



Taxonomic diversity, distribution and host associations of parasitic plants in Yavatmal District (M.S.) India

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Abstract

Parasitic flowering plants constitute a specialized ecological group whose survival depends, to varying degrees, on vascular connections established with host plants through haustoria. These plants occur in both natural vegetation and cultivated systems, where they may influence host performance, plant-community relationships and agricultural productivity. Information on their district level diversity in central India is still fragmentary. Yavatmal District, situated in the Vidarbha region of Maharashtra, contains dry deciduous forests, agricultural fields, scrub vegetation, grasslands and disturbed habitats that can support several parasitic taxa. The present work consolidates published floristic information on parasitic angiosperms reported from Yavatmal and examines their taxonomic composition, local distribution, host associations, habitats and phenology. Five taxa were identified from the available literature: *Cuscuta reflexa* Roxb., *Dendrophthoe falcata* (L.f.) Ettingsh., *Striga gesnerioides* (Willd.) Vatke, *Striga asiatica* (L.) Kuntze and *Orobanche cernua* Loeft. These represent stem and root parasitism and include both hemiparasitic and holoparasitic strategies. *D. falcata* has been recorded on *Diospyros melanoxylon* and *Madhuca longifolia*, whereas *S. asiatica* has been associated with *Sorghum* spp. and *O. cernua* with *Solanum melongena*. The records demonstrate that parasitic plants occur across forest and agricultural environments in the district. The compiled baseline also indicates important gaps in contemporary information, particularly regarding population density, host range, seasonal occurrence and spatial distribution. Systematic field surveys supported by voucher specimens and GPS/GIS documentation are therefore recommended.

Keywords: Parasitic angiosperms, *Cuscuta*, *Dendrophthoe*, *Striga*, *Orobanche*, Yavatmal, Maharashtra, floristic diversity

Introduction

Parasitism represents a highly specialized nutritional association that has evolved independently in several lineages of flowering plants. Parasitic angiosperms establish intimate physiological connections with their hosts by means of haustoria and thereby obtain water and mineral nutrients; depending on the degree of dependence, they may also acquire substantial amounts of organic carbon from the host. On the basis of the position of attachment, parasitic plants are generally separated into root and stem parasites. A second useful distinction is between hemiparasites, which retain photosynthetic activity and holoparasites, which depend predominantly or completely on their hosts for nutrition (Westwood *et al.*, 2010) ^[10]. The families Orobanchaceae, Convolvulaceae and Loranthaceae contain important examples of these life forms. *Striga* and *Orobanche* are principally root-parasitic genera, whereas *Cuscuta* and mistletoes are characteristic stem parasites (Kannan & Pathak, 2016) ^[4].

Parasitic plants have ecological effects that extend beyond the immediate host-parasite interaction. They can alter host growth, nutrient movement and competitive relationships within plant communities. Some are also serious agricultural weeds. *Striga* species are obligate root hemiparasites and are particularly associated with grasses and cereal crops (Cochrane & Press, 1997) ^[2], while *Orobanche* and related root holoparasites can substantially reduce crop

performance (Mutuku *et al.*, 2021) ^[7]. Consequently, documentation of their occurrence at regional and district scales is relevant to both plant ecology and agricultural management.

Yavatmal District forms part of Maharashtra's Vidarbha region and has a tropical climate characterized by a distinct monsoon and a hot summer. District level environmental variation includes differences in terrain, vegetation, agricultural land use and availability of seasonal habitats. The principal floristic baseline for the district was provided by Karthikeyan and Anand Kumar (1993) ^[5], who documented 577 species representing 98 families. Later investigations continued to add taxa to the known flora. Bhogaonkar *et al.* (2015) ^[1], Lachure and Dhore (2017) ^[6] and Kakpure (2020) ^[3] among others, contributed additional records, including parasitic members of Orobanchaceae.

