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FAMILY AND CLUSTERS OF ELAEOCARPACEAE OF KARNATAKA, INDIA

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ABSTRACT

Family Elaeocarpaceae is represented by a single genus *Elaeocarpus* in Karnataka and are endemic to the Western Ghats part of the state. Review of literature showed that there are five taxa viz., *E. munronii* (Wt.) Mast, *E. serratus* var. *serratus* L, *E. serratus* var. *weibelii* Zmarzty, *E. tuberculatus* Roxb. and *E. variabilis* Zmarzty. There is scanty and imprecise information in the Floras about the family and taxa of Elaeocarpaceae. Aim of the present study is to document the characteristic features of the family and taxa which will help in identification of the plants belonging to this family. Extensive field survey and material collection were conducted to document the morphological and reproductive characters of each taxa and based on this the family characters were consolidated. On the basis of studies family Elaeocarpaceae is divided into four clusters *viz*., Munronii, Tuberculatus, Serratus and Variabilis. Herbarium of the specimens were prepared and deposited at Central National Herbarium, Botanical Survey of India, Kolkota (CAL).

Keywords: Elaeocarpaceae, Elaeocarpus, Endemic, Herbarium, Taxa, Western Ghats

INTRODUCTION

Family Elaeocarpaceae is represented by five taxa in Karnataka, *E. munronii, E. serratus* var. *serratus, E. serratus* var. *weibelii, E. tuberculatus and E. variabilis* **[1-10]**. All these taxa belong to the genus *Elaeocarpus*. They are all endemic to the Western Ghats parts of Karnataka, *i.e.* distributed in Chamarajanagara, Kodagu, Hassan, Dakshina Kannada, Udupi,

Chikkamagaluru, Shivamoga, Uttara Kannada and Belagavi districts, but not reported from Mysuru district.

Elaeocarpus taxa are evergreen trees recognizable from distance by their brick-red old leaves. They are moderate to large, buttressed trees, tree crown round or flat-topped, branching monopodial or produced in pseudo-whorls. Phyllotaxy alternate and acroramous. Inflorescence axillary raceme. Flowers hermaphrodite, radially symmetrical, pentamerous and hypogynous. Sepals 5, occasionally 4, polysepalous, valvate. Petals 5, rarely 4, polypetalous, and placed inner to corolla, stamens arranged on or inner to disc. Stamens 20 to 75, filaments short, anther long. Gynoecium bi to pentacarpellary, syncarpous, locules equal to the number of carpels, placentation axile. Style simple, stigma tapering, subulate, fruits drupe, encloses tuberculed one to few seeded stony endocarp, seed endospermic. Fruit dispersal zoochorous **[11-15]**. Genus *Elaeocarpus* is represented by 5 taxa in Karnataka, there are 3 species *E. munronii, E. serratus* var. *serratus, E. serratus* var. *weibelii, E. tuberculatus* and *E. variabilis*.

This study is an effort to compile the characters of Elaeocarpaceae family, based on the compilation of characters of five taxa distributed in Karnataka. This study will help in the identification of the taxa belonging to this family.

MATERIALS AND METHODS

Study area is part of the central Western Ghats which passes through Karnataka, locally called as 'sahyadri' or 'malenadu'. It is situated between 12.8 N and 16.14 N latitudes and 74.08" E and 76.19" E longitudes. The Western Ghats in Karnataka State covers an area of 44,870 km^2. The forest cover in Western Ghats of Karnataka makes up about 57% of state's forest. It covers 23 taluks of ten districts in the state *viz*., Chamarajanagara, Mysuru, Kodagu, Hassan, Chikkamagaluru, Shivamogga, Dhakshina Kannada, Uttara Kannada, Belagavi and Udupi **[16, 17]**.

Information on the geographical distribution of the plants belonging to the family *Elaeocarpaceae* distributed in Karnataka state is collected from the relevant Floras of this region and visiting herbaria. Specimens were collected from the 10 Districts of Karnataka where the Western Ghats extend. Several field visits were made to locate *Elaeocarpus* taxa, during collection visits, information about the habitat, height of the tree and other information was recorded in the field note book. Plant materials were collected during the vegetative, flowering and fruiting season and tied with collection number tag. Collected materials were sprinkled with water, stored in polythene bags, brought to the laboratory for the detailed study of material and preparation of herbarium.

