



***DENDROPHTHOE FALCATA* (L.F) ETTINGSH VAR. PUBESCENS (HOOK.F). ON DIFFERENT HOST RECORDED FROM REGION IN AND AROUND YEOOR HILL, THANE**

Laxmishree S. Chengala and Geetha S. Menon*

Department of Botany, R. K. Talreja College of Arts, Science & Commerce, Ulhasnagar, Dist. Thane, Maharashtra

*Corresponding Author Email: drgeetamenon@gmail.com

ABSTRACT

Dendrophthoe falcata is a hemiparasite associated with tropical trees specifically the mango tree and rarely few timbers yielding trees. This hemiparasite has been recognized as a damaging agent of fruit yielding and timber yielding plants. It has been reported to have increased its host range and found growing on varieties of trees. In the present investigation the region in and around the forest of Yeoor hill, Thane (18sq .km) was explored for a period of four years from 2013 to 2017 and all the trees growing in the region were screened to locate the association of the hemiparasite *Dendrophthoe falcata* belonging to family Loranthaceae. The hemiparasite was found associated with only 200 trees of the total trees screened, on twenty different members belonging to twelve families like Anacardiaceae, Sapotaceae, Leguminosae, Rhamnaceae, Verbenaceae, Bombacaceae, Moraceae, Boraginaceae, Lythraceae, Myrtaceae, Meliaceae and Tiliaceae. The hemiparasite was identified as *Dendrophthoe falcata* (L.f) Ettingsh var *pubescens* (Hook.f). Both, the variety of the hemiparasite and its occurrence on different host are reported for the first time from the study area. In this region it was more common on fruit trees like *Achras sapota* and *Mangifera indica* as compared to other host trees like *Acacia auriculiformis*, *Ficus religiosa*, *Samanea saman*, *Melia azadirach*, *Zizyphus jujuba*, *Ceiba pentandra*, *Bauhinia purpurea*, *Ficus glomerata*, *Eucalyptus globulus* and *Grewia* sps.

KEY WORDS

Dendrophthoe falcata, hemiparasite, Loranthaceae, Yeoor hill, Thane region

INTRODUCTION:

Dendrophthoe falcata (L.f.) Ettingsh (known as mistletoe) belonging to family Loranthaceae is an angiospermic perennial climbing woody hemiparasitic plant indigenous to tropical regions especially in India, Sri Lanka, Thailand, China, Australia, Bangladesh, Malaysia and Myanmar. The genus comprises of about 31 species spread across tropical Africa, Asia and Australia and reported on number of host (Huaxing and Michael, 2003). It is widely distributed throughout India, frequently observed on many host plants and about 7 species are reported in India (Kodithala and Kiran Mani, 2013). Moreover, four variety of the plant *Dendrophthoe falcata* (L.f.) Ettingsh has been reported

on various host in different parts of Indian forest. The entire plant of *Dendrophthoe falcata* has ethnobotanical importance and is used in indigenous system of medicine as a potential medicinal agent for cooling, astringent, aphrodisiac, narcotic and diuretic activities (Alekutty *et al.*, 1993). The plant parts like leaves, stem and bark are known to possess antibacterial and antioxidant activities (Gaurav *et al* 2010 & Nipun *et al* 2011).

The medicinal properties of this hemiparasite seem to be greatly influenced by its host plant. The plant is also called 'Vriksha bhaksha' in Sanskrit meaning 'eater of trees' as it causes lot of damage to the host, also suggesting that it was present in India since ancient

times. This hemiparasite poses a serious threat to economically valuable fruit trees, flowering plants and those with medicinal properties, whether growing in forests, orchards or gardens (Singh 2013). The parasite makes a contact with their host plants by forming a complex organ called haustorium and through this they draw water and nutrients from the host plants (Kuijt, 1977). The non-specificity for the selection of host plant is one of the characteristic features of the *Dendrophthoe falcata* (L.f) Ettingsh (Sampathkumar, 1980). There is an increase in host range of *D. falcata* saying that is found to be continuously and rapidly widening (Calvin and Wilson, 2009).

