

# Seasonal incidence of the mealybug, *Phenacoccus solenopsis* Tinsley (Hemiptera: Pseudococcidae) on ashwagandha in Raipur (Chhattisgarh)

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## ABSTRACT

Studies on the seasonal incidence of mealybug, *Phenacoccus solenopsis* Tinsley on ashwagandha, *Withania somnifera* Dunal was carried out for two consecutive years during 2015-16 to 2016-17. The mealybug, *P. solenopsis* was observed as a major insect pest on ashwagandha. The present investigation revealed that the maximum population of mealybugs was observed during the second fortnight of December with 123.00 mealybugs per ten centimeter apical stem during 2015-16 while in 2016-17 maximum population was noticed during the first fortnight of January with 117.75 mealybugs per ten centimeter apical stem. The correlation analysis of mealybug population to meteorological parameters showed that the population was highly significant and negatively correlated with maximum temperature (-0.562\*\*) and minimum temperature (-0.837\*\*) during 2015-16 but highly significantly negatively correlated with minimum temperature (-0.839\*\*) in 2016-17.

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## INTRODUCTION

Ashwagandha, *Withania somnifera* Dunal is one of the potential medicinal crops. The dried roots are rich source of withanine and somniferine which are mainly used in ayurveda (Ravikumar *et al.*, 2007). Various types of insect pests attack on ashwagandha but the mealybug, *Phenacoccus solenopsis* is one of the most dominant and problematic species of insects that cause heavy damage. Both nymphs and adults feed continuous the

soft leaves, shoots of the plants and on young apical parts and undersides of mature leaves of ashwagandha. They appeared as waxy and cottony-white structures either in clusters or solitary and moved very little. Host leaves were sometimes deformed and shed prematurely (Sharma and Pati, 2013). They are sucking insect pests and often observed in high numbers with an aggressive population trend. Mealybugs do not only destroy the host plant by depleting the plant sap but they are also

responsible for transmitting viral diseases (Bertin *et al.*, 2010). It is mostly polyphagous, affecting huge number of economically important in field and horticultural crops including ornamentals (Sinacori, 1995). Eleven species of phytophagous pests including *Henosepilachna vigintioctopunctata* Fab., *Mylokerus discolor* Fab. and *Mylokerus viridanus* Fab., *Deilephila nerii* Linn., Leaf miner, *Oxyra chistarandus* Fab., *Ferrisia virgata*, *Nezara viridula*, Aphids, *Tetranychus urticae* Koch. and *Helicoverpa* sp. have been noticed to be associated with ashwagandha (Murali *et al.*, 2007; Sharma *et al.*, 2014). The cotton mealybug, *P. solenopsis* Tinsley has been described as a serious and invasive polyphagous pest with a vast host range by several authors. It has been described as a serious and invasive pest of shoe flower in Pakistan and India (Hodgson *et al.*, 2008). Worldwide, *P. solenopsis* Tinsley is a major threat to agriculture and horticulture in many tropical and subtropical countries which was found to attack large number of plant species including crops, vegetables, ornamental plants and weeds (Wang *et al.*, 2010 and Abbas *et al.*, 2010). In India, *P. solenopsis* was recorded from 22 plant species of 10 families comprising 7 field and vegetable crops, 3 ornamentals and 12 weeds which makes it a polyphagous pest (Dhawan *et al.*, 2010). Due to large number of host range, mealybug seems to be present throughout the year (Gautam, 2007). *P. solenopsis* cause crinkling, twisting, condensed flowers, bud, boll growth and finally plant exploitation along yield loss (Sahito *et al.*, 2009). The main objective of this study was to collect information for a better understanding of its population dynamics and about the seasonal incidence of *P. solenopsis* on ashwagandha which could be used for prediction, distribution and adequate management of the pest.

