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RESEARCH ARTICLE

New Host plants of few parasitic angiosperms in Karnataka

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Abstract

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Parasitic flowering plants are a small group of dicotyledons yet among them there exists a great wealth of structural diversity that continues to fascinate botanists. They cause severe damage to important fruit trees, timber yielding, economic and aesthetic value plants. A total of 106 species belonging to 32 families of dicotyledons are recognized as hosts parasitized by parasitic angiosperms. The range of hosts species recorded were vary from 3-42 per parasitic plants. The highest number of hosts were recorded for *Dendrophthoe falcata* is 42 species. The present paper enlists the binomials and families of host plants parasitized by particular species of parasitic plants.

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Introduction

Parasitic Angiosperms have been the subject of assiduous research in recent years not only as object of intrinsic botanical and physiological interest, but also because of increased awareness of their importance as pest of agriculture, horticulture and forestry. A typical plant is an autotrophic organism that obtains its necessary resources such as sunlight, water and minerals from the abiotic environment. This perspective however overlooks large number of plants that depend on other plants, obtaining much or all of their prey (Govier & Harper, 1965; Press, 1988; Press & Graves, 1995). Parasitic plants are common in many natural and semi natural ecosystem from tropical rain forests to high arctic (Press, 1988) accounting for 1% of angiosperm species (~3-4000), within c. 270 genera and more than 20 families (Nickrent et al., 1998; Press et al., 1999). For the first time Mitten (1847) reported parasitism in santalaceae member i.e., *Thesiumlinophyllum* in which roots attached to those of other plants by means of haustoria. Water, nitrogen, fixed carbon compounds, and minerals are moved unidirectionally from host to parasite through a physiological and anatomical bridge i.e., the haustorium (Stewart & Press, 1990; Seel et al., 1992). Parasitic plants are present in every major ecosystem (Kuijit, 1969), can alter outcome of competition between species (Gibson & Watkinson, 1991) and have been shown in both experimental studies and theoretical work to play a major role in determining community structure (Gibson & Watkinson, 1991). The hemi parasites studies acquired large amount of nutrients from their hosts, and night time transpiration would allow the parasites to continue to acquire nutrients in the xylem stream, many parasitic plants have ability to deregulate host stomatal control (Press, 1988). Stomatal deregulation may decrease host water-use-efficiency and whole plant water relations (Goldstein et al., 1989; Sala et al., 2001). Parasitic plants can attack a large number of varieties of taxonomically unrelated hosts (Docters van Leeuwen, 1954; Kuijit, 1969).

Material and methods

Extensive plant exploration trips were undertaken during 2011-2013 to different parts of Karnataka to collect the parasitic plants. Both the host and parasites were identified by using different floras such as the flora of Madras presidency (Gamble 1969), the flora of Karnataka (Saldanha, 1996) and the flora of Shimoga (Ramswamy, 2001). The collected materials were preserved in the form of herbarium using standard herbarium techniques (Forman & Birdson, 1989).

Dendrophthoe falcata (L. f) Ettingsh

1. Ailanthus excelsa, Roxb. (Simarubaceae)
2. Calycopteris floribunda, Roxb. Lam. (Combretaceae)
3. Carissa carandus, L. (Apocynaceae)
4. Cassia alata, L. (Caesalpinaceae)
5. Cassia montana, Heyne. (Caesalpinaceae)
6. Cassia sophera, L. (Caesalpinaceae)
7. Citrus aurantium, L. (Rutaceae)
8. Citrus maxima, Merr. (Rutaceae)
9. Citrus medica, L. (Rutaceae)
10. Citrus grandis(L), Osbeck.(Rutaceae)
11. Clematis gouriana, Roxb. (Ranunculaceae)
12. Croton sparsiflorus, (Mor). (Euphorbiaceae)
13. Dalbergia latifolia, Roxb. (Papilionaceae)
14. Elaeocarpus ganitrus, Roxb.(Elaeocarpaceae)
15. Flacourtia indica, (Burm) Merr. (Flacourtiaceae)
16. Glochidion arboreum, HK.f (Phyllanthaceae)
17. Gmelina arborea, Roxb.(Verbenaceae)
18. Grewia orientalis, L. (Tiliaceae)
19. Ixoracoccinea, L. (Rubiaceae)
20. Lagerströemia microcarpa, W.(Lythraceae)
21. Lagerströemia parviflora, Roxb. (Lythraceae)
22. Lantana camara, L. (Verbenaceae)
23. Madhuca longifolia. J. F. Macbr (Sapotaceae)
24. Malletia pinnata, L. (Papilionaceae)
25. Manihot esculenta, Crantz. (Euphorbiaceae)
26. Melia dubia, Hiern. (Meliaceae)
27. Melilotus parviflora, Desf. (Papilionaceae)
28. Michelia champaca, L. (Magnoliaceae)
29. Millingtonia hortensis, L.f. (Bignoniaceae)
30. Nathodytes nimmonia, (J.Graham) Mabb.(Icacinaceae)
31. Peltaphorum pterocarpum (Caesalpinaceae)
32. Pongamia pinnata (L), Merr. (Fabaceae)
33. Prosopis juliflora (Sw) DC. (Mimosaceae)
34. Randia aculeata, L. (Rubiaceae)
35. Sesbania grandiflora, Pers. (Fabaceae)
36. Solanum torvum, Swartz. (Solanaceae)
37. Strychnos vomica, L. (Loganiaceae)
38. Swetenia mahagonia, L. (Meliaceae)
39. Syzigium caryophyllaeum, Gaertn. (Myrtaceae)
40. Thespesia populnea, Cav.(Malvaceae)
41. Thevetia peruviana(Pers)K. Schum(Apocynaceae)
42. Xanthophyllum flavescens, Roxb. (Polygalaceae)

