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SHORT NOTE

Population dynamics of sapota fruit mite, *Tuckerella kumaoensis* Gupta (Acari:Tuckerellidae) in Gujarat, India

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Sapota, *Manilkara achras* (Mills) Foseberg commonly also known as *Chiku* or Saposilla is a slow growing evergreen tree. India ranks first in the world in sapota production (14.24 lakh MT). In Gujarat it is mainly cultivated in South Gujarat in general and Navsari and Valsad districts in particular. Gujarat is one of the largest sapota producing states in India with an area of a 28,800 ha and an annual production of 3, 08,704 M.T., which accounts for 20 per cent of total sapota production of total sapota production in India (Patel *et al.*, 2013). Earlier, sapota was not much affected by insect pests and diseases but incidence of many insect pests has been reported during last two decade. The pest complex of sapota also includes a mite, *Tuckerella kumaoensis* Gupta and it affects the fruits of the sapota. The red coloured mite feeds on fruit surface from marble size fruit stage, resulted the fruit surface rough and thereafter suck the cell sap. The affected fruit surface becomes rough or black or dark coloured which results in qualitative loss of harvested products. For the effective management of any pest it is very essential to know its seasonal incidence. Considering the importance of the mite pest in sapota the present experiment was designed.

Population dynamics of the fruit mite in relation to weather parameters were carried out at Fruit Research Station, Navsari Agricultural University, Gandevi on sapota cv. Kalipatti during 2009-10 to 2011-12. For this purpose, ten trees were randomly selected from untreated orchard of sapota. Ten fruits from each tree were observed at weekly interval. The adult as well as immature stages has been counted from the basal region ($2cm^2$) of the fruit. The mite were observed under stereoscopic microscope. The mite population recorded was correlated with various abiotic factors *viz.*, maximum temperature, minimum temperature, average temperature, and morning, evening and average relative humidity for individual years as well as with three year pooled data. It is evident from the Table-1 that during 2009-10, the fruit mite incidence started from the 45th standard meteorological week (SMW) and observed through out the year. The population of fruit mite fluctuated at various time intervals. It showed two peaks during 2009-10, the first peak during 51st SMW (5.89 mites per fruit) and letter on it was again increased during 14th SMW i.e., April and reached to the maximum level i.e. 7.22 mites per fruit during 18th SMW. Then the population gradually decreased. During 2009-10 the mite population showed a significant positive correlation with maximum temperature (r=0.5519), while it was negatively correlated with minimum temperature (r=-0.4491), morning RH (r=-0.6935) and evening RH (r=-0.6988). During 2010-11, these data revealed that the *T. kumaoensis* population gradually increased and it has two peaks, the first is first during 1st SMW, first week of January where the mite population were 7.21 mites per fruit. Further, a second peak was also observed during 9th to 22nd SMW (February to June). The mite population during this period ranges 4.67 to 7.67 per fruit. The highest mite population per fruit was 7.67 in 20th SMW. The correlation studies revealed that the mite population showed a significant positive correlation (r=0.283) while negatively correlated with minimum temperature (r=-0.3412), morning RH (r=-0.7086) and evening RH (r=-0.6135). further, in the year 2011-12 the data showed that the mite were active round the year with various population levels. The mite population gradually increased from 6th SMW (5.00 mites per fruit) and reached maximum during 20th SMW. Then the population declined and it was nil during 31st to 36th SMW. Then again it increased. The correlation studies suggested that the mite population had a significant positive correlation (r=0.5066) with maximum temperature while it was negatively correlated with minimum temperature (r=-0.163), morning RH (r=-0.5619) and evening RH (r=-0.5083).

The pooled data of three years revealed that the fruit mite was active throughout the year and its population fluctuated at various time intervals. The mite population

Table 1. Population dynamics of sapota fruit mite, *Tuckerella kumaoensis* Gupta

Std. Week	No. fruit mites /2 cm²			
	2009-10	2010-11	2011-12	Pooled data
45	2.63	1.36	2.31	2.10
46	2.90	1.50	3.00	2.47
47	3.76	1.79	2.35	2.63
48	3.88	1.90	3.75	3.18
49	3.49	2.72	1.95	2.72
50	3.67	2.93	3.10	3.23
51	5.89	3.68	2.67	4.08
52	5.80	4.45	1.50	3.92
1	5.17	7.21	0.50	4.29
2	4.76	5.45	0.25	3.49
3	3.42	5.55	0.25	3.07
4	3.70	5.00	0.50	3.07
5	4.45	2.10	3.75	3.43
6	4.89	3.00	5.00	4.30
7	5.11	3.15	5.50	4.59
8	4.89	2.33	4.75	3.99
9	4.28	5.11	4.70	4.70
10	4.10	6.10	4.90	5.03
11	3.58	5.15	5.10	4.61
12	4.25	4.67	4.70	4.54
13	4.12	5.21	5.10	4.81
14	5.62	5.67	5.50	5.60
15	5.40	5.85	5.50	5.58
16	5.47	5.95	6.25	5.89
17	5.90	6.17	6.70	6.26
18	7.22	7.67	7.00	7.30
19	6.45	7.15	7.50	7.03
20	6.18	7.67	8.00	7.28
21	6.00	6.70	7.70	6.80
22	3.71	5.77	5.75	5.08
23	4.00	4.67	5.50	4.72
24	4.42	4.77	5.50	4.90
25	4.00	3.75	5.50	4.42
26	2.28	3.11	3.25	2.88
27	1.40	1.67	2.00	1.69
28	0.40	2.75	2.00	1.72
29	0.27	1.11	1.25	0.88
30	0.22	1.13	0.45	0.60
31	0.19	1.15	0.00	0.45

