Seasonal incidence of mealy bug, *Phenacoccus solenopsis* in bidi tobacco

Babu Lal Jat, D M Mehta[1], L V Ghetiya[1], R A Patil and A S Tetarwal[2]

Department of Entomology, B A College of Agriculture, Anand Agricultural University, Anand - 388 110, Gujarat, India.
[1]Bidi Tobacco Research Station, Anand Agricultural University, Anand - 388 110, Gujarat, India.
[2] Department of Entomology, College of Agriculture, CCS Haryana Agricultural University, Hisar - 125 004, Haryana, India.
E mail: solenopsisp.aau@gmail.com

Tobacco (*Nicotiana tabacum* L.) is an important non-food narcotic cash crop, belongs to family Solanaceae. India stands second in tobacco production and exports in the world (Krishnamurthy, 2011). Tobacco being a long duration crop passes through various biotic and abiotic stresses. Among various biotic stresses, insect pests are responsible in causing quantitative and qualitative damage to seeds, seedlings, field crop and stored products. The first occurrence of mealy bug (*Phenacoccus solani* Ferris) on tobacco as a serious pest was recorded by Williams *et al*., (1985) in Zimbabwe. In Gujarat, *Phenacoccus solenopsis* Tinsley was first reported on cotton (Jhala *et al*., 2008a) and later on tobacco (Jhala *et al*., 2008b). In India, mealy bug, *P. solenopsis* is a newly emerging pest on tobacco. Therefore, it is essential to develop effective management strategies to manage this insect pest. In view of this, the present investigation on seasonal incidence of mealy bug was conducted in middle Gujarat conditions during the month of September 2009 to January 2010 at Bidi Tobacco Research Station, Anand Agricultural University, Anand.

To study the seasonal incidence or population fluctuation of mealy bug, *P. solenopsis*, nursery bed for seed germination of the bidi tobacco cv Anand-119 was prepared at the Bidi Tobacco Research Station Seed Farm, Anand Agricultural University, Anand. Thirty days old, one hundred healthy seedlings of the respective cultivar were transplanted in experimental screen houses in RCC Raised bed micro plots of 1 x 1 x 1 m sizes. Between two plants spacing of 60 x 60 cm was maintained with three replications. In all, 25 micro plots were used containing four seedling plants in each micro plot in each replication. The seedling plants were raised under recommended agronomical package of practices and plants were kept free from insecticidal spray to allow mealy bugs to multiply throughout the season. From all micro plots, 50 plants (two plants from each micro plot) selected randomly and regular vigil on the experimental micro plots for the appearance of mealy bug was kept. Observations were made critically at weekly interval to record the mealy bug population per plant in morning hours. Mealy bug population was kept under vigilance throughout the crop period until the plants become dry. Average mealy bug population of the three replications was worked. The correlation coefficient between mealy bug population and weather parameters *viz*., bright sunshine hours, rainfall, wind speed, maximum temperature, minimum temperature, morning relative humidity, evening relative humidity, morning vapour pressure and evening vapour pressure was worked out to know the congenial climatic conditions for mealy bug multiplication according to that management strategies are to be made. The distance between experimental field and meteorological weather station is less than 300 meter.

The activity of mealy bug (*P. solenopsis*) on tobacco was commenced naturally from 39th standard week (5th week of September, 2009) with an average of 3.8 mealy bug population per plant and found constantly increasing up to the 1st standard week (1st week of January, 2010) 561.8 average mealy bug population per plant. The peak activity of mealy bug on tobacco was observed between 50th standard week (3rd week of December, 2009) to 1st standard week (1st week of January, 2010). During this period plants were in luxurious growth and with full of plant juice. Tobacco leaf proteins were well balanced, containing high levels of essential amino acids. Results show that tobacco leaf protein was maximum and thus could provide viable food for mealy bugs. In this growth period in the presence of abundant protein mealy bug multiplies very fast resulting in vast population of mealy bugs per plant. In severe infestation plant can not withstand and their recovery is very less. Thus the plants start drying up and the population of the mealy bug also declines from the plants. The correlation study between mealy bug population and various weather parameters from the commencement of mealy bug incidence and the highest peak i.e. 1st standard week indicate highly significant negative association between mealy bug population and maximum temperature (r = -0.87), minimum temperature (r = -0.76) and morning vapor pressure (r = -0.71), whereas positive association was with morning

