



A REVIEW ON CURRENT STATUS OF RESEARCH ON INSECTS ASSOCIATED MITES

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ABSTRACT:

This paper shows the current status of studies on insect (order: Coleoptera) associated mites' special reference to phoresy from different areas of the world and states of India. Phoresy is a phenomenon of symbiotic association in which transfers of one individual using another animal from one habitat to another. Mites are small microscopic ubiquitous animals that inhabit almost all habitats on earth, while living in these all diverse habitats they greatly adapted to interact with other biotic as well as abiotic components in an ecosystem. Abiotic components like temperature, humidity, and rainfall show an effect on the occurrence of mites as well as host insects in their habitat. Mites show different modes of association with insects like Phoretic (dispersal), Parasitic (hematophagous), Predation and Fungivorous. A coprophagous beetle also plays an important role to maintain and increase the sustainable development of an ecosystem. Dung beetles are feeds and complete their life cycle using cattle dung and they are very easily available transport vehicles in dung manure for phoretic mites. Some mites show morphological adaptation for phoresy. In India, there is very limited research has been conducted on insect associated mites due to its microscopic size as well as sporadic in their habitat thus we initiated a study on phoresy from Ahmednagar, Maharashtra. Some research work in India from West Bengal, Tamil nadu, and Maharashtra were reviewed and at the world level from Canada, Australia, Saudi Arabia, Europe, Malaysia, Turkey, Arizona, Indonesia, Germany, Poland, etc., were studied. This paper revealed that very little research work has been conducted in India as compare to other countries.

Key words: - Mites, Phoresy, Inhabit, Habitat, Biotic, Ecosystem, Sustainable.

INTRODUCTION:

Mites are microscopic arthropods usually less than 1 mm in length placed in class Arachnida which also encompasses ticks, scorpions, spiders, etc. It was suggested that 500,000-1000,000 species of mites exists on earth but out of these only 45000 species named (Hofstetter *et al.*, 2017). Perhaps due to their tiny size, their research study was ignored. But from the last few decades researchers actively showing interest in mites study due to knowing their important role in all ecosystems. Some parasitic and other groups of mites, directly and indirectly, recycle material in the dung and detritus ecosystem along with association with other invertebrates in the same ecosystems. The

study of mites as a bioresource for conservation and sustainable development of an ecosystem has gained worldwide recognition (Jogdand 2007). Most of the predatory mites have adapted to live in habitat association with mammalian dung and many times these mites transfer to another same habitat by the phenomenon phoresy using coprophilous insects that have the same habitat (Krantz 1983). The larvae and adults of dung beetles (Coleoptera: Scarabaeidae) are Coprophagous which feed on the excrement of various mammals (Masan 2009). Mites of family Macrochelidae are biological control agents for synantropic flies thus because of this reason interest has recently

been renewed in microchelid mites (Cicolani 1992).

There is a huge variety among phoretic association especially with dispersal mites (Mesostigmata, Astigmata, etc.) and their beetle hosts. Phoresy is a phenomenon of symbiotic association in which transfers of one individual using another animal from one habitat to another. During this phenomenon, the carried animal is known as phoretic or phoront stops feeding as well as reproduction, phoresy results in dispersal from unsuitable habitat to suitable ones (Bahrami 2011). In the case of phoretic mites most easily available, arthropod hosts to transfer in different ecosystems are beetles (Insecta: Coleoptera), to do that they are morphologically adapted for attachment to the body surface of beetles. They exploit and distributed on different areas of the body of hosts for attachment such as on elytra, wings, thorax, legs, head, and ventral surface. Some species of mites attach themselves using permanent organs such as modified chelicerae (females of Macrochelidae), claws and pulvilli of legs (deutonymphs of Parasitidae) or ventral suckers (hypopodesin e.g. Histiostomatidae, Carpoglyphidae, Acaridae) and claspers (hypopodes in Glycyphagidae) and anal pedicle in deutonymphs of Uropodina mites (Bajerlein 2013). The parasitic mites are one of the threats to other invertebrates like honeybees, one of the best examples is *Varroa destructor* a mesostigmatid mite which is an important enemy of *Apis mellifera* and other honeybees.

