Mite pests of horticultural crops

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Mites play an important role in agricultural and horticultural production. Over 550 species of mites are known to be associated with plants in India. Horticultural crops especially trees, because of their perennial nature, provide a more stable environment for development and build up of mite populations, as against the ephemeral habitat of short lived plants. The plant feeding mites cause various types of injury like loss of chlorophyll which results in bronzing of foliage, stunted growth and premature defoliation. Feeding by certain species of mites also results in various types of plant deformities like galls, erenium, crinckling and curling which reduce the yield drastically. Apart from these direct damages some species are known to transmit certain virus diseases of plants. Of the several groups of mites, only, three families *viz.*, Tetranychidae (Spider Mites), Tenuipalpidae (False spider mites), Tarsonemidae (yellow mite) and Eriophyidae (Gall mites) are important as plant feeders. The relationship of mites with their hosts reveal that eriophyids are to a great extent host specific. The families Tetranychidae, Tarsonemidae and Tenuipalpidae are mostly polyphagous and occur on a wide variety of plants.

Feeding behaviour and life cycle: Most of the plant mites are non-phototrophic and are normally found on the under surface of leaf either in colonies or in solitary forms. When the population on lower surface increases considerably, some of the mites may stray on to upper surface of the leaf and other parts of the plant like stem, petioles, fruits, buds etc. However, there are a few species which usually inhabit the upper surface of leaves (e.g. *Eutetranychus orientalis*). Mites usually inhabit tender parts of plants like young leaves and shoots. A large number of mites may be found in the flowers, fruits and some mites are found within the galls. Phytophagous mites while feeding on plants penetrate the plant tissue by their needle like chelicerae and suck the sap. During the process of feeding, the mite extracts the chlorophyll resulting in white speaks on majority of host plants. There speaks enlarge gradually and coalesce to form big silvery spots. The chlorophyll loss due to feeding may be to an extent of 15 to 35 per cent and this result in drying and dropping of leaves. Sometimes feeding also results, and white some others also inject certain toxins during feeding which causes diverse reaction like retardation of growth, reduction in size of leaf, flowers and fruits, appearance of various types of plant deformities. These deformities affect the yield of crops. In recent years it is observed that the loss due to mites is on the increase mostly due to more and more use of pesticides and improved agricultural practices. Several members of the family Eriophyidae are known to cause galls and they are commonly called as "gall mites". The shape and structure of gall produced by one species vary from those of another species and this gives clue to differentiate the species. Some of them cause dense hairy growth on leaves and shoots (e.g. jasmine and litchi). Some cause resetting of leaves as in citrus rust mite *Phyllocoptruta oleivora*, witches broom on mango. The eriophyid mites are also known to be the vectors of plant diseases like Sterility Mosaic of Pigeonpea and Fig Mosaic. Some mites of the family Tenuipalpidae cause corky appearance of fruits of guava, pomegrnate, citrus, papaya, coconut etc.

The life cycle of plant feeding mites consists of five stages *viz.*, egg, larva, protonymph, doutonymph and adult. Mites reproduce sexually as well as asexually. Fertilization results in the production of both female and male progeny, whereas parthenogenetic eggs develop into males in most species, but in certain species (e.g. *Brevipalpus phoenicis*) unfertilized eggs produce female progeny. Mating is generally accomplished immediately after the female emerges. Most of the plant feeding mites completes their life cycle in about a fortnight.

Plant associated mites also include some beneficial predatory mites which have significant importance in biological control of insect and mite pests of crops. Among the families of predatory mites, phytoseiidae have received worldwide attention. These are very efficient predators because of their shorter life cycle, greater reproductive potentiality, efficient prey searching capacity and ability to survive on low prey density. Several of them exhibit interesting adaptability of surviving the absence of prey on alternate food like pollen and nectar produced by plants.

Mites as pests:

Vegetable crops **:** Among the vegetable crops, brinjal,

tomato, French bean, okra and cucurbits are infested by one or the other species of red spider mites *viz.*, *Tetranychusurticae, T. ludeni, T. cinnaberinus* and *T. neocaledonicus*. All the three species cause similar symptoms. They become abundant mostly during dry months of the year and at times cause severe damage to the crops.

