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Seasonal Abundance of Midrib Folder and Leaf Miner on Different Varieties of Sapota

*Chirag V. Khambhu[1] and K. D. Bisane[2]**

Abstract: *The research trial was carried out on seasonal abundance of foliage feeders particularly midrib folder (*Banisia myrsusalis elearalis*) and leaf miner (*Acrocercops gemoniella*) on eight varieties of sapota viz., PKM-1, PKM-3, PKM-4, DHS-1, DHS-2, Kalipatti, Cricket ball and CO-3 at Fruit Research Station, N.A.U., Gandevi during 2014-15. With respect to foliage damage, the maximum abundance of midrib folder was observed in September-October and December to the extent of 8.19 to 9.29% on new foliage flush, whereas leaf miner showed maximum occurrence of 8.24 to 12.11% during July-August. The maximum temperature, morning relative humidity and evaporation rate had significant influence on midrib folder leaf damage. While, leaf miner occurrence revealed significant correlation with all ecological factors except morning relative humidity. On evaluation of eight varieties, CO-3 had comparatively less infested with midrib folder, whereas Cricket ball showed less damage towards leaf miner. PKM-4 had higher leaf damage by midrib folder and leaf miner was prominently damage to Kalipatti. Overall, there is no much differences among varieties on infested foliage of sapota.*

Keyword: *Seasonal Abundance, Midrib Folder, Leaf Miner, Sapota.*

INTRODUCTION

Sapota or sapodilla *[Manilkara achras* (Mill.) Forsberg] is an important fruit of tropical region and commonly known as *'chiku'* in India. Gujarat shared 16% sapota area and 17% production of the country and ranked third position after Maharashtra and Karnataka [Anonymous (7)].

In Gujarat, cultivation of sapota coupled with intensive monoculture of Kalipatti variety supported by changing environmental condition as well as unchecked pest population caused explosion of insect pests in wider area. The persistent efforts of last two decades by scientists have resulted in identification of 16 insect pests and mites from sapota growing area of Gujarat [Patel (13)]. Among different foliage insect pests, midrib folder (lead folder), *Banisia myrsusalis elearalis* (Walker) (Lepidoptera : Thyrididae) and leaf miner (margin folder), *Acrocercops gemoniella* Stainton (Lepidoptera: Gracillariedae) are regular pest of sapota crop.

Earlier, the midrib folder was reported on sapota in Punjab by Sandhu and Sran (16) and later Jhala *et al.* (11) also reported in South Gujarat area damaging the leaves of *Khirnee* rootstocks (*Manilkara hexandra*) in nursery. Recently, the pest was recorded for the first time and becoming a serious at ZHRS, Mudigere under hill zone of Karnataka [Ravulapenta *et al.* (14)].

It is necessary to have basic information on abundance and damage intensity of pest in relation to ecological factors and crop specific on major cultivar of sapota. Therefore, the details study on

[1] Department of Agricultural Entomology, N. M. College of Agriculture, Navsari Agricultural University, Navsari- 396 450, Gujarat.

[2] Fruit Research Station, AICRP on Fruits (Banana, Sapota and Papaya), Navsari Agricultural University, Gandevi - 396 360, Gujarat.

* *E-mail: kdbisane@yahoo.co.in*

midrib folder and leaf miner incidence was studied to assess pest staus under high density plantation of sapota cultivars in changing agro-ecological condition of South Gujarat.

MATERIAL AND METHODS

The experiment was carried out during 2014-15 at sapota orchard of Fruit Research Station, Navsari Agricultural University, Gandevi. The seasonal abundance study of midrib folder and leaf miner on per cent leaf damage on different varieties of sapota was examined in randomized block design with three replication (each tree as one replication) under high density planting of 5 × 5 m spacing.

In sapota orchard, randomly selected 5 twig of each variety was selected at fortnightly interval for the incidence of midrib folder and leaf miner on leaves. The total number of new leaves as well as leaves damaged by midrib folder and leaf miner were recorded from each twig. The per cent leaf infestation was recorded from the data of foliage damage. To evaluate the influence of various ecological factors on progression of foliage feeders, the leaf damage was correlated with different meteorological parameters *viz*., maximum and minimum temperature; morning and evening relative humidity; bright sunshine hrs; rainfall and evaporation and simple correlation was determined.

