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Eriophyes prosopidis induced flower galls of *Prosopis cineraria*

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Abstract

Khejri (*Prosopis cineraria*) suffers from a severe infestation of inflorescence/flower gall caused by *Eriophyes prosopidis*, adversely affecting the yield of sangria in Rajasthan. These galls are green in colour initially and turn to brownish on maturity. It has been observed that in case of heavy infestation the inflorescence spikes may be completely devoid of pods affecting the yield of sangri tremendously.

Keywords: *Prosopis cineraria*, *Eriophyes prosopidis*, flower gall

Introduction

Galls are basically a protective covering around an insect/mite or its various stages of larvae. Galls are irregular growth of cells produced by the host organism usually in response to the presence of another living organism, leading to increase in terms of cell size (called as hypertrophy) or in the number of cells (known as hyperplasia) as a result of stimulation from foreign organisms. Gall forming organisms include viruses, bacteria, fungi, nematodes, mite, aphids and other insects (Gullan and Cranston 2005) [16].

Galls act as both the habitat and food source for the maker of the gall. The interior of a gall can contain edible nutritious starch and other tissues. Some galls act as "physiologic sinks", concentrating resources in the gall from the surrounding plant parts (Larson and Whitham 1991). Galls may also provide the insect/mite with physical protection from predators (Weis and Kapelinski, 1994; Stone and Schonrogge 2003).

Eriophyid mites are a specialized group of phytophagous arachnids, exhibiting a high level of host specificity and adaptability (Lindquist and Oldfield, 1996; Amrine, 1996). They belong to a large family of microscopic plant eating mite. Mites in this family feed by inserting their mouthparts into plant cells to extract sap. Feeding by these mites causes economically significant damage to their hosts, inducing varied growth malformations like the shortening of shoots or internodes, twisting and the rolling of leaf edges and plant tips, growth inhibition, stunting, rusetting, browning, production of spots or other discoloration of leaves, sterility, witches broom effect, galls/erinea on leaves/stems/ flowers.

Although some eriophyids are agricultural and forestry pests due to the damage they cause to crops, other species can cause substantial damage to weeds and are a useful tool in suppressing them. Apart from the direct damage, several species transmit phytopathogenic viruses, thereby leading to various plant diseases (Amrine and Stasny, 1994; Frost and Ridland 1996; Flechtmann, 2000; Huang, 2001; Huang, 2001b; Huang, 2001c; Skoracka, 2004) [7-13]. Over multiplications of certain eriophyid mites species leads to the injury of their host plant (Vaneckova, 1996). An abundance of galls on the leaves would affect the host trees because the nutrients necessary for their development are absorbed by the galls. Besides strong deformation of leaves with galls reduces assimilation processes (Skuhrový and Skuhrová 1998) [5]. Amrine and Stasny (1994) [7] have given a worldwide count of eriophyoid species approximates to 4600 known species, described under 420 genera.

Eriophyids have only two pairs of developed legs located ventrally near the head (Ireson, 2009) [1]. They are translucent white, cigar-shaped tapering from head to rear & cause deformities on many plant species. These mites are noticed when their feeding causes abnormalities of plant tissues such as erineum, galls, brooms, leaf curling, blisters, rusts, silvering, fruit rusetting, and deformed buds, catkins, fruits, etc. Nasareen and Ramani (2014) [4] reported that all species of eriophyid mites from 29 species of economically important

plants were found inducing galls on the leaves of respective host plants and exhibited high host specificity.

Life Cycle of Eriophyid mite: There are several overlapping generations during the plant growing season. Growing-season forms include both sexes. Eriophyid mites develop through four stages: egg, first nymph, second nymph, and adult. Dormant-season forms are fertile females that hide under bud scales or other protected sites. Species are often hard to identify because growing and dormant season forms can be different shapes and sizes.

Damage: Infestations of eriophyid mites produce a variety of symptoms on plants. The saliva in some mites produces bladder, bead, pouch, or finger galls of bright colors; others may cause leaf bronzing or brittleness. Some induce irregular leaf blisters and some stunt or distort buds or flowering parts. In fact, it is often possible to identify a causal organism by the type of gall induced on the host. Eriophyid mites can induce changes in plant hairs that produce velvety or cottony patches called erineum.

