

Systematics and morphometrics of armoured scales infesting mango (*Mangifera indica* L) in Himachal Pradesh

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ABSTRACT

Systematic and morphometrics of four armoured scales viz *Chrysomphalus dictyospermi* (Morgan), *Hemiberlesia lataniae* (Signoret), *Octaspidiotus tripurensis* Takagi and *Aulacaspis tubercularis* Newstead infesting mango in different regions of Himachal Pradesh were studied. The identifying characters of each of these species were described and measurement of body size and various structures present on dorsum and ventrum of adult females were taken. The average body size of length and breadth of adult females of *C dictyospermi*, *H lataniae*, *O tripurensis* and *A tubercularis* were 0.95 ± 0.08 mm long and 0.78 ± 0.08 mm broad, 0.88 mm long and 0.62 mm broad, 1.14 ± 0.64 mm long and 0.90 ± 0.05 mm broad and 0.98 ± 0.04 mm long and 0.50 ± 0.01 mm broad respectively.

Keywords: One-barred, ducts; two-barred ducts; armoured scale; mango

INTRODUCTION

Armoured scales are microscopic insects. Their body is covered with protective covering called armour and derived the name armoured scale. The armoured scales do the damage to host plants by sucking the plant sap. They infest wide range of perennials, ornamentals and fruit trees. Mango, *Mangifera indica* L is one of the important fruit crops of Himachal Pradesh and is grown in subtropical regions of Kangra, Mandi, Hamirpur, Bilaspur, Sirmour and also in foothills of Chamba

and Solan districts of the state. Very little information is available with respect to identification of scale insects in Himachal Pradesh. Khan and Ansari (1940) reported the *Aonidiella orientalis* Newstead from Bilaspur in Himachal Pradesh. Verma and Dinabandhoo (2005) also reported the infestations of *A orientalis*, *C dictyospermi*, *H lataniae*, *O tripurensis* and *A tubercularis* from different regions of the state. In the present paper diagnostic characters and morphometrics of armoured scales associated with mango trees in Himachal Pradesh are described.

MATERIAL and METHODS

Survey was undertaken during the years 1999 and 2000 to collect the scale infested leaves and twigs of mango from different parts of Himachal Pradesh. Scale infested leaves and twigs were collected from the localities viz Ropri (Sarkaghat), Sundernagar, Sindhari (Bilaspur), Jachh (Kangra) and Lahru (Chamba). The alleviation of these areas ranged from 430 to 1175 m amsl. The leaves and twigs were collected in polythene bags, labeled and brought to the laboratory for processing, microscopic studies and identification. The mounting was done in Hoyer's medium as reported by Willoughby and Kosztarab (1974). Only the adult females were processed as the identification of armoured scales is largely based on various structures (such as pygidial lobes, plates, gland spines, one-barred and two-barred dorsal ducts, setae, disc pores and perivulvar pores) present on ventrum and dorsum of pygidium. While mounting the scale/test of female was gently lifted with the help of a needle. The exposed live adult female was lifted from the infested plant part with the help of a needle and placed on the droplet of Hoyer's medium and covered with cover slip. The slides were placed in slide cabinet tray and heat dried in oven for a week at 35°C. The mounted slides were later on used for studying the morphological characters. Measurements (length and breadth) of 10 specimens were taken. The colour coding of tests/live adult females was

done by comparing the colour of tests and females with Royal Horticultural colour chart (Anon 1966).

RESULTS and DISCUSSION

Identifying characters and morphometrics of four scales are described below:

Chrysomphalus dictyospermi (Morgan)
(Fig 1 and Plate 1)

Morgan HA 1889. *Aspidiotus dictyospermi*. Entomologist's Monthly Magazine **25**: 352.

Host plant:	mango
Plant parts infested:	leaves and twigs
Locality:	Ropri (Sarkaghat)

Identifying characters

Adult female: yellow (group 10/A), body round, three pairs of pygidial lobes, median pair biggest, median, second and third pairs of lobes notched from outer margin, paraphyses between lobes present, plates between lobes present, paired between median lobes, between median and second lobes, three between second and third lobes, three after the third lobe, 30-46 one-barred dorsal ducts on pygidium, some extending beyond the vulvar opening, dorsal ducts also present singly or in twos on prepygidial segments, discpores not associated with anterior and posterior spiracles, perivulvar pores present

in four groups, two in anterolateral groups, four in posterolateral groups, vulvar opening anterior to anal opening.