The Yeoor Hills has around sixty sq km of deciduous forest with moist and warm climate and 2667mm average rain fall (Patwardhan, 2008). The forest is covered with tall trees, shrubs, herbs and climbers approximately of 150 types (Pejaver, 2001). This moist and warm climatic conditions of the Yeoor Hills are suitable for parasitic and epiphytic plants to thrive, grow and flourish well on various angiospermic plants of tree habit. The Yeoor Hill range, extending from Thane to Borivali, is a wealth of beautiful landscapes, complete with different species of flora and fauna. It has been previously listed as a "reserved forest" and boasts of a unique, flourishing ecosystem. Yeoor hills forest in Thane city is a part of Sanjay Gandhi National park (Borivali National park) and popularly known for panthers. In the present study occurrence of *Dendrophthoe falcata* (L.f) Ettingsh var. *pubescens* (Hook.f.) on different host plant generated interest to survey the area in and around Yeoor hills.

MATERIALS AND METHODS

The Yeoor hill range is located at 19° 14'14.98"N, 72°56'42.19"E, spread over 60 sq. km and the study include exploring the area in and around the Yeoor hill extending up to 18sq .km for a period of four years from 2013 to 2017, during the flowering and fruiting season (November to February). The hemi parasitic plant with its different hosts was collected along with flowers, dried ,herbarium specimens was prepared and deposited in Department Of Botany,R.K.Talreja college, Ulhasnagar. The plant was also photographed and samples were sent for authentication to Blatter Herbarium at St. Xavier's College, Mumbai. The voucher

specimen was preserved in the herbarium library with accession No.22637. The host plants were identified using Flora of the Presidency of Bombay (Cooke ,1958).

RESULTS AND DISCUSSION:

The Hemi parasitic plant under study was collected and sent to Blatter Herbarium for authentication. The plant was identified as *Dendrophthoe falcata* (L.f) Ettingsh var. *pubescens* (Hook.f.) (specimen submitted with accession No.22637). The plant is large woody, evergreen, semi parasitic much branched shrub. The leaves are oblong or elliptical, rounded at the base. The corolla in bud condition, peduncles, pedicel and calyx are minutely pubescent, with style projecting beyond corolla tube (Plate I). The fruit is a berry, oblong, smooth, pink, crowned by cup shaped calyx. Though *D.falcata* has been reported earlier, however the occurrence of variety *pubescens* in this region is being reported for the first time. This hemiparasite have been recognized as damaging agents of fruit yielding and timber yielding plants by forming a haustorial connection (Smith ,1990). The host tree branches infected by *D.falcata* shows gradual reduction in the growth and diameter compared to non-infected branches (Karunaichamy *et al.*1999).

During the investigation, hemiparasite *Dendrophthoe falcata* (L.f) Ettingsh var. *pubescens* (Hook.f.) was found associated with as many as 20 host plant members belonging to twelve families viz. Anacardiaceae, Sapotaceae, Leguminosae, Rhamnaceae, Bombacaceae, Moraceae, Myrtaceae, Meliaceae, Tiliaceae, Boraginaceae, Verbenaceae and Lythraceae. Among these twelve families, members of Leguminosae were largely infested with seven different plant species, of which three plant species belonged to subfamily Mimosae (*Acacia auriculiformis*, *Samanea saman* & *Albizia procera*); three to Caesalpiniae (*Bauhinia purpurea*, *Cassia siamea* & *Peltophorum pterocarpum*) and one to Papilionaceae (*Dalbergia sissoo*). Similarly two plant species each belonging to family Myrtaceae (*Psidium guajava* & *Eucalyptus globulus*) and Moraceae (*Ficus religiosa* & *F. glomerata*) while other nine families, each represented by single plant species (Table 1).

