

Seasonal occurrence of *Solenopsis mealybug*, *Phenacoccus solenopsis* Tinsley on different host plants in cotton based agro ecosystem

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ABSTRACT : Surveys were carried out during 2008-2011 to study the seasonal occurrence *Solenopsis mealybug*, *Phenacoccus solenopsis* Tinsley (Hemiptera: Pseudococcidae) on different host plants in cotton growing areas around Hisar. The pest was recorded to colonize 51 plant species belonging to 19 families. Greater preference of the pest, based on number of plant species attacked, as well as maximum damage by the pest (injury Grade IV symptoms) was recorded on the plants belonging to family Malvaceae, Solanaceae and Asteraceae. Important host plants supporting *P. solenopsis* throughout the year included *Achyranthes aspera*, *Conyza canadensis*, *Parthenium hysterophorus*, *Codiaeum variegatum*, *Abutilon indicum*, *Hibiscus rosa sinensis*, *Hibiscus schizopetalus*, *Hibiscus syriacus*, *Withania somnifera*, *Corchorus trilocularis* and *Lantana camara*. Prominent host plants supporting the pest during off season were *Chrysanthemum indicum*, *Tagetes erecta*, *Tagetes patula*, *Azadirachta indica*, *Lycopersicon esculentum*, *Helianthus annuus* and *Verbena hybrida*.

Key words : Cotton, host plants, mealybug, *Phenacoccus solenopsis*, seasonal occurrence

Phenacoccus solenopsis Tinsley (Hemiptera: Pseudococcidae) has been reported from 35 localities of various ecological zones of the globe. It has a wide range of variation in morphological characters, biological adaptations and ecological adjustability (Hodgson *et al.*, 2008). *P. solenopsis* was originally described from USA in 1898 where it was wide spread infesting cultivated cotton and 29 other plant species of 13 families. Subsequently, the species was also reported to occur in a number of countries including India. Arif *et al.*, (2009) recorded 154 plant species from 53 families comprising 20 field and horticultural crops, 45 ornamentals, 64 weeds and 25 bushes and trees as hosts of *P. solenopsis* in Pakistan. Nagrare *et al.*, (2012) recorded 70 alternate hosts of mealybug from north cotton growing zone of India.

Solenopsis mealybug incidence on cotton in India was first recorded in 2005 in Gujarat (Jhala *et al.*, 2008). Subsequently, damage by this pest was reported from Punjab (Dhawan *et al.*, 2007) and Haryana (Saini and Ram, 2008; Monga *et al.*, 2009). A country wide

survey across 47 locations during 2007 and 2008 established the rapid and widespread distribution of *P. solenopsis* on *Bt*-cotton throughout India (Nagrare *et al.*, 2009).

Some of the preferred host plants of this pest, particularly those present throughout the year or for most part of the year, can play important role in perpetuation of the pest through different seasons. However, comprehensive information with respect to the potential role of such host plants in supporting population of this pest is lacking.

Therefore, the present investigations were undertaken to document various host plants which supported its development and survival.

MATERIALS AND METHODS

Fortnightly observations on host plants of *P. solenopsis* in cultivated fields, orchards, plant nurseries, wastelands, roadsides and water channels were made in the cotton growing areas around Hisar, Haryana during January, 2008 to December, 2011. A plant

species was considered as a host of *P. solenopsis* on which colonies of the pest were present. Sample size varied from 100 to 150 plants of each plant species. Severity of the pest on different host plants was determined on the basis of pest grading (Dhawan *et al.*, 2007) described as under: Grade I presence of mealybug, Grade II presence of mealybugs on central shoot of the plant, Grade III presence of mealybugs on stem, leaves and reproductive parts of the plant, and Grade IV appearance of honey dew and stunted growth, almost all plant host with mealybug showing white appearance.