Although individual parasitic species have been reported in different floristic works, the information is scattered among publications and locality-specific records. A consolidated account is therefore useful for understanding the currently documented taxonomic composition and distribution of parasitic plants in the district. The objective of the present study was to assemble these records, organize them according to taxonomic and ecological attributes, summarize known host associations and phenological information and identify priorities for future field-based investigation.

Materials and Methods

1. Study area

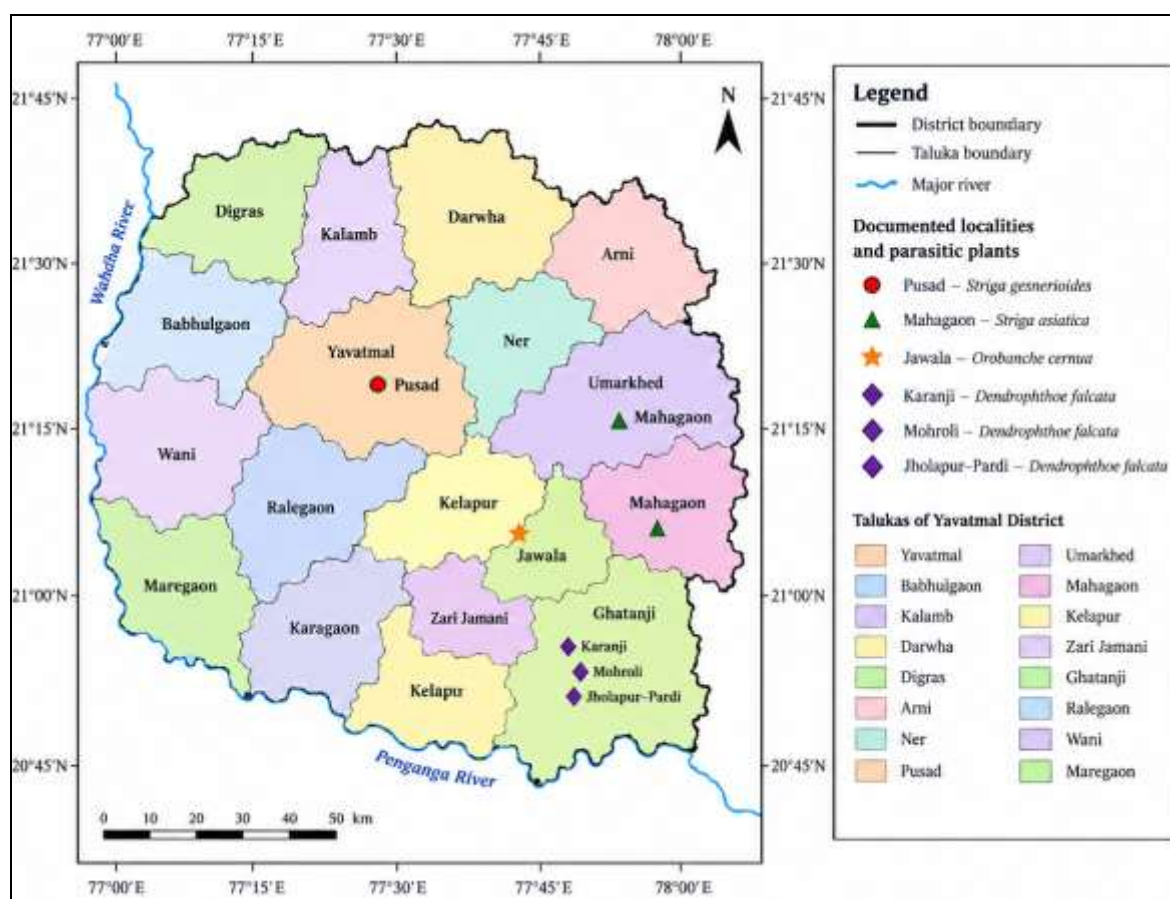


Fig 1: Study area and documented localities of parasitic plants in Yavatmal District, Maharashtra, India.