RESULTS AND DISCUSSION

Midrib folder (*B. myrsusalis elearalis*)

The caterpillar of midrib folder damages the leaves by making the leaf fold and feed within by making the pea shaped leaf. Generally, single larvae feed by folding the single leaves or batches of 2-3 leaves and damage mostly terminal tender leaves.

The average seasonal occurrence of midrib folder showed a varying degree of leaf damage throughout the year in different months (Table 1). The maximum abundance of midrib folder (9.29%) was observed in first fortnight of September, whereas it was minimum (3.84%) in second fortnight of May. After August on initiation of new foliage, midrib folder damage was remain higher till December (8.93%) and then decline during

Table 1

Seasonal occurrence of midrib folder (B. myrsusalis elearalis) in different varieties/hybrids of sapota (2014-15)

Tr. No.	Per cent leaf damage*																												Avg.
	MARCH, 14		APRIL, 14		MAY, 14		JUNE, 14		JULY, 14		AUG., 14		SEP., 14		OCT., 14		NOV., 14		DEC., 14		JAN., 15		FEB., 15		
	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	
T1: PKM-1	9.32 (17.68)	7.99 (16.42)	4.32 (11.95)	4.28 (11.88)	3.70 (10.99)	4.37 (10.49)	6.02 (14.22)	7.55 (15.95)	5.48 (13.53)	3.54 (10.82)	4.25 (11.87)	6.13 (14.34)	8.90 (17.32)	10.08 (18.51)	10.32 (18.74)	9.65 (18.09)	7.81 (16.23)	5.44 (13.47)	8.38 (16.80)	7.63 (16.04)	5.98 (14.15)	6.27 (14.49)	7.27 (15.63)	9.37 (17.82)	6.84
T2: PKM-3	8.01 (16.45)	6.10 (14.31)	6.77 (15.08)	7.22 (15.58)	5.28 (13.24)	2.32 (8.59)	7.71 (16.11)	6.11 (14.31)	6.44 (14.71)	7.01 (15.35)	7.52 (15.91)	8.77 (17.21)	8.52 (16.97)	9.53 (17.99)	8.87 (17.29)	7.66 (16.02)	8.57 (17.03)	6.76 (15.06)	8.59 (17.02)	10.40 (18.79)	6.78 (15.09)	7.84 (16.27)	6.04 (14.23)	7.43 (15.82)	7.34
T3: PKM-4	9.08 (17.54)	7.76 (16.16)	5.40 (13.42)	6.38 (14.61)	5.96 (14.13)	4.02 (11.54)	5.41 (13.43)	4.68 (12.44)	5.92 (14.08)	5.73 (13.84)	6.22 (14.42)	10.90 (19.27)	9.12 (17.59)	10.17 (18.61)	10.52 (18.93)	9.57 (18.01)	8.21 (16.67)	7.07 (15.42)	8.00 (16.43)	10.70 (19.11)	7.75 (16.17)	7.18 (15.53)	8.36 (16.80)	8.93 (17.38)	7.63
T4: DHS-1	7.10 (15.47)	6.96 (15.28)	5.73 (13.86)	5.49 (13.53)	4.67 (12.40)	5.85 (13.99)	3.29 (10.41)	5.84 (14.01)	9.65 (18.09)	8.65 (17.08)	6.48 (14.70)	9.97 (18.39)	8.68 (17.11)	9.15 (17.60)	10.36 (18.78)	8.83 (17.28)	7.64 (16.05)	6.12 (14.32)	8.22 (16.65)	7.60 (16.01)	8.23 (16.66)	9.46 (17.92)	8.27 (16.71)	6.55 (14.83)	7.45
T5: DHS-2	7.59 (15.99)	6.59 (14.99)	5.61 (13.69)	4.81 (12.67)	3.96 (11.37)	3.61 (10.86)	3.96 (11.43)	6.35 (14.56)	8.09 (16.52)	5.03 (12.93)	6.11 (14.25)	7.59 (15.96)	10.53 (18.95)	8.33 (16.75)	9.11 (17.55)	7.48 (15.83)	6.70 (15.01)	10.00 (18.43)	8.75 (17.21)	9.22 (17.68)	8.31 (16.77)	6.16 (14.36)	7.41 (15.81)	6.31 (14.54)	6.99
T6: Haipustili	6.49 (14.76)	8.98 (17.40)	5.98 (14.12)	4.13 (11.71)	3.76 (11.05)	3.32 (10.39)	3.52 (10.72)	6.36 (14.30)	7.77 (16.10)	7.04 (15.30)	6.28 (14.52)	9.93 (18.30)	10.60 (18.90)	7.51 (15.90)	8.41 (16.96)	9.01 (17.44)	8.45 (16.90)	9.20 (17.65)	7.56 (15.97)	9.07 (17.52)	7.30 (15.70)	9.24 (17.60)	8.59 (17.02)	7.05 (15.39)	7.31
T7: Cricket ball	9.25 (17.70)	8.73 (17.20)	6.30 (14.51)	4.24 (11.82)	3.94 (11.42)	3.53 (10.80)	5.09 (13.03)	6.55 (14.82)	7.22 (15.58)	7.00 (15.34)	8.32 (16.73)	9.59 (18.03)	8.15 (16.57)	6.09 (14.23)	6.30 (14.52)	7.14 (15.48)	5.79 (13.92)	7.29 (15.66)	6.94 (15.28)	8.39 (16.84)	7.78 (16.20)	8.87 (17.32)	6.76 (15.10)	7.75 (16.16)	6.96
T8: CO-3	7.99 (16.42)	6.55 (14.83)	6.41 (14.66)	6.85 (15.16)	4.60 (12.29)	3.73 (11.14)	3.56 (10.85)	7.16 (15.51)	5.94 (14.10)	5.71 (13.33)	5.75 (13.86)	7.31 (15.67)	9.83 (18.29)	9.81 (18.24)	8.33 (16.75)	8.33 (16.70)	5.68 (13.79)	7.98 (16.39)	9.08 (17.52)	8.45 (16.90)	6.00 (14.18)	7.94 (16.36)	5.77 (13.89)	4.50 (12.23)	6.80
Avg.	8.10	7.47	5.82	5.43	4.48	3.84	4.82	6.33	7.06	6.21	6.37	8.77	9.29	8.83	9.03	8.46	7.36	7.48	8.19	8.93	7.27	7.87	7.31	7.24	7.16
S.E.m±	0.88	0.37	0.54	0.55	0.96	0.70	0.50	0.35	0.32	0.25	0.62	0.41	0.45	0.53	0.52	0.77	0.55	0.67	0.87	0.58	0.61	0.44	0.64	0.78	--
CD at 5%	2.68	1.13	1.65	1.66	2.90	2.11	1.52	1.05	0.97	0.75	1.87	1.25	1.37	1.60	1.58	2.35	1.67	1.85	1.56	1.56	1.74	1.35	1.62	1.29	--

