

Occurrence of mistletoes and their hosts in and around Rajshahi city, Bangladesh

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Abstract

Mistletoes are the unique group of parasitic flowering angiosperm and can victimized a large number of woody plants. In the study area, a total 62 flowering species were found parasitized by only three mistletoes such as *Dendrophthoe falcata* (L.f.) Ettingsh., *Macrosolen cochinchinensis* (Lour.) Tiegh. and *Scurrula pulverulenta* (Wall.) G. Don. Among the infested plant species 51 were tree, 10 were shrub and only one was woody climber and all were dicotyledons, no herbaceous and monocotyledons were found. *Dendrophthoe falcata* (L.f.) Ettingsh. was observed frequently than others and 56 plants were found infested by it. Mistletoes are harmful for our valuable fruits, timber and ornamental tree as well as shrubs and climbers. Therefore we should be aware of it to protect our plants.

Keywords: Hemiparasite, *Dendrophthoe falcata*, *Macrosolen cochinchinensis*, *Scurrula pulverulenta*. Rajshahi city

Introduction

Mistletoe (In Bangla 'Dhyra') is the common name for obligate hemiparasitic perennial flowering plants of the order Santalales^[12] and belonging to five families such as Amphorogynaceae, Loranthaceae, Misodendraceae, Santalaceae and Viscaceae^[11]. Mistletoes are the unique types of flowering plants and are adapting to parasitic life on host plants. This special ability of adaptation of mistletoes can victimized a large number of taxonomically distinct hosts. Most of them are dicotyledons and few are gymnosperms^[15], no monocotyledons have reported yet. Longevity and intensity of parasitism and degree of damage varies species to species of mistletoes and host. Mistletoes are usually found on a wide range of woody plants, no herbaceous plants have reported still today. Generally, forest trees, avenue trees, fruit trees and ornamental trees to shrubs, thorny scrubs, euphorbs and cacti are parasitized by mistletoes^[5]. Mistletoe can cause a variety of damage to host plants, such as poor fruit and seed production; drying tops; reduction of vigour and growth rate, predisposition to other pests and diseases and eventually the host species dies prematurely. From Rajshahi city 140 tree species had reported including ornamental, edible fruits and timber yielding plants^[9]. Rajshahi is famous for Mango (*Mangifera indica* L.), Litchi (*Litchi chinensis* Sonn), Guava (*Psidium guajava* L.) and Indian jujubes (*Ziziphus mauritiana* Lam.)

in Bangladesh. So, it is necessary to know about mistletoes and also to be aware of this parasitic shrub. Unfortunately very little work has been done regarding mistletoes and their host range in Rajshahi city area as well as Rajshahi district. It is recognized that the comprehensive survey and proper documentation of the plant species of an area is very important aspect in the field of the taxonomy as well as further research. Though some articles were published focusing on the qualitative assessment of angiosperm flora of this area but unfortunately mistletoes were failed to draw attention to the researcher or authors of the articles. The early published reports were concentrated on the host range of *Dendrophthoe falcata* (L.f.) Ettingsh. of the family Loranthaceae only^[8]. But a list of other taxon of mistletoes and their hosts occurring in Rajshahi is much wanting. Thus the present study was aimed to enumerate mistletoes and their hosts in and around the Rajshahi City which will be helpful for the researcher.

Materials and methods

Study Area

Rajshahi City is located in between 24°20' and 24°24' north latitudes and in between 88°32' and 88°40' east longitudes and the total area is 95.56 sq km. It is bounded by Paba upazila on all sides (Figure 1).



Fig 1: Location map of the study area (Rajshahi City)

Under Koppen climate classification, Rajshahi has a tropical wet and dry climate. The area comprises various types of plants such as the evergreen, semi-evergreen and also deciduas.

Floristic survey

The present work was the outcome of extensive survey at different corners of the city and its surroundings from January 2019 to December 2020. Mistletoes are shrubby and bushy in nature and it is attached in an aerial parts of the host plant. As a result, presence of any hemiparasite on the host can easily visible. The mistletoes and host species were identified with the help of books [2], [1], [20]; relevant literature and online flora. "Plants of the world online (<http://www.plantsoftheworldonline.org>)" was accessed for the taxonomic nomenclature of mistletoe and host species.

