Indian J.L.Sci.2(2) : 39-42, 2013

ISSN : 2277-1743 (Print)
ISSN : 2278-7879 (Online)

MORPHOTAXONOMY, MEDICINAL USE AND NEW HOST RANGE OF *Dendrophthoe falcata* var. *coccinia* IN CHAMPARAN, ITS CAUSE AND CONSEQUENCES

R. B. SINGH[a1] AND P.K. GUPTA[b]

[a]P.G. Department of Botany, M.S. College, Motihari, Bihar, India
E-mail: rbsingh@gmail.com
[b]Research Plantica, Near S.N.S. College, Motihari, Bihar, India
E-mail: pkg555@rediffmail.com

ABSTRACT

***Dendrophthoe falcata* (L) Ettingsh var. *Coccinia* commonly called "Banda" is a very attractive and common angiospermic parasite of the area and grows on various angiospermic trees, but in this district of Champaran it is being reported for the first time from uncommon and unusual host trees, viz., *Punica granatum, Callistemon lanceolatus, Psidium guajava, Eugenia jambolana, Aegle marmelos, Albizzia lebbeck, Eucalyptus globuls, Citrus maxima* other than common hosts *Mangifera indica, Ficus religiosa,* and *F. rumphii*. These unusual host ranges have attracted us to know the real causes. Our findings report that due to over exploitation and cutting of their natural host trees this parasite has changed its habitat and begin to grow and establishes itself on such uncommon and unusual host trees. Medicinal studies reports its effectiveness on some new and important diseases, further studies are being continued.**

KEYWORDS : Champaran, *Dendrophthoe falcata* (L), Morphotaxonomy, Medicinal Uses, New Unusual Hosts And Causes

The district Champaran (North Bihar) is well known in the history of India for its "Champaran Satyagrah Movement" of Mahatma Gandhi, the father of Nation, who started this movement against the 'British rule' in the month of April 1917. Champaran is the northern extremities of Indian territory of Bihar touching Nepal, lies between 26^0, 16' -27^0.31N latitude and in between 83^0.50-85^0.18' E longitude at an elevation of 66.4-135.8 m above sea level covers an area of 8,404.7 Sq. Km. with a population of 90,05,648.

The foot hills of Himalayan Tarai region of the district, touching Nepal was once well known for its wealthy flora with diverse vegetation, but is loosing its identity now due to over exploitation and human interference, and these all activities led to extinction of most of the valuable plants and others are under threat . Due to moist climatic conditions, the parasitic and epiphytic plants also found their suitable home, grow and flourish well on various angiospermic plants of tree habit. *Dendrophthoe falcata* (L) Ettingsh var. *Coccinia*, commonly known as 'Banda' is a very attractive and common parasite growing mainly on Mango, Shisham, Sirish, Bargad almost throughout the country (Wellman, 1964) but is being reported for the first time from some uncommon and unusual host trees viz. *Punica granatum* (Anar), *Callistemon lanceoltus* (Bottle-Brush), *Psidium guajava* (Amrood), *Eugenia jambolana* (Jamun), *Aegle marmelos* (Bel), *Albizzia lebbeck* (Siris), *Ficus religiosa* (Pipal), *Ficus rumphii* (Pakad) *Eucalyptus globulus*, *Citrus maxima* (Gagal) from this district , the Champaran, North Bihar.

