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OFF-SEASON SURVIVAL OF MEALY BUG AND ITS IMPACT ON SUCCEEDING COTTON CROP

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ABSTRACT

Mealy bug, *Phenacoccus solenopsis* Tinsley, a newly introduced pest has appeared on cotton in a devastating manner in North India. Though overwintering of mealy bug was reported in stacks of infested cotton stalks, bark of trees near infested area, weed hosts that survived during winter of 2007-08 but it was maximum in stacks of infested cotton stalks. In the preceding cotton crop of 2008-09 near the source of previous infestation of 2007-08, the earliest initiation (April-May) and highest infestation (41%) was recorded around stacks of infested cotton stalks, though in general the infestation was less during 2008-09 as compared to 2007-08. The maximum distribution of mealy bug was found to parallel the source of infestation (39 -62%) reducing to the perpendicular side (6-31%). The manipulation in source of overwintering (off-season survival) population significantly affects the infestation.

Key words: *Phenacoccus solenopsis*, cotton, off season, overwintering, alternate host, infestation

Mealy bug *(Maconellicoccus hirsutus)* was first reported from India on mulberry (Green, 1908) and later on it spread to Egypt in 1912 causing damage to *Albizia labbek* (Leguminoceae), Mulberry (Moraceae), *Hibiscus* spp. (Malvaceae) and many more plants but cotton was not severely attacked being an annual crop and sufficient time was not available to the mealy bug to damage the crop (Hall, 1921). Afterwards the pest spread to countries like Hawaii, Grenada, St. Lucia, USA, South Africa. Misra (1920) reported this species attacking cotton in Bihar and later on Dhawan *et al*. in 1980 reported it on *desi* cotton from Punjab. It was again recorded from Wagad and Kachch region in 2000 (Muralidharan and Badaya, 2005). Severe attack of mealy bug was again observed on cotton in Gujarat during 2006-07 (All India Co-ordinated Cotton Improvement Project, Report 2006-07). But *Phenacoccus solenopsis* Tinsley was reported in 1898 from USA, in 1992 Central America, 2002 in Chile on *Solanum muricatum* and 2005 in Brazil on tomato as host. It was recorded in Pakistan on cotton during 2005. Though the presence of mealy bug was reported in 2006-07 from Bathinda (Punjab) but its severe attack was observed in cotton growing areas of Punjab during 2007-08 from where it apparently spread to adjoining areas of Haryana. Two species of mealy bugs occurring in cotton in north India are *Maconellicoccus hirsutus* Green and *Phenacoccus solenopsis*. Out of which *Phenacoccus solenopsis* was abundant and has been reported for the first time in cotton in north India. Though the pestis available throughout the year, its population decreased with the onset of winter. The peak activity is in August - September. So, in this study an effort has been made to find out its source of survival during the off-season and ultimately the effect of this source on the infestation in the succeeding cotton crop.

MATERIALS AND METHODS

A survey was conducted in Sirsa, Fatehabad and Hisar District to find out the infestation of mealy bug during 2006-07 cotton season. The number of available hosts of mealy bug from field, fruit, vegetable, weeds and plantation crops were recorded. The observations on the stage in which mealy bug overwintered and the most prominent source of mealy bug off-season survival and its impact on the infestation of the mealy bug in the succeeding crop were recorded. For conducting this study the highly infested area was marked and it was regularly monitored during 2007-08 and 2008-09. The highly infested and preferred weeds were regularly monitored for the survival of any mealy bugs. During winter (December-February) the majority of weeds died because of low temperature but some weeds were available under the protected conditions like shadow of trees and other shrubs. The bark of the trees in and around the five infested fields were regularly monitored from November till March. The samples of soil taken from five infested fields were examined

thrice between November to March. The infested cotton stalks stacked in or around the infested field were examined in five stacks of infested cotton stacks thrice between December to March.

During 2007-08 the infestation data from 5 spots of each location described as under were recorded.

a) Road side with mealy bug infested weeds
b) Near railway track with mealy bug infested weeds
c) Parallel to water channel having perennial infested weeds
d) Adjoining to stack of infested cotton stalks
e) Control (no source of infestation)

These locations were marked and the observations on per cent infestation in succeeding year (2008-09) were recorded. The pattern of infestation in field was also studied by observing the number of infested plants both perpendicular and parallel to the roadside with mealy bug infested weeds.