Detailed observations of the floral parts were done using the stereo binocular microscope (Labomed CZM4). Photographs of individual leaf, part of the leaves, floral parts were taken using stereo microscope and camera. Relevant units are used for the measurement of different parts of the plant based on the size of the part viz., µm, mm, cm and ft. Henslow **[18]**, Willis **[19]**, Harris & Harris **[20]**, Hickey & King **[21]**, Mabberley **[22]** and Beentje **[23]** were referred for the technical description.

Collected specimens were identified using Floras, consulting expert Taxonomists and comparing with the voucher specimens deposited in the herbarium centers viz., Department of Botany, Yuvaraja's College, University of Mysore, Mysuru [YCM(UOM)]; Department of Studies in Botany, Manasagangotri, University of Mysore, Mysuru; Gandhi Krishi Vignan Kendra, Bangalore (UASB); Madras Herbarium, Botanical Survey of India, Southern Regional Centre, Coimbatore (MH); Herbarium, Botanical Survey of India, Western Regional Centre, Pune (BSI). Authentic digital herbarium centres were also referred viz., Digital Flora of Karnataka (JCB), (http://florakarnataka.ces.iisc.ac.in/hjc); Royal Botanic Garden, Edinburgh (RBGE), (http://www.rbge.org.uk); Royal Botanic Garden, Kew (RBG), (http://www.kew.org); New York Botanic Garden (NY), (http:sciweb.nybg.org); Missouri Botanical Garden (MO), (http://www.missouribotanicalgarden.org); Tropicos (http://www.tropicos.org). Nomenclature of taxon and classification are followed according to International Association for Plant Taxonomy (http://www.iapt-taxon.org); Angiosperm Phylogeny Website, (www.mobot.org/MOBOT/research/AP) and The Plant List, (http://www.theplantlist.org).

Herbarium preparation and deposition of suitable plant material with reproductive structure were used for the preparation of herbarium. Standard procedures were followed for herbarium preparation. Pressed, dried and poisoned materials were mounted on the handmade paper of standard size and labelled **[24, 25]**. The voucher specimens of *Elaeocarpaceae* members collected from Karnataka are deposited at the Central National Herbarium, Botanical Survey of India, Kolkata (CAL), herbarium of DOS in Botany, Manasagangotri, University of Mysore, Mysuru and Department of Botany, Yuvaraja's College (Autonomous), University of Mysore, Mysuru [YCM (UOM)BOT].

RESULTS & DISCUSSIONS

Elaeocarpus taxa were collected from the stretch of the central Western

Ghats passing through nine districts of Karnataka namely Chamarajanagara, Kodagu, Hassana, Dakshina Kannada, Udupi, Chikamagaluru, Shivamoga, Uttara Kannada and Belagavi. They are distributed in the uninterrupted montane, along the slopes of hills, riverine, lowlands of evergreen, semievergreen, moist deciduous, with an annual rainfall ranging 600–3500 mm and at an altitude of 700–2150 m.

Family Elaeocarpaceae is represented by single genus *Elaeocarpus* in Karnataka; all taxa are trees, height ranges from 8–25m; trees often with buttresses, it may be plank, root spur, or sinuous type; branching in most taxa is monopodial, in some 'Terminalia' type; tree crown may be flat or round **(Figure 1)**.

Phyllotaxy alternate, usually acroramous; stipulate, stipules free lateral, triangular, sericeous, caducous; petiolate, often serrate, usually acute; domatia common, gland-like in the axils of main veins, sometimes in axils of sub-veins, mature domatia open and become crater-like, acarodomatia or 'mite houses' type, inhabited by mites.