Chilli : Chilli crop suffers seriously from a malady known as "leaf-curl complex" due to insects, mites and viruses. One of the agents is the tarsonemid mite, *Polyphagotarsonemus latus* which infests a number of hosts like potato, cotton, tea, sesame and various ornamental plants. In some of these hosts if induces severe malformation of the foliage like curling, reduction in size, glossy appearance etc. Chilli is usually attacked during humid months, resulting in severe stunting, reduced leaf size etc.

Fruit crops : Many of the fruit crops, because of their long life provide a more stable environment for the mites to develop and assume serious status. Fig crop suffers from the attack of a spider mite, *Eutetranychus sp.* The leaves are reduced in size, turn yellowish and brittle, and the infested fruits do not attain the normal size and exhibit bronzy surface. The most common species of mite on guava is the false spider mite, *Brevipalpus phoenicis* which has a large range of host plants. Different species and varieties of citrus are susceptible to the attack of the rust mite, *Phyllocoptuta oleivora* which usually goes unnoticed. The spider mite *Eutetranychus orientalis* has been recorded as an important pest of citrus from various parts of India. Litchi plants are usually subject to heavy attack of an eriophyid mite, *Aceria litchi* which produces chacelate coloured erineum on tender foliage. The infested leaves are deformed and twisted and fresh growth is suppressed. In the case of mango an eriophyid mite, *Accria mangiferae* is found in the vegetative buds and inflorescences. The mites was associated with the mango inflorescence malformation.

Jasmine : The eriophyid mite, *Aceria jasmini* is a serious pest of certain species and varieties of jasmine. The flower production is greatly suppressed by the attack of this mite.

Management of mites:

Chemical : Chemical control of mites has had a dynamic history. Sulphur was essentially the only acaricide used to control mites until about 1920. Sulphur is still extensively employed to control many mite species, as certain mite groups seem to be more susceptible to sulphur than others. Most of the mites belonging to families Eriophyidae and Tenuipalpidae are susceptible to sulphur, lime-sulphur sprays or sulphur dusts. The majority of tetranychid mites (spider mites) belonging to the genera *Oligonychus, Tetranychus,* and *Eutetranychus* are usually most economically controlled by sulphur application. Sulphur has many advantages for use as an acaricide. It is non-toxic to the applicator or to those who consume crops on which it is applied. After application it releases vapors that are toxic to many mite species. Another advantage of sulphur is its safety to predatory mites especially at lower doses. In recent years, several organophosphorus compounds have been successfully used as acaricides. They are phosphamidon, dimethoate, monocrotophos, phosalone, etc. which are found to be equally effective as acaricides like dicofol, omite etc.

Biological : The management of the plant mites by utilizing their natural enemies is yet to make a beginning in our country. Although many European countries have been successfully employing predators of the family Phytoseiidae to check plant mites in green houses and fruit orchards on tetranychid mites. In recent years there has been a substantial contribution to our knowledge of the taxonomy of phytoseiid predators of our country. Information on biology, ecology and predator prey interaction is available in the case of some common predators, like *Amblyseius tetranychivorus, A. longispinosus* and *Euseius concordis.* Mass rearing techniques in the laboratory for these predators are also standardized. These predators are found to be efficient and effective in checking the buildup of tetranychid, tenuipalpid and eriophyid mites in the laboratory and have proved successful in pot experiments. There is scope for utilization of these predators. A few more species appear to be promising and require intensive studies in order to employing them in the biological control of mite pests. Information on insect predatory coccinellid beetle *Stethorus pauperculus* is also available for utilization in the management programme of plant mites.

Integrated management : A satisfactory and long range management of mite pests lies in suitably integrating chemical and biological methods. In cases where mite pests have acquired resistance to pesticides it becomes essential to think of biological control. Integration of the two methods can be achieved in two ways. In one, suitable acaricides may be used to suppress higher population of mite pests to lower levels and then handle these low levels of population through predators. In the other, acaricides safe to effective predators in the environment or identifying safer dosages of pesticides to predators are used. There is need to initiate and intensify studies in this direction. It may be mentioned that stable habitat like the perennial tree habitat is more suitable for an integrated approach in tackling mite pest problems.

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