Morphometrics

Adult female: 0.95 ± 0.08 mm long and 0.78 ± 0.08 mm broad, antennal tubercle 0.005 ± 0.004 mm long 0.006 ± 0.005 mm broad, antennal seta 0.028 ± 0.001 mm long, clypeolabral shield 0.12 ± 0.002 mm long 0.11 ± 0.004 mm broad, labium 0.05 ± 0.001 mm long ± 0.05 mm broad, stylet 0.30 ± 0.06 mm long, anterior spiracle 0.026 ± 0.005 mm long and 0.015 ± 0.0005 mm board, posterior spiracle 0.025 ± 0.0006 mm long and 0.014 ± 0.0007 mm broad, anal opening 0.011 ± 0.0002 mm long and 0.010 ± 0.0003 mm broad, marginal seta 0.021 mm long, one-barred dorsal duct 0.119 ± 0.003 mm long, prepygidial macroduct 0.021 mm long.

The distance between antennal tubercles is 0.18 ± 0.02 mm, between anterior and posterior spiracle 0.20 ± 0.03 mm, between anal and vulvar opening 0.079 mm.

Discussion

The diagnostic characters of *C dictyospermi* recorded are in agreement with those noted by Rao and Chatterjee (1950) and Takagi (1969) and confirms the presence of *C dictyospermi* in Himachal Pradesh. *C dictyospermi* infested mango at Ropri. Takagi (1969) has also reported the infestation of *C dictyospermi* on mango from Taiwan.

Hemiberlesia lataniae (Signoret) (Fig 2)

Signoret V 1869. *Aspidiotus lataniae*. Annales de la Société Entomologique de France **4(9)**: 124.

Host plant:	mango
Plant parts infested:	leaves and twigs
Locality:	Ropri (Sarkaghat)

Identifying characters

Adult female: (described from a single specimen) body pyriform, median pair of lobes well developed, biggest, notched from inner and outer margin, second and third lobes represented by points, paraphyses between lobes present, plates between lobes present, 26 small one-barred dorsal ducts present on pygidium, discpores not associated with anterior and posterior spiracles, perivulvar pores present in four groups, two to three in anterolateral groups, three to seven in posterolateral groups, antennal tubercles spaced apart and with a seta, anal opening large.

Morphometrics

Adult female body 0.88 mm long and 0.62 mm broad, antennal tubercle 0.010 mm long 0.005 mm broad, clypeolabral shield 0.13 mm long and 0.10 mm broad, labium 0.05 mm long and 0.05 mm board, anterior spiracle 0.029 mm long 0.021 mm broad, posterior spiracle 0.028 mm long and 0.016 mm broad, anal opening 0.016 mm long, marginal seta 0.018 mm long, dorsal duct 0.043 mm long.

Discussion

Morphological characters observed are in conformity with those described by Rao and Chatterjee (1950). Takagi (1969) recorded the *H tataniae* on mango and also described the identifying characters which are in line with the presented study and also confirms the mango tree a host of *H latamiaae*.

Octaspidiotus tripurensis Takagi
(Fig 3 and Plate 2)

Takagi S 1984. Some aspidiotine scale insects with enlarged setae on the pygidial lobes (Homoptera: Coccoidea: Diaspididae). Insecta Matsumurana: New series, Entomology 28, 9p.

Host plant:	mango
Plant parts infested:	leaves
Locality:	Nalagarh

Identifying characters

Adult female: body round, three pairs pygidial lobes, median pair biggest, notched from inner and outer margin, paraphyses absent, plates between lobes present, paired between medium lobes, between median and second lobes, three between second and third lobes, seven dentate plates after third lobe, one-barred dorsal ducts tended to be sclerotized for short distance with in orifice, disc pores not associated with anterior and posterior spiracles, perivulvar pores present in four groups, 12-19 pores in anterolateral groups, 7-12 in posterolateral groups.

Morphometrics

Adult female body 1.14 ± 0.04 mm long and 0.90 ± 0.05 mm broad, antennal tubercle 0.005 ± 0.0002 mm long and 0.005 ± 0.0005 mm broad, antennal seta 0.021 ± 0.001 mm long, clypeolabral shield 0.15 ± 0.002 mm long and 0.13 ± 0.003 mm broad, labium 0.05 ± 0.002 mm long and 0.05 ± 0.002 mm broad, stylet 0.37 ± 0.04 mm long, anterior spiracle 0.030 ± 0.0006 mm long and 0.014 ± 0.0006 mm broad, posterior spiracle 0.026 ± 0.0005 mm long and 0.012 ± 0.0005 mm broad, marginal seta 0.012 mm long, anal opening 0.021 ± 0.0008 mm long and 0.012 ± 0.0004 mm broad.

The distance between antennal tubercle is 0.014 ± 0.0005 mm long, between anterior and posterior spiracle 0.27 ± 0.01 mm long, between anal and vulvar opening 0.051 ± 0.007 mm long.