Inflorescence axillary raceme, long interval between emergence of young inflorescence axis and flower blooming; by the time flowers bloom, leaves subtending inflorescence fall off exposing inflorescences; the inflorescence thus looks extra-axillary or developed below cluster of leaves, a striking phenomenon observed in *Elaeocarpus* taxa.

Flowers showy, bracteate, pedicellate, regular, hermaphrodite, dichlamydeous, pentamerous rarely tetramerous, hypogynous; sepals 5 rarely 4, ovate, green or red, polysepalous, valvate, petals 5 or 4, polysepalous, lacinate apex, induplicate-valvate, bright yellow, orange or pale brown annular cushion like disc present; stamens 25–75, arranged in five groups on inner side of disc, alternating with disc lobes, filaments short, anthers long, anthers comose, aristate or with extended apex, dithecous, tetragonal, basifixed, dehiscence through apical transverse splitting; carpels 2–3, syncarpous, superior, locules equal to carpels, 2–3 rows of ovules in each locule, placentation axile, one rarely 2 fertile, remaining abortive, style long, stigma stylodia, subulate; Floral construction is essentially similar in all *Elaeocarpus* taxa. Fruit drupe, epicarp thin, mesocarp pulpy, endocarp stony, variously tubercled, oblong, ellipsoidal, obovate or spherical; pyrene bi– tri valved, radially or bilaterally symmetrical, tuberculation characteristic of the species; seeds usually single, fusiform **(Figure 2)**.

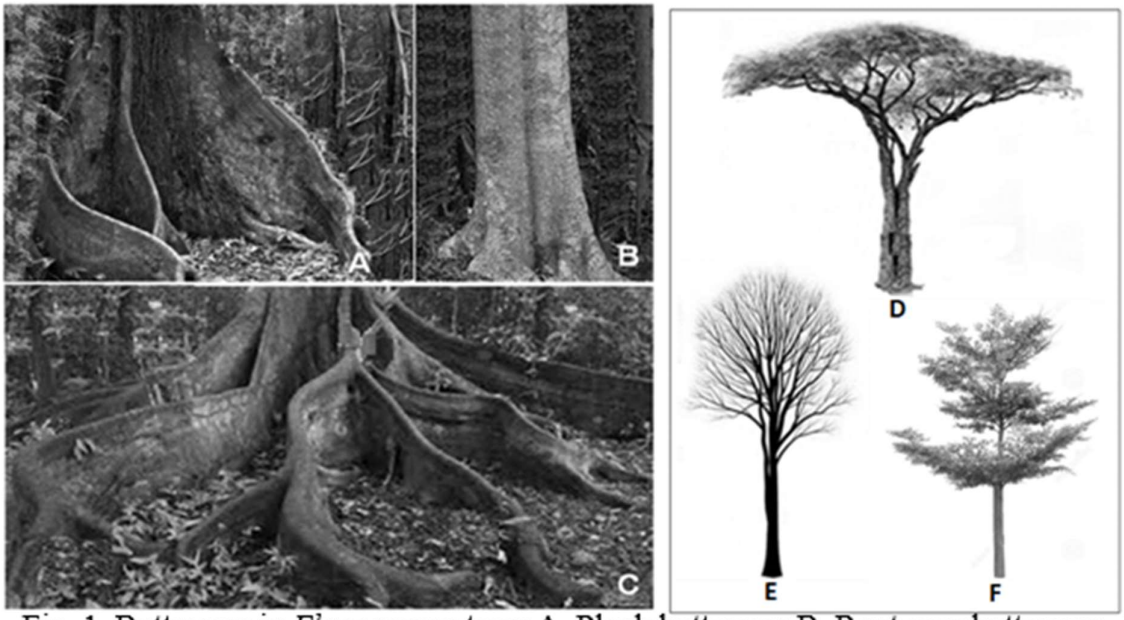

Fig. 1. Buttresses in *Elaeocarpus* taxa: A. Plank buttresses B. Root spur buttresses C. Sinuous buttresses
Type of crown and branching: D. Flat crown, monopodial branching E. Round top Crown F. Terminalia type branching