Yavatmal District is located approximately between 19°23'–20°48' N latitude and 77°19'–79°07' E longitude. Its vegetation and land use mosaic includes agricultural fields, dry deciduous forest, scrub, grassland, wasteland, roadside vegetation and habitats associated with rivers and seasonal drainage. This environmental heterogeneity provides a range of potential hosts and microsites for parasitic plants.

The district was treated as the geographical unit of analysis. Locality records were compiled from published floristic literature, beginning with the district flora of Karthikeyan and Anand Kumar (1993) [5] and supplemented with subsequent records, particularly those of Bhogaonkar *et al.* (2015) [1], Lachure and Dhore (2017) [6], Kakpure (2020) [3] and Rothe (2000) [8].

2. Floristic literature survey

Published taxonomic and floristic sources dealing with Yavatmal District were examined for documented occurrences of parasitic plants. A taxon was included when its presence in the district was explicitly reported in a recognized source. For each record, the available information on accepted scientific name, family, parasitic strategy, locality, habitat, host plant, host organ, flowering and fruiting period and collection or specimen information was noted. Because the available evidence was literature based, the study is considered a consolidated floristic assessment rather than a standardized quantitative survey of present day populations.

3. Species identification and nomenclature

Scientific names were retained in accordance with the botanical nomenclature used in the cited regional floristic sources. Taxonomic information was checked against the Flora of Yavatmal District, Maharashtra and Flora of Maharashtra State: Dicotyledones (Singh *et al.*, 2001) [9], together with the species level records cited in the literature.

4. Species-wise distribution assessment

Reported localities were arranged by species. The compiled records include the Arni-Yavatmal road, Hiwri R.F., Jholapur-Pardi forest, Karanji, Mohroli, Pusad, Pandharkawada, Mahagaon, Kharbi and Jawala. Historical records and later observations were kept separate where possible so that an old locality would not automatically be interpreted as evidence of a currently persistent population.

5. Host-parasite associations

Host information was extracted from the cited floristic records and species accounts. The host species and the plant organ penetrated by the parasite were recorded whenever the source supplied those details. A future standardized survey should additionally record host family, growth form, locality, habitat, number of hosts examined, number infected and parasite abundance.

6. Habitat assessment

Habitats were grouped into agricultural fields, dry deciduous forest, scrubland, grassland, roadside vegetation,

wasteland and other disturbed or semi-natural environments. Habitat interpretation was made in relation to the distribution of suitable hosts and the biological characteristics of each parasite.

7. Phenological observations

Flowering and fruiting information was compiled from published Yavatmal records. Where field observations are available, phenological stages should be recorded during each visit as vegetative, budding, flowering, immature fruiting and mature fruiting. Historical and current observations should be reported separately because phenological periods may vary among years and localities.

8. Photographic documentation

For future publication oriented field documentation, photographs should include the complete habit, diagnostic

morphological features, flowers or inflorescences, the host plant and the surrounding habitat. Original field photographs are preferable to secondary images.

Results

1. Taxonomic diversity

Five parasitic angiosperm taxa belonging to three families were documented from the available Yavatmal literature. They include *Cuscuta reflexa* Roxb. (Convolvulaceae), *Dendrophthoe falcata* (L.f.) Ettingsh. (Loranthaceae), *Striga gesnerioides* (Willd.) Vatke, *Striga asiatica* (L.) Kuntze and *Orobanche cernua* Loefl. (Orobanchaceae). The documented species represent different parasitic strategies. *C. reflexa* is a stem holoparasite, *D. falcata* is a stem hemiparasite, *Striga* species are root hemiparasites and *O. cernua* is a root holoparasite.