Discussion

The diaspidid *Octaspidiotus tripurensis* was found to infest mango in Nalagarh area of Himachal Pradesh which is a first report of its infestation from the state. Earlier Takagi (1984) reported *O tripurensis* infestation on mango from Tripura. The identifying characters observed are in line with these recorded by Takagi (1984) which also confirms the presence of *O tripurensis* in Himachal Pradesh.

Aulacaspis tubercularis Newstead
(Fig 4 and Plate 3)

Newstead R 1906. General Entomology (Identification of Egyptian insect pests, list of other known African species, preliminary report on collection of insect sent from Khedival Agricultural society for identification). Liverpool University Institute of Commercial Research in Tropics Quarterly Journal **1**: 68-72.

Host plant:	Mango
Plant parts infested:	leaves and twigs
Locality:	Ropri (Sarkaghat), Sundernagar, Sindhari (Bilaspur) and Jachh (Kangra)

Identifying characters

Adult female: test white (group 155/D), female orange red (group 30/C), body elongate, prosoma wider than postsoma, prominent constriction between thoracic and abdominal segments, three pair of pygidial lobes, median pair biggest, unilobed, serrated from inner margin, second and third pair of lobes bilobed, gland spines present singly on pygidium, two-barred dorsal macroducts present in marginal, submarginal and submedian groups, marginal macroduct longer, disc pores associated with anterior and posterior spiracles, seven-13 with anterior spiracle, two to four with posterior spiracle, perivulvar pores present in four groups, 16-31 in anterolateral groups, 15-28 in posterolateral groups, antennal tubercles set close together with a seta, anal opening

round, vulvar opening posterior to anal opening.

Morphometrics

Adult female test 1.98 ± 0.08 mm long and 1.87 ± 0.11 mm broad, body 0.98 ± 0.04 mm long and 0.50 ± 0.001 mm broad, antennal tubercle 0.004 ± 0.001 mm long and 0.005 ± 0.001 mm broad, antennal seta 0.028 ± 0.001 mm long, clypeolabral shield 0.13 ± 0.002 mm long and broad 0.12 ± 0.004 mm, stylet 0.71 ± 0.02 mm long, anterior spiracle 0.023 ± 0.001 mm long and 0.018 ± 0.001 mm broad, posterior spiracle 0.020 ± 0.001 mm long and 0.015 ± 0.000 mm broad, and opening 0.012 mm long. The distance between antennal tubercles is 0.070 mm, between anterior and posterior spiracle 0.23 ± 0.01 mm.

Discussion

The scale insect *Aulacaspis tubercularis* was found to infest *Mangifera indica* at Ropri (Sarkaghat), Sundernagar, Jachh (Kangra) and Lahru (Chamba). The *A tubercularis* is being reported for the first time on mango from Himachal Pradesh. However Takagi (1970) mentioned mango as one of the host plant of *A tubercularis* and the morphological characters noted are in conformity with those reported by Takagi (1970).

CONCLUSION

Four species of diaspidids viz *C dictyospermi*, *H lataniae*, *O tripurensis*

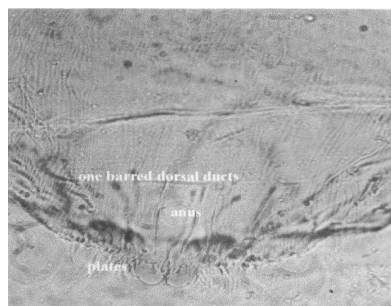
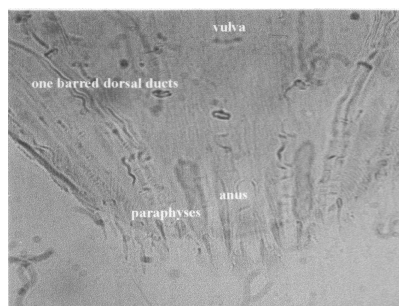


Fig 1. Pygidium of *Chrysomphalus dictospermi* Fig 2. Pygidium of *Hemiberlesia lataniae*

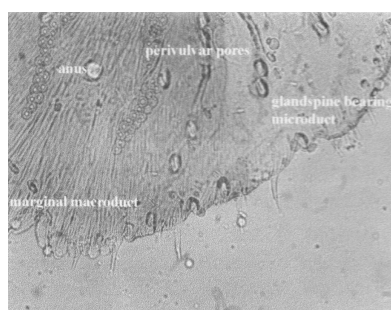


Fig 3. Pygidium of *Octaspidiotus tripurensis* Fig 4. Pygidium of *Aulacaspis tubercularis*



Plate 1. Infestation of *Chrysomphalus dictyospermi* Plate 2. Infestation of *Octaspidiotus tripurensis*



Plate 3. Infestation of *Aulacaspis tubercularis*

and *A. tubercularis* were found to infest mango trees in Himachal Pradesh. Morphological characters and morphometrics each of these species were given in this paper which will be helpful in identification and formulating suitable control measure against these species.

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