*Figures in parentheses are arc sin transformed values.

summer period. It indicated that that its damage was higher on new foliage flush in all varieties. In regards to varietal leaf damage succession, PKM-1 and PKM-4 had more leaf damage in February and March also. While, midrib folder caused higher leaf infestation from September to December in DHS-2 and Kalipatti and early higher incidence was commenced from August in Cricket ball and remain maximum in September and December.

The results of present research work regarding the annual abundance of midrib folder damage under South Gujarat condition is consistent in varying degree which confirmed by Deshmukh (9), while under same sapota orchard locality, successive maximum infestation in the span of September to December was 5.72 per cent in 1997-98 [Anonymous (2)], 9.70 per cent in 2006-07 [Anonymous (3)], 11.60 per cent in 2009-10 [Anonymous (10)], 11.83 per cent in 2011-12 [Anonymous (5)], 11.53 per cent in 2013-14 [Anonymous (6)] and 8.28 per cent in 2014-15 [Anonymous (8)] during last two decade on Kalipatti. Patel *et al.* (12) reported midrib folder damage throughout the year under South Gujarat condition to the extent of 4.47 to 17.08 per cent. Similarly, Ravulapenta *et al.* (15) observed peak activity of midrib folder during November to December at vegetative stage of sapota under hill zone of Karnataka.