Results and Discussion

Rajshahi district and its surrounding is the hub of Mango (*Mangifera indica* L.) and Litchi (*Litchi chinensis* Sonn) in Bangladesh. So many orchards in this city area were found in the past, but due to rapid urbanization nowadays, the numbers of orchard are decreasing. On the other hand many ornamental flowering tree and shrubs are now getting preference for beautification of the city. During the study, most of the host species were found at various institutions premises, park, graveyard, embankment side, railway side,

road side and in front of house etc. Very few of the species grow up around the house also. Mistletoes are aerial hemiparasitic plant and found them as a menace on various tree and shrubs. In this study, only 3 mistletoes species belonging to 3 genera were found and all of them were from *Loranthaceae* Juss. family.

They were *Dendrophthoe falcata* (L.f.) Ettingsh., *Macrosolen cochinchinensis* (Lour.) Tiegh. and *Scurrula pulverulenta* (Wall.) G. Don (Figure 2 A-C). We are fortunate enough that there are very few mistletoe found in Rajshahi, may be due to unavailable of susceptible host plant, low tree density, scarcity of seed spreading birds or dry climate. However, 1598 mistletoe species of 88 genera recorded worldwide [12] and Bangladesh is the home of 15 mistletoes [2]. Most of the recorded mistletoes in Bangladesh were found in the forest area of Chattogram and Sylhet division and only *Dendrophthoe falcata* and *Macrosolen cochinchinensis* were available throughout the country [1]. The relevant information regarding mistletoes in Rajshahi is very scanty. Earlier presence of *Macrosolen cochinchinensis* was noted from Rajshahi [2]. *Dendrophthoe falcata* was reported from Rajshahi city and the adjacent area "Katakhal" [8] [16]. *Loranthus* spp. had also mentioned from Rajshahi City but authors were not specified species name [10]. However, a comparative data was presented in table 1.

