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Biodiversity and Annotated Checklist of Scale-Insects, and Mealybugs (Hemiptera: Coccoidea) of Jammu, Kashmir and Ladakh (North-west Himalaya), India

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A B S T R A C T

In Jammu, Kashmir and Ladakh Himalayan regions, a total of 26 species of scale insects/ mealy bugs, distributed over 21 genera, under 5 families, viz. Coccidae, Diaspididae, Kerridae, Margarodidae and Pseudococcidae, has so far been recorded. These insect pests damage more than 44 species, under 33 genera of host plant species, including agricultural crop and economically important plants like fruit and forest/timber trees, medicinal, aromatic and ornamental plants. The dominant family of the superfamily Coccoidea is Diaspididae, having 14 species, followed by Coccidae (7 spp.), Pseudococcidae (3 spp.) and the rest of the families viz., Kerridae and Margarodidae, possess one species each. An up-to-date systematic checklist of scale insects/ mealy bugs has been provided. Besides, necessary information on their diversity and distribution has been given.

Introduction

Scale insects and mealy bugs belong to insect order Hemiptera, suborder Sternorrhyncha, super family Coccoidea. These insects are small and mostly soft-bodied, protected by waxy secretion of scale cover. The adult females of scale insects are sexually mature nymphs and lack wings. The males are active, with fore-wings. The adult males do not feed and live for a day or less.

These insects are serious plant pests and because of their cryptic nature, they commonly not detected, until they have rendered significant damage to the host-plants. In Jammu, Kashmir and Ladakh regions of J & K State, in north-west Himalaya, have been found to cause severe damage to fruit, forest/ timber trees, woody ornamentals, perennial, medicinal / aromatic plants. The damage caused to the host plants is mainly by removal of plant sap by the

insects or by plant pathogens, toxins or production of large quantity of honey dew, leading to formation of sooty mould. The damage is caused to all parts of host-plants like leaves, branches, trunk, fruit and root.

The previous checklists pertaining to the scale-insects and mealybugs of J & K State, are found in the South Asian checklists on these insects, authored by Varshney (1992 & 2002) and, in online information of Zoological Survey of India (Varshney *et al.*) and in online world database, provided by Ben-Dov *et al.* (2012). In the present communication, an attempt has been made to incorporate additional data on the taxa, host-plant diversity, synonyms, distribution, nomenclatural changes, of scale insects and mealy bugs of this region of paramount zoogeographical significance. This information has been encapsulated in the form of updated annotated checklist, along with brief faunal biodiversity of scale insects and mealy bugs as pests of plants, including fruit crops / trees, forest, timber trees, medicinal, aromatic and ornamental plants.

Result and Discussion

Keeping in view the incompleteness of data on scale insects and mealy bugs of Jammu, Kashmir and Ladakh regions, in previous authors' works, as well as online database, the present communication is provided. About 26 species of scale insects / mealybugs, belonging to 21 genera, under 5 families, *viz.* Coccidae, Diaspididae, Keridae, Margarodidae and Pseudococcidae, are known to occur in diverse regions and localities of J & K State. About 44 species of host plants, belonging to 33 genera, have so far been encountered, severely affected by these insect pests in diverse localities and areas of J & K State. The host-plants damaged by these insects *inter alia* include temperate and tropical

fruit crops/trees, forest and timber trees, medicinal, aromatic and ornamental plants.

The dominant family of super family Coccoidea of the region is Diaspididae (armoured scale insects), having 14 species, belonging to 10 genera, damaging more than 18 species of host-plants. Next family in dominance has been found to be Coccidae (soft scales), with 7 spp. (6 gen.), attacking 24 species of host-plants. Family Pseudococcidae (mealy bugs) incorporates (3 spp.), belonging to 3 genera, infesting 4 spp. of fruit/ forest trees. Rest of the families, *viz.* Keridae and Margarodidae 1 species. (1 genus) each, damaging 4 spp. (4 gen.) of fruit /forest trees and 1 sp. (1 genus) of fruit tree respectively.

The systematic updated checklist of scale-insects and mealy bugs of Jammu, Kashmir and Ladakh, is being presented under five families. In this annotated faunal checklist, the references pertaining to authors reporting and describing taxa from different regions and localities, are in the form of code numbers. Apart from these, many abbreviations have also been used in connection with distribution of taxa in various Provinces and localities of J & K State. The keys to the code numbers and abbreviations, are cited at the end of Checklist. The synonyms of the taxa are under listed valid species, given in parentheses.

Systematic Checklist

I. Family: Coccidae (Soft Scales)

(i) *Ceroplastodes* sp.

Host: Mango

Locality: JA

Reference: 24

(ii) *Coccus hesperidum* (Linnaeus) (Soft brown scale)

Hosts: *Cichorium intybus*, *Cunninghamia lanceolata* (= *Cunninghamia sinensis*), *Rosa brunonii*, *Rosa webbiana*, *Lonicera* sp.

