

IPM combines regular monitoring, cultural practices (pruning and destruction of galled inflorescences), use of botanicals and biopesticides and need-based safe chemical applications. By integrating these strategies, the gall problem can be minimized without disturbing the desert ecosystem balance.

Cultural & Preventive Measures

- ❖ Removal of fallen dried flower galls of khejri
- ❖ Prune/lopping of trees at an interval of 1 year

Since gall mites hide inside the galls and are not easily exposed to pesticides, removing infested plant parts is one of the most effective ways to break their life cycle and reduce spread. Cultural practices such as pruning and destruction of infested flowers stop the gall mites at the source. It prevents initial build-up of the pest population before it reaches damaging levels.



Use of Botanicals /entomopathogens

- ❖ Spray of *Putranjiva roxburgii* (10%) or *Balanites aegyptiaca* (10%) leaf extract.
- ❖ Spray of *Metarhizium anisopliae* at the time of bud initiation at a concentration of 2.5×10^7 conidia/ml @2 gm/L

The use of botanicals and entomopathogens provides a sustainable, eco-friendly alternative to chemical pesticides for khejri flower gall management.



Use of pesticides

- ❖ Abamectin 1.9% EC @1ml/L
- ❖ diafenthuron 25% WW + pyriproxyfen 5% WW @ 2ml/L

Pesticides can play a role in suppressing severe outbreaks of Khejri flower gall, but their use should remain judicious, selective and need-based. They should not replace cultural and biological measures, which form the backbone of sustainable IPM in arid ecosystems.



Benefits of Integrated Management

- ❖ Reduces gall incidence.
- ❖ Eco-friendly—Reduces reliance on harmful chemical pesticides, protecting soil, water, and biodiversity.
- ❖ Sustainable—Promotes long-term pest management through a balanced use of cultural, mechanical, biological, botanical and chemical approaches.



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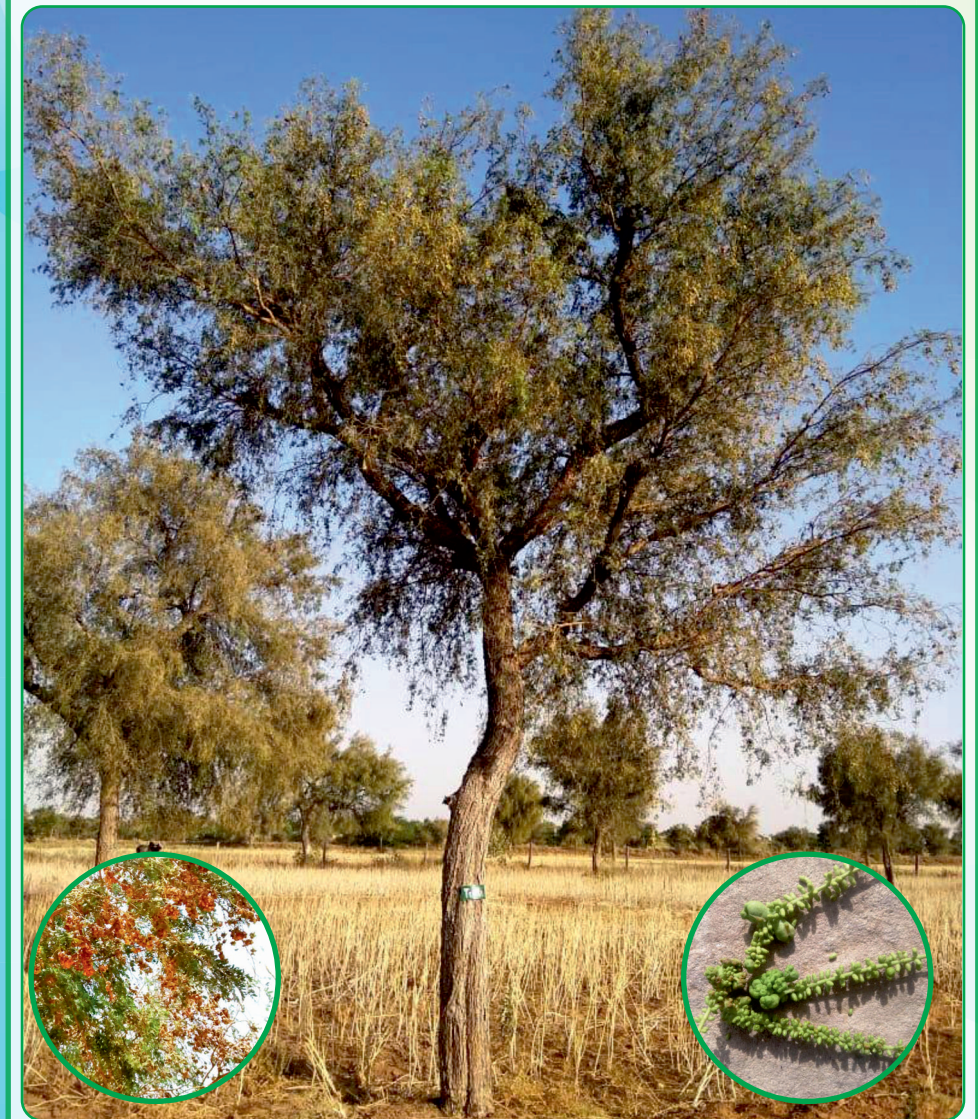
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STRATEGIES FOR THE MANAGEMENT OF KHEJRI FLOWER GALL INFESTATION