Table 1: Taxonomic enumeration of parasitic plants documented from Yavatmal District

S. N.	Taxon	Family	Parasitic type	Distribution / record
1	<i>Cuscuta reflexa</i> Roxb.	Convolvulaceae	Stem holoparasite	Forest and along roadsides
2	<i>Dendrophthoe falcata</i> (L.f.) Ettingsh.	Loranthaceae	Stem hemiparasite	Jholapur–Pardi forest, Karanji; Mohroli
3	<i>Striga gesnerioides</i> (Willd.) Vatke	Orobanchaceae	Root hemiparasite	Pusad
4	<i>Striga asiatica</i> (L.) Kuntze	Orobanchaceae	Root hemiparasite	Mahagaon
5	<i>Orobanche cernua</i> Loefl.	Orobanchaceae	Root holoparasite	Jawala

The occurrence of *C. reflexa* and *D. falcata* is supported by the district flora. The former is described as a common parasite in relevant forest vegetation, whereas the latter is specifically described as parasitic on *Diospyros melanoxylon* and *Madhuca longifolia*. Later literature provides records of *S. gesnerioides*, *S. asiatica* and *O. cernua*. Rothe (2000) recorded *S. gesnerioides* from Pusad, while Kakpure (2020) documented *S. asiatica* from Mahagaon and *O. cernua* from Jawala.

2. Species-wise distribution

The compiled localities show that parasitic plants are not confined to one habitat type. Stem parasites are chiefly associated with woody vegetation, whereas the root-parasitic taxa are linked more closely with herbaceous hosts and cultivated land. The following species accounts summarize the available district records.



Fig.: *Cuscuta reflexa* Roxb



Fig.: Flower of *Cuscuta reflexa* Roxb

2.1.2 *Dendrophthoe falcata* (L.f.) Ettingsh.

D. falcata is a perennial woody mistletoe and stem hemiparasite. The species retains green leaves and therefore differs physiologically from holoparasitic *Cuscuta*. The district flora describes it as a common parasite and records it on *Diospyros melanoxylon* and *Madhuca longifolia* in forest

areas around Jholapur–Pardi, Karanji and Mohroli. The species therefore represents an important component of the arboreal parasitic flora of Yavatmal. Its occurrence on multiple tree hosts also suggests that host availability may be an important factor influencing its local distribution.



Fig.: *Dendrophthoe falcata* (L.f.) Ettingsh with flower.

2.2 Root Parasitic Plants

2.2.1 *Striga gesnerioides* (Willd.) Vatke

Rothe (2000) reported *S. gesnerioides* as a new addition to the flora of Yavatmal District and recorded it from Pusad. The taxon is a hemiparasitic member of Orobanchaceae. Contemporary taxonomic resources recognize *S. gesnerioides* as an accepted species with a distribution

extending across seasonally dry tropical regions of Africa, the Arabian Peninsula and the Indian subcontinent. Its occurrence in Yavatmal is important from an agricultural perspective because species of *Striga* are recognized as economically significant parasitic weeds. Their attachment to host roots allows them to obtain resources before or during development of the aerial portion of the parasite.