Dendrophthoe trigona (Wt&Arn) Danser

1. Anogeissus latifolia, wall.(Combretaceae)
2. Casuarina equisetifolia, Frost (Casuarinaceae)
3. Eugenia jambolana, Lam. (Myrtaceae)
4. Grevillea robusta, A. Cunn (Proteaceae)
5. Ficus elastica, Roxb. (Moraceae)

Helicanthus elastica. (Desr) Danser.

1. Ailanthus excelsa, Roxb. (Simarubaceae)
2. Anacardium occidentale, L. (Anacardiaceae)
3. Callistemon lanceolatus, R.Br. (Myrtaceae)
4. Eugenia jambolana, DC. (Myrtaceae)

5. *Ficus hispida*, L.f. (Moraceae)
6. *Ficus glomerata*, Roxb. (Moraceae)
7. *Holigarnaarnottiana*, Hook. (Anacardiaceae)
8. *Hopea ponga*, (Dennst.) Mabberly. (Dipterocarpaceae)
9. *Garcineagummi-gatta*, W. (Clusiaceae)
10. *Lantana camera*, L. (Verbenaceae)
11. *Memecylonangustifolicum*, W. (Combretaceae)
12. *Mangifera indica*, L. (Anacardiaceae)
13. *Murrayakoenigii*, (L) spr. (Rutaceae)
14. *Nyctanthus arbor-tristis*, L. (Nyctaginaceae)
15. *Punicagranatum*, Vent. (Punicaceae)
16. *Manikarazapota*, A. DC. (Sapotaceae)
17. *Securinegaleucopyrus*, Wild. (Euphorbiaceae)
18. *Steriospermumangustifolium*, Haines. (Bignoniaceae)
19. *Syzigiumcaryophyllaeum*, Gaertn. (Myrtaceae)
20. *Tectonagrandis*, L.f. (Verbenaceae)
21. *Terminalia bellarica*, Roxb. (Combretaceae)
22. *Vitexnegundo*, L. (Verbenaceae)

Macrosollencapitellatus (Wt&Arn) Danser

1. *Artocarpushirsuta*, Lam. (Moraceae)
2. *Bombaxceiba*, L. (Bombacaceae)
3. *Ceibapentandra*, (L) Gaetrn. (Bombacaceae)
4. *Ficus glomerata*, Roxb. (Moraceae)
5. *Glochidionsps* (Phyllanthaceae)
6. *Grevillea robusta*, A.cunn. (Proteaceae)
7. *Holoptelea integrifolia*, Pl. (Ulmaceae)
8. *Muntingiacalabura*, L. (Elaeocarpaceae)
9. *Manikarazapota*, A. DC. (Sapotaceae)
10. *Tectonagrandis*, L. f. (Verbenaceae)
11. *Terminalia arjuna*Wt.&Arn. (Combretaceae)
12. *Terminalia paniculata*, Roth. (Combretaceae)
13. *Clematis gouriana*,Roxb. (Ranunculaceae)

Macrosollenparasiticus. (L.) Danser.

1. *Acacia auriculiformis*, A. cunn. exBenth. (Mimosaceae)
2. *Casuarinaequisetifolia*, Forst. (Casuarinaceae)
3. *Calycopteris floribunda* (Roxb) Lam. (Combretaceae)
4. *Ficus glomerata*, Roxb. (Moraceae)
5. *Ficus religiosa*, L. (Moraceae)
6. *Makarangapeltata*, M.Arg. (Euphorbiaceae)
7. *Mallotusphilippinensis*, M.Arg. (Euphorbiaceae)

Scrulla cordifolia.(Wall). G. Don.

1. *Ficus religiosa*, L. (Moraceae)
2. *Thespesiapopulnea*, (Cav) (Malvaceae)
3. *Muntingiacalabura*, L. (Elaeocarpaceae)
4. *Securinegaleucopyrus*, Wild. (Euphorbiaceae)
5. *Strychnosnux-vomica*, L. (Loganiaceae)

Scrullaparasitica.(Linn.)