Immature stages of some nematodes have particular structures that enable them to attach their hosts for dispersal. Some macrocheles mites act as a vehicle for these phoretic nematodes. (Ramsay 1970).

Insect associated mites research at India and the world level.

A review of literature concerned, there is very less research on insect associated mites has been done in India, whatever work has been done in different parts of India are from south India specifically in Tamil Nadu by (Ramraju, K and Mohanasundaram 1996, 1999, 2001) and from east India specifically in West Bengal by Das & Gupta (2013); Roy et al., (2016) and Sarangi et al., (2010). Honey bee associated parasitic mites have been reported from different states of North India from Haryana and Punjab (Bhaskar & Putatunda 1989), (Putatunda 1996), (Putatunda & Kapil 1988, 1990); Jammu and Kashmir (Abrol and Putatunda 1995), (Prasad 1947), (Kapil et al 1985), (Putatunda and Abrol 2003), (Kotwal et al 2013). In West India, water mites associated with Odonata insects by (Andrew et al., 2015) in Nagpur, Maharashtra. Other than above literature no any other literature was found from west-central India, West India, North India, North-East India, and Central India on insect associated mites.

Research on Insects associated mites especially with coleopteran insects have been more conducted from different parts of world such as New York State (Axtell 1963), (Mollin and Hunter 1964); South Africa (Krantz 1981); Italy (Cicolani 1992); Germany (Schwarz and Muller 1992), (Nehring et al., 2017); Poland (Bajerlein and Bloszyk 2004); Austria (Moser et al., 2005); Colorado (Grossman and smith 2008); Slovakia (Masan and Halliday 2009); Saudi Arabia (Negm and Alatawi 2011); Iran (Bahrami et al., 2011); Abu Dhabi, UAE (Al deeb 2012); Finland (Penttinen et al., 2013); Egypt (Metwally et al., 2014); Czech Republic (Hava 2015); Malaysia (Dilipkumar et al., 2015); Russia (

Vinarski and Korallo-vinarskaya 2016); Indonesia (Hartini and Dwibadra 2017); Arizona, USA (Hofstetter et al., 2017); Brazil (Souza et al., 2018) etc.

RESEARCH METHODOLOGY:

For the study of mites associated with the insects, several host insects (Order: Coleoptera) were collected from the agricultural field, grazing livestock and other possible areas in the Ahmednagar district. Host insects were collected during all seasons of a year at night time using insect net, night traps as well as directly by hands and forceps in the light source from the study area. Insects were attracted to light source among them coleopteran insects were collected separately in sterilized sampling bottles. All developing stages, as well as adults of coleopteran insects, were collected. Sampling bottles were labeled with the name of collector, date, time, location, humidity and temperature. Insects were brought to the laboratory a fresh and examine immediately the different parts of the body such as head, thorax, legs, elytra, regions between thorax and abdomen under Stereo binocular dissecting microscope. Mites from the insect body were separated using fine camel brush which was moistened in 4 % lactic acid and also by brushing the entire body of an insect in a clean Petri dish. Mite infested insect was put in a glass vial having Ethyl alcohol (70 %) and the vial was shaken well to detach mites from the insect body (Negm, 2011).

CONCLUSION:

The study of insect associate mites has gained worldwide recognition due to its Phoretic (dispersal), Parasitic, Predation and Fungivorous role in almost all ecosystems. As literature

reviewed, in India less attention has been paid to this microscopic research and need uplift these studies. Hence we started this study which is lagging.

Our study is ongoing in Maharashtra, from 2018, to observe the phoretic mite diversity, ecology, host specification, population dynamics, and environmental dynamics. Till today total of 58 individuals of beetles (Coleoptera; Scarabaeidae etc.) were collected with associated 734 specimens of phoretic mites. These collections need an investigation to study their identification and ecology which is in process.

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Figure1. Mites attached ventrally to *Omorgus sp.*