## MATERIAL AND METHODS

The present field experiment to study the seasonal incidence of mealybug on ashwagandha, *W. somnifera* was conducted at the research cum instructional farm, IGKV, Raipur, Chhattisgarh from July, 2015 to June, 2017. Observations on the occurrence and infestation of mealybugs on the crop were taken at fortnightly intervals for a period of two years by selecting four young apical shoots of 10 cm length having 10-14 leaves randomly on which the number of nymphs and adults were counted as per Hanchinal *et al.* (2010) (Fig. A and B). Mealybugs

collected from leaves, stems and flower were preserved in 70 per cent ethanol and sent to National Bureau of Agricultural Insect Resources (NBAIR), Bangalore for identification. In order to study the influence of abiotic factors on mealy bug population, the meteorological data on maximum and minimum temperature, relative humidity (morning and evening) and rainfall were collected from the Department of meteorology, IGKV, Raipur (Chhattisgarh).



Fig. A : Ashwagandha plant infested by mealybug, *P. solenopsis*



Fig. B : Population of mealybug recording 10 cm apical shoots

## RESULTS AND DISCUSSION

During present investigation mealybugs on ashwagandha was identified as *Phenacoccus solenopsis* Tinsley. This is the first record of the mealybug, *P. solenopsis* on ashwagandha in Chhattisgarh, India. Similarly, Sharma and Pati (2013) first recorded *P. solenopsis* on ashwagandha from Punjab, India. The *P. solenopsis* was observed as a major insect pest on ashwagandha in Chhattisgarh. They mainly attacked on

the young apical portions of the stem and also on the undersides of mature leaves by sucking the sap from phloem tissues which retarded plant growth, leading leaf and to bud drop during heavy infestations. The studies on mealy bug over two seasons indicated that, the mealy bugs were noticed throughout the year except some months of rainy season.

In the first year (2015-16), the mean maximum population of mealybug was observed during the second fortnight of December with 123.00 nymphs and adults per ten centimeter apical shoot. No mealybugs were recorded in the month of July to first fortnight of August (Table 1). The correlation analysis of mealybug population with meteorological parameters showed that the population was highly significant and negatively correlated with maximum temperature (-0.562\*\*) and minimum

temperature (-0.837\*\*), significant and negatively correlated with rainfall (-0.417\*), maximum temperature (-0.495\*), non-significant and negatively correlated with evening relative humidity (-0.299), non-significant and positively correlated with morning relative humidity (0.239) (Table 3).

During the second year (2016-17), the maximum population of mealybug was observed during first fortnight of January with 117.75 nymphs and adults per ten centimeter apical shoot. No population was observed from July to August (Table 2) as in the previous year. The correlation analysis showed that the population was highly significantly and negatively correlated with minimum temperature (-0.839\*\*), significant and negatively correlated with maximum temperature (-0.434\*) and morning relative humidity (-0.428\*), non-

**Table 1: Population of mealybug, *P. solenopsis* infesting ashwagandha along with weather parameters during 2015-16**

SMW	Month and date	Mealybugs per 10 cm apical shoots	Temperature (°C)		Rainfall (mm)	Relative humidity (%)	
			Max.	Min.		RH- I	RH- II
26	01 Jul. 2015	0.00	33.5	25	25.8	87	59
29	16 Jul. 2015	0.00	31.8	25.6	7.8	91	71
31	31 Jul. 2015	0.00	31.2	25.2	48.7	86	69
33	15 Aug. 2015	0.00	31.7	25.3	126.4	94	73
35	30 Aug. 2015	0.25	30.8	25	37.9	94	80
37	14 Sep. 2015	4.50	33.5	25.4	68.4	93	62
39	29 Sep. 2015	6.75	32.5	24.6	0	92	57
41	14 Oct. 2015	16.25	33.9	22.2	0	89	47
44	29 Oct. 2015	39.50	30	19.4	0	90	55
46	13 Nov. 2015	33.75	31.7	16.3	0	89	33
48	28 Nov. 2015	59.75	31.9	16.7	0	87	34
50	13 Dec. 2015	76.50	30.1	17.3	4.4	77	46
52	28 Dec. 2015	123.00	26.9	10.8	0	87	29
2	12 Jan. 2016	77.00	29.3	11.1	0	87	27
4	27 Jan. 2016	57.00	27	9	0	90	33
6	11 Feb. 2016	24.25	31.1	14	0	78	32
9	26 Feb. 2016	21.00	33.6	20.8	0	81	37
11	12 Mar. 2016	16.00	34.6	21.3	2.9	75	38
13	27 Mar. 2016	7.50	38.6	21.8	0	67	25
15	11 Apr. 2016	6.00	41.5	25	0	48	13
17	26 Apr. 2016	5.25	42.9	26.2	0	44	16
19	11 May 2016	10.00	40.2	26.6	0	46	20
21	26 May 2016	8.75	42.9	28.4	7.6	46	22

significant and negatively correlated with rainfall (-0.335) and non-significant but positively correlated with evening relative humidity (0.172) (Table 3).