The varietal evaluation of sapota varieties (Table 1) indicated that none of the variety was found completely free from the attack of midrib folder during the year 2014-15. There was no much difference between different varieties of sapota. However, the lower seasonal occurrence on leaves was recorded in variety CO-3 (6.80%), while the variety PKM-4 had the higher leaf damage (7.63%). Rest of varieties *viz.*, PKM-1, Cricket ball, DHS-2, Kalipatti, PKM-3 and DHS–1 were recorded 6.84, 6.96, 6.99, 7.31, 7.34 and 7.45 per cent leaf infestation, respectively. Previously, Cricket ball variety with 5.14 per cent damage found more susceptible to midrib folder as compare to other [Anonymous (1)], which slightly match with the present data.

The coefficient correlation data of average midrib folder damage in sapota (Table 2) indicated highly significantly positive association with morning relative humidity ($r = 0.429$), but significant negative correlation results were showed by maximum temperature ($r = –0.407$) and evaporation rate ($r = –0.666$). All the varieties had significant negative correlation with evaporation rate except PKM-1, while only PKM-4 and Cricket ball also showed significant negative correlation with minimum temperature. The influence of maximum temperature and morning humidity was not found on leaf damage of midrib folder in PKM-1, PKM-3, PKM-4 and CO-3. Overall it clearly revealed that

Table 2
Correlation of midrib folder (*B. myrsusalis elearalis*) seasonal abundance with weather parameters (2014–15)

Weather Parameter	*Temperature (°C)*		*Relative Humidity (%)*				
Tr. No.	*Max.*	*Min.*	*Morning*	*Evening*	*Bright Sunshinehrs*	*Rainfall (mm)*	*Evaporation (mm/day)*
T_1: PKM-1	0.019	–0.267	0.067	–0.284	0.377	–0.328	–0.179
T_2: PKM-3	–0.354	–0.237	0.249	0.006	0.066	0.022	–0.515**
T_3: PKM-4	–0.220	–0.394*	0.229	–0.216	0.280	–0.162	–0.467*
T_4: DHS-1	–0.448*	–0.185	0.558**	0.125	–0.059	0.267	–0.709**
T_5: DHS-2	–0.366	–0.356	0.419*	–0.107	0.332	–0.046	–0.663**
T_6: Kalipatti	–0.449*	–0.363	0.533**	–0.037	0.222	0.118	–0.729**
T_7: Cricket ball	–0.647**	–0.413*	0.464*	0.048	–0.033	0.157	–0.593**
T_8: CO-3	–0.254	–0.202	0.284	0.007	0.254	–0.039	–0.483*
Avg.	–0.407*	–0.377	0.429*	–0.083	0.237	–0.014	–0.666**

*Significant at 5% level and ** at 1% level.

the decrease level of maximum temperature and evaluation rate along with higher relative humidity increase the damage of midrib folder on sapota. The other four varieties *viz.*, DHS-1, DHS-2, Kalipatti and Cricket ball showed the similar type trend as compiled in the mean leaf infestation correlation data.

During similar period of peak incidence, the present data match with the recent reports [Anonymous 6 and 8)] found on Kalipatti at same location as well as Patel *et al.* (2014) observed significant negative correlation of midrib folder with maximum temperature and evaporation in South Gujarat condition. However, in earlier findings [Anonymous 1 and 2)], the results are not counterpart may be due to alteration in ecological circumstances.

Leaf Miner (*A. gemoniella*)

Leaf miner is tiny caterpillar and mine through the upper or epidermal layer of young and tender leaves. The minute caterpillar was seen inside these galleries and such leaves get distorted, curl, dry up and ultimately fall down.

