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Research Paper

Forking Pattern of Carpophore in Some Himalayan Umbellifers

Botany

KEYWORDS : forking, carpophore, mericarp, dissemination

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ABSTRACT

Evaluation of fruit morphology of 48 taxa of Himalayan Umbelliferae belonging to different tribes and all the three sub families of Apiacae(sensu Drude, 1898) through stereo microscope has revealed that the development of a free carpophore is extensively visible in taxa of the sub family Apioidae. It exhibits varied degree of forking at maturity and facilitates complete separation and improved mechanism for dissemination of the mericarps.

Introduction

The family Apiacae (nom.alt.Umbelliferae) comprising 3000-3750 species(Pimenov and Leonov, 1993) is cosmopolitan, although it portrays more abundance in the northern hemisphere(Mathias,1965,1971). The schizocarpic fruit in umbelliferae exhibits variation in various characteristics such as shape and size of ribs, location and arrangement of vascular bundles, number of scretory canals, presence of lignified cells in the inner layer of fruit wall and carpophore morphology. This has been fully realised by Tikhomirov and Tretyakova(1967) who opined that this variability holds tremendous potential in identification and classifiction of the family at different levels of taxanomic hierarchy.

Materials and methods

Source of the material : The present study is based on umbellifers collected either from natural populations inhabiting different parts of Jammu and Kashmir Himalaya or cultivated in the area for varied uses or from the herbarium specimens deposited in the Herbaria, University of Jammu, Jammu and University of Kashmir, Srinagar. The forking pattern of the carpophore of the fruit has been studied under 'Meopta' stereomicroscope and photomicrographs were taken at different magnifications on the meopta stereomicroscope, using 35 mm photo micrographic Olympus camera.

Carpophore

A specialized structural adaptation in the schizocarp of Umbelliferae is provided by the development and differentiation of the carpophore(Fig 1). At maturity, the ventral vascular bundle of the schizocarp gets detached and keeps the two

Fig 1: Anethum graveolens: two mericarps attached to a carpophore

mericarps held together until dispersal. In Araliaceae, which is phylogenetically nearest to Umbelliferae, the fruit does not bear distinct carpophore (Rodriguez, 1957). The carpophore is either absent in some taxa (*Centella asiatica, Hydrocotyle sibthorpoides*) or a free carpophore may be present in dorsally compressed fruit of the species of *Drusa, Gymnophyton, Mulinum* (Rodriguez 1957 and Tseng 1967). During evolutionary differentiation of the umbelliferae, the development of a free carpophore has accompanied broadening of the commissural face (Rodriguez 1957). In Saniculoideae including *Eryngium billardieri, E. coeruleum* and *Sanicula elata*, the schizocarps lack carpophore. On the contrary, the presence of calcium oxalate crystals on the commissural face of these and other species of the subfamily Hydrocotyloideae and Saniculoideae studied earlier, assist in achieving separation of the mericarps at maturity (Tseng, 1967).

The development of a free carpophore is extensively visible in taxa of the subfamily Apioideae. It exhibits varied

Fig 2: Carpophore forked at tip in Foeniculum *vulgare*

degree of forking (Fig 2 & Fig 3) at maturity and facilitates complete separation and improved mechanism for dissemination of the mericarps. Le-Maut and Decainse (1876) and Grey (1876) opined that the carpophore is of axial nature. Van Tieghem (1890-1894), Von Mohl (1863), Eichler (1875) and Hanslow (1891) however, suggested it to be appendicular. On the basis of her extensive study, Jackson (1933) concluded that being the central part of the ovary, the carpophore is mainly appendicular except for the short basal portion, which is receptacular.

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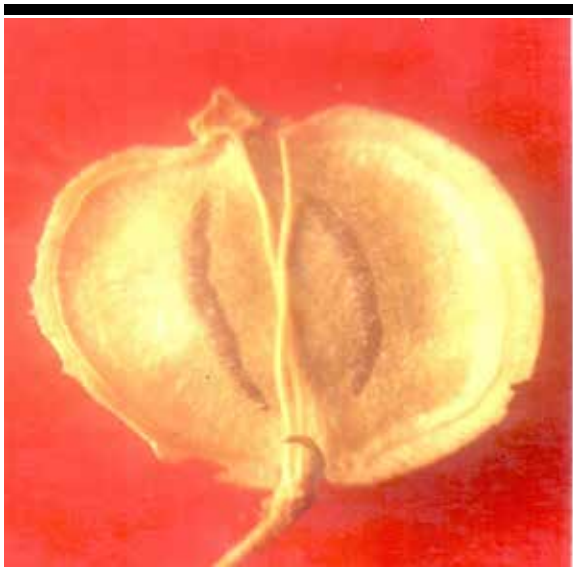