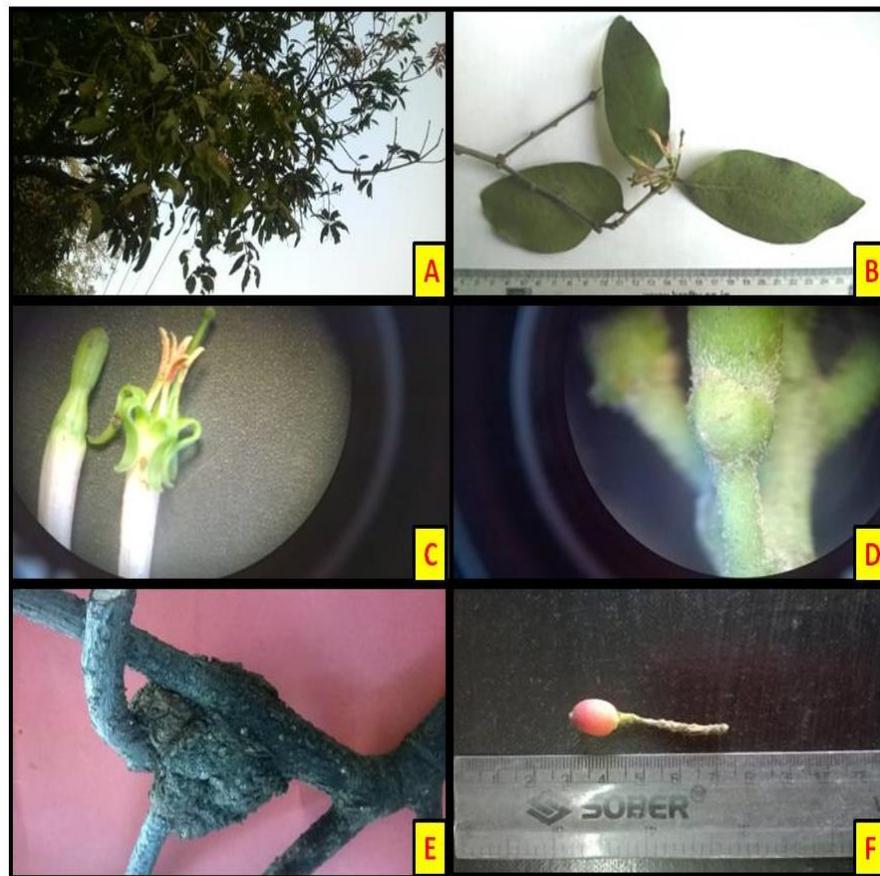


Plate I: *Dendrophthoe falcata* (L.f) Ettingsh var. *pubescens* (Hook.f). A- Whole Plant; B- Inflorescence; C- Flower; D- Calyx with pubescent hairs, E- Haustorium; F- Fruit.

The variety pubescence commonly found in the study area was not reported earlier and this can be considered to be the first report.

The study area was thoroughly explored to locate the hemiparasite infestations. Around 200 odd plants were found to be infested with *D. falcata*. Fruit trees like mango (*Mangifera indica*) and chickoo (*Achras sapota*) were found to be largely infested. There were more than 100 chickoo trees (frequency > 50%) and around 50 Mango trees (frequency > 25%) infested. It appeared that these trees were most preferred host. The hosts of *Dendrophthoe falcata* has been reported to vary in different parts of the country e.g. *Diospyros melanoxylon* and *Mangifera indica* have been reported as the most common host by Rothe *et al* (2017), though at the present study area in and around Yeoor Hills the main host was found to be *Achras sapota* and *Mangifera indica*. The frequency of the infestation can be correlated to the visit of the birds feeding the fruits on

the tree that has resulted in the infection of the tree. The total number of plants belonging to Leguminosae infested was > 10 %, out of which 75 % were belonging to Mimosae subfamily. *Acacia auriculiformis* were found to be more frequently infected than other members of Mimosae. The frequency of infestation on Pipal (*Ficus religiosa*), Vilayati neem (*Melia azadirach*), Katesavar (*Bombax malabaricum*) and Kachnar (*Bauhinia purpurea*) were between 2-2.5 % only; while trees like Ber (*Zizyphus jujuba*), Cassia tree or Siamese cassia (*Cassia simea*), Gullad (*Ficus glomerata*), Taman (*Lagerstroemia speciosa*), Amrut (*Psidium guajava*), Booch/ Bhokar (*Cordia dichotoma*), Nilgiri (*Eucalyptus globulus*), Palsa (*Grewia sps*), Sag (*Tectona grandis*), Kapok (*Ceiba pentandra*), Shisham (*Dalbergia sissoo*), Copper pod (*Peltophorum pterocarpum*) and Safed Siris (*Albizia procera*) were the least frequently infested (0.5-1%) (Fig 1).

Table 1: Host plant affected by *Dendrophthoe falcata* (L.f) Ettingsh var. *pubescens* (Hook.f).