The seasonal incidence of leaf miner (Table 3) showed diverse degree of infestation throughout the year in the different varieties of sapota during 2014-15. The maximum occurrence of leaf miner was reported during second fortnight of June to August to the tune of 8.34 to 12.11 per cent damage with highest in first fortnight of July, whereas it was minimum (1.18%) in first fortnight of April. Leaf miner was also caused higher damage on initiation of new foliage flush to middle of monsoon period, then decline and reached minimum during summer with round the year incidence. In regards to individual leaf damage in eight varieties, incidence was commenced from first fortnight of June in PKM-1, PKM-3, DHS-1 and DHS-2 till first fortnight of September, while other four varieties *viz.*, PKM-4, Kalipatti, Cricket ball and CO-3 had similar leaf infestation pattern. From October onwards, all the varieties had decline trend of leaf damage.

Earlier, Jhala *et al.* (10) and Deshmukh (9) also reported similar leaf miner incidence propensity and peak activity figures as well as Patel *et al.* (12) found 0.68 to 8.13 per cent leaf damage from South Gujarat ecological situation on Kalipatti. Similarly in preceding records of Gandevi on leaf miner damage on Kalipatti was up to 33.80 per cent in 1994-95 [Anonymous (1)], 10.11 per cent [Anonymous (2)] in September, 1997 and 7.07 per cent in July, 2006 [Anonymous (3)] and showed analogous prototype of incidence. In contrast, Ravulapenta *et al.* (15) reported leaf miner peak activity in second fortnight of May at vegetative stage of sapota under hill zone of Karnataka.

From the data presented in Table 3 indicated that none of the variety was found completely free from the attack of leaf miner during the season. There was no much difference between different varieties of sapota except in few months. However, the lower seasonal occurrence was recorded on variety Cricket ball with 5.10 per cent leaf damage. The variety Kalipatti had the comparatively higher percentage of leaf infestation (6.77%) during 2014-15. Rest of varieties *viz.*, PKM-4, DHS-2, DHS-1, PKM-1, CO-3 and PKM-3 were recorded as 6.50, 6.48, 6.46, 6.22, 6.19 and 6.17 per cent leaf damage, respectively. The varietal evaluation of sapota varieties against leaf miner in present investigation is agree with earlier reports where Cricket ball (1.98%) had lower leaf damage than Kalipatti (8.29%) during 1994-95 [Anonymous (1)] as well as where PKM-1 (4.38%) showed lower susceptibility than Kalipatti (6.74%) during 1997-98 [Anonymous (2)].

The coefficient correlation data of leaf miner incidence with ecological factor (Table 4) indicated highly significant positive correlation with minimum temperature (r = 0.514), evening relative humidity (r = 0.730) and rainfall (r = 0.578), while revealed significant negative correlation with maximum temperature (r = –0.507), bright sunshine hrs (r = –0.572) and evaporation rate (r = –0.420). This result clearly indicated that leaf miner caused peak damage with increase in minimum temperature, evening relative humidity as well as rainfall, but under lower bright sunshine hrs in low maximum temperature and evaporation rate. Generally, all weather factors influenced the leaf miner damage in all eight varieties, which was seen in the correlation data of average infestation. With few exceptions, leaf damage was not affected by

Table 3

Seasonal occurrence of leaf miner (*A. gemoniella*) in different varieties/hybrids of sapota (2014–15)