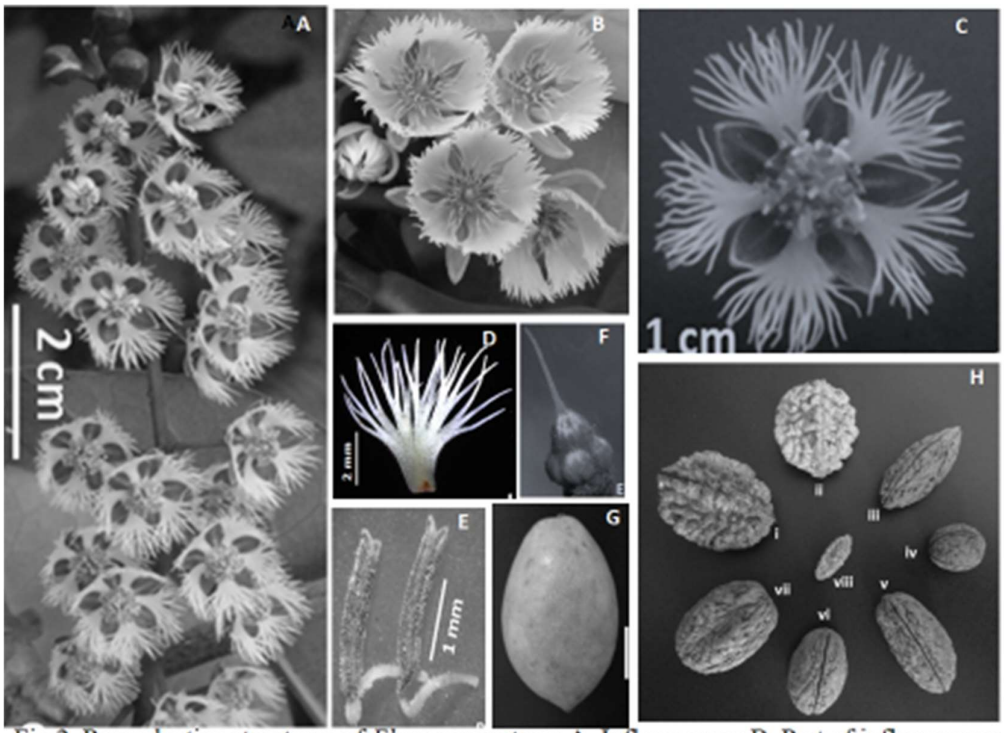

Fig.2. Reproductive structures of *Elaeocarpus* taxa: A. Inflorescence B. Part of inflorescence, C. Flower D. Petal E. Stamens F. Gynoecium G. Fruit H. Pyrenes

For the sake of convenience and to facilitate easy identification, Elaeocarpus taxa are divided into four clusters-

1. Cluster Munronii: Flat topped trees with sinuous buttresses; senescent leaves turn yellow; diameter of flowers > 2 cm, anthers aristate, ovary bilocular, 2 ovules per locule; ripe fruits turn bluish grey, pyrenes bilaterally symmetrical, endocarp fibrous. The cluster encloses one species *E. munronii*.

2. Cluster Tuberculatus : Trees with plank buttresses; branching 'Terminalia' type in young stage; senescent leaves turn red or yellow; flower diameter > 2 cm; anthers aristate; ovary bilocular; fruits green, pyrenes bilaterally symmetrical, stony, tubercles prominent, seeds flat. The cluster includes *E. tuberculatus.*

3. Cluster Serratus : Round topped trees, buttresses when present root spur type, aerial roots may be present; flower diameter < 2 cm; anthers comose; ovary three locular; fruits non edible, pyrenes radially symmetrical, endocarp stony, tubercles not prominent, canaliculation may be present. Cluster comprises two varieties, *E. serratus* var. *serratus* and *E. serratus* var. *weibelii*.

4. Cluster Variabilis: Round topped trees, buttresses when present root spur type, aerial roots may be present; flower diameter < 2 cm; anthers non-comose; ovary three locular; fruits edible, pyrenes radially symmetrical, endocarp stony, tuberculation obscure. Cluster includes one species *E. variabilis*.

