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Impact of meteorological parameters on population dynamics of mango hopper in high rainfall zone of Konkan region*

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ABSTRACT

Mango hopper is the important serious pest of mango in all over parts of Konkan region causing loss to the extent of 60%. The population dynamics of mango hopper for four consecutive years (2005 to 2008) as well as the average population were correlated with the weather parameters like maximum and minimum temperature and afternoon relative humidity. The results revealed that all the three weather parameters viz., maximum temperature (r=-0.525*), minimum temperature (r=-0.561**) and afternoon relative humidity (r=-0.556*) had a significant negative correlation with the average population of mango hopper. Hopper population was started from 42nd Std. Meteorological Week (SMW) and attained peak value during 2nd MW and decreased thereafter upto 9th SMW.

Key words : Monophagous, population dynamics, weather parameters

The effect of changing weather parameters on agriculture is very significant. As weather affects of crop productivity and insect-pest biology, the effect of weather elements will significantly affect productivity in agriculture (Dhaliwal *et al.*, 2004). Mango is one of the important commercial crops of Konkan region of Maharashtra cultivated on an area of 4.4 lakh ha. Commercial cultivation of mango is not possible unless it is protected from the infestation of various pests. Among the several pests infesting mango, mango hopper is supposed to be the most destructive. So far 22 species of mango hopper (Dalvi, 1989) are reported, of which *Idioscopus neveosparsus* and *Amritodus atkinsoni* are considered to be more destructive. However, in recent past years, *I. neveosparsus* is the most predominant species of Konkan region. The pest activity is maximum in December-January that coincides with emergence of inflorescence and floral development in mango, which decreases considerably when fruits attain marble size. This hemipteran pest is monophagous and mango is the only host of this pest. Both nymphs and adult suck the sap from tender shoots, leaves, inflorescence and from even tender developing fruits causing severe inflorescence and fruits drop. Apart from feeding injury, they also secrete honeydew like substance on which black sooty mould gets developed, which hinders photosynthetic activity of the plant and deteriorates fruit quality. Losses to the extent of 60% were reported by Kumar *et al.* (1985).

MATERIALS AND METHODS

A field experiment was conducted for consecutive four years from 2005-06 to 2008-09 of Agronomy Farm of College of Agriculture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli. Dist. Ratnagiri (M. S.) located at 17°45′ latitude, 76°26′ longitude and 250 m altitude above the MSL. The population build-up of mango hopper was monitored throughout the year. For recording observations, 10 plants of alphanso mango were selected from Agronomy Farm of College of Agriculture, Dapoli and observations on the pest activity were recorded starting from panicle initiation at weekly intervals till the maturity of fruits. Mango hopper nymph as well as adult population was recorded on each of the 20 randomly selected shoots and panicles along all four directions of each selected plant. Both the nymph and adult populations were recorded early in the morning, when hoppers were slightly sluggish or inactive. The average population per plant was worked out. The weekly meteorological data of respective weeks from 1972 to 2009 were collected from the agrometeorological observatory located near to the experimental site within the campus of Agronomy Department and average meteorological data were worked out. Correlation analysis of average meteorological parameters with hopper population was carried out for the individual year of experiment as well as with the average hopper population of four years of experiment to find out the effect of various meteorological parameters viz., maximum

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Table 1: Influence of weather parameters on hopper population alongwith correlations

