eastern region.

Economic importance

The rhizome of *C. raktakanta* is used for the extraction of arrowroot (Sasikumar, 2005). The essential oils of *C. raktakanta* have been reported to have antioxidant, antibacterial properties, and antidiabetic and

antihyperlipidemic effect by enhancing insulin release (Dan *et al.*, 2002; Rajamama *et al.*, 2012; Inthirakanthi *et al.*, 2013).

3. *Curcuma sylvatica* Valetton

Morphological description

The rhizome is white and has a characteristic aroma of mango and it is slightly bitter in taste. Leaves are lanceolate, green and glabrous with a purple midrib (Figs. 1g–i). Inflorescence is lateral. The fertile bracts are greenish purple and subtend a cincinni of flowers. The coma bracts are dark purple. The calyx is light purple. The corolla is creamy white and labellum is yellow. Presence of anther spurs.

Distribution

C. sylvatica is distributed in India and Java. In India, it is found in Kerala and north-eastern region.

Economic importance

C. sylvatica is an active ingredient in traditional herbal medicines of Indonesia, Japan and China (Sasikumar, 2005; Rajamma *et al.*, 2012) due to pharmacological properties (Wilson *et al.*, 2005; Upadhyay *et al.*, 2013; Owolabi *et al.*, 2012). The rhizome is used in the extraction of arrowroot (Sasikumar, 2005).

Conclusions

Curcuma species have diverse uses in fields such as medicine, aromatherapy, cosmetics, floriculture and food industry. Wild *Curcuma* species like *C. montana*, *C. raktakanta* and *C. sylvatica* are known to exhibit numerous biological activities which are important in pharmaceutical industry and act as a rich source of arrowroot. However, these species are undervalued and underutilized. Therefore, understanding the genetic structure and diversity of these species will help in conservation programs and maintenance of plant genetic resources.

Acknowledgements

The authors are thankful to the Head, Department of Biotechnology and Bioinformatics, North-Eastern Hill University, Shillong for providing necessary facilities, the Director, Indian Institute of Spices Research (IISR), Kozhikode for providing the germplasm and Dr. V.A. Parthasarathy and Dr. Prasath Duraisamy for their help and encouragement. The DBT-JRF Program, Department of Biotechnology, Government of India provided financial assistance (Ref. No. DBT-JRF/2010-11/582 dated 27th January, 2011).