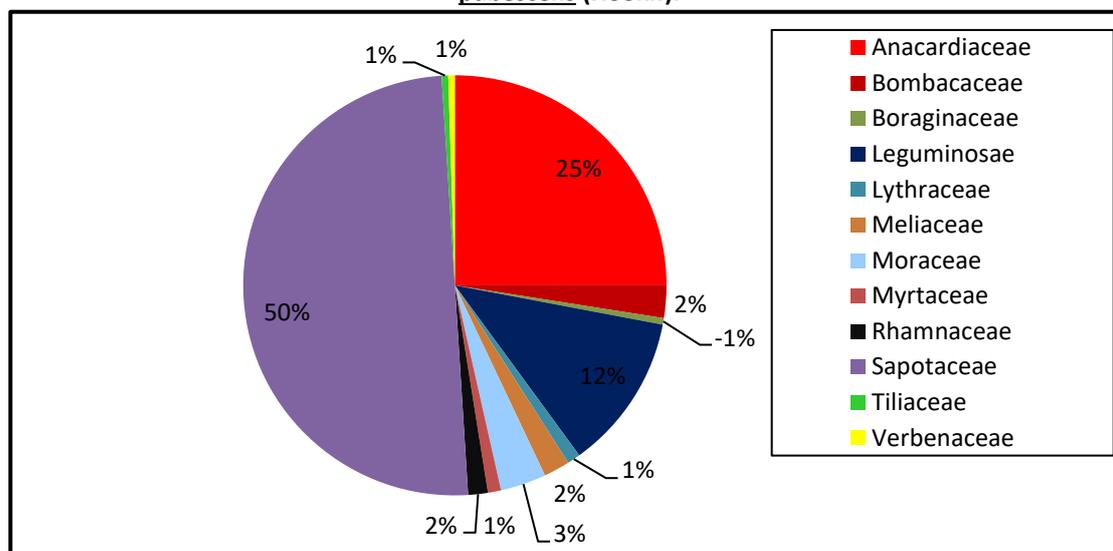
Sr. No.	Host plant	Family	No of affected individuals	Economic value of the Host plant
1	<i>Acacia auriculiformis</i>	Leguminosae	10	Wood, Ornamental
2	<i>Achras sapota</i> L	Sapotaceae	>100	Fruit
3	<i>Albizia procera</i>	Leguminosae	01	Wood
4	<i>Bauhinia purpurea</i>	Leguminosae	3	Ornamental, wood
5	<i>Bombax malabaricum</i>	Bombacaceae	4	Medicinal
6.	<i>Cassia siamea</i> .Lam	Leguminosae	3	Ornamental
7	<i>Ceiba pentandra</i> (L)	Bombacaceae	1	
7.	<i>Cordia dichotoma</i> Forst	Boraginaceae	1	Fruit
8	<i>Dalbergia sissoo</i> .Roxb	Leguminosae	2	Timber
9	<i>Eucalyptus globulus</i>	Myrtaceae	1	Medicinal
10	<i>Ficus glomerata</i>	Moraceae	2	Fruit/ Medicinal
11	<i>Ficus religiosa</i>	Moraceae	5	Religious
12	<i>Grewia</i> sps	Tiliaceae	1	Fruits
13	<i>Lagerstroemia speciosa</i> (L.) Pers.	Lythraceae	2	Ornamental
14	<i>Mangifera indica</i> L.f	Anacardiaceae	>50	Fruit
15	<i>Melia azadirach</i>	Meliaceae	4	Medicinal
16	<i>Peltophorum pterocarpum</i> (DC.) Backer ex Heyne	Leguminosae	1	Wood, ornamental
17	<i>Psidium guajava</i> L.	Myrtaceae	1	Fruit
18	<i>Samanea saman</i>	Leguminosae	4	Ornamental
19	<i>Tectona grandis</i> Linn	Verbenaceae	1	Timber
20	<i>Zizyphus jujuba</i> .Lam	Rhamnaceae	3	Fruit

Dendrophthoe falcata (Linn) Ettingsh var *pubescens* (Hook.f) was reported from Kerala on 11 species of host plants (Gosh and Balasundaran ,1984).The host plant recorded from the study area were different than those reported earlier, indicating the shift in the choice of host by the parasite for its own survival. This shift can also be attributed to change in the composition of the vegetation due to varied reasons and the relative adaptation by the parasite to new host establishing the novel and fresh host parasite relationship.