Flower gall formation is a serious problem
that reduces pod set and lowers productivity



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Introduction

Khejri (*Prosopis cineraria*) is a lifeline tree of the Thar Desert. It is a multipurpose, drought-hardy tree species belonging to the family Fabaceae. It is known for its exceptional adaptability to extreme arid environment and its importance in sustaining rural livelihoods. Culturally, *P.cineraria* is deeply embedded in the heritage of Rajasthan. Revered in folklore and worshipped for its sacred value, it has historically been protected under community-based conservation practices, such as those of the Bishnoi community, who sacrificed their lives in the 18th century to save these trees in the legendary “Khejarli movement”. *P. cineraria* contribute to soil fertility improvement through nitrogen fixation, enhanced organic matter, and provision of shade and microclimate regulation in fragile desert ecosystems. The species is invaluable to rural communities. Its leaves (known as Loong) serve as highly nutritious fodder for livestock during periods of scarcity, particularly in prolonged droughts. The tender pods, locally known as sangri, are a rich source of protein and minerals and are consumed as a delicacy in traditional diets. *P. cineraria* is not only an asset but also a socio-cultural and economic lifeline for the people of Rajasthan. Its integration into farming systems and desert ecology makes it indispensable for sustainable land management, biodiversity conservation and climate resilience in arid regions.

Importance of Khejri

- ❖ Multipurpose Tree – Provides fodder, pods (sangri), fuelwood, timber, and shade.
- ❖ Drought Hardy – Thrives in extreme arid conditions.
- ❖ Cultural Significance – Revered in desert communities for sustaining rural livelihoods.

Ecological Role

- ❖ Improves soil fertility through biological nitrogen fixation.
- ❖ Enhances organic matter and soil health.
- ❖ Provides shade, shelter and microclimate regulation in fragile desert ecosystems.
- ❖ Acts as a keystone species supporting biodiversity and desert sustainability.