SUMMARY AND CONCLUSION

Extensive field survey and material collection were done to document the diversity of *Elaeocarpus* taxa for the study of morphological characters. Plant collections were made from Chamarajanagara, Kodagu, Hassan, Chikkamagaluru, Shivamogga, Dhakshina Kannada, Uttara Kannada and Belagavi Districts of Karnataka State. Field observations were noted down and photographs were taken in the field. Collected plant materials were brought to the laboratory for further studies.

Plant descriptions of the taxa collected were done based on extensive field survey and study of materials. Herbarium of each taxon collected from various localities were prepared. Plant specimens were identified using relevant literature, consulting the experts and studying the herbarium specimens in various herbarium centres *viz*., YCM(BOT)UOM, DOS in Botany, Manasagangotri, University of Mysore, Mysuru; JCB, UASB, MH and BSI, also digital images of RBGE and RBGK were referred.

Present study resulted in the study of characters of 5 taxa comprising 3 species and 2 varieties of genus Elaeocarpus distributed in Karnataka E. munronii, E.

serratus var. serratus, E. serratus var. weibelii, E. tuberculatus and E. variabilis.

All *Elaeocarpus* taxa are trees, most of them can be recognized easily by the presence of characteristic senescent leaves; alternate leaves acroramous, stipulate, simple, penninerved; inflorescence axillary racemes, inflorescence and flowers are produced in large numbers, at the time of blooming due to falling off of subtending leaves, inflorescences get exposed below crown of leaves; flowers bracteate, ebracteolate, bisexual, actinomorphic, usually pentamerous and hypogynous; ovary bi or trilocular, placentation axile, ovules more than 2 per locule; fruit a drupe, pyrene variously tuberculated, encloses usually single fertile seed; young parts of plant usually sericeous, floral organs hairy, often velvutinous.

This study has helped to divide the genus *Elaeocarpus* into four clusters. Earlier also taxonomists have tried to further divide the genus in order to resolve the complication of species delimitation and identification, different taxonomists have tried to subdivide the genus into sections. Masters divided the species of Indian sub-continent into 4 sections **[26]**. Schlechter **[27]** divided Papuasian species into 9 sections. New Guinea species of Elaeocarpus were divided into 7 sections by Smith **[28]**. As the Elaeocarpus species show local endemism, infra generic division proposed by various authors is specific to particular habitat **[26, 27, 29]**. This clustering can be extrapolated for grouping of species distributed in India as well as Indian subcontinent.

REFERENCES

[1] Rao, R. R. and Razi, B. A., 1981. A Synoptic Flora of Mysore District. Today & Tomorrow‟s Printers & Publishers, New Delhi. 674 pp.

[2] Yoganarasimhan, S. N., Subramanyam, S. N. and Razi, B. A., 1982. Flora of Chikmagalur District. International Book Distributors, Dehra Dun. 407 pp.

[3] Saldanha, C. J., 1984. Flora of Karnataka 1. Oxford & IBH Publishing Co., New Delhi. 535 pp.

[4] Murthy, K. R. K. and Yoganarasimhan, S. N., 1990. Flora of Coorg (Kodagu), Karnataka, India. Vimsat Publishers, Bangalore. 712 pp.

[5] Ramaswamy, S. N., Rao, M. R. and Govindappa, D. A., 2001. Flora of Shimoga District, Karantaka. Prasaranga, University of Mysore, Mysore. 753 pp.

[6] Zmarzty, S., 2001. Revision of Elaeocarpus (Elaeocarpaceae) section Elaeocarpus in Southern India and Sri Lanka. Kew Bull 56: 405–447.

[7] Bhat, K. G., 2003. Flora of Udupi. Indian Naturalist, Udupi. 915 pp.

[8] Manjunath, B. K., Krishna, V. and Pullaiah, T., 2004. Flora of Davanagere District, Karnataka, India. Regency Publications, New Delhi. 212 pp.