Tr. No.	Per cent leaf damage*																								Avg.
	MARCH, 14		APRIL, 14		MAY, 14		JUNE, 14		JULY, 14		AUGUST, 14		SEP., 14		OCT., 14		NOV., 14		DEC., 14		JAN., 15		FEB., 15		
	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II	
T_1: PKM-1	3.64 (10.97)	4.69 (12.49)	1.00 (5.74)	2.78 (9.59)	4.17 (11.80)	6.05 (14.24)	12.24 (20.48)	8.33 (16.77)	10.24 (18.67)	10.16 (18.59)	8.04 (16.48)	10.47 (18.87)	10.42 (18.82)	8.69 (17.14)	7.98 (16.39)	5.04 (12.95)	4.96 (12.86)	5.00 (12.90)	4.11 (11.71)	6.51 (14.79)	6.37 (14.63)	2.71 (9.43)	2.56 (9.38)	2.90 (9.82)	6.22
T_2: PKM-3	2.02 (8.18)	5.90 (14.08)	1.75 (7.61)	1.89 (7.89)	6.49 (14.74)	7.40 (15.78)	10.48 (18.89)	3.33 (10.51)	11.04 (19.40)	8.85 (17.31)	7.20 (15.57)	9.38 (17.82)	7.68 (16.07)	8.19 (16.63)	6.16 (14.34)	3.58 (10.93)	7.94 (16.35)	9.48 (17.92)	1.75 (7.58)	5.52 (13.58)	9.02 (17.46)	3.19 (10.29)	1.04 (5.86)	2.85 (9.69)	6.17
T_3: PKM-4	6.80 (15.10)	0.60 (3.97)	1.10 (6.05)	0.70 (4.78)	0.30 (3.13)	3.33 (10.48)	8.70 (17.16)	14.39 (22.28)	15.99 (23.66)	10.96 (19.32)	8.30 (17.72)	10.42 (18.82)	8.51 (16.95)	9.35 (17.79)	7.67 (16.07)	6.57 (14.87)	1.28 (6.48)	6.93 (15.27)	4.00 (11.54)	6.03 (14.22)	6.58 (14.89)	9.66 (18.12)	4.25 (11.91)	3.56 (10.86)	6.50
T_4: DHS-1	2.56 (9.21)	0.88 (5.27)	2.52 (9.14)	1.79 (7.53)	2.30 (8.71)	8.73 (17.19)	9.32 (17.77)	11.67 (19.95)	12.85 (20.99)	14.31 (22.24)	9.07 (17.53)	11.98 (20.24)	10.99 (19.33)	8.87 (17.31)	6.79 (15.09)	3.53 (10.82)	3.37 (10.57)	6.59 (14.87)	5.63 (13.75)	3.95 (11.41)	3.81 (11.24)	7.16 (15.51)	1.40 (6.78)	4.95 (12.85)	6.46
T_5: DHS-2	5.62 (13.71)	0.49 (3.90)	0.40 (3.62)	1.33 (6.63)	2.32 (8.77)	5.38 (13.34)	9.38 (17.82)	13.68 (21.70)	10.35 (18.77)	11.59 (19.90)	9.94 (18.40)	10.98 (19.34)	9.63 (18.08)	8.89 (17.34)	7.67 (16.08)	8.74 (17.19)	2.15 (8.44)	4.30 (11.95)	4.34 (12.02)	6.28 (14.50)	8.21 (16.66)	6.96 (15.30)	1.39 (6.77)	5.43 (13.50)	6.48
T_6: Kalipatti	5.72 (13.85)	2.12 (8.34)	1.06 (5.88)	3.68 (11.04)	4.35 (12.03)	4.57 (12.34)	6.46 (14.72)	11.44 (19.78)	11.93 (20.22)	10.11 (18.52)	8.16 (16.59)	9.36 (17.82)	10.70 (19.10)	9.31 (17.77)	8.29 (16.74)	7.63 (16.04)	4.17 (11.79)	7.71 (16.11)	6.00 (14.18)	6.14 (14.32)	8.86 (17.33)	8.77 (17.23)	2.96 (9.85)	2.92 (9.80)	6.77
T_7: Cricket ball	2.53 (9.15)	1.67 (7.37)	0.50 (3.68)	1.97 (8.04)	0.40 (3.58)	0.80 (5.10)	2.12 (8.38)	8.33 (16.77)	12.96 (21.10)	12.33 (20.54)	7.22 (15.59)	9.50 (17.97)	8.74 (17.18)	6.21 (14.44)	7.65 (16.05)	3.66 (11.02)	1.28 (6.52)	5.29 (13.29)	2.43 (8.95)	9.14 (17.59)	7.77 (16.20)	5.75 (13.89)	1.33 (6.62)	2.84 (9.68)	5.10
T_8: CO-3	4.71 (12.53)	3.43 (10.69)	1.11 (6.03)	3.57 (10.88)	1.70 (7.48)	3.03 (10.03)	7.69 (16.09)	14.31 (22.22)	11.52 (19.84)	11.11 (19.46)	8.79 (17.24)	10.26 (19.69)	9.62 (18.08)	7.97 (16.38)	8.28 (16.70)	5.21 (13.22)	5.64 (13.73)	4.82 (12.68)	3.89 (11.37)	6.64 (16.05)	9.80 (18.23)	2.56 (9.21)	2.00 (8.13)	0.93 (5.59)	6.19
Avg.	4.20	2.47	1.18	2.21	2.75	4.91	8.29	10.68	12.11	11.17	8.34	10.29	9.53	8.43	7.56	5.49	3.84	6.26	4.01	6.27	7.55	5.84	2.12	3.29	6.24
S.E.m±	0.36	0.65	0.46	0.58	0.53	0.48	0.86	0.62	0.79	0.60	0.42	0.82	0.56	0.69	0.74	0.80	0.77	0.56	0.52	0.77	0.82	0.55	0.67	0.46	--
CD at 5%	1.11	1.97	1.41	1.75	0.71	1.15	0.49	1.37	0.96	1.22	0.97	0.67	1.50	0.87	0.73	1.90	2.81	1.80	0.98	0.81	0.68	1.06	0.83	0.79	--