MATERIALS AND METHODS

Dendrophthoe falcata (L) Ettingsh var. *Coccinia* belonging to Loranthaceae family of mistletoes is a common hemi-parasite of fruits, wastelands, avenues and forest trees. Reports say that it has about 401 plant hosts and about 31 species spread across tropical Africa, Asia and Australia (Flora of China, 2003) among which 7 species are found in India. Two varieties viz. *Falcata* (Honey suckled Mistletoe) and var. *Coccinia* (Red Honey suckled Mistletoe) distinguished by white and red flowering respectively, are wide spread in our country. The most common host is the mango tree, and in northern India 60-90% of the mango trees and some other trees such as Ficus sp, *Albizzia* sp. and *Dalbergia* sp. are infected by the parasite. It poses serious losses to economically valuable fruit trees, flowering plants and those with medicinal properties, whether growing in forests, orchards or gardens (Sridhar & Rao, 1979). In Central India most common host is *Madhuca latifolia* (Mehrotra, 1983). It is called 'Vriksha bhaksha' in Sanskrit and as 'Banjhia' in Hindi, meaning eater of trees, describes the damage done by it and suggests that it was present in India since ancient times. (Photo plate-1,2 & 3).

[1]**Corresponding author**

Photo Plate 1 :*Dendraphthoe falcata* var. *coccinia* as angiospermic parasite on Mangifera indica tree

Photo Plate 4: Tumour formed at the point of haustorium penetration in the host tissues

Photo Plate 7: Bright red colored inflorescence with tubular flowers of *D. falcata* var. *coccinia*

Photo Plate 2: *D. falcata* parasites on Ficus rumphii

Photo Plate 5: A leaf of *D. falcata* showing leathery texture

Photo Plate 3: *D. falcata* with cluster of red colored inflorescence on Aegle marmelos

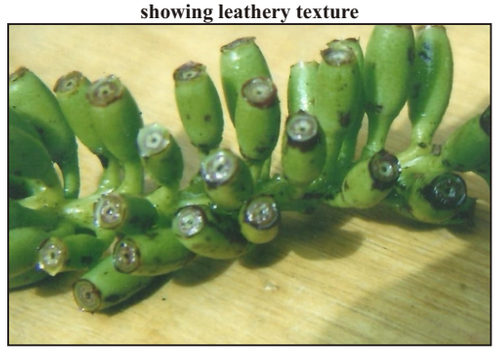

Photo Plate 6: Cluster of fruits

Morphotaxonomy

Dendrophthoe falcata (L) Ettingsh var. *Coccinia* is a strongly branched and glabrous shrub, grows on flowering plants as parasite. The stem is thick, erect, flattened at the nodes and appears to arise in clusters at the point of attack. This cluster forms a dense and bushy growth which can easily be spotted on the host trees. The point at which the host is attacked and where haustorium penetrates, often swells to form tumour (Photo Plate-4) which vary in size according to age of the parasite. Some times the parasite produces creeping branch which runs parallel to the host stem and forms haustoria at certain intervals. There are different opinions regarding haustoria, some called it suckers, however most of the morphologists have been thought to be adventitious roots greatly modified as organs of absorption (Mathur, 1970). . Leaves are simple, leathery (Coriaceous), entire, thick, persistent, attractive and evergreen with smooth texture, venation net like but not well clear (Photo Plate-5). There is variation in shape and size of lamina and its phyllotaxy. Leaves are sessile or semi sessile and exstipulate, alternate or in whorls of three or opposite or the opposite leaves may be little below or above on the nodes. Flowers are large, tubular, bisexual and bright red colored, develop in clusters and are arranged in spike (Photo Plate-6). Perianth are large, bright colored, a slightly toothed rim known as 'Calyculus' is present just below the

perianth, some times it is treated as calyx and perianth proper as corolla; while other think it to be the part of the receptacle. Stamens are six with long filament, extrose, anthers are adnate. Pollen grains are trilobed with smooth margin (Bera et al, 2006). Carpels are-3, syncarpus, unilocular with large central placenta having many ovules and are not differentiated with placenta. Placentation is basal and ovary is inferior.

The fruits are pseudocarp, where ovary got fused with receptacular cup developing a berry like fruits which are single seeded (Photo Plate 7). Pollination is entomophilous, the bright colored perianth attract the insects and birds. The seeds are easily carried by birds embedded in th sticky and viscous pulp of the berries. The bright red colour of the berries attracts the insects and birds. Kunwar et al (2005) has reported spangled. 'Dronao sun' birds as new pollinators which carried nectar of *Dendrophthoe falcata* flowers.

