

SCALE INSECTS OF BLACK PEPPER AND THEIR MANAGEMENT

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The world's romance with Indian spices is unabated and India still continues to be the largest producer, consumer and exporter of spices. The spices production and marketing are the main economic stay of millions of people of our country. India is reputed as the 'Land of Spices' and about 63 spice crops (out of 109) are being extensively cultivated in the country at present.

Black pepper, known as the King of Spices, is the most important and most widely used spice in the world. The characteristic pungency and flavour of black pepper is an essential ingredient in many food preparations and at the dining table it is the only spice invariably served. Though India is the largest producer of black pepper (65,000 metric tonnes in 2002-'03), the productivity is lowest in the world with just 317 kg ha⁻¹. During that period India exported nearly 21,609 metric tonnes bringing forth a foreign exchequer of 178.88 crore rupees. The productivity of black pepper is reported highest in Thailand (3,594 kg ha⁻¹).

Infestation by insect pests is one of the main constraints responsible for the low productivity of black pepper in India. It is being depredated by

56 genera / species of insect pests in India damaging various parts of the vine such as roots, stems, shoots, leaves, spikes and berries. Based on the nature and extent of damage *pollu* beetle (*Longitarsus nigripennis* Mots.), top shoot borer (*Cydia hemidoxa* Meyr.), Marginal gall thrips (*Liothrips karnyi* Bagnall) and scale insects (*Lepidosaphes piperis* Green and *Aspidiotus destructor* Signoret) were considered as major ones. The intensity of infestation as well as distribution of these insect pests varies significantly in plains and high ranges of Kerala due to unique environmental conditions.

Scale insects

Scale insects are small soft-bodied homopteran insects covered with hard chitinous scale belonging to the order Hemiptera. These insects have piercing and sucking mouthparts and desap the plants through the pointed stylets. The appendages of female scale insects are highly atrophied and are sedentary thereby permanently fixed on plant parts, however, male insects are ephemeral and winged, possessing a pair of wings. The first-instar active nymphs are termed "crawlers" and have appendages so as to locate

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new site for feeding. Once the feeding site is found out, the appendages are atrophied and become sedentary. Scale insects are major insect pests of black pepper at high altitudes (> 600 m MSL) especially in Wyanad and Idukki high ranges of Kerala, Kodagu (Karnataka) and Nilgiris (Tamil Nadu). Survey conducted at high ranges of Idukki district for the past five years, revealed the occurrence of scale insects in 79.2% of plantations ranging from 0.4% to 49.3 per cent. Yield loss of 30-50% was observed in severely affected gardens.

Three important species are recorded on black pepper viz., mussel scale (*Lepidosaphes piperis* Green), coconut scale (*Aspidiotus destructor* Signoret) and soft scale [*Marsipococcus* (*Lecanium*) *marsupiale* Green].

1) Mussel scale (*Lepidosaphes piperis* Green) F. Diaspididae O: Hemiptera

Symptoms and damage: Mussel scales encrust the main stem of young vines and lateral branches, mature leaves, spikes, berries and petioles of pepper vines. The female scale insect sucks the sap causing serious injuries on feeding parts. Except for roots, all other parts have been terribly damaged. The infestation results in chlorotic spots / patches, yellowing and necrosis of leaves due to desaping. Young vines succumb to the infestation whereas older infested lateral branches wilt and dry in patches resulting in necrotic vacant spaces in the canopy.

Infestation by mussel scale causes significant loss of production as it affects all parts of plant including berries. The pest population

reaches maximum during January-May, coinciding with or immediately following the harvest of berries.

Biology: Fully-grown females are small dark brown and boat shaped measuring about 3.5 mm in length. It appears like a lifeless minute piece of scale. The eggs are laid by the female under the scale cover and crawlers that hatch out from the eggs move about and fix themselves on the host plant at suitable places and thereafter become sedentary during the remaining part of their life. Early instar nymphs are spindle shaped. Once feeding is commenced, white silken threads are being secreted and cover the posterior part of abdomen. After a period of five days white coloured silken threads become melanised and turn darker and harder. Males produced in large numbers during certain period of their life cycle resemble to that of cecidomyiids. Males are short-lived measuring 2 mm and die immediately after mating. It possesses one pair of hyaline wings with reddish body. The total life cycle lasts for about a month.

2) Coconut scale (*Aspidiotus destructor* Signoret) F. Diaspididae O: Hemiptera

Symptoms and damage: Coconut scales are highly polyphagous and have been recorded on more than 20 economically important host plants in India. Coconut scales are creamish-white circular scales that are confined in large numbers only on the under surface of leaves. The incidence is not observed on other parts including upper surface of leaf. However, chlorotic streaks are visualized on upper leaf surface where such scales are feeding from beneath. The circular females, which cluster on the undersurface of the leaves, feed on the sap. As a result of feeding, the leaves

turn yellowish and in severe cases wither and dry up. In severe outbreaks, the insect multiplies with abundance so that it appears like a continuous yellow crust all over the underside of leaf. It causes premature death of leaflets by sucking the sap and obstructing the stomatal opening. Infested leaves turn yellow in colour, wither and die.

Biology: The species is oviparous and eggs hatch under the scale giving rise to active young ones. The female lays as many as 90 eggs under its shield like circular scale. Crawlers that hatch out move and distribute themselves to healthy leaves. Crawlers are small, oval and pale yellow in colour. They affix themselves on favourable tissues by means of rostra and cover themselves individually with a transparent filmy, waxy material. Early instar nymphs are devoid of silken covering, which get secreted in course of development and cover the entire insect. The adult male is winged and fragile. Males require 32 days and females 35 days for completion of life cycle.

