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Sesamum Phyllody: Symptoms and Management

*Govind Junjadia, Manish Kumar and Surjeet
College of Agriculture, Agriculture University, Jodhpur, Rajasthan, India
*Corresponding Author's email: govindchoudhary1644@gmail.com

Sesame (*Sesamum indicum*), often referred to as the "Queen of Oilseeds," is one of the oldest cultivated oilseed crops, prized for its high-quality edible oil and adaptability to diverse agro-climatic conditions. India stands as a leading producer of sesame, with significant cultivation in states like Rajasthan, Gujarat, Uttar Pradesh, and Madhya Pradesh. Despite its economic importance, sesame cultivation faces several challenges, among which phyllody disease is particularly detrimental.

Phyllody is a severe disease affecting sesame, caused by phytoplasmas—wall-less, pleomorphic bacteria that reside in the phloem tissue of plants. These pathogens are transmitted by insect vectors, primarily the leafhopper *Orosius albicinctus*. The disease is characterized by the transformation of floral parts into leafy structures, leading to sterility and significant yield losses. Infected plants exhibit symptoms such as floral virescence (greening of floral parts), proliferation of shoots (witches' broom), and cracking of seed capsules. The prevalence of phyllody has been reported across various sesame-growing regions in India, with incidence rates varying based on environmental conditions and vector populations. Studies have indicated that early infection stages result in more pronounced symptoms and greater yield reductions. The disease's impact is exacerbated by factors such as high humidity, moderate temperatures, and the presence of alternate host plants that support vector populations.

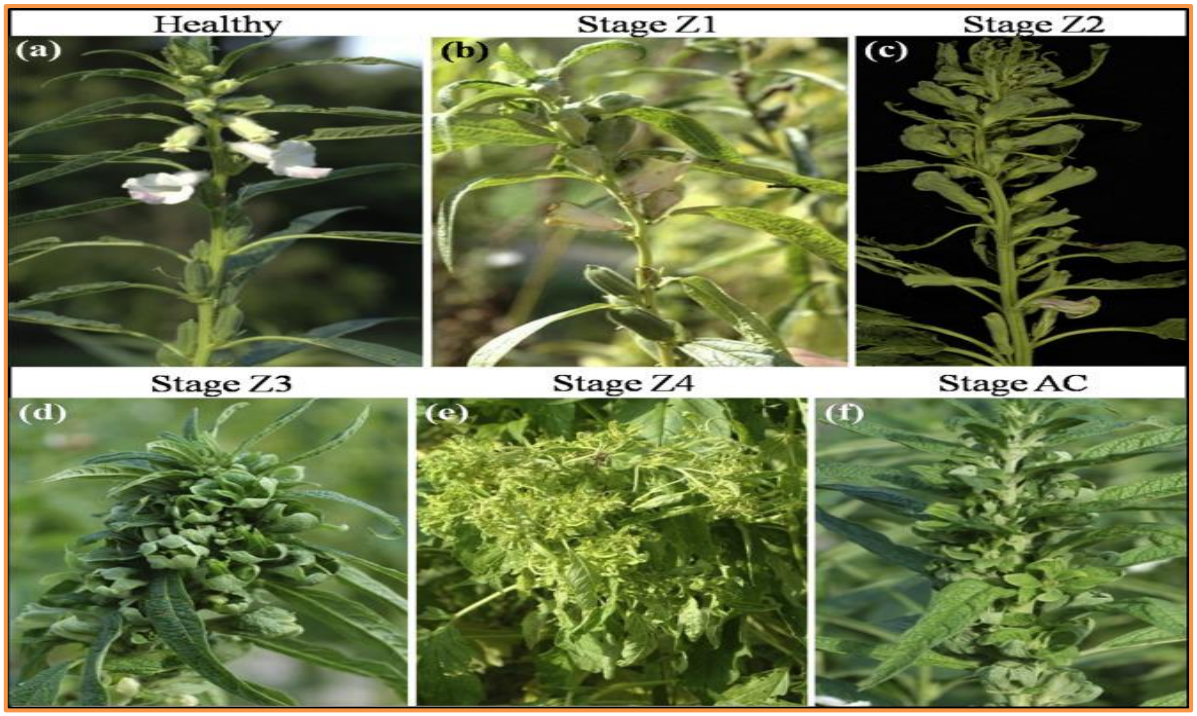
Effective management of sesame phyllody necessitates an integrated approach combining cultural, chemical, and biological strategies. Cultural practices include the removal and destruction of infected plants, intercropping with non-host species like pigeon pea, and the use of resistant sesame varieties such as TKG 21, RT-125, and RT-103. Chemical control involves seed treatment with systemic insecticides like imidacloprid and foliar applications of insecticides to manage vector populations. Biological control measures, including the use of neem-based products, have also shown efficacy in reducing disease incidence.