Locality: KA (SR, BA)

References: 7,22, 24,27

(iii) *Eulecanium tiliae* (Linnaeus) (Nut Scale)

(Syn.: *Eulecanium capreae* Linnaeus and *E.coryli* Linnaeus)

Hosts: *Berberis*, *Cotoneaster aitchisoni*, *Cydonia oblonga*, *Malus domestica*, *Prunus dulcis*, *P.armeniaca*, *P. domestica*, *P.persica*,

Juglans regia, *Salix caprea*, *Vitis vinifera*

Locality: JK

References: 4, 6,23,24,27, 28

(iv) *Parasaissetia nigra* (Niether) (Nigra scale)

(Syn.: *Saissetia nigra* Cockerell)

Host: Not known

References: 24,27

Locality: KA

(v) *Parthenolecanium corni corni* (Bouche) (Brown scale)

(Syn.: *Parthenolecanium corni* Bouche)

Hosts: *Crataegus sangarica*, *Rubus anatolicus*, *Salix alpina*, *Sophora japonica*, *Viburnum foetidum*, *Vitis vinifera*

Locality: KA (SR)

Reference: 7

(vi) *Pulvinaria (Pulvinaria) nr. Borschenii* Danzig (Cottony scale insect)

Host: *Populus caspica*

Locality: KA (SR)

Reference :7

(vii) *Pulvinaria (Pulvinaria) inconspiqua* Danzig

Host: *Celtis australis*

Locality: KO

References:6, 7

II Family: Diaspididae (Armoured scale insects)

(i) *Abgrallasopiscyanophylli* Signoret (Cyanophyllum scale)

(Syn.: *Hemiberlesia (Abgrallaspis) cyanophylli* Signort

Host: *Rosa* sp

Locality KA (PA)

Reference:18

(ii) *Aspidiotus destructor* Signoret

Host: *Mangifera indica*

Locality: JA

References :24, 27

(iii) *Chionaspis furfura* (Fitch) (Scurfy Scale)

Host: *Prunus armeniaca*

Locality: KA (SR)

Reference: 7,25

(iv) *Chionaspis salicis* (Linnaeus) (Black willow scale)

Host: *Salix* sp.

Localities: JA, KA, LA

References: 13,16,25,28

(v) *Chrysomphalusaonidium* Cockerell (Floridared scale)

Host: Citrus fruits

Locality: JA

Reference: 27

(vi) *Dentachionaspis centripetalis* Rao)

(Syn: *Chionaspis centripetalis* Rao)

Host: *Malus domestica*

Locality:KA

Reference :19,23,25,27

(vii) *Diaspidiotus juglansregiae* (Comstock) (English walnut scale)

(Syn.: *Quadraspidotus juglansregiae* Comstock)

Localities: KA (KN,SH)

Reference: 17

(viii) *Diaspidiotus perniciosaus* (Comstock) (Chinese pernicious Scale /San Jose Scale)

(Syn.: *Quadraspidotus perniciosus* Comstock)

Hosts: *Aesculus indica* (Cheshnut), *Betula* sp., *Eucalyptus*, *Juglans regia*, *Malus domestica*, *Morus* sp., *Prunus armeniaca*, *P. domestica*, *P. dulcis*, *P.persica*, *Populus* spp., *Pyrus communis*, *Rosa* spp., *Vitis*

vinifera, and wild fruit trees, bushes and other forest range plantations.

Localities: Widely distributed in many localities of Jammu and

Kashmir regions

References: 1,2,5,6,9,10,17,20, 21,23,25,26

(ix) *Lepidosaphes malicola* (Borshsenius) (Kirgis commascale)

(Syn. *Lepidosaphes kergisica* Borschenius)

Host: *Salix*

Locality: KA (KN)

References: 16, 27

(x) *Lepidosaphes (Lepidosaphes) salicina* (Borschenius) (Far-eastern-oystershell scale)

Hosts: *Salix alba*, *Salix babylonica*

Locality: KA (GU)

References: 18,27

(xi) *Octaspidotus multipori* Takagi

Host: *Rosa indica*

Locality: KA (SR)

References :18,27

(xii) *Parlatoria oleae* Leonardi Olive parlatoria)

Host: Mango

Locality: JA

References :25,27

(xiii) *Parlatoria cupressi* (Takajae & Kawai)

(Syn.: *Parlatoria thujae* Takajae & Kawai)

Host: *Cedrus deodara*

Localities: KA (VE,SR)

Reference: 18

(xiv) *Pinnaspis strachani* (Ferris) (Cotton white scale)

Host: Not known

Locality: JK

References: 25,27

III Family: Keriidae (Lac-insects)

(i) *Kerria fici fici* (Green) (Ficus lac)

(Syn.: *Lakshadia fici* Green)

Hosts: *Acacia*, *Butea*, *Ficus*, *Lychnae*

Locality: JA:

References: 14,26,27

IV. Family: Margarodidae (Ground pearl)

(i) *Drosicha dalbergia* (Green)

Host: *Prunus dulcis*

Locality: KA

References: 8, 12,15,21

V. Family: Pseudococcidae (Mealybugs)

(i) *Humococcus resinophila* (Green)

(Syn.: *Repersia resinophila* Green)

Host: *Pinus wallichiana* (= *Pinus excelsa*), *Pinus longifolia*

Locality: KA (KM)

References: 2, 3, 11,23

(ii) *Phenococcus* sp. (Mealybug)

Host: unknown

Locality: JK

Reference: 27

(iii) *Rastrococcus* sp.