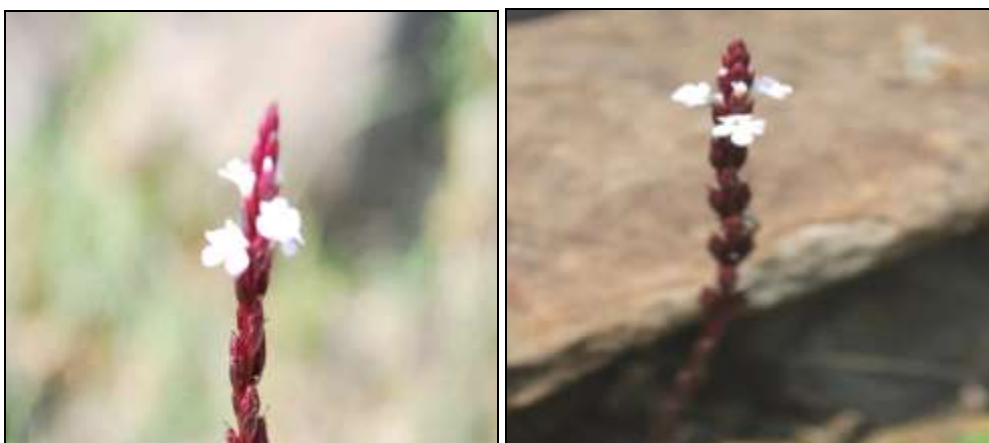


Fig.: *Striga gesnerioides* (Willd.) Vatke with flower

2.2.2 *Striga asiatica* (L.) Kuntze

Kakpure (2020) documented *S. asiatica* from Mahagaon, Yavatmal. The species was described as a small, erect root-parasitic herb approximately 10–15 cm tall and was observed parasitizing *Sorghum* spp. in dry, stony agricultural fields. Flowering and fruiting were recorded from July to January in the cited investigation. *S. asiatica* is an obligate root hemiparasite,

particularly associated with grasses and cereals. Its occurrence in sorghum fields has direct agricultural significance because the genus *Striga* includes some of the world's most important parasitic weeds of cereal crops. The Mahagaon record is particularly relevant because it demonstrates that parasitic plants in Yavatmal are not restricted to natural forests but also occur in cultivated ecosystems.



Fig.: *Striga asiatica* (L.) Kuntze with flower

2.2.3 *Orobanche cernua* Loefl.

Kakpure (2020) documented *O. cernua* from Jawala, Yavatmal. It was characterized as a non-photosynthetic, scapigerous root parasite with a fleshy underground base and leafless flowering stem. The plant was reported as a rare root parasite of *Solanum melongena* in cultivated fields and

was noted to cause damage to its host. Unlike *Striga*, which is hemiparasitic, *Orobanche* is a holoparasitic group. Comparative studies indicate that *Orobanche* develops primarily in association with host roots and differs from *Cuscuta*, whose haustoria are associated mainly with aerial host organs.



Fig.: *Orobanche cernua* Loefl. with flower

3. Taxonomic Composition

According to Angiosperm Phylogenetic Group (APG) of Classification, the documented parasitic flora represents three families -

1. Convolvulaceae - *Cuscuta reflexa* Roxb
2. Loranthaceae – *Dendrophthoe falcata* (L.f.) Ettingsh

3. Orobanchaceae – *Striga gesnerioides*, *Striga asiatica*, *Orobanche cernua*

Thus, Orobanchaceae contributes the largest number of documented parasitic taxa in the currently assembled literature-based dataset.

4. Host-parasite associations

Table 2: Parasite-host associations documented in Yavatmal District

S.N.	Name of Parasite	Recorded host(s)	Host organ attacked	Evidence/source
1	<i>Cuscuta reflexa</i> Roxb.	<i>Achyranthus aspera</i>	Stem	District flora record
2	<i>Dendrophthoe falcata</i> (L.f.) Ettingsh.	<i>Diospyros melanoxylon</i> ; <i>Madhuca longifolia</i>	Stem/branches	District flora record
3	<i>Striga asiatica</i> (L.) Kuntze	<i>Sorghum</i> spp.;	Roots	Rothe 2000; Kakpure 2020
4	<i>Striga gesnerioides</i> (Willd.) Vatke	Grasses	Roots	Rothe 2000
5	<i>Orobanche cernua</i> Loefl.	<i>Solanum melongena</i>	Roots	Kakpure 2020

The host associations demonstrate two major ecological groups: stem parasites associated mainly with woody plants

and root parasites associated predominantly with herbaceous or agricultural hosts.

5. Flowering and fruiting

Table 3: Flowering and fruiting period of parasitic plants recorded from Yavatmal District

No.	Species	Flowering & fruiting	Basis/remark
1	<i>Cuscuta reflexa</i> Roxb.	November–March	District flora
2	<i>Dendrophthoe falcata</i> (L.f.) Ettingsh.	December–March	District flora
3	<i>Striga asiatica</i> (L.) Kuntze	June–August (Rothe, 2000); July–January (Kakpure, 2020)	Two Yavatmal sources report different ranges
4	<i>Striga gesnerioides</i> (Willd.) Vatke	September–December	Rothe, 2000
5	<i>Orobanche cernua</i> Loefl.	January–March	Kakpure, 2020

Differences among reported phenological periods may reflect variation in locality, rainfall, host condition and year of observation. Therefore, future multi-season field observations are necessary to establish species-specific phenological calendars for Yavatmal District.