1. *Buteamonosperma*, Roxb. (Papilionaceae)
2. *Dalbergia paniculata*, Roxb. (Papilionaceae)
3. *Dalbergia sissoo*, Roxb. (Papilionaceae)
4. *Ficus religiosa*, L. (Moraceae)
5. *Muntingiacalabura*, L. (Elaeocarpaceae)

6. *Spathodeacampanulata*, P. Beauv. (Bignoniaceae)
7. *Tectonagrandis*, L. f. (Verbenaceae)
8. *Terminalia arjuna* Wt. & Arn. (Combretaceae)
9. *Terminalia bellarica*, Roxb. (Combretaceae)
10. *Vitexnegundo*, L. (Verbenaceae)

Taxillustomentosus (Roth.) vanTiegh.

1. *Buteamonosperma*, (Lam.) Taub. (Papilionaceae)
2. *Ceibapentandra*, (L.) Gaetrn. (Bombacaceae)
3. *Madhuca longifolia*, J.F. Macbr (Sapotaceae)
4. *Tectonagrandis*, L.f. (Verbenaceae)
5. *Terminalia arjuna*, Wt. & Arn. (Combretaceae)

Viscumnepalense, spr.

1. *Dalbergia sissoo*, Roxb. (Papilioaceae)
2. *Ficus glomerata*, Roxb. (Moraceae)
3. *Syzigiumaromaticum* (L) Merr. (Myrtaceae)
4. *Strychnosnux-vomica*, L. (Loganiaceae)

Viscumangulatum.Heyne.

1. *Diospyrospaniculata*, Dalz. (Ebenaceae)
2. *Lophopetalumwightianum*, Arn. (Celastraceae)
3. *Memecylonangustifolium*, W. (Combretaceae)

Results

A total of 106 species belonging to 56 genera and 32 families were recorded as hosts of different parasitic angiosperms. Out of 56 genera 1 did not identify to species level e.g. *Glochidion*. The remaining host genera were determined up to species rank. The number of host species recorded per parasitic angiosperms species ranged from 3 to 42. The highest number of host plants recorded for *Dendrophthoefalcata* is 42, the lowest numbers of host plants were recorded for *Viscumangulatum* 3species and 22 hosts have been recorded for *Helicanthuselastica*. This parasite was mainly distributed in the coastal region of Karnataka. Two major genera of host species were *Ficus* and *Terminalia*. All the recorded host plants were dicotyledonous angiosperms, without even single taxa from the monocotyledons and gymnosperms.

Discussion

Dendrophthoefalcata, a widespread hemi parasite belonging to family Loranaceae, has been recorded 420 hosts distributed among 227 genera of 77 families and is considered to be one of the most devastating parasitic weed on important timber yielding plants. Thriveni et al reported on 93hosts species of 28 families in Karnataka. In the present investigation recorded 121 host species of 34 families in Karnataka. Among these 42 reported as new hosts for *Dendrophthoefalcata*. It has been widely recognized as a parasite containing broad host range. The present catalogue of new host species of parasitic angiosperms in Karnataka indicates a great diversity of plant species which are parasitized. A list of the total number of host species attacked by a parasite species is referred to as its host range. However, Shaw (1994) suggests that parasites have a narrow host range when they first arise as distinct species and that the host range may then subsequently expand. Manter's second rule states that a long association between a parasite and host will result in greater host specificity (Brooks & Mc Lenan, 1993). Parasites exercises some selectivity in the hosts that utilizes, so that some species are more frequently attacked than one might expect by chance, although the selectivity is not consistent between population or between plants from different parts of the same population (Gibson & Watkinson, 1989). The plants which are growing besides the trees highly infested with mistletoes need not be its host always due to dissemination of mistletoe seeds (Thriveni et al., 2010). Fruits are often adapted for bird dispersal. Birds act as seed dispersers, and some instances the same species may act as both pollinators and seed dispersers (Kuijit, 1969). Indeed, many of the bird species are highly specialized to consume mistletoe berries (Restrepo et al., 2002). Godschalk (1983) proposed that among mistletoes the loranaceae family with large, one seeded, highly nutritious fruits (i.e. protein and lipids) dispersed by specialized avian frugivores should follow the high investment strategy. Whereas the viscaceae with small, many seeded, less nutritive fruits (i.e. water and sugar) dispersed by more generalized avian frugivores should follow the low investment strategy. The seed coat is sticky allowing seeds to adhere to host branches, and seeds can often germinate in the absence of water.

Why some parasitic plants choose a particular host? and why the performance of the parasitic plant varies between hosts, and combinations of hosts sometimes are superior to a single host and not at other times, require a better understanding of the host traits that matter most to parasitic plants, extensive research on this issue within the context of the parasite-host relations has identified a wide variety of traits, including plant secondary chemistry, toughness and content of nitrogen and sterols, that mediate host choice in particular cases; however, the importance of these factors often varies between different species (Behmer & Elias, 2000; Pennings & Callaway, 2002). Finally, current knowledge on the biology of the parasitic angiosperms is dominated by laboratory studies, and there is a need for more field studies of parasitic plants in the communities on which they naturally occur (host plants) and such list would definitely help us to assess the loss of yielding and to propose best management strategies.

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