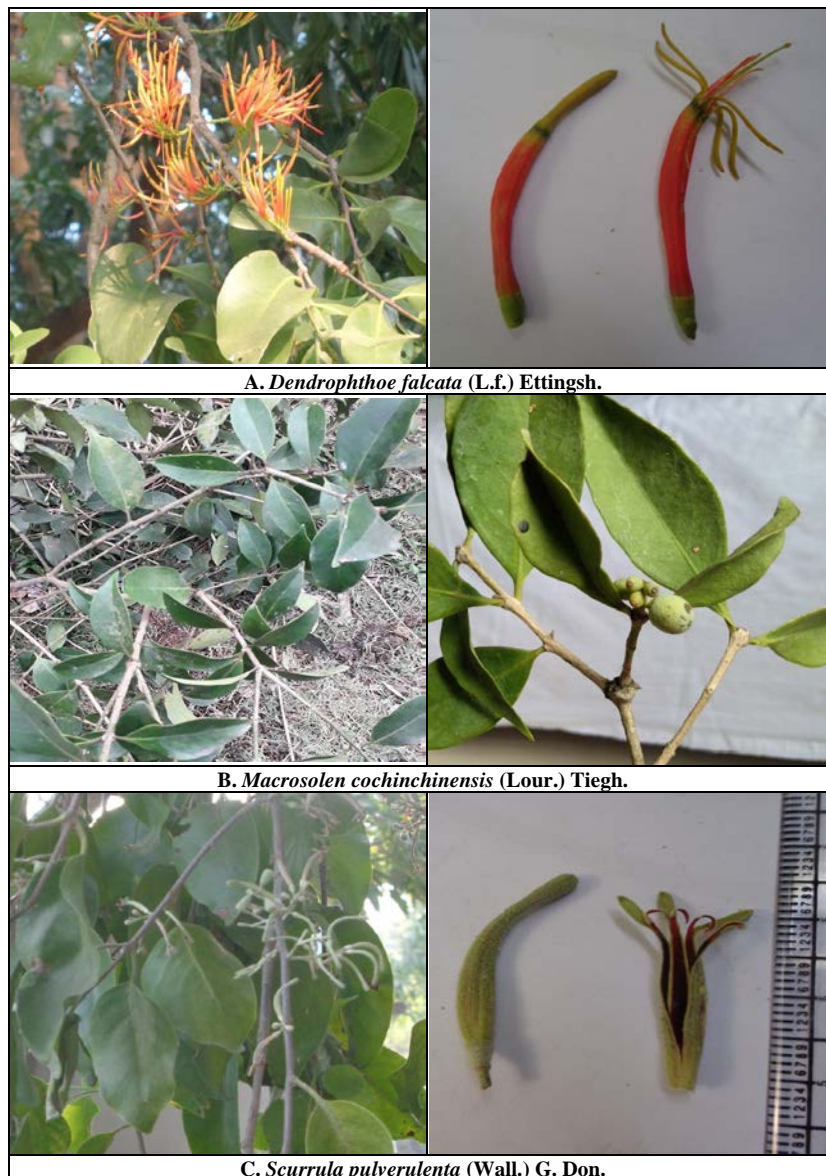


Fig 2: Photograph of different mistletoes found in and around Rajshahi city

Table 1: A comparison of occurrence of Mistletoes

Family	Genera			Species		
	World ^[12]	Bangladesh ^[1]	Rajshahi* [*]	World ^[12]	Bangladesh ^[1]	Rajshahi* [*]
Misodendraceae,	1	--	--	10	--	--
Loranthaceae,	73	6	3	990	12	3
Santalaceae,	3	--	--	11	--	--
Amphorogynaceae	4	--	--	37	--	--
Viscaceae.	7	1	--	550	3	--
Total	88	7	3	1598	15	3

*Present study

In respect of host plant, a total 62 plant species were found victimized by the recorded three mistletoes belonging to 19 families in the study area (Table 2). Among the parasitized plants 51 were tree, 10 were shrub and only one was woody climber. All of them were dicotyledonous not a single monocotyledons were found and most of them were tree species. The obtained results are in the accordance with the earlier reports ^[19] and ^[8]. Though the height of the tree is beyond the reach of human beings, may be the birds generally seeds dispersal agents of mistletoes are preferred tree species than others. Among the recorded species, 56

plant species of 16 families were infested by *Dendrophthoe falcata* (L.f.) Ettingsh which was 90.32% (Figure 3) of the total infested host. Earlier, several researcher had reported number of hosts of *D. falcata* from different area such as 98 from Karnataka, India ^[19]; 19 from Jahangirnagar University campus, Savar, Bangladesh ^[18] and 50 from Rajshahi city, Bangladesh ^[8]. *Dendrophthoe falcata* (L.f.) Ettingsh is the most common parasitic angiosperm and found with a large host range in each and every part of the country as well as geographical location ^[19].

Table 2: Mistletoes and their host plant species in and around Rajshahi city, Bangladesh

SI No.	Family Name	Scientific Name	Local Name	Habit	DF	MC	SP
1	Fabaceae Lindl.	<i>Acacia auriculiformis</i> A.Cunn. ex Benth.	Akashmoni	Tree	+		
2	Rutaceae Juss.	<i>Aegle marmelos</i> (L.) Corrêa	Bel	Tree	+		
3	Fabaceae Lindl.	<i>Albizia lebbek</i> (L.) Benth.	Sirish	Tree	+		
4	Fabaceae Lindl.	<i>Albizia procera</i> (Roxb.) Benth.	Sada Koroi	Tree	+		
5	Annonaceae Juss.	<i>Annona reticulata</i> L.	Nona	Tree	+		
6	Annonaceae Juss.	<i>Annona squamosa</i> L.	Ata	Tree	+		
7	Meliaceae Juss.	<i>Aphanamixis polystachya</i> (Wall.) R.Parker	Pithraj	Tree	+		
8	Moraceae Gaudich.	<i>Artocarpus heterophyllus</i> Lam.	Kanthal	Tree		+	
9	Fabaceae Lindl.	<i>Bauhinia variegata</i> L.	Lalkanchon	Tree	+		
10	Malvaceae Juss.	<i>Bombax ceiba</i> L.	Simul	Tree	+		
11	Fabaceae Lindl.	<i>Butea monosperma</i> (Lam.) Kuntze	Polash	Tree		+	+
12	Fabaceae Lindl.	<i>Calliandra haematocephala</i> Hassk.	Powder puff	Shrub	+		
13	Bignoniaceae Juss.	<i>Campsis radicans</i> (L.) Bureau	Trumpet vine	Climber	+		
14	Apocynaceae Juss.	<i>Cascabela thevetia</i> (L.) Lippold	Kolkeful	Shrub	+		
15	Fabaceae Lindl.	<i>Cassia fistula</i> L.	Bandar lathi	Tree	+		
16	Fabaceae Lindl.	<i>Cassia javanica</i> L.	Java sonalu	Tree	+		
17	Casuarinaceae R.Br.	<i>Casuarina equisetifolia</i> L.	Jhau	Tree	+		+
18	Malvaceae Juss.	<i>Ceiba pentandra</i> (L.) Gaertn.	Kapuk	Tree	+		
19	Rutaceae Juss.	<i>Citrus maxima</i> (Burm.) Merr.	Jambura	Tree	+		
20	Euphorbiaceae Juss.	<i>Codiaeum variegatum</i> (L.) Rumph. ex A.Juss.	Patabahar	Shurb	+		
21	Fabaceae Lindl.	<i>Dalbergia sissoo</i> Roxb. ex DC.	Sissoo	Tree	+		
22	Moraceae Gaudich.	<i>Ficus benghalensis</i> L.	Bot	Tree	+		
23	Moraceae Gaudich.	<i>Ficus hispida</i> L.f.	Khoksa	Tree	+		
24	Moraceae Gaudich.	<i>Ficus racemosa</i> L.	Jogadumur	Tree	+		
25	Moraceae Gaudich.	<i>Ficus religiosa</i> L.	Pakur	Tree	+	+	+
26	Lamiaceae Martinov	<i>Gmelina arborea</i> Roxb. ex Sm.	Gamar	Tree	+	+	
27	Proteaceae Juss.	<i>Grevillea robusta</i> A.Cunn. ex R.Br.	silky oak	Tree	+		
28	Malvaceae Juss.	<i>Hibiscus rosa-sinensis</i> L.	Joba	Shrub	+		
29	Euphorbiaceae Juss.	<i>Jatropha integerrima</i> Jacq.	Lal phul	Shurb	+		
30	Lythraceae J.St.-Hil.	<i>Lagerstroemia indica</i> L.	Purus	Shrub	+		
31	Lythraceae J.St.-Hil.	<i>Lagerstroemia speciosa</i> (L.) Pers.	Jarul	Tree	+		
32	Anacardiaceae R.Br.	<i>Lannea coromandelica</i> (Houtt.) Merr.	Jiga	Tree	+		
33	Lythraceae J.St.-Hil.	<i>Lawsonia inermis</i> L.	Mehadi	Shrub	+		
34	Rutaceae Juss.	<i>Limonia acidissima</i> L.	kod bell	Tree	+		
35	Lauraceae Juss.	<i>Litsea monopetala</i> (Roxb.) Pers.	Kukur chita	Tree		+	
36	Sapotaceae Juss.	<i>Madhuca longifolia</i> (J.Koenig ex L.) J.F.Macbr.	Mohua	Tree	+		
37	Anacardiaceae R.Br.	<i>Mangifera indica</i> L.	Amm	Tree	+	+	