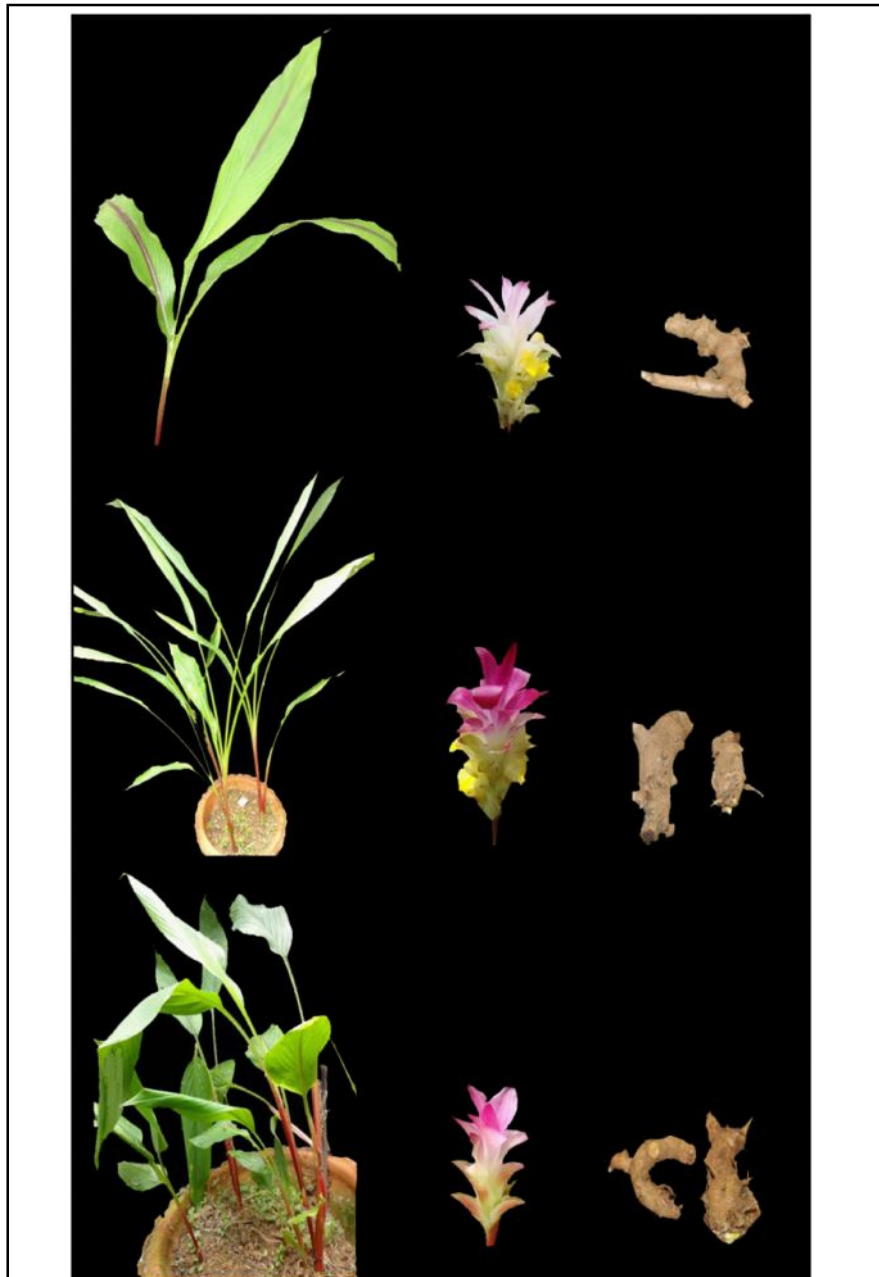


Fig. 1. Illustration of three species of *Curcuma*: a to c, *C. montana*; d to f, *C. raktakanta*; g to i, *C. sylvatica*.

References

- Chen, J., Xia, N.H., Zhao, J.T., Chen, J.J. and Henny, R.J. 2013. Chromosome numbers and ploidy levels of Chinese *Curcuma* species. *HortScience* 48, 525-530.
- Dan, M., George, V. and Pushpagadan, P. 2002. Studies on the essential oil of *Curcuma haritha* and *Curcuma raktakantha*. *Journal of Spices and Aromatic Crops* 11, 78-79.
- Hynniewta, S.R. and Kumar, Y. 2010. The lesser-known medicine *Ka Dawai Òiangsohpet* of the Khasis in Meghalaya, Northeast India. *Indian Journal of Traditional Knowledge* 9(3), 475-479.
- Inthirakanthi, R.N., Malathy, N.S. and Anusuya, N. 2013. Antidiabetic, antihyperlipidemic and antioxidant effect of ethanolic extract of *Curcuma raktakantha* J.K. Mangaly & M. Sabu on streptozotocin induced diabetic rats, *International Journal of Pharmacy and Pharmaceutical Sciences* 5, 201-206.
- Koh, H.L., Chua, T.K. and Tan, C.H. 2009. A guide to medicinal plants: An illustrated, scientific and medicinal approach. World Scientific Publishing Co. Pte. Ltd., Singapore.
- Maknoi, C. 2006. Taxonomy and phylogeny of the genus *Curcuma* L. (Zingiberaceae) with particular reference to its occurrence in Thailand. Ph.D. Thesis, Prince of Songkla University.
- Owolabi, O.J., Arhewoh, M.I. and Aadum, E.J. 2012. Evaluation of the antidiarrheal activity of the aqueous rhizome extract of *Curcuma longa*. *Journal of Pharmaceutical and Allied Sciences* 9, 1450-1457.
- Rajamma, A.G., Vimala, B. and Bala, N. 2012. Antioxidant and antibacterial activities of oleoresins isolated from nine *Curcuma* species. *Phytopharmacology* 2(2), 312-317.
- Sasikumar, B. 2005. Genetic resources of *Curcuma*: diversity, characterisation and utilisation. *Plant Genetic Resources: Characterization and Utilization* 3, 230-251.
- Skornickova, J. and Sabu, M. 2002. The genus *Curcuma* L. in India: resume and future prospects. In: A.P. Das (Ed.), *Perspectives of Plant Biodiversity*, Bishen Singh mahendra Pal Singh, Dehradun, pp. 45-51.
- Škorníèková, J., Šída, O., Jarolimova, V., Sabu, M., Fér, T., Trávníèek, P. and Suda, J. 2007. Chromosome numbers and genome size variation in Indian species of *Curcuma* (Zingiberaceae). *Annals of Botany* 100, 505-526.
- Škorníèková, J., Šída, O., Sabu, M. and Marhold, K. 2008. Taxonomic and nomenclatural puzzles in Indian *Curcuma*: the identity and nomenclatural history of *C. zedoaria* (Christm.) Roscoe and *C. zerumbet* Roxb. *Taxon* 57, 949-962.

- Upadhyay, A., Sharma, R.K., Singh, G. and Jain, A.K. 2013. Evaluation of antitumor activity of *Curcuma amada* Roxb rhizome. *International Journal of Scientific and Engineering Research* 4, 238-242.
- Velayudhan, K.C., Muralidharan, V.K., Amalraj, V.A., Gautam, P.L., Mandal, S., Kumar, D. 1999. *Curcuma* Genetic Resources. Scientific Monograph No. 4, New Delhi, National Bureau of Plant Genetic Resources.
- Wilson, B., Abraham, G., Manju, V.S., Mathew, M., Vimala, B., Sundaresan, S. and Nambisan, B. 2005. Antimicrobial activity of *C. zedoaria* and *C. malabarica* tubers. *Journal of Ethnopharmacology* 99, 147-151.