Comparison with Earlier Yavatmal Records

The presently compiled parasitic flora combines the original district level baseline with records added through subsequent floristic investigations. Karthikeyan and Anand Kumar (1993) established the principal floristic framework

for Yavatmal, while later studies progressively broadened the known plant inventory. The records of *S. asiatica* and *O. cernua* reported by Kakpure (2020) are especially important because they contributed additional parasitic taxa and recognized Orobanchaceae among the district flora. Direct numerical comparison of abundance or population

size among the published records is not appropriate because the earlier studies differed in purpose, sampling intensity and methodology. Nevertheless, the sequence of records indicates that the documented parasitic flora has expanded as additional localities and less conspicuous taxa have been investigated.

Table 4: Comparison with previous Yavatmal records and implications for the present study

Species	Previous Yavatmal baseline	Interpretation for current survey	Key source
<i>Cuscuta reflexa</i> Roxb.	District flora already documented it as common at Arni–Yavatmal road and Hiwri R.F.	Confirms persistence of a widespread stem parasite; new survey should test current host range and local frequency.	Karthikeyan & Anand Kumar, 1993
<i>Dendrophthoe falcata</i> (L.f.) Ettingsh.	District flora recorded it from Jholapur–Pardi forest, Karanji and Mohroli on <i>Diospyros melanoxylon</i> and <i>Madhuca longifolia</i> var. <i>latifolia</i> .	Provides a baseline for checking present-day host occurrence and infestation intensity.	Karthikeyan & Anand Kumar, 1993
<i>Striga asiatica</i> (L.) Kuntze	Rothe (2000) recorded Pandharkawada; Kakpure (2020) recorded Mahagaon on <i>Sorghum</i> spp.	Later record expands/updates the documented district locality set; field counts are needed to assess current agricultural importance.	Rothe, 2000; Kakpure, 2020
<i>Striga gesnerioides</i> (Willd.) Vatke	Rothe (2000) recorded Pusad.	A historical district record that warrants confirmation with voucher specimens and host identification.	Rothe, 2000
<i>Orobanche cernua</i> Loefl.	Rothe (2000) recorded Kharbi; Kakpure (2020) recorded Jawala on <i>Solanum melongena</i> .	The later record provides an additional locality and explicit crop-host association.	Rothe, 2000; Kakpure, 2020

Discussion

The compiled evidence shows that parasitic angiosperms in Yavatmal occur across markedly different ecological settings and employ contrasting parasitic strategies. The district records include the stem holoparasite *C. reflexa*, the stem hemiparasite *D. falcata* and three root parasites belonging to Orobanchaceae. This combination illustrates both taxonomic and functional diversity within a relatively restricted geographical unit.

The historical district flora remains an important reference point because it documented parasitic plants as established components of local vegetation. *D. falcata* was associated with more than one tree host, while *C. reflexa* was recognized as a common parasite in relevant forest vegetation. Subsequent records demonstrate that the original inventory did not encompass all parasitic taxa occurring in the district. Rothe (2000) added *S. gesnerioides*, and Kakpure (2020) reported *S. asiatica* and *O. cernua*. Continued botanical exploration is therefore particularly important for parasites whose aerial phases are seasonal or inconspicuous.

Root parasites present a special challenge to floristic inventories because much of their life cycle is associated with the host root system. Early stages of *Striga* development can remain below ground and difficult to detect, while *Orobanche* has highly reduced vegetative structures. Consequently, surveys focused only on conspicuous above ground vegetation may underestimate the occurrence of these plants. Targeted searches in crop fields during appropriate seasons are likely to improve detection.