32	0.00	0.00	0.00	0.00
33	0.00	0.00	0.00	0.00
34	0.00	0.00	0.00	0.00
35	0.00	0.50	0.00	0.17
36	0.00	1.50	0.00	0.50
37	0.00	1.25	0.50	0.58
38	0.00	2.30	0.50	0.93
39	0.00	0.50	0.50	0.33
40	0.00	0.50	0.50	0.33
41	0.00	0.00	0.00	0.00
42	0.00	1.75	0.00	0.58
43	0.00	1.45	1.75	1.07
44	0.00	1.00	2.50	1.17

Table 2. Correlation of sapota fruit mite, *T. kumaoensis* Gupta with abiotic factors

Abiotic Factor	fruit mite density/2 cm^2			
	2009-10	2010-11	2011-12	Pooled data
Maximum Temperature	0.5519 **	0.2836 **	0.5066 **	0.4194**
Minimum Temperature	-0.4491 **	-0.3412 **	-0.1632 **	-0.3040 **
Average Temperature	0.1017 ^{NS}	-0.1095 ^{NS}	0.1238 ^{NS}	-0.0240 ^{NS}
Morning R.H.	-0.6935 **	-0.7086 **	-0.5619 **	-0.6256 **
Evening R. H.	-0.6988 **	-0.6135 **	-0.5083 **	-0.5924 **
Average R.H.	-0.7768 **	-0.7067 **	-0.575 **	-0.6640 **

Table 3. Multiple regression equation to predict population buildup of *T. kumaoensis* on the basis of weather parameters

Year	Regression Models	R^2	Multiple R
2009-10	Y= 17.8528 + 0.1193 (X_1) - 0.1461 (X_2) + 17.6748 (X_4) + 17.8267 (X_5) - 35.6884 (X_6)	63.38	81.84
2010-11	Y= 24.0075 + 0.0474 (X_1) - 0.0754 (X_2) + 24.4888 (X_4) + 23.6955 (X_5) – 47.4250 (X_6)	57.24	78.38
2011-12	Y= 6.257 + 0.2926 (X_1) - 0.1498 (X_2) + 20.6532 (X_4) + 20.7939 (X_5) – 41.5951 (X_6)	48.57	72.53
Pooled data	Y= 12.4468 + 0.1228 (X_1) - 0.0085 (X_2) + 22.9592 (X_4) + 23.0495 (X_5) – 46.1771 (X_6)	51.19	72.64

Y=a+bx, where, Y =mite population and X_1, X_2, X_4, X_5 and X_6 are maximum temperature, minimum temperature, morning RH, evening RH and mean RH, respectively.

gradually increased during 14th SMW (5.60 mites per fruit) and reached to its peak in 18th SMW i.e., 7.30 mites per fruit and then gradually shows a declining trends. In mid August (32nd to 34th SMW) no mite was recorded. The correlation studies of the three years pooled data suggest that the fruit mite population showed a significant positive correlation (r= 0.4194) with maximum temperature, whereas it has a negative correlation with minimum temperature (r= -0.3040), morning RH (r=-0.6256) and evening RH (r=-0.5924). The multiple regression equation developed from all three years data as well as from pooled data is also presented in Table 3. During 2009-10, the regression analysis revealed that total impact of weather parameters on population buildup of *T. kumaonensis* was 63.38 per cent, whereas for 2010-11 it was 57.24 per cent and for 2011-12 the R^2 value is 48.57 per cent. The R^2 value for the pooled data was 51.19 per cent. Patel (1997) also reported that *T. kumaonensis* showed highly significant positive correlation with maximum temperature, non-significant negative correlation with minimum temperature, average temperature and morning relative humidity and a highly significant negative correlation with evening relative humidity and average relative humidity at Navsari. Under the present study the *T. kumaonensis* also showed a highly significant positive correlation with maximum temperature, while it showed a significantly negative correlation with minimum temperature, morning evening and mean relative humidity. Further, he also reported 61.09 per cent variation in the buildup of mite population due to weather parameters at Navsari. The present findings also showed similar trends and based on these findings it is possible to predict mite infestation and device suitable management practices.

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