It was very specifically evident that parasitic infestation was more on the secondary branches than on the primary branches. Similarly, trees are more preferred as host than shrubs and herbs by the hemiparasite. This nature can be attributed to the parasitic plant's mode of seed dispersion. It has been confirmed that the seeds are dispersed by the avian members the birds by defecation or bill wiping, the mistletoes seeds adhere to branches by a sticky viscin "known as bird glue" (Reid et

al. 1995). The seed after germination forms a specialized structure called the haustorium which taps in to the host's vascular system to absorb water, minerals and nutrients (Calder, 1983).Moreover the trees can sustain their existence and are hence the preferred host that are likely to receive the infestation as compared to the shrubs and herbs. Studies in various parts of our country have reported the spread of infestation of *Dendrophthoe falcata* (Linn) Ettingsh on to different host depending on the natural population of flora in the region. Joshi and Soni (2013) have reported 28 host trees in GSFC Township in Vadodara, another 40 host plants affected by *Dendrophthoe falcata* (Linn.f) Ettingsh in Tiruchirappalli city area by Vijayan (2015), 5 new in addition to 19 from east Melaghat by Rothe et al (2011), and 10 species of host plants affected by *Dendrophthoe falcata* (Linn .f) Ettingsh var. *coccinia* from district Champaran (North Bihar) (Singh and Gupta, 2013).

Fig1: Percentage of Plant Families from Yeoor hills infected By *Dendrophthoe falcata* (L.f) Ettingsh var. *pubescens* (Hook.f).



Mistletoes are important part of the landscape which influence the spatial distribution and complex interaction help in understanding their biology and management. According to Rothe *et al* (2017) selection and occurrence of Mistletoes on variety of host has led to decrease in the number of medicinal plant and economically important plant which is dangerous for any forest flora as it is indirectly affecting the economy of tribal community depending on them and birds feeding on them.

CONCLUSION:

In the present study area, *Dendrophthoe falcata* (L.f) Ettingsh var. *pubescens* (Hook.f) is reported for the first time. It was observed that this hemiparasite was associated with 20 different host plant species and most of them seems to not been reported earlier. During the study period extending up to four years few trees like *Mangifera indica*, *Melia azadirach*, *Achras sapota* were noted to have been destroyed due to the hemiparasite infestation. A decade or two ago, Yeoor Hill in the Thane district which was a dense forest, today the urban development with tall buildings and dwellings have taken a heavy toll on the biodiversity. Further the occurrence of *Dendrophthoe falcata* (L.f) Ettingsh var. *pubescens* (Hook.f) on different host indicating increased adaptability of the hemiparasite that have added up to the destruction of the trees in the vicinity. Hence there is a need to find the control measure to protect the forest flora from infestation.

ACKNOWLEDGEMENT:

The authors wish to thank Prof Neeta Dighe and Ms Shital S. Garge for rendering technical help during compilation of data.

REFERENCES

- Alekutty N. A., Srinivasan K. K., Gundu Rao P., Udupa A. C., Keshavamurthy K. R., " Diuretic and antilithiatic activity of *Dendrophthoe falcata*. " *Fitoterapia*, 64, 325-31, (1993).
- Calder, D. M., " Mistletoes in focus an introduction". In Calder M and Bernhardt P (Eds). The biology of mistletoes San Diego, C Academic Press, 1-18, (1983).
- Calvin C.L., Wilson C.A., "Epiparasitism in *Phoradendron durangense* and *P. falcatum* (Viscaceae)." *Aliso*. 27.1-12, (2009).
- Cooke, T.1958.Flora of the Presidency of Bombay,Vol.I-III,B.S.I., Calcutta, (1958)
- Gosh, S.K., Balasundaran. M. and Mohamed Ali,M.I.: "Studies on the Host-Parasite Relationship of Phanerogamic Parasite(s) on Teak and their possible control". *KFRI Research Report*.1-39, (1984).
- Gaurav Mehta, Manisha Tare and Geetha Menon:" Phytochemical, Antimicrobial and Antioxidant Evaluation of *Dendrophthoe falcata* (L.f) Ettingshsh Leaves", *Indian J. Applied and Pure Bio*. Vol.25 (2) ,285-292, (2010).
- Huaxing Qiu and Michael G. Gilbert: Flora of China; Published by Science Press (Beijing) and Missouri Botanical Garden Press.,Vol .5 .220, (2003).
- Joshi, P. N. and Soni, H. B., "Host plants of *Dendrophthoe falcata* (L.f) Ettingshsh.-A Parasite in GSFC township,