The association of *S. asiatica* with *Sorghum* is of particular interest for Yavatmal because jowar is an important crop in the district. The documented parasite-host relationship therefore warrants investigation of infestation frequency, host susceptibility, spatial clustering and possible effects on crop performance. Similarly, the report of *O. cernua* on *Solanum melongena* indicates that parasitic plants may also occur in vegetable-growing systems. The description of the

latter as rare at one locality should not be generalized to the entire district without systematic sampling.

Local occurrence of parasitic plants is likely to reflect several interacting factors, including host availability, vegetation structure, soil properties, rainfall, temperature, agricultural practices and mechanisms of propagule dispersal. *Dendrophthoe* and *Cuscuta* may be favored where suitable above-ground hosts are abundant, whereas *Striga* and *Orobanche* are more directly constrained by the distribution and physiological characteristics of compatible host roots. The three families represented in the district also emphasize the evolutionary diversity of plant parasitism, which has arisen in multiple angiosperm lineages.

Conservation and Agricultural Significance

The ecological role of parasitic plants should not be reduced to their effects as agricultural weeds. In natural communities, parasitic relationships form part of the structure and functioning of plant ecosystems. Mistletoes such as *Dendrophthoe* contribute to forest-community interactions and may influence relationships among hosts and other organisms. Their occurrence should therefore be interpreted within the broader ecological context of the habitat.

In cultivated landscapes, however, root parasites such as *Striga* and *Orobanche* can have substantial economic consequences. Effective management requires knowledge of host range, germination cues, host recognition, haustorial establishment and the timing of parasite emergence. For Yavatmal, management and conservation assessments should distinguish among naturally occurring forest parasites, parasites on non-crop hosts, agriculturally important parasitic weeds and taxa whose present distribution remains uncertain.

Research Gaps and Future Scope

The existing literature provides a useful baseline but does not constitute a complete contemporary inventory of

parasitic plants of Yavatmal District. Future research should include:

1. Systematic district-wide field surveys covering all seasons.
2. GPS-based mapping of each parasitic species.
3. Host-range documentation for every population.
4. Population-density estimation using standardized quadrats/transects.
5. Seasonal phenological studies.
6. Assessment of crop infestation by *Striga* and *Orobanchae*.
7. Herbarium documentation and voucher specimens.
8. Morphological and molecular confirmation of difficult taxa.
9. Assessment of host specificity.
10. Long-term monitoring to detect changes in distribution.
11. Assessment of the effect of land-use change and agricultural intensification.
12. Geospatial analysis using GIS to identify environmental variables associated with parasite occurrence.

A particularly useful follow-up investigation would be a district-level survey of *S. asiatica*, *S. gesnerioides* and *O. cernua* in agricultural ecosystems, combined with assessment of host crops and infestation intensity.

Conclusion

The available floristic literature establishes the presence of at least five parasitic angiosperm taxa in Yavatmal District: *Cuscuta reflexa* Roxb., *Dendrophthoe falcata* (L.f.) Ettingsh., *Striga gesnerioides* (Willd.) Vatke, *Striga asiatica* (L.) Kuntze and *Orobanchae cernua* Loefl. Together they encompass stem and root parasitism as well as hemiparasitic and holoparasitic modes of nutrition. The documented localities demonstrate that parasitic plants occur in both forest and agricultural environments. *Cuscuta* and *Dendrophthoe* are principally associated with above-ground host tissues and woody vegetation, whereas the documented *Striga* and *Orobanchae* records involve cultivated or herbaceous hosts.

The addition of parasitic taxa through successive floristic studies indicates that the district flora remains incompletely explored. The present literature-based synthesis therefore serves as a baseline rather than a final inventory. A systematic contemporary survey integrating seasonal field sampling, host association studies, quantitative population assessment, voucher specimens and GPS/GIS-based mapping would substantially improve understanding of the diversity, distribution, ecological role and agricultural significance of parasitic plants in Yavatmal District.

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