Phanerogamic Plant Parasites

Hasan Mahmadul Hoque and Bidisha Borgohain*

M.Sc. Scholar, Biswanath College of Agriculture, Assam Agricultural University, Assam

Corresponding Author
Bidisha Borgohain
Email: borgohainbidisha195@gmail.com

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ABSTRACT

Phanerogamic plant parasites, also known as flowering plant parasites, are a complex aspect of plant biology and ecology. These parasitic plants, which belong to various families and genera, derive their nutritional requirements from other living plants. They have evolved strategies to exploit host plants, often forming specialized structures. This interaction impacts the health and growth of host plants and plays a significant role in ecosystem dynamics. Plants can be divided into two categories such as Phanerogam plants and cryptogam plants. Phanerogams are flowering plants that produce seeds, while cryptogams reproduce by spores and do not produce seeds or flowers. Thus, A phanerogamic parasite is a flowering plant that parasitizes a healthy plant, relying on the host for food and nutrition (Costa *et al*., 2024).

INTRODUCTION

Classification of Phanerogamic plant parasites

Phanerogams are classified into two categories based on habitat and site of attachment of the parasites and host. Based on the habitat phanerogamic parasites are classified as Total parasite and Partial parasite. And based on the attachment to main host they are classified as Stem parasite and Root parasite.

Sl. No.	Types of Phanerogams parasites	Common Name	Scientific Name
1	Total stem parasite	Dodder	*Cuscutta* sp
2	Partial stem parasite	Loranthus / Giant Mistletoe	*Dendrophthoe* sp

3	Total root parasite	Broom rape / Tokra	*Orobanche* sp
4	Partial root parasite	Witch weed	*Striga* sp

A. Total Parasite: These parasites rely solely on the host plant for food and water they produce haustoria for absorption of food and nutrition from the host plant. These parasites depend on the host plant for sustenance since they lack the ability to produce their own food. These parasites are sometimes known as complete or holo parasite.

B. Partial parasites: They can synthesize their own food, but rely on the host plant for fundamental nutrients like minerals. The host plant provides nutrients to the parasite. Using these nutrients, the parasite will generate food. These parasites are also known as hemi parasites.

C. Stem Parasite: The parasite parasitizes the host plant's stem portion. There are two forms of stem parasite total stem parasite or partial stem parasite.

D. Root parasite: This parasite parasitizes the root portion of the host plants. There are two types of root parasite total root parasite or partial stem parasite

1. Dodder or Cuscuta (*Cuscutta* sp)

A non chlorophyllous, leafless parasitic seed plant, yellow, pink, or orange, produces flower and fruit without leaves. A single plant produces 3000 seeds. Its first appearance is a thread-like stem without green pigment, twine around the stem or leaves of the host. When the plant comes into contact with the host, the minute root organs i.e. haustoria, penetrate into the host and absorbs. Once the host relationship is established, the plant loses soil contact, causing it to weaken and yield poorly. However, it remains viable when conditions are favourable.

Symptoms

- Host suffers from malnutrition and it may be dwarf.
- Yellowing of the leaves with less flowers and fruits.
- In severe case, whole plant of the affected parts may die.

Management: For controlling dodder infestations, including using dodder-free seeds and manure, crop rotation with non-host plant, limiting domestic animal movement, cleaning agricultural implements before relocation, and using chemical control methods like 2,4-D**.**

2. Loranthus (*Dendrophthoe* sp)

This parasite is a partial parasite of tree trunks and branches, with a brown stem and dark green leaves but no roots. It appears in clusters at the attack point and produces long, tubular, greenish, whitish, or red flowers. At the point of attachment with tree, it shows swellings or tumorous growth where the haustoria are produced. The host plant becomes stunted, and seed dispersal is mainly through birds and animals. The affected plant's growth is stunted.

Symptoms

- Stunted growth of the host and reduce the leave size.
- Flowering and fruiting may be hampered.
- On the infected area tumour may form

Management: for the controlling of Loranthus infestation involves pruning infected branches, detaching the parasite from the host during early growth stages, cutting off wood below the tumour if it's one side of the branch, and

injecting copper sulphate sodium or 2,4-D into affected branches**.**

3. Broom rape (*Orobanche* sp)

Symptoms

- Stunted growth, malnutrition and dwarfness of the host.
- Flowering and fruiting reduced.

Management: To combat broom rapes, prevent seed introduction, crop rotation with non-host crops, frequent weeding and removal of broom rapes before seed production, and spray the soil with a 25% sodium sulphate solution to destroy the parasite**.**

Overwintering and dissemination: The parasite overwinters as seed in the 1-inch depth of soil. It requires a chemical stimulant benzopyran released from the roots of the host plant to germinate.

4. Witch weed (*Striga* sp)

Symptoms

- Plants which are affected they turn yellowish, wilt and remain stunted.
- Infected root bears a large number of witches weed haustoria which are attached to roots and feed on it, if plants are heavily parasitized death of the plant may occur.

Management: During early stages, successful weeding and intercultural operations are employed. Watering the field and draining it helps control the parasite. Trap crops stimulate seed germination to destroy the striga, and weedicides like 2,4-D are used effectively against the parasite.

Overwintering and dissemination: Seeds survive as dormant structure in soil. Seeds germinate only in response to chemical stimulant viz., strigol ethylene, cytokinin, gibberellin and coumarin strigol released from host roots.

Modes of attachment and nutrient acquisition

- **Attachment:** Phanerogamic parasites have specialized projections/root like branch or organ that penetrates the host tissue that is called haustoria.
- **Nutrient acquisition:** The haustoria will release certain enzymes predominantly pectolytic and cellulolytic enzymes which softens the host tissues. This process paves pathway for the haustoria to spread deep into the host tissues. Haustoria have higher osmotic pressure than that of host tissues which facilitates easy absorption of nutrients. This causes minimized growth, chlorosis and death of the host plant. (Kirschner *et al*., 2023)

Ecological roles and impact: Parasites can disrupt nutrient cycling, potentially leading to host plant death, affecting plant diversity. They also influence species interactions, affecting the dynamics of plant-plant interactions and contributing to the complexity of ecosystems.

CONCLUSION:

Phanerogamic plant parasites, including dodder, broomrape etc, illustrate fascinating evolutionary strategies for resource acquisition from host plants. Their study not only enriches our understanding of plant interactions and ecosystem dynamics but also offers potential benefits for agriculture and medicine. Despite their parasitic nature, these plants play a crucial role in ecological balance and scientific research.

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