RESULTS AND DISCUSSION

Phenacoccus solenopsis was recorded on 51 host plants belonging 19 families *i.e.* Malvaceae, Solanaceae, Asteraceae, Amaranthaceae, Chenopodiaceae, Verbenaceae, Poaceae, Zygophyllaceae, Aizoaceae, Tiliaceae, Fabaceae, Pedaliaceae, Polygonaceae, Portulacaceae, Rhamanaceae, Acanthaceae, Euphorbiaceae, Cucurbitaceae and Meliaceae (Table I). The plant species attacked by the pest included five vegetable crops (*Beta vulgaris*, *Abelmoschus esculentus*, *Lycopersicon esculentum* and *Solanum melongena*), five field crops (*Helianthus annus*, *Cyamopsis tetragonolobus*, *Gossypium hirsutum*, *Gossypium arboreum* and *Sesamum indicum*) and 13 ornamental (*Ruellia tuberosa*, *Chrysanthemum indicum*, *Tagetes erecta*, *Tagetes patula*, *Codiaeum variegatum*, *Hibiscus rosa sinensis*, *Hibiscus schizopitalus*, *Hibiscus syriacus*, *Withania somnifera*, *Lantana camara*, *Alcea rosea*, *Achania malvaviscus* and *Verbena hybrida*). *Azadirachta indica* and *Acacia* sp. were the host plants belonged to tree category and *Zizyphus rotundifolia* was only the host plant belonged to fruit plant category. The remaining 25 plants species attacked by *P. solenopsis* were weeds. It was noted that apart from field infestation the incidence of the pest was prominent mainly on the host plants growing

along water channels, roadsides and field borders. The pest incidence was quite common on the plants belonging to family Malvaceae, Solanaceae and Asteraceae. Arif *et al.*, (2009) also observed that most of the plants attacked by *P. solenopsis* belonged to the above families, apart from its record on other families also. Nagrare *et al.*, (2012) recorded 70 host plants from north zone belonging to 28 botanical families. Among the various host plants, 34 were recorded during the active cotton season followed by host plants which supported the mealybug throughout the year while the remaining served as host during off season. *Chrysanthemum indicum*, *Tagetes erecta*, *Tagetes patula*, *Azadirachta indica*, *Lycopersicon esculentum*, *Helianthus annus* and *Verbena hybrida* served as host plants of the pest during off season. Host plants supported the pest throughout the year included *Achyranthes aspera*, *Conyza Canadensis*, *Parthenium hysterophorus*, *Codiaeum variegatum*, *Abutilon indicum*, *Hibiscus rosa sinensis*, *Hibiscus schizopitalus*, *Hibiscus syriacus*, *Withania somnifera*, *Corchorus trilocularis* and *Lantana camara*.

Host plants from Malvaceae (11), Solanaceae (5), Asteraceae (3), Amaranthaceae (3), Chenopodiaceae (1), Poaceae (1), Portulacaceae (1) and Tiliaceae (1) showed maximum severity of Grade 4. Severity of *P. solenopsis*, in decreasing order, was on Malvaceae > Solanaceae > Asteraceae > Amaranthaceae > Chenopodiaceae > Poaceae > Portulacaceae > Tiliaceae.

It was concluded from the studies that removal of alternate host plants which supported greater population of the pest, particularly those which were present throughout the year, was essential to manage this pest effectively.

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Table 1. Host plants of *Phenacoccus solenopsis* recorded in cotton based agro-ecosystem during 2008-2011.