II. Medicinal Uses *Dendrophthoe falcata* (L) Ettingsh var. *Coccinia* is being used in indigenous system of medicine as cooling, bitter, astringent, aphrodisiac, narcotic and diuretic for the last two decades (Alekutty et al, 1993) and is also useful in treatment of pulmonary tuberculosis, asthma, menstrual disorders, swelling wounds, ulcers, renal and vesicle calculi (Amarthe et al, 2008; Pattanayak and Sunita, 2008). Nadkarni, (1993) has reported the anticancerous activity, especially the plant decoction used by women as an anti-fertility agent. Recently Pattanayak and Sumita, 2008 has reported that ethanolic extracts of *Dendrophthoe falcata* possess the wound healing, antimicrobial, anti-oxidant and antiseptic properties. Similar report was also made by Shihab et al 2006. Mallavadhani et al 2006 are of opinion that medicinal properties of this hemi parasite may vary in its effect respective to different hosts, to which it establishes a relation. Very Recently Pattanayak and Sunita, (2008) has reported that hydro-alcoholic extract of *D. falcata* reduces tumour of mammary carcinogenesis in 'Wistar' female rats.

III. Host Range: The District Champaran of north Bihar possess the tropical dry deciduous forest with unique vegetation and diversity of plant flora .Various lentic and lotic water bodies, riverine network etc. has provided ample opportunity to flourish diverse form of vegetation. The forest vegetation near foot hill areas of Himalayan Tarai, adjacent to Nepal is tropical and the majority of the forest embraces evergreen, semi evergreen and deciduous forest. But for the last few decades due to various human activities viz. cutting of forest trees for construction of roads, agricultural practices, infrastructure development , loggers, slash and burn farmers in and around study area has resulted the loss of many vascular plants, especially of tree habits and it caused soil erosion (Bera et al, 2006) . These all anthropogenic activities have caused the loss of biodiversity. The loss of biodiversity may also be attributed to heavy rainfall and flood, especially in the Himalayan belt, caused soil erosion and led to loss in biodiversity and perhaps has changed the habitat of the parasite. In lack of usual host trees, the parasite begins to grow and establish on uncommon and unusual host tress.

RESULTS AND DISCUSSION

The host-parasite inter-relations are of great ecological importance. Louis Pasteur was of opinion that the susceptibility of a host is increased as the result of stress caused by effect of low environmental temperature. However, recent studies have revealed that other environmental factors are also involved in maintaining the host-parasite relationship. The study of macro and micro ecology reveals that the presence or absence of a number of physical and biological factors in the environment directly or indirectly affects the densities and distribution of parasite.

Parasite population is greatly influenced by the vegetation that serve as food and shelter for hosts, both definitive and intermediate.

The bright and yellowish green berry fruits of *Dendrophthoe falcata* attract the birds (and insects), the minute seeds embedded in sticky fruit-pulp got sticks with the bird's beak during eating of fruits, and when birds rub their beak with the host plant stem, they adhere to the branch of host plant and after rainy season, germinate into a new plant. As they grow, their modified adventitious roots or haustoria penetrate the stem bark and sap wood of host plant and absorb water and minerals from them. In the absence of the usual host trees, the birds which act as pollinating agent, sit on other trees of the areas, rub their beak with the branches of trees and leave the minute seeds with the sticky pulp of the berry fruit. The left seeds on stem branches