Detailed Symptoms of Sesame Phyllody Disease

Sesame phyllody, caused by phytoplasmas and primarily transmitted by the leafhopper *Orosius albicinctus*, manifests through a range of distinct and progressive symptoms that severely impact plant development and yield. The disease predominantly affects the reproductive structures but also induces systemic changes throughout the plant.

1. **Phyllody (Leafy Flower Syndrome)**: The hallmark symptom is the transformation of floral parts into green, leaf-like structures. Petals, stamens, and carpels lose their typical morphology, adopting leaf-like appearances, rendering the flowers sterile and incapable of seed production.
2. **Floral Virescence**: Accompanying phyllody, floral organs exhibit virescence, where non-green parts such as petals and stamens turn green due to chlorophyll development, further indicating abnormal floral development.

3. **Witches' Broom**: Infected plants often display a proliferation of axillary shoots, leading to a dense, bushy appearance known as witches' broom. This results from the suppression of apical dominance and the activation of dormant buds.
4. **Shoot Tip Fasciation and Flattening**: The apical regions of shoots may become flattened and broadened, a condition termed fasciation, leading to abnormal growth patterns and further distortion of plant architecture.
5. **Cracking of Seed Capsules**: Capsules that develop before infection may exhibit longitudinal cracking. In some cases, seeds within these capsules begin to germinate prematurely, a phenomenon known as vivipary.
6. **Leaf Deformation and Size Reduction**: Leaves on infected plants may become smaller, distorted, and exhibit abnormal shapes. The overall leaf area is significantly reduced, compromising the plant's photosynthetic capacity.



7. **Internode Shortening**: The distance between nodes on the stem decreases, leading to a compact and stunted plant stature.
8. **Chlorosis and Yellowing**: Affected plants may show yellowing of leaves due to chlorophyll degradation, impacting the plant's vigor and productivity.
9. **Overall Plant Stunting**: The cumulative effect of these symptoms results in significant stunting of the plant, with reduced height and biomass, ultimately leading to substantial yield losses.

Causal Organism and Transmission

Phyllody in sesame is caused by phytoplasmas, which are wall-less, pleomorphic bacteria that reside in the phloem tissue of plants. These pathogens are transmitted by insect vectors, primarily the leafhopper *Orosius albicinctus*. The disease spreads when these vectors feed on healthy plants after acquiring the phytoplasma from infected ones.

Favorable Conditions for Disease Development

Certain environmental conditions favor the proliferation and spread of phyllody:

- **High Relative Humidity**: Levels above 85% create a conducive environment for the disease.
- **Temperature**: Moderate temperatures ranging between 20°C to 25°C are optimal for disease development.
- **Rainfall**: Heavy rainfall can increase vector populations, thereby enhancing disease spread.

Management Strategies

Effective management of sesame phyllody requires an integrated approach combining cultural, chemical, and biological methods:

1. **Cultural Practices**:

- **Field Sanitation**: Remove and destroy infected plants promptly to prevent the spread of the disease.
- **Weed Management**: Eliminate reservoir and weed hosts that can harbor the phytoplasma or its vectors.
- **Crop Rotation**: Avoid planting sesame near crops like cotton, groundnut, and grain legumes, which can serve as alternate hosts.
- **Adjusting Sowing Dates**: Time sowing to avoid peak vector activity periods, thereby reducing infection rates.

2. **Chemical Control**:

- **Seed Treatment**: Treat seeds with systemic insecticides like imidacloprid to protect seedlings from early vector attacks.
- **Foliar Sprays**: Apply insecticides such as imidacloprid (17.8% SL) at 0.25 ml/liter and antibiotics like tetracycline hydrochloride at 500 ppm at 15-day intervals to control vector populations and suppress phytoplasma activity.

3. **Biological Control**:

- **Neem-Based Products**: Use neem oil or azadirachtin-based formulations to reduce vector populations in an eco-friendly manner.

4. **Resistant Varieties**:

- Cultivate sesame varieties that have shown moderate resistance to phyllody, such as 'Madhavi', to minimize disease impact.