Fig 3: Heracleum canescens: well developed and completely forked carpophore

While no free carpophore is evident in *Coriandrum sativum* of the tribe Coriandreae and the mericarps do not separate easily at maturity, taxa of other tribes portray intra- as well as intertribal differences in the development of carpophore. The Coriandreae thus exhibiting an altogether distinct line of specialization within Apioideae (Heywood, 1971). Although, a free and forked carpophore is present in *Scandix pecten – veneris, species of Chaerophyllum, Turgenia latifolia and species of Torilis (tribe* Scandiceae) and in *Scaligeria stewartiana, Pleurospermum stylosum* and *Prangos pabularia* (Smyrineae), it is forked at the tip in *Daucus carota* (Dauceae). On the contrary, in taxa of the tribe Apieae, the carpophore forking varies; being forked at the tip in *Carum carvi, Foeniculum vulgare* and almost completely forked in *Bupleurum falcatum, B. longicaule, B. tenue, Oenanthe javanica and Ligusticum elatum.* However, in Angelica *arcangelica, Ferula jaeschkeana,* species of *Heracleum* and *Platytaenia lasiocarpa* (tribe Peucedaneae), it is *completely* forked and well developed.

Summary and conclusion

The carpophore is a specialized morphological structure that has developed in the schizocarp along with broadening of the commissure and achievement of dorsal compression. The schizocarp among Himalayan umbellifers, is devoid of any carpophore in *Hydrocotyle sibthorpioides, Centella asiatica, Eryngium billardieri, E. coeruleum, Sanicula elata* and *Coriandrum sativum,* whereas in other taxa, the carpophore forking varies, being forked only at tip to completely forked. The differentiation of carpophore and its forking pattern has been achieved in response to adaptation for different modes of dispersal. As compared to the schizocarp dispersal by epizoochory, the carpophore in anemochorous taxa is deeply forked.

REFERENCE

Eichler, A.W. (1875). Bluthendiagramme, Leipzig. | Gray, A. (1879). Structural Botany. 6th Ed. New York. | Hanslow, G. (1891). On the vasculasr system of floral organs and their importance in the interpretation of the morphology of flowers. J. Linn. Soc. Bot. London 28 : 151-197. | Heywood, V.H. and Dakshini, K.M.M. (1971). Fruit structure in the Umbelliferae Caucalideae. In V.H. Heywood (ed.) Biology & Chemistry of the Umbelliferae, pp. 215-232. Linn. Soc. Academic Press, London. | Jackson, G. (1933). A study of the carpophore of the umbelliferae. Am. J. Bot., 20 : 121-144. | Le-Maut, E. and Decainse, J. (1876). Traite general de botanique. London. | Mathias, M. E. (1971). Systematic survey of New world Umbelliferae. In V.H. Heywood (ed.). The Biology and chemistry of the Umbelliferae: 13-29. Academic Press, London. | Mathias, M.E. (1965). Distribution patterns of certain Umbelliferae. Ann. Mo. Bot. Getn. LII : 387-398. | Pimenov, M.G and Leonov, M.V. (1993). The genera of the Umbelliferae: a nomenclator., Kew: Royal Botanic Gardens, Kew | Rodriguez, R.L. (1957). Systematic anatomical studies on Myrrhidendron and other woody umbellales. Univ. Calif. Publ. Bot., 29(2) : 145-318. | Tikhomirov, V.N. and Tretyakova, O.N. (1967). A contribution to the morphology of Angelicinae. II. Comparative anatomy of the fruit of the species belonging to the subgenus Angelica of the genus Angelica L. Byull. mosk. Obshch. Ispyt. Prir., 72 :43-54. | Tseng, C.C. (1967). Anatomical studies of flower and fruit in the Hydrocotyloideae (Umbelliferae). Univ. Calif. Publs. Bot., 42 :1-79. | Von Mohl, H. (1863). Eine Kurze Bermerkoung Uber des Corpophorum der Umbelliferen. Frucht. Bot. Zeit. 21 : 264-266. |