[9] Sharvani, K. A., Sadananda, K. B., Sampath Kumara, K. K. and Devaki N. S., 2013. Floristic study of Kikkarally, a village located in the Western Ghats, a biodiversity hot spot. Ind J Trop Biod 21: 1–14.

[10] Bhat, K. G., 2014. Flora of South Kanara: Dakshina Kannada and Udupi Districts of Karnataka. Taxonomy Research Centre, Udupi. 928 pp.

[11] Brongniart, A. T. and Gris, 1861. Description de quelques Elaeocarpees de la Nouvelle Caledonie. Bull Soc Bot France 8: 198–203.

[12] Merrill, E. D., 1995. Plant life of the Pacific world. Tuttle Publishing, Vermont, U.S.A. 320 pp. Merrill, E. D., 1951. Notes on Elaeocarpus Linnaeus. J Arn Arb 32: 157–200.

[13] Brizicky, G. K., 1965. The genera of Tiliaceae and Elaeocarpaceae in the southeastern United States. J Arnold Arbor 46: 286–307.

[14] Weibel, R.W., 1968, Morphologie de l‟embryon et de la graine des Elaeocarpus. Candollea 123: 101–108.

[15] Coode, M. J. E., 2004. Elaeocarpaceae, 135–144. In: E Kubitzki (ed.) The Families and Genera of Vascular Plants 6-Flowering Plants, Dicotyledons, Celastrales, Oxalidales, Roasales, Cornales, Ericales. Springer-Verlag, Berlin.

[16] Menon, S. and Bawa, K. S., 1997. Applications of geographic information systems, remote-sensing, and a landscape ecology approach to biodiversity conservation in the Western Ghats. Curr Sci 73 : 134–145.

[17] Kaveriappa and Shetty, B. V., 2001. Biodiversity of the Western Ghats with speciesl reference to conservation of plant diversity at Kaiga. Int J Nuclear Power 15: 40–42.

[18] Henslow, J. S., 1856. A Dictionary of Botanical Terms. Cambridge University Press. 218 pp.

[19] Willis, J. C., 1919. A Dictionary of the Flowering Plants and Ferns. Cambridge University Press. 701 pp.

[20] Harris, J. G. and Harris, M. W., 1994. Plant Identification

Terminology-An Illustrated Glossary. Spring Lake Publishing, Spring Lake, Utah. 206 pp.

[21] Hickey, M. and King, C., 2000. The Cambridge Illustrated Glossary of Botanical Terms. Cambridge University Press, Cambridge. 19 pp.

[22] Mabberley, D. J., 2008. Mabberley‟s Plant-book A Portable Dictionary of Plants, their Classifications and Uses. Cambridge University Press. 1040 pp.

[23] Beentje, H., 2010. The Kew Plant Glossary: An illustrated Dictionary of Plant Terms. Kew Publishing London. 160 pp.

[24] Bridson, D. and Forman, L., 1998. The Herbarium Handbook. Royal Botanic Gardens, Kew, UK. 334 pp.

[25] Resource Inventory Committee, 1999. Voucher Specimen Collection, Preparation, Identification and Storage Protocol: Plants & Fungi. Standards for Components of British Columbia's Biodiversity No. 4b. Version 2.0. Ministry of Environment, Lands and Parks Resources, Victoria, British Columbia. 37 pp.

[26] Hooker, J. D., 1872. Flora of British India 1. Reeve & Co., London. 740 pp. Hule, A. K. and Juvekar, A. R., 2009. Effect of alkaloidal fraction of Elaeocarpus ganitrus Roxb. seeds on murine in vitro immune parameters. J Pharm Res 2: 1261–1265.

[27] Schlechter, R., 1916. Die Elaeocarpaceen Papuasiens. 5. Bot Jahrb Syst 54: 92–155.

[28] Smith, A. C., 1953. Studies of Pacific Island plants, XV: The genus Elaeocarpus in the New Hebrides, Fiji, Samoa and Tonga. Washington. 51 pp.

[29] Corner, E. J. H., 1939. Notes on the systematy and distribution of Malayan Phanerogams III. Gard Bul stru Settlem 10: 239–329.