Common Eriophyid mites of trees and their damage symptoms

Common Name	Scientific Name	Host	Symptoms
Peach Silver Mite	<i>Aculus cornutus</i>	Almond	It causes silvering of leaves in late summer before leaf drop.
Apple Rust Mite	<i>Aculus schlechtendali</i>	Apple	It injures terminal growth; leaf curl; fruit resetting.
Poplar Bud Gall Mite	<i>Eriophyes parapopuli</i>	Poplar	It causes irregular, asymmetrical, bumpy, solid mass of fleshy swelling of the bud.
Apple leaf blister mite Pear leaf blister mite	<i>Phytoptus mali</i> <i>Phytoptus pyri</i>	Apple Pear	It forms Blister-like galls on upper surface of leaves; yellow green turning brown; blister-like lesions on fruit
Leaf gall of <i>Salvadora persica</i>	<i>Eriophyes</i> spp.	Kharijal	It mostly forms epiphyllous, globose/ subglobose or sometimes agglomerated; lobed, smooth, greenish/yellowish pouch gall, with large hypophyllous gall cavity and ostiole.
Leaf gall of <i>Pongamia pinnata</i> / <i>Pongamia glabra</i>	<i>Aceria pongamia</i> / <i>Eriophyes cheriani massee</i>	Karanj	It forms solitary, elongate spindle shaped galls with the truncate apices on the upper surface of leaves
Leaf galls occurs on <i>Dalbergia sissoo</i> Roxb	<i>Aceria dalbergiae</i>	Shisham	It causes pale green or whitish yellow warty patches on leaf surface. Severe infestation may cause malformation and degreening of leaves resulting in early leaf fall.

Prosopis cineraria: 'Khejri' (*Prosopis cineraria*) is the state tree of Rajasthan and is linked with the socio economic development of the Indian Thar Desert. This tree is termed as 'king of desert' owing to its food, feed medicinal values and is an integral part of the traditional agriculture and the lifeline of the desert inhabitants. It plays a significant role in rural economy as a source of top feed, fuel and timber (Parihar, 1993) [3]. The dried pods are consumed as a vegetable and leaves as a traditional medicine to cure a wide range of diseases in Rajasthan, India. Green pods are locally known as sangri and the same pods on ripening are known as Khokha. Being a legume it improves soil fertility. A fully grown tree (30-50 yrs. old) with well spread crown cover produces approximately 5-6 kg of dried pods. But there is a severe pod reduction due to mite attack during the flowering period which leads to gall formation. Flower gall and leaf gall of khejri is caused by *Eriophyes prosopidis*. Its leaf containing several pimples blistered structures and its inflorescence turn into irregular, rough and solid mass of tissues due to mite infestation. Leaf galls are usually present on both surfaces. These are green in colour initially and turn to brownish yellow on maturity. They vary in shape, size, and weight and are scattered irregularly on the lamina. These mites can also deform young leaves on vegetative shoots. In recent years, a severe infestation of inflorescence/flower gall caused by *Eriophyes prosopidis* was noticed in Rajasthan which adversely affected the yield of sangria in this region. Inflorescence galls are unique example of a plant pest relationship causing harmful effects such as hypertrophies and tumorous (neoplastic) outgrowths. It reduces the pod formation tremendously. In case of heavily infested inflorescence spikes may be completely devoid of pods or only 2-3 pods per inflorescence can be seen. Mites pierce the most superficial cells of the plant and induces the undeveloped flower bud to develop into a gall.



Fresh Inflorescence gall of Khejri



Mature Inflorescence gall of Khejri



Eryiophid mites



Eriophyes prosopidis

It was observed that these eryiophid mites comes out on the surface of the mature galls and appears as rust in colour which under microscope can be seen as large colonies of mature and immature stages of mite. When the mature gall falls on the ground these mites finds the hiding places near the tree, in cracks and crevices, under the bark etc. and causes fresh infestation on the newly formed buds in Feb-march in the next season. Davis (2011) [2] reported that overwintering females emerge from protected sites to lay eggs and feed on new foliage when buds begin to break in the spring. This time is most adventitious for insecticide applications to manage the population of mites below economic injury level.

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