Table 2: Continued...

SI No.	Family Name	Scientific Name	Local Name	Habit	DF	MC	SP
38	Sapotaceae Juss.	<i>Manilkara zapota</i> (L.) P.Royen	Sofeda	Tree	+		
39	Myrtaceae Juss.	<i>Melaleuca citrina</i> (Curtis) Dum.Cours.	Bottle brush	Tree	+		
40	Meliaceae Juss.	<i>Melia azedarach</i> L.	Ghoraneem	Tree	+	+	
41	Sapotaceae Juss.	<i>Mimusops elengi</i> L.	Bokul	Tree	+	+	
42	Moraceae Gaudich.	<i>Morus alba</i> L.	Tunt	Tree	+		
43	Rutaceae Juss.	<i>Murraya paniculata</i> (L.) Jack	Kamini	Shrub	+		
44	Apocynaceae Juss.	<i>Nerium oleander</i> L.	karabi	Shrub	+		
45	Fabaceae Lindl.	<i>Pithecellobium dulce</i> (Roxb.) Benth.	Jilapi	Tree	+		
46	Myrtaceae Juss.	<i>Psidium guajava</i> L.	Piyara	Tree	+		
47	Lythraceae J.St.-Hil.	<i>Punica granatum</i> L.	Dalim	Shrub	+	+	
48	Fabaceae Lindl.	<i>Samanea saman</i> (Jacq.) Merr.	Koroi	Tree	+	+	+
49	Fabaceae Lindl.	<i>Senegalia catechu</i> (L.f.) P.J.H.Hurter & Mabb.	Khoir	Tree	+		
50	Fabaceae Lindl.	<i>Senna siamea</i> (Lam.) H.S.Irwin & Barneby	Minjiri	Tree	+		
51	Anacardiaceae R.Br.	<i>Spondias dulcis</i> Parkinson	Bilatiamra	Tree	+		
52	Meliaceae Juss.	<i>Swietenia macrophylla</i> King	Mahagoni	Tree	+		
53	Lamiaceae Martinov	<i>Tectona grandis</i> L.f.	Segun	Tree	+		
54	Combretaceae R.Br.	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn.	Arjun	Tree	+		
55	Combretaceae R.Br.	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Bohera	Tree	+		
56	Combretaceae R.Br.	<i>Terminalia catappa</i> L.	Katbadam	Tree	+		
57	Combretaceae R.Br.	<i>Terminalia citrina</i> (Gaertn.) Roxb.	Hatiyal	Tree	+		
58	Malvaceae Juss.	<i>Thespesia populnea</i> (L.) Sol. ex Corrêa	Poros pipul	Tree		+	
59	Meliaceae Juss.	<i>Toona hexandra</i> (Wall.) M.Roem.	Toon	Tree	+		
60	Cannabaceae Martinov	<i>Trema orientale</i> (L.) Blume	Gobra	Tree		+	
61	Fabaceae Lindl.	<i>Vachellia nilotica</i> (L.) P.J.H.Hurter & Mabb.	Babla	Tree		+	
62	Rhamnaceae Juss.	<i>Ziziphus mauritiana</i> Lam.	Boroi	Tree	+		+