Nutritional Value

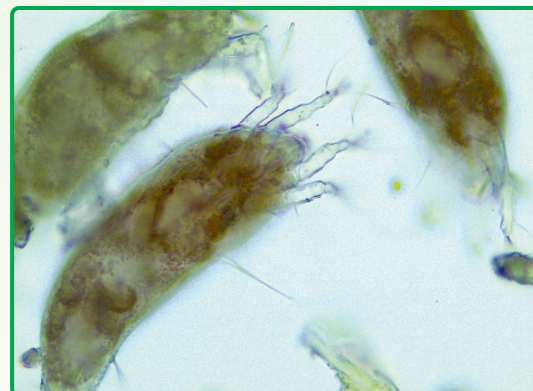
- ❖ Tender pods (Sangri) – Rich in protein and minerals.
- ❖ Consumed as a traditional delicacy in local diets.
- ❖ Serves as nutritious fodder for livestock, especially in drought years.

Socio-Economic Significance

- ❖ Supports food security, fuelwood needs, and livelihoods.
- ❖ Integral to agroforestry systems in arid regions.

Emerging Threat – Flower/inflorescence Gall Problem

Despite its recognized resilience to drought and high temperature stresses, recent field observations have highlighted a serious emerging pest problem of flower/inflorescence galls. Infested flowers fail to form pod and seed set is drastically reduced. It is caused by the Eriophyid mite *Eriophyes prosopidis*.



Symptoms:

- ❖ It was observed that gall infested trees looks sick having large number of unorganized, round, oblong and spindle-shaped galls.
- ❖ These galls were initially green and soft but on maturation became firm to hard and brown in colour when dried.
- ❖ Heavily infested inflorescence spikes were completely devoid of pods or only 2-3 pods per inflorescence were seen.

Why to managing Khejri Flower Gall

Management of Khejri flower gall is crucial for pod yield, farmer livelihoods, desert ecology and food security.

Impact on Reproductive Success

- ❖ The gall-forming insects (*Eriophyes prosopidis*) attack the flower buds of Khejri.
- ❖ Instead of developing into normal flowers, the tissues transform into galls.
- ❖ This directly reduces flowering and pod set, leading to drastic declines in pod production (Sangri), which is the most valued product of Khejri.

Loss of Economic Value

- ❖ Khejri pods (Sangri) are a high-value commodity in Rajasthan, consumed as a vegetable and marketed as part of the famous “Panchkuta” dish.
- ❖ Gall formation significantly reduces pod yield, affecting rural livelihoods and desert economies.
- ❖ Farmers depending on Khejri for income and nutrition may suffer major economic losses when gall incidence is high.

Ecological Significance

- ❖ It provides shade, leaf fodder (Loong), soil fertility enhancement (through nitrogen fixation) and shelter for birds and insects.
- ❖ Decline in its reproductive potential threatens the stability of arid ecosystems, livestock feed supply and biodiversity.

Seed Production and Propagation Challenges

- ❖ Galls hamper seed formation, which restricts natural regeneration.
- ❖ Limited seed availability hampers afforestation, agroforestry and nursery-based propagation programs aimed at combating desertification.

Food and Nutritional Security

- ❖ Sangri (pods) are an important nutritional resource rich in protein, vitamins, and minerals.
- ❖ Loss of pod yield reduces local food security, especially in drought-prone areas where Khejri is a fallback food and fodder source.

Long-Term Sustainability Concerns

- ❖ Continuous infestation without management may cause a progressive reduction in Khejri populations due to poor regeneration.
- ❖ This could alter traditional agroforestry systems (Khejri-based farming) that sustain agriculture in arid Rajasthan.

Management measure:

Sole reliance on chemical pesticides is ineffective due to the concealed feeding of mites inside galls, potential resistance build-up, non-target effects and unsuitability in fragile desert ecosystems. Therefore, Integrated Pest Management (IPM) provides the most sustainable and ecologically sound approach. Integrated Pest Management (IPM) represents a multi-disciplinary, ecosystem-based strategy for the sustainable suppression of pests. It integrates biological, ecological, and chemical tools within a framework designed to maintain insect populations below the Economic Injury Level (EIL) while preserving environmental integrity. Unlike conventional pesticidal control, IPM emphasizes compatibility of management measures, reduction of pesticide resistance and conservation of natural enemies.