SMW	Av. weather parameters from 1972-2009			Hoper population per plant					
	Tmax.	Tmin.	RH II	2005-06	2006-07	2007-08	2008-09	Average	Pre. 2008-09
41	30.67	21.78	72.89	0	0	0	0	0.00	3.58
42	31.39	20.26	67.58	1	1	2	0	1.00	0.00
43	32.39	18.80	60.16	3	5	10	15	8.25	0.73
44	32.42	17.32	55.44	5	7	10	13	8.75	8.61
45	32.56	17.49	54.87	7	9	11	15	10.5	9.84
46	32.05	16.63	54.73	9	11	12	27	14.75	13.59
47	32.27	15.82	52.99	11	13	12	17	13.25	10.16
48	31.92	14.12	50.16	13	16	13	15	14.25	15.33
49	31.91	14.25	48.67	16	18	17	21	18.00	23.26
50	31.48	13.24	48.01	18	20	21	40	24.75	26.36
51	31.67	11.91	45.83	20	20	27	38	26.25	21.11
52	31.31	12.96	48.00	20	21	29	41	27.75	27.49
1	30.62	12.85	45.58	21	23	32	133	52.25	51.11
2	30.87	12.42	47.37	23	25	35	217	75.00	34.56
3	30.79	12.46	46.43	25	50	37	48	40.00	40.77
4	31.42	11.79	46.73	50	31	40	23	36.00	21.02
5	31.27	12.41	44.77	32	12	43	11	24.50	38.02
6	30.73	11.64	46.32	12	3	13	123	37.75	35.46
7	30.84	12.88	49.41	1	0	2	48	12.75	30.01
8	31.09	12.29	47.25	0	0	0	21	5.25	29.65
9	32.24	13.01	48.69	0	0	0	4	1.00	6.17
10	32.08	14.05	51.34	0	0	0	0	0.00	6.39

and minimum temperature and afternoon relative humidity and degree of association between population of mango hopper and weather parameters.

RESULTS AND DISCUSSION

The average weekly weather parameters from 1972 to 2009 alongwith mango hopper population (nymphs and adults) are presented in Table 1. During 2005-06, 2006-07 and 2007-08, hopper population was initiated in 42nd SMW, whereas in 2008-09, it was started from 43rd SMW when the maximum temperature ranged between 31.4° to 32.4°C and minimum temperature ranged between 18.8° to 20.3°C, whereas afternoon relative humidity ranged from 60.2 to 67.6%. The hopper population attained its peak value in 4th SMW (2005-06), 3rd SMW (2006-07), 5th SMW (2007-08) and in 2nd SMW (2008-09), when the average maximum temperature ranged from 30.8° to 31.4°C, minimum temperature ranged from 11.8° to 12.5°C and afternoon relative humidity ranged from 44.8 to 47.4% and afterward it got reduced.

The correlation between hopper population and meteorological parameters was worked out separately for every year under study and also with the average hopper population. During 2005-06, there was highly significant negative correlation between the hopper population and minimum temperature (r=-0.54**), and afternoon relative humidity (r=-0.54**), whereas during 2006-07, the correlation was negative but significant with minimum temperature (r=-0.43*) and afternoon relative humidity (r=-0.47*). During 2007-08, the correlation was negative but non-significant with maximum temperature (r=-0.32) and significant with minimum temperature (r=-0.523*) and highly significant with afternoon relative humidity (r=-0.57**). During 2008-09, the correlation of hopper population was highly significant but negative with maximum temperature (r=-0.54*), significant with minimum temperature (r=-0.43*) and non-significant with afternoon relative humidity (r=-0.40). The average hopper population of four years showed significant negative

correlation with maximum temperature (r=-0.53*) and highly significant negative correlation with minimum temperature (r=-0.56**) and afternoon relative humidity (r=-0.56**). Multiple regression analysis showed that weather accounted for 79% variation in mango hopper population. Similarly, Choudhari *et al*. (1999) reported a negative correlation between *Helicoverpa armigera* (Hubner) with minimum temperature and afternoon relative humidity. But Balsubramanian *et al*. (1982) reported positive correlation of maximum temperature with bollworm (r=0.74). Anuj and Saxena (1999) reported that green leaf hopper (GLH) had a negative correlation with minimum temperature and afternoon relative humidity. Pandey *et al.* (2003) also reported similar results. Considering the activities of this sucking pest, appropriate spray applications at appropriate time can effectively prevent the further build-up of hoppers infesting mango.

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