- Vadodara, Gujarat, India" *Life Science Leaflet*.5:50-59,(2011).
- Karunaichamy, K.S.T.K., K. Paliwal and P.A. Arp.: " Biomass and nutrient dynamics of mistletoe (*Dendrophthoe falcata*) and Neem (*Azadirachta indica*) seedlings". *Current Science*. 76 (6): 840–843. (1999).
- Kodithala S, G. P. Yogananda and M. Kiranmai; "Pharmacognostical, phytochemical and anticancer studies of *Dendrophthoe falcata* (L. f.) Ettingshsh (Loranthaceae) growing on the host plant *Azadirachta indica* (Meliaceae)." *Int. J Pharm Bio Sci.*, 4(2), 1010-1018, (2013).
- Kuijt, J. "Haustoria of Phanerogamic Parasites". *Ann. Rev. Phytopathol.*17: 91-118, (1977).
- Nipun Dashora, Vijay Sodde, Kirti S., Prabhu and Richard Lobo:"In vitro Cytotoxic Activity of *Dendrophthoe falcata* on Human Breast Adenocarcinoma cells -MCF-7". *Int.J of Cancer Research.*,7(1):47-54, (2011).
- Patwardhan, A and Kurve, P:"Preliminary Study of Butterfly Diversity from Thane City and Forest around Thane, Maharashtra" *Proc. Sem.*"Wonderful World of Insects".53-57, (2008).
- Pejaver M.K., and Borkar,M.U., : " A Contribution to the Vascular Flora, Birds and Butterflies of Yeoor hills and its Environs". *BioResearch Journal*.13(1):23-32, (2001).
- Reid, N.; Smith, N. M. and Yan, Z: Ecology and population biology of mistletoes. In: Lowman, M.D. and Nadkarni, N. M. (Eds) *Forest canopies* San. Diego. C. A. Academic Press, 285-310, (1995).
- Rothe S.P., Muratkar, G.D., Kokate U. R.:"Occurrence and diversity in host by Mistletoes from fire families in East Melghat Forest.", *Current Botany*, 2(9): 19-21, (2011).
- Rothe S. P and Maheshwari A. A.," Addition to the hosts of partial stem parasite *Dendrophthoe Falcata* (L. f.) Ettingshsh from East Melghat Forest", *World Journal of Pharmacy and Pharmaceutical Sciences*.6(8):2046-2051, (2017).
- Sampathkumar, R. and R.Selvaraj : " Some new hosts for *Dendrophthoe falcata* (L.f) Ettingshsh. (*Loranthus longiflorus* Desr.)". *Journal of Bombay Natural History Society*. 78: 200, (1980).
- Singh, R.B. and Gupta, P.K.: "Morphotaxonomy, Medicinal use and New Host Range of *Dendrophthoe falcata* var *Coccinia* in Champaran, its Cause and Consequences." *Indian J.L.Sci*.2(2): 39-42, (2013).
- Sinoriya, P., Sharma, V., Sinoriya, A.: A Review on *Dendrophthoe falcata* (Linn.F) *Asian Journal of Pharmaceutical and clinical Research* .4(2):1-5, (2011).
- Smith, S. and G.R. Stewart.:" Effect of potassium levels on the stomatal behavior of the hemi-parasite *Striga hermontica*". *Plant Physiology*. 94: 1472–1476, (1990).
- Vijayan, A., Vivekraj, P. and Kalavathy, S.: A report of the stem parasitic plant *Dendrophthoe falcata* (L.f) Ettingshsh. (Loranthaceae) from the associates with trees along roadsides in Tiruchirappalli, Tamilnadu, India. *International Journal of Institutional Pharmacy and Life sciences*. 5(2): 92-100, (2015).

***Corresponding Author:**

Geetha S. Menon*

Email: drgeetamenon@gmail.com