3) **Soft scale (*Marsipococcus (Lecanium) marsupiale* Green). F. Coccidae O: Hemiptera**

Symptoms of damage:

The soft scale infests on the upper surface of the foliage and vines especially at higher altitude. It was not recorded in plains as well as on other parts of vine including under surface of leaf. On severe cases there is complete blackening of leaves due to growth of sooty mould fungus developed over the honeydew excretion. This leads to reduction in the photosynthetic efficiency and berry yield. The incidence is severe during summer and post-monsoon period.

Biology: Adults are large ovoid flattened chestnut brown scales surrounded by a conspicuous yellow border. Emerging crawlers are reddish in colour with appendages and are fast moving. Once proper feeding site is identified, the appendages are shed down and become whitish at initial stages. The young adults are very large 7mm long.

Integrated Management Practices

a) Pruning and destroying severely affected lateral branches due to mussel scales as well as affected leaves of other two types of scale insects.

b) Number of parasitoids and predators (*Chilocoris circumdatus*, *Sarajiscymnus dwipakalpa* (Ghorpade), *Pseudoscymnus* sp.) were found feeding on all three species of scale insects and the population of soft scale and coconut scale reduce during monsoon period.

c) Among the biorationals evaluated, neem formulations 0.5% and fish oil insecticidal soap (3%) when applied four times at fortnight intervals after the harvest of berries was found to be effective in the suppression of scale population.

d) Experiments conducted under All India Co-ordinated Research Project on Spices at Cardamom Research Station, Pampadumpara revealed that two sprayings of either Dimethoate 0.05% or Monocrotophos 0.05% at fortnightly intervals after the harvest of berries effectively control black pepper mussel scale and has been included in National Package of Practices as approved in the XVI biennial workshop.

Mussel Scale (*Lepidosaphes piperis* Gr.)



Yellowing due to Scale infestation



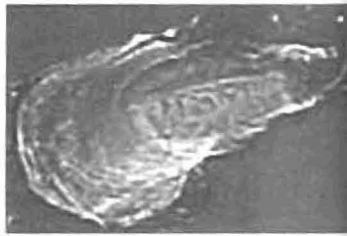
Scale Infested twig



Spindle shaped early instar



Winged Male



White silken threaded nymph

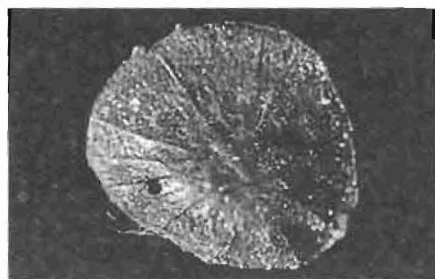


Boat shaped apterous female



Pear shaped melaused nymph

Soft Scale (*Marsipococcus marsupiale* Gr.)



Adult apterous female



Healthy and infested leaf



First instar crawler

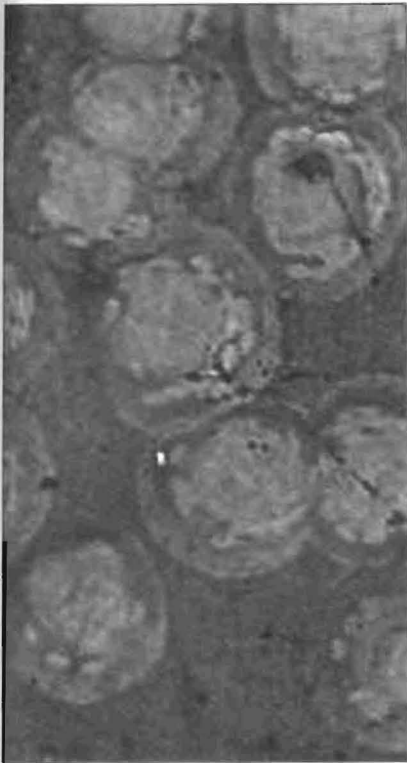
Void chestnut brown scale (Late instar)



Early instar white colour nymph



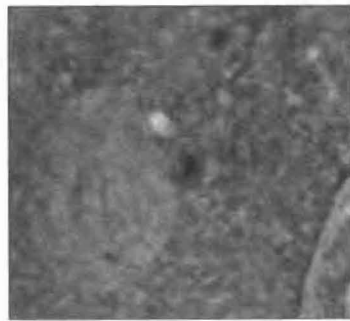
Coconut Scale (*Aspidiotus destructor* Signoret)



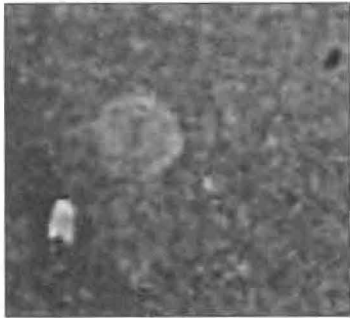
Adult females with eggs



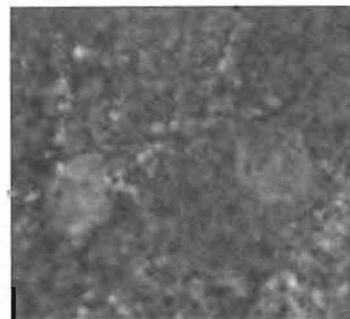
Adult females with eggs



c



b



a

a-c : Developing scales



Chlorotic streaks on upper surface



Scales on lower surface of leaf



Adult winged male