germinate after getting moisture from the environment and grow into a new plant. It is important to note that the birds do not sit only on particular plant trees, to which we are reporting as the new host trees, but also on other trees, but they germinate and grow only on certain trees and not-on all trees. The reason might be the Louis Pasteur's host parasite relationship which is of great ecological importance . In our opinion other factors are also involved which may be external or internal or both factors are equally responsible for its growth and survival. The seeds either do not germinate due to lack of proper temperature and moisture or if germinate, do not survive due to certain environmental factors or they grow but do not establish into mature plant either due to lack of proper nutrients and moisture or the haustoria could not make relation with the conducting tissues of the host plant or the nutrients whatever are taken from the host tissues are not suited to the parasite, resulting its death or senescence. These might be the cause that this *Dendraphthoe falcata* (L) Ettingsh var. *Coccinia* has not been reported from the other flowering trees of the area but from the trees mentioned above. However, new reports on *D. falcata* has mentioned around 40% plant hosts (Pattanayak & Sunita, 2008). Increase in host range of *D. falcata* has also been reported by Calvin & Wilson, 2009 saying that it continuously and rapidly widening and is in favour of our finding.

REFERENCES

Alekutty N.A., Srinivasan K.K., Gundu Rao P, Udupa A.C. and Keshavamurthy K.P., 1993. Diuretic and antilithiatic activity of *Dendraphthoe falcata*. Fitoterapia **64**: 325-331.

Anarthe S.J., Bhalke R.D., Jadhav R.B., Surana S.J., 2008. In vitro antioxidant activities of methanol extract of *Dendraphthoe falcata* (L) Stem.Biomed **3(2)**:182-189.

Calvin C.L. and Wilson C.A., 2009. Epiparasitism in Phoradendron durangense and Dendraphthoe falcata (Viscaceae). Aliso. **27**: 1-12.

Flora of China vol. 5, Page 227. June 1, 2003 published by Science Press (Beijing) & Missouri Botanical Garden Press, on line at www. e.floras, Org.

Kujit J., 1969. The biology of parasitic flowering plants. Univ. of Callifornia Press, Berkely:264.

Kunwar R.M., Adhikari N. and Devkota M.P., 2005. Indigenous use of mistletoes in tropical and temperate region of Nepal, Banko Jankari, **15**:38-42.

Mathur R.C., 1970. Systematic Botany (Angiosperm). Agra Book Stores at Om Printing Press, Agra (X^{th} Ed.) 210.

Mallavadhani U.V, Narasimhan K., Sudhakar AVS, Mahapatra A., Li W.,Breemen, RBV., 2006. Three new penta cyclic Triterpenes and some Flavonoids from the fruits of an Ayurvedic plant *Dendrophthoe falcata* and their Estrogen Receptor binding activity. Chem. Pharma.Bull., **54**:740-744.

Mehrotra R.S., 1983.Plant pathology. Tata Mc Graw-Hill publicaton Company Ltd.: 743-744.

Nadkarni K.M., 1993. Indian Materia Medica Vol. I Popular Prakashan : 750.

Pattanayak S.P. and Sunita P. 2008, Wound healing, anti-microbial and antioxidant potential of *Dendrophthoe falcata* (L.F.) Ettingsh.. J. of Ethnopharmacology, **1200**: 241-247.

Shihab H.M, Iqbal A.M, Sukla M., Methedi M.M.,Kumar S.,Masami I.and Jamal, U.S., 2006.Antioxidant, Antinoceceptive activity and general toxicity. Study of *Dendraphthoe falcata* and isolation of quercitrin as the major component. Oriental Pharmacy and Experimental Medicine, **6**:355-360.

Singh R. S., 1998. Plant Diseases. Oxford & I.B.M. Publishing Co. Pvt. Ltd. ($VIII^{th}$ ed.): 588-59.

Sridhar T.S. and Rao V.R., 1979, *Dendraphthoe falcata*, a menace to fruit Orchards. Current Science **38**:1908.

Tarr S.A.J.; 1972. The Principles of plant pathology. The Mac Millan Press, London.

Wellman F.L. (1964). Parasitism among neotropical phanerogams Ann. Rev. Phytopath. **2:**43-56.