S.No.	Family	Botanical Name	English Name	Plant category	Season*	Grading	Location of hosts**
1.	Acanthaceae	<i>Peristrophe paniculata</i> F.	Panicled	Weed	CS	I	R
2.		<i>Ruellia tuberosa</i> L.	Minnie root	Ornamental	CS	III	R
3.	Aizoaceae	<i>Trianthema portulacastrum</i> L.	Desert Horse Purslane	Weed	CS	III	R, F
4.	Amaranthaceae	<i>Achyranthes aspera</i> L.	Devil's horsewhip	Weed	TOY	IV	R
5.		<i>Amaranthus viridis</i> L.	Pigweed	Weed	CS	IV	R, F
6.		<i>Digeria arvensis</i> Forsk	False Amaranth	Weed	CS	IV	F
7.	Asteraceae	<i>Chrysanthemum indicum</i> L.	Chrysanthemum	Ornamental	OS	III	R
8.		<i>Conyza canadensis</i> L.	Horseweed	Weed	TOY	III	W
9.		<i>Helianthus annuus</i> L.	Sunflower	Field crop	OS	IV	F
10.		<i>Launea asplenifolia</i> Hook.f.	-	Weed	CS	III	F,W
11.		<i>Parthenium hysterophorus</i> L.	Carrot grass	Weed	TOY	IV	R,F,B,W
12.		<i>Tagetes erecta</i> L.	African marigold	Ornamental	OS	III	R,F
13.		<i>Tagetes patula</i> L.	French marigold	Ornamental	OS	III	R,F
14.		<i>Xanthium strumarium</i> L.	Cockle burs	Weed	CS	IV	R,B,W
15.	Cucurbitaceae	<i>Cucumis sativus</i> L.	Cucumber	Vegetable	CS	II	F
16.	Chenopodiaceae	Beta vulgaris L.	Beet	Vegetable	CS	III	F
17.		<i>Chenopodium murale</i> L.	Lamb's quarters	Weed	CS	III	
18.		<i>Suaeda fruticosa</i> Forsk	Sea goose fort	Weed	CS	IV	W,R
19.	Euphorbiaceae	<i>Codiaeum variegatum</i> (L.) A.Juss	Croton	Ornamental	TOY	III	R
20.	Fabaceae	<i>Cyamopsis tetragonolobus</i> L.	Clusterbean	Field crop	CS	III	F
21.		<i>Acacia</i> sp.	Acacia	Tree	CS	II	R
22.	Malvaceae	<i>Abutilon indicum</i> Sw.	Indian mallow	Weed	TOY	IV	R,W
23.		<i>Abelmoschus esculentus</i> L.	lady's finger	Vegetable	CS	IV	F
24.		<i>Achania malvaviscus</i> S.	Turkcap	Ornamental	CS	III	R
25.		<i>Alcea rosea</i> L.	Hollyhock	Ornamental	CS	IV	R
26.		<i>Gossypium hirsutum</i> L.	American cotton	Field Crop	CS	IV	F
27.		<i>Gossypium arboreum</i> L.	Arboreum cotton	Field Crop	CS	IV	F
28.		<i>Hibiscus rosa sinensis</i> L.	China rose	Ornamental	TOY	IV	R
29.	Malvaceae	<i>Hibiscus schizopetalus</i> (Mast.) H.	China rose	Ornamental	TOY	IV	R
30.		<i>Hibiscus syriacus</i> L.	China rose	Ornamental	TOY	IV	R
31.		<i>Sida cordifolia</i> L.	Country mallow	Weed	CS	IV	R,W
32.		<i>Urena lobata</i> L.	Caesar's weed	Weed	CS	IV	R,B
33.	Meliaceae	<i>Azadirachta indica</i> A. Juss	Neem	Tree	OS	II	R,B
34.	Pedaliaceae	<i>Sesamum indicum</i> L.	Sesame	Field Crop	CS	II	F
35.	Poaceae	<i>Aerva javanica</i> B.	Javanese wool	Weed	CS	IV	F
36.		<i>Dactyloctenium aegyptium</i> L.	Crow foot grass	Weed	CS	III	F
37.	Polygonaceae	<i>Polygonum barbatum</i> L.	Water smartweed	Weed	CS	III	W
38.		<i>Polygonum plebijem</i> R. Br	Water smartweed	Weed	CS	III	W
39.	Portulacaceae	<i>Portulaca oleracea</i> L.	Purslane	Weed	CS	IV	F,B
40.	Rhamanaceae	<i>Zizyphus rotundifolia</i> F.	Ber	Fruit plant	CS	III	R,W
41.	Solanaceae	<i>Datura metel</i> L.	Jimson weed	Weed	CS	IV	R
42.		<i>Lycopersicon esculentum</i> Mill.	Tomato	Vegetable	OS	IV	F
43.	Solanaceae	<i>Nicotina palembagnifolia</i> Viv.	Wild tobacco	Weed	CS	III	B
44.		<i>Physalis minima</i> L.	Sun berry	Weed	CS	II	B,
45.		<i>Solanum melongena</i> L.	Brinjal	Vegetable	CS	IV	F
46.		<i>Solanum nigrum</i> L.	Black nightshade	Weed	CS	IV	B,R
47.		<i>Withania somnifera</i> Dunal	Winter cherry	Ornamental	TOY	IV	R,B
48.	Tiliaceae	<i>Corchorus trilocularis</i> L.	Wild jute	Weed	CS	IV	B,R
49.	Verbenaceae	<i>Lantana camara</i> L.	Spanish flag	Ornamental	TOY	III	R
50.		<i>Verbena hybrida</i> L.	Verbena	Ornamental	OS	II	R
51.	Zygophyllaceae	<i>Tribulus terrestris</i> L.	Puncture vine	Weed	CS	I	F,R

Grading: Grade I: presence of mealybug, Grade II- presence of mealybugs on central shoot of the plant, Grade III- presence of mealybugs on stem, leaves and reproductive parts of the plant and Grade IV - appearance of honey dew and stunted growth, almost all plant host with mealybug showing white appearance. ***Season:** CS: Cotton Season; OS: Off season; TOY: Throughout the year. ****Location of hosts:** F: Within field; B: Field Border; R: Roadside; W: Water channel.

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