



New record of scales and mealybugs (Hemiptera: Coccoidea) infesting sandalwood (*Santalum album* Linn.) in agroforestry conditions

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ABSTRACT: Survey conducted on sandalwood, *Santalum album* Linn. growing in agroforestry conditions revealed infestation of 31 species of scales and mealybugs. Of these, seven are new records on *S. album*. © 2016 Association for Advancement of Entomology

KEY WORDS: Sandalwood, coccids, species of scales and mealybugs

Agroforestry systems are not new to India; traditionally each and every Indian locality has its own types of indigenous agroforestry systems (Dhyani and Handa, 2013). Indian sandalwood, *Santalum album* Linn. is emerging as one of the important agroforestry species due to the amendments in the Sandalwood acts in 2001 and 2002, respectively by the Karnataka and Tamil Nadu governments. The Amended Acts clearly states that “every occupant or the holder of the land shall be legally entitled to the sandalwood tree in his land”. This is encouraging community and private entrepreneurs to cultivate *S. album* in agroforestry, farm forestry and varied agri-silvi-horticultural and mixed plantation systems (Sundararaj, 2014a). Farmers are growing *S. album* along with other agricultural, horticultural, commercial and other tree species based on their need and choice. Trees like, *Tectona grandis* L.f., *Grevillia robusta* A. Cunn. ex R. Br., *Azadirachta indica* A. Juss., *Tamarindus*

indica L., *Melia dubea* Cav., *Simarouba glauca* DC., *Pongamia pinnata* (L.) Pierre, *Pterocarpus santalinus* L.f., *Cassia siamea* L. and *Ailanthus excels* Roxb; horticultural crops like *Anacardium occidentale* L., *Areca catechu* L., *Cocos nucifera* L., *Phyllanthus emblica* L., *Moringa oleifera* Lam, *Citrus reticulata* Blanco, *Punica granatum* L., *Psidium guajava* L., *Carica papaya* L., and *Musa* spp. and agricultural crops like cucurbitaceous vegetables, chillies and lemon grass were found commonly grown with *S. album*. The inter-cultivation of sandalwood with other plants are commonly preferred than the pure plantations (Sundararaj, 2014b). Surveys were conducted at an interval of once in four months for two years (2014 and 2015) to study the insect pest problems of *S. album* growing outside forest in different agroforestry conditions and the findings related to scales and mealybugs infesting *S. album* is presented in this communication.

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Table 1. Scales and Mealybugs infesting on *S. album* in India

Sl.No	Family	Scientific name	Common name
1.	I. Coccidae	<i>Cardiococcus bivalvata</i> (Green)	Bivalved scale
2.		<i>Ceroplastes actiniformis</i> Green	Coconut wax scale
3.		<i>Ceroplastes ceriferus</i> (Fabricius)	The Indian wax scale
4.		<i>Coccus viridis</i> (Green) *	Green coffee scale
5.		<i>Parasaisseti anigra</i> (Nietner)	Nigra scale/Black bug
6.		<i>Pulvinaria psidii</i> Maskell	The green shield scale
7.		<i>Saissetia coffeae</i> (Walker)	Hemispherical scale
8.		<i>Megapulvinaria maxima</i> (Green)	Neem scale
9.		<i>Pulvinaria polygonata</i> Cockerell*	Cottony citrus scale
10.	II. Diaspididae	<i>Abgrallaspis cyanophylli</i> (Signoret) *	Cyanophyllum scale
11.		<i>Aonidiella orientalis</i> (Newstead)	Oriental scale
12.		<i>Chrysomphalus aonidum</i> (Linn.)*	Black scale
13.		<i>Fiorinia fioriniae</i> TargioniTozzetti	Fiorinia/Avacado scale
14.		<i>Hemiberlesia lataniae</i> (Signoret)*	Latania scale
15.	<i>Ischnaspis longirostris</i> (Signoret)*	Black line scale	
16.	III. Kerridae	<i>Paratachardina lobatalobata</i> (Chamberlin)	Lobate scale/ pseudo scale
17.		<i>Paratachardina silvestri</i> (Mohdihassan)	The pseudolac scale
18.	IV. Margarodidae	<i>Hemaspidopectus cinereus</i> (Green)	Giant mealybug
19.		<i>Perissopneumon phyllanthi</i> (Green)	-
20.	V. Monophlebidae	<i>Icerya aegyptiaca</i> (Douglas)	Egyptian mealybug
21.		<i>I. formicarum</i> Newstead	-
22.		<i>I. purchasi</i> Maskell	Cottony cushion scale
23.		<i>I. seychellarum</i> Westwood	Common white mealybug
24.		<i>Labioproctus poleii</i> (Green)*	
25.	VI. Ortheziidae	<i>Ortheziainsignis</i> (Browne)	Croton bug
26.	VII. Pseudococcidae	<i>Ferrisi avirgata</i> (Cockerell)	Striped mealybug
27.		<i>Nipaecoccus filamentosus</i> (Cockerell)	Spherical mealybug
28.		<i>Nipaecoccus viridis</i> (Newstead)	Coconut mealybug
29.		<i>Pseudococcus longispinus</i> (TargioniTozzetti)	Long tailed mealybug
30.		<i>Rastrococcus iceryoides</i> (Green)	Mutabilis mealybug
31.		<i>Lankacoccus ornatus</i> (Green)	Jasmine mealybug

* new record on *S. album*

The study revealed 31 species of scales and mealybugs under 7 families infesting *S. album* in India (Table 1). Among the 31 species, the infestation of 7 species viz., *Coccus viridis*, *Pulvinaria polygonata*, *Abgrallaspis*

cyanophylli, *Chrysomphalus aonidum*, *Hemiberlesia lataniae*, *Ischnaspis longirostris* and *Labioproctus poleii* on *S. album* form the new records. The infestation of these scales and mealybugs on *S. album* confirms the earlier reports

(Varshney, 1992 and 2002) of their polyphagous nature. Sundararaj *et al.* (2006) reported the infestation of 23 species of scales and mealybugs and Sundararaj (2011) reported the infestation of Croton bug, *Orthezia insignis* on *S. album*, thus a total of 24 species of scales and mealybugs were earlier known to infest *S. album*. Among the more than 150 insects known to occur on *S. album* in India, the infestation by sucking insects belonging to the family Coccidae is very deleterious as they affect the normal growth and reproduction of sandal plants (Remadevi *et al.*, 2005). Often the infestation of *Cardiococcus bivalvata*, *Parasaissetia nigra*, *Saissetia coffeae*, *Ceroplastes actiniformis*, *C. ceriferus* and *Paratachardina silvestri* results in drying of branches causing dieback symptoms and ultimately death in seedlings and trees (Sundararaj *et al.*, 2006). The affected flowers wither and fruits dry and fall off prematurely and do not germinate (Sivaramakrishnan *et al.*, 1987). In agroforestry conditions, very often the infestation of *Ca. bivalvata*, *Ce. actiniformis*, *Coccus viridis*, *M. maxima*, *A. orientalis*, *I. aegyptiaca* and *Nipaecoccus viridis* were severe resulting in dieback symptoms and death of young trees. Ananthakrishnan (2007) commented that climate change is expected to bring extension in the host range of many pests and diseases and the microclimate of many sucking pests will tend to change, leading to acceleration of their reproductive cycles, resurgence, behaviour and reproductive potential. Hence in the present context of growing *S. album* in agroforestry conditions outside forest a holistic approach, for the better management of economically important coccids is very much required to increase the production of sandalwood in pace with increased area of cultivation.

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