Hanchinal *et al.* (2010) observed the population of *P. solenopsis* was 0.50 /10 cm apical shoot on Bt cotton in the 38<sup>th</sup> meteorological week and reached to 115.42/ 10 cm apical shoot in the third week of January and thereafter, increased suddenly to 180.42/10 cm apical shoot in the 7<sup>th</sup> meteorological week *i.e.* 2<sup>nd</sup> week of February. Jat *et al.* (2014) studied the activity of mealy

bug, *P. solenopsis* on tobacco was commenced naturally from 39<sup>th</sup> standard week with an average of 3.8 mealy bug population per plant and found constantly increasing upto the 1<sup>st</sup> standard meteorological *i.e.* first week of January with an average population of 561.8 mealy bug per plant. The correlation study between mealy bug population and various weather parameters revealed that there was highly significant negative association with maximum temperature), minimum temperature and morning vapor pressure whereas positive association was

**Table 2: Population of mealybug, *P. solenopsis* infesting ashwagandha along with weather parameters during 2016 to 2017**

SMW	Month and date	Mealybugs per 10 cm apical shoots	Temperature (°C)		Rainfall (mm)	Relative humidity (%)	
			Max.	Min.		RH- I	RH- II
26	01 Jul. 2016	0.00	35	26.2	32.4	2	88
29	16 Jul. 2016	0.00	30.6	24.5	207	5	94
31	31 Jul. 2016	0.00	30.7	25.3	28	1	92
33	15 Aug. 2016	0.00	28.7	21.6	11.6	2	89
35	30 Aug. 2016	0.00	32.2	26	22.2	1	90
37	14 Sep. 2016	1.25	31.1	24.3	132.8	5	95
39	29 Sep. 2016	3.00	30	24.5	134.6	6	97
41	14 Oct. 2016	14.25	31.5	22.9	9.2	1	94
44	29 Oct. 2016	23.75	30.6	19.8	0.00	0	85
46	13 Nov. 2016	28.25	29	14.4	0	0	89
48	28 Nov. 2016	46.25	30.7	13	0	0	88
50	13 Dec. 2016	72.50	28.8	11.9	0	0	83
52	28 Dec. 2016	110.25	28.2	9.9	0	0	86
2	12 Jan. 2017	117.75	29.3	11.1	0	0	87
4	27 Jan. 2017	57.00	27	9	0	0	90
6	11 Feb. 2017	19.25	31.1	14	0	0	78
9	26 Feb. 2017	20.25	33.6	20.8	0	0	81
11	12 Mar. 2017	15.00	34.6	21.3	2.9	1	75
13	27 Mar. 2017	9.75	38.6	21.8	0	0	67
15	11 Apr. 2017	6.75	41.5	25	0	0	48
17	26 Apr. 2017	9.50	42.9	26.2	0	1	44
19	11 May 2017	8.25	40.2	26.6	0	0	46
21	26 May 2017	6.25	42.9	28.4	7.6	1	46

**Table 3 : Correlation co-efficient of incidence of *P. solenopsis* population with the climatic factors indicating the level of significance**

Sr. No.	Parameters	Correlation co-efficient	
		2015-16	2016-17
1.	Maximum temperature	-0.562**	-0.434*
2.	Minimum temperature	-0.837**	-0.839**
3.	Rainfall	-0.417*	-0.335
4.	Morning relative humidity	0.239	-0.428*
5.	Evening relative humidity	-0.299	0.172

\*and \*\* indicate significance of values at P=0.05 (r value = 0.413) and 0.01 (r value = 0.526), respectively

found with morning relative humidity.

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