*Figures in parentheses are arc sin transformed values.

Table 4
Correlation of leaf miner (*A. gemoniella*) seasonal abundance with weather parameters (2014–15)

Weather Parameter	*Temperature (°C)*		*Relative Humidity (%)*				
Tr. No.	*Max.*	*Min.*	*Morning Sunshinehrs*	*Evening (mm)*	*Bright (mm/day)*	*Rainfall*	*Evaporation*
T_1: PKM–1	–0.292	0.642**	0.170	0.738**	–0.496*	0.519**	–0.196
T_2: PKM–3	–0.178	0.458*	0.206	0.479*	–0.354	0.383*	–0.201
T_3: PKM–4	–0.506**	0.367	0.303	0.577**	–0.546**	0.435*	–0.395*
T_4: DSH–1	–0.455*	0.642**	0.392*	0.813**	–0.618**	0.651**	–0.317
T_5: DSH–2	–0.510**	0.470*	0.269	0.659**	–0.569**	0.482*	–0.340
T_6: Kalipatti	–0.531**	0.380	0.385	0.606**	–0.420*	0.467*	–0.503**
T_7: Cricket ball	–0.653**	0.222	0.482	0.589**	–0.448*	0.629**	–0.647**
T_8: CO–3	–0.391*	0.483*	0.249	0.683**	–0.540**	0.495**	–0.334
Avg.	–0.507**	0.514**	0.352	0.730**	–0.572**	0.578**	–0.420*

*Significant at 5% level and ** at 1% level.

maximum temperature and evaporation in PKM-1 and PKM-3 as well as minimum temperature had not as much of role in incidence of PKM-4 and bright sunshine hrs in PKM-3.

The effect of various weather parameters on leaf damage of leaf miner was also observed in previous findings on Kalipatti variety in South Gujarat circumstance, wherein positive correlation with relative humidity and negative correlation with maximum temperature during 1994-95 [Anonymous (1)] as well as negative influence of maximum temperature and positive impact of minimum temperature and rainfall during 1997-98 [Anonymous (2)]. Similarly, Patel *et al.* (12) showed negative impact of maximum temperature and evaporation rate on leaf damage and support the results of present investigation data.

With respect to sapota foliage pests, the maximum abundance of midrib folder was observed in September to December and leaf miner showed maximum occurrence in July-August during monsoon to winter season in varying intensity on new foliage. The midrib folder damage significantly associated with maximum temperature, morning relative humidity and evaporation rate. While, leaf miner occurrence revealed significant correlation with maximum-minimum temperature, evening relative humidity, rainfall, sunshine hrs and evaporation rate. Therefore, plant protection measure should be commenced at the initiation of new foliage during monsoon.

On evaluation of eight varieties, CO-3 showed least leaf damage to midrib folder, whereas Cricket ball had less susceptibility to leaf miner. PKM-4 reported higher damage to midrib folder, whereas Kalipatti recorded higher damage to leaf miner. However, PKM-1, PKM-3, DHS–1 and DHS-2 were also found comparatively similar to midrib folder and leaf miner incidence.

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