RESULTS AND DISCUSSION

The survey results on the presence of mealy bugs and various sources and during off season is given in Table 1. The survival of mealy bug on the weeds on ratoon cotton crop left unharvested (for experimental purpose only) on its partially dried branches/ bolls was evident. At majority of the locations the mealy bug along with crawlers was present in the barks but its number was very low. Among the available individual of mealy bug in the bark of trees, the crawler stage was dominating. At all the locations the mealy bug (all stages) was found surviving in the stalks through out the season. The maximum numbers of surviving mealy bugs (adult and crawlers) were found in the deeper side of stacks.

Though in general the mealy bug infestation was low during 2008-09 as compared to 2007-08 the highest impact of the previously infested cotton stalks was recorded on the succeeding cotton crop with 41% significantly higher infestation than the locations by road side with mealy bug infested weeds (32.20%) followed by parallel to water channel having perennial infested weeds (30.80%), near railway track with mealy bug infested weeds (31.60%) in comparison to control (having no already available source of infestation) with 9.0% infestation only (Table 2). The pattern of mealy bug infestation in cotton field was also studied near roadside with mealy bug infested weeds, and it was observed that the average percentage of mealy bug infested cotton plants recorded were comparatively more (48.8% with a range of 39-62%) to parallel side of the roadside with mealy bug infested weeds than to perpendicular side (17.6%, ranged between 6-31%) (Fig. 1).

Table 1. Source of mealy bug survival (overwintering) during off-season of 2007-08

Source of survival	Status of mealy bug	Stage of mealybug	Remarks
Cotton stalks lying in stacks	Available	Crawlers & adults	In the interior side of the stack all stages of mealy bug were found surviving.
Ratoon cotton Plants	Available	Crawlers adults	In the calyx and corolla of dead and unopened bolls
Weeds	Available	-	The mealy bug was observed only on surviving perennial weeds like *Parthenium, Xanthium sp, Abutilon indicum, Sida sp., Trianthema monogyna* under protected conditions
Seasonal Ornamental plants	Available	All stages	Seasonal flowers during February- March
Tree bark	Available	Crawler	*Azadirachta indica* and *Dalbergia sisoo*
Soil	Not available	-	No surviving mealy bug was observed

* The data was recorded from 5 locations

Table 2. Per cent infestation of mealy bug with respect to various already infested locations

Field location	Percent infestation 2007-08	Percent infestation 2008-09	Initiation of infestation
Road side with mealy bug infested weeds	43.20* (41.06)**	32.20 (34.44)	May- June
Near railway track with mealy bug infested weeds	40.40 (39.42)	31.60 (34.07)	May-June
Parallel to water channel having perennial infested weeds	41.40 (40.01)	30.80 (33.48)	June- June
Adjoining to stack of infested cotton stalks	50.20 (45.10)	41.00 (39.37)	April- May
Control (no source of infestation)	12.80 (20.87)	9.00 (16.97)	Sept.-Oct.
CD at 5%	3.41	2.19	

* Observation based on 5 locations
** Angular value in parenthesis

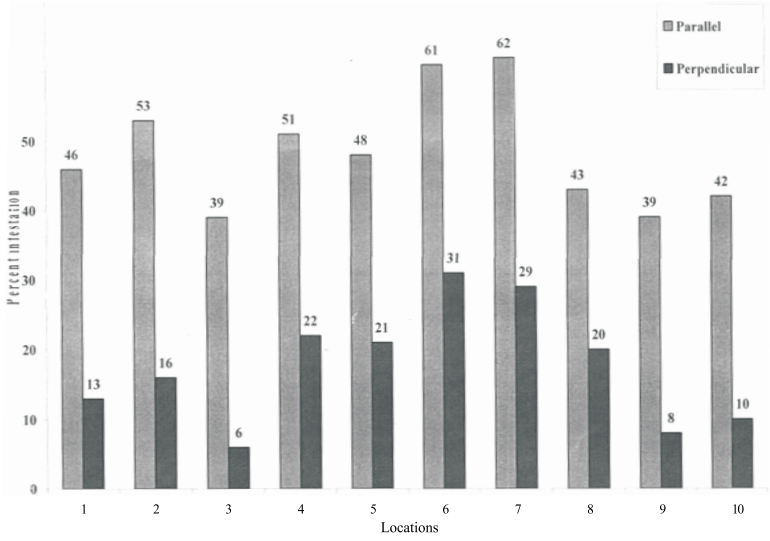

Fig. 1. Pattern of mealy bug infestation in cotton field

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