Table 1. Population of mealy bug, *Phenacoccus solenopsis* infesting bidi tobacco along with weather parameters during 2009-2010

Std. week	Weather parameters									Av. mealy bug pop./plant
	BSS	RF	WS	MAXT	MINT	RH_1	RH_2	VP_1	VP_2	
39	9.6	0.0	5.6	36.0	26.5	74.4	45.7	20.2	19.6	3.7
40	7.8	3.6	4.6	36.3	25.5	82.4	49.1	22.0	20.7	5.9
41	9.4	0.0	3.1	34.4	23.3	83.6	39.3	19.9	15.3	16.0
42	10.0	0.0	2.3	36.6	19.8	74.0	28.1	15.3	12.4	24.7
43	10.0	0.0	2.7	36.0	16.0	72.7	25.9	12.2	11.1	47.8
44	9.7	0.0	2.0	35.9	16.8	80.4	22.6	12.8	9.9	68.5
45	7.8	0.4	2.3	34.2	18.4	76.3	42.4	14.3	13.4	102.5
46	3.7	4.8	3.1	28.5	18.9	91.1	55.0	16.5	16.2	163.1
47	9.6	0.0	2.6	30.3	14.8	78.6	35.6	11.3	11.4	236.7
48	9.6	0.0	1.8	31.4	14.1	86.1	32.0	11.3	10.5	260.3
49	8.6	0.0	1.7	30.3	14.1	89.9	34.4	11.9	10.8	293.7
50	8.5	0.0	1.5	31.6	17.0	85.9	40.6	11.8	13.6	375.4
51	7.6	0.0	3.3	29.3	17.1	89.7	52.4	14.0	15.1	447.2
52	8.8	0.0	2.4	28.4	12.4	87.4	38.3	10.0	10.5	498.2
1	7.0	0.0	3.7	27.5	11.1	81.4	50.0	9.6	13.0	561.7
2	9.0	0.0	2.9	27.8	12.5	76.0	40.4	8.9	10.7	457.5
3	9.6	0.0	2.6	28.1	11.6	80.9	37.1	8.5	10.8	235.1
4	9.9	0.0	1.6	30.7	11.8	80.6	33.6	7.7	10.6	101.9

Std. = Standard meteorological week
BSS = Bright sunshine hours
RF = Rainfall
WS = Wind speed
MAXT = Maximum temperature
MINT = Minimum temperature
RH_1 = Morning relative humidity
RH_2 = Evening relative humidity
VP_1 = Morning vapour pressure
$VP_{2.}$ = Evening vapour pressure

Table 2. Correlation coefficient between mealy bug (*Phenacoccus solenopsis*) and weather parameters

Parameters	Correlation coefficient
Bright sunshine hours	-0.275
Rainfall	-0.244
Wind speed	-0.260
Maximum temperature	-0.878**
Minimum temperature	-0.762**
Morning relative humidity	0.549**
Evening relative humidity	0.308
Morning vapour pressure	-0.715**
Evening vapour pressure	-0.357

Sign. r value 5% = 0.377

relative humidity (r =0.54). The bright sun shine, rain fall, wind speed, evening relative humidity and evening vapor pressure do not show any significant effect on mealy bug population. During this period the mealy bug population was ranged from 375.4 to 561.8 mealy bugs/ plant. These findings corroborate the findings of Saroja *et al*., (2009), Hanchinal *et al*., (2010) and Arve (2010), according to whom, the higher activity of mealy bug occurred during these periods on hibiscus and cotton, respectively.

The study confirmed that maximum mealy bug population on tobacco started from 4th week of November (47th standard week of November) and continued up to 3rd week of January (3rd standard week of January). The population of mealy bug between this period was 236.7 to 235.1 mealy bugs per plant. At this stage the plant vigour and morning relative humidity is suitable for fast multiplication of mealy bugs.

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