Host: Mango

Locality: JA

Reference: 27

References/ authors: 1=Ahmad *et al.* (2008); 2= Ali (1970); 3= Ali - (1970a); 4= Ali (1974); 5= Bandey *et al.* (2012); 6= Bhagat *et al.* (1992); 7=Bhagat *et al.* (1991); 8= Bhat (1991); 9= Fotedar (1941); 10= Fotedar & Kapur (1947); 11= Green (1916); 12= Kaul *et al.* (2000); 13= Kumar *et al.*-(2007); 14= Mahdi-Hassan (1937); 15= Masoodi *et al.* (1988); 16= Masoodi & Trali (1987); 17= Mir & Wani (2005); 18= Ramzan *et al.* (1991); 19= Rao - (1953).; 20= Rishi (1966); 21= Rishi (1968); 22= Varshney (1984); 23= Varshney (1985); 24= Varshney (1992); 25= Varshney (2002); 26= Varshney (2005); 27= Varshney *et al.* (2012); 28= Zaka-ur-Rab (1983); 29= Zaki (1999).

Localities: AN= Anantnag; BA= Bandipore; GU= Gurez; JA= Jammu; JK= Jammu & Kashmir; KA= Kashmir; KM= Kamraj Forest Division; KN= Kangan; KO=

Kokernag; LA= Ladakh; PA= Pattan; SH= Shopian; SR= Srinagar; VE=Verinag.

Scale insects and mealy bugs of horticultural importance:

The scale insects / mealybugs of horticultural importance of J&K State include 13 species belonging to 12 genera, under 5 different families. The fruit trees as well as crops severely affected by these pests, are about 12 in species, covering temperate and sub-tropical fruits trees, pome as well as stone fruits, viz. apple, almond, apricot, citrus fruits, peach, pear, plum, grape vine, litchi, mango, quince and walnut. The highest number i.e. 4 of insect pests is found to be damaging mango, followed by apple, infested with 3 species. Almond, apricot, grape-vine, walnut, damaged by two species each of scale insect /mealybug. Rest of the fruit trees like citrus fruits, plum, peach, pear, litchi and quince, are found to be damaged by 1 species each of scale insect. The details regarding the host- plant spectrum, with distribution are highlighted in the above given systematic catalogue.

Scale insect, *Diaspidiotus perniciosus* is posing threat to number of fruit trees in orchards, in wide localities and areas of Kashmir, affecting the fruit crop such as apple, apricot, plum, peach, grape vine, pear and walnut, besides number of wild fruit trees, bushes and forest range plantations. In the recent years, another species of *Diaspidiotus*, *D. juglansregiae*, has been reported from Kangan and Shopian areas of Kashmir valley (Mir & Wani, 2005). Another major scale insect pest, the nut scale (*Eulecanium tiliae*), showed wide spectrum of host- fruit trees and also wide prevalence in Kashmir region. The various host fruit trees include apple, almond,

apricot, peach, plum, grape-vine and quince (see above given catalogue).

Scale insects / mealybugs of forestry importance:

A total of about 12 species of scale insects/ mealybugs, have been found to be damaging about 19 species of forest/ timber trees in J & K State. The highest number of insect species as 5 found to be infesting 5 different species of Salix, followed by 2 species, damaging 2 species of poplars. The rest of the forest/ timber trees like acacia (1sp.), *Betula* sp., *Buteasp.*, cedar deodar (1 sp.), *Celtis australis*, *Cunninghamia lanceolata*, *Eucalyptus* sp., *Ficus* sp. *Morus* sp., Pines (2 spp.), oak (1 sp.), are known to be attacked by one species each of scale insect / mealybug species (see above given catalogue).

Scale insects damaging medicinal and aromatic plants:

More than 9 spp. of medicinal and aromatic plants of this region, have been reported to be affected by 6 spp. of scale insects, belonging to genera viz., *Coccus*, *Eulecanium*, *Parthenolecanium*, *Abgallaspis*, *Diaspidiotus*, and *Octaspidotus*. The various medicinal / aromatic plants: *Berberis*, *Aesculus indica*, *Cichorium intybus*, *Crataegus songarica*, *Rosa* spp. (4 spp.) and *Sophora japonica*, have shown infestations with 1 sp., 1 sp., 1 sp., 1 sp., 4 spp. and 1 sp. of scale insect respectively (see above cited catalogue).

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