DF=*Dendrophthoe falcata*, MC=*Macrosolen cochinchinensis* and SP=*Scurrula pulverulenta*

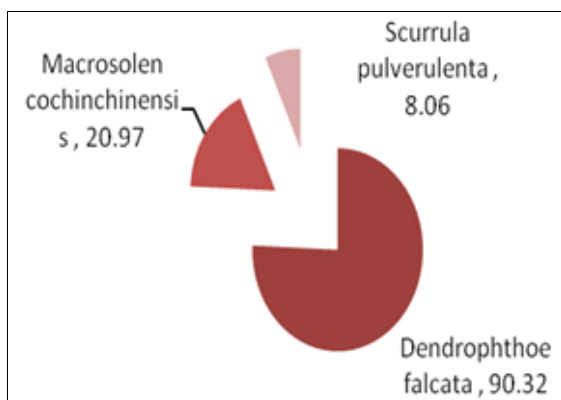


Fig 3: Host ranges of Mistletoes in Rajshahi City(%)

The second most aggressive mistletoe in this area was *Macrosolen cochinchinensis* but susceptible host were much fewer than *D. falcata*. Only thirteen host species (20.97%) belonging to 9 family were found infested. Among them, *Artocarpus heterophyllus* Lam. and *Mangifera indica* L. were observed frequently infested by *Macrosolen cochinchinensis*. Information about the host range of *Macrosolen cochinchinensis* was very scanty. In Nepal, seven and only one host for *Macrosolen cochinchinensis* had recorded from Phulchoki Area of Kathmandu [4] and Central Nepal [3] respectively. Two hosts for *Macrosolen cochinchinensis* was noted from Penang, Malaysia [14]. Another mistletoes species *Scurrula pulverulenta* has the least number of infestations (6 plants) in this area which was only 8.06% of infested hosts. Seven and two hosts for *S. pulverulenta* were recorded in Khimti forest, Nepal [6] and Central Nepal [3] respectively. In this study area, *S. pulverulenta* was found commonly on *Samanea saman* (Jacq.) Merr. However, the host range of observed mistletoe species in world was presented in table 3.

Table 3: Number of recorded host species for observed mistletoe species in the world.

Mistletoe species	No of host species	References
<i>Dendrophthoe falcata</i>	426	[15]
<i>Macrosolen cochinchinensis</i>	27	[7]
<i>Scurrula pulverulenta</i>	81	[13]

During this study, it was observed that some hosts were infested by two or three mistletoes at a time, which called as double parasitism and triple parasitism respectively and this is the most fascinating characteristic of mistletoes. Among the recorded host plants *Butea monosperma* (Lam.) Kuntze, *Casuarina equisetifolia* L., *Gmelina arborea* Roxb. ex Sm., *Mangifera indica* L., *Melia azedarach* L., *Mimusops elengi* L., *Punica granatum* L., and *Ziziphus mauritiana* Lam. become parasitized by any of two mistletoes. On the other hand, *Ficus religiosa* L. and *Samanea saman* (Jacq.) Merr. become parasitized by all three mistletoes.

The current study has established a baseline study of mistletoe and their host in Rajshahi. A total 140 tree species had recorded from Rajshahi city [9] fortunately all trees were not susceptible to the mistletoes. This study has been observed that the plants in orchard or garden were less affected than the roadside or the scattered growing plants may be due to regular care or pruning. Consequently, not a single *Moringa oleifera* was found infested which had already been reported as a host [17]. It may be due to regular cutting after harvest which is a normal practice of the people of the Rajshahi [8]. This indicated plant-parasitic infestations can be controlled by regular care.

Future studies should address the relationship between mistletoe distribution, their host species and dispersal agents. So that we can safe guard our valuable plant species from the adverse effects of mistletoes.

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