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Studies on population dynamics and damage potential of banana leaf and fruit scarring beetle, *Basilepta subcostatum* jacoby on local and wild banana genotypes of Tripura

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Abstract
The present experiments was conducted to study the population dynamics and damage potential of banana leaf and fruit scarring beetle, *Basilepta subcostatum* Jacoby on eight local and wild banana genotypes like Shabri (AAB), Mizo-Cavendish (AAA), Katch Kela (ABB), Champa (AAB), Gopi (ABB), Attia Kela (BB), Kanai Basi (AA) and *Musa flaviflora* at banana orchard, College of Agriculture, Tripura during 2018-19. The highest mean number of beetle population per plant and scars on 10 sq.cm leaf were recorded on Mizo-Cavendish (16.84/ plant and 21.26/ 10 cm2) followed by Shabri banana (13.36/ plant and 16.20/ 10 cm2) and katch Kela (9.62/ plant and 12.63/ 10 cm^2). Whereas, the lowest population and scars were recorded on *Musa flaviflora* (0.24/plant and 0.37/ 10 cm^2), Kanai-Basi (0.35/ plant and 0.69/10 cm^2) and Attia Kela (0.67/ plant and 1.51 /10 cm^2). The highest beetle population and peak infestation (scars) noticed during 27rd standard week (July 3rd week) to 39th standard week (Sept. 4th week). The incidence of beetle population and scars produced by the beetle was positively and significantly correlated with rainfall, maximum and minimum temperature except relative humidity. Significantly highest fruit damage per bunch was recorded in Shabri cultivar (87.53 %) followed by Mizo-Cavendish (78.13 %) and Champa (65.86 %). Also the least infested bunches were Kanai Basi., *Musa flaviflora* and Attia Kela which ranged from 2 to 5 per cent.

Keywords: banana leaf and fruit scarring beetle**,** *Basilepta subcostatum*, local and wild genotypes, scars, correlation

Introduction
Banana and plantain (*Musa* sp.) are one of the most old known fruit crops and widely grown in India. It is the second most important fruit crop next to mango. It evolved in the humid tropical regions of S.E. Asia with India as one of its centres of origin. The major banana growing states in India are Maharashtra, Tamil Nadu, Andhra Pradesh, Karnataka, Kerala, Bihar, Orissa and West Bengal [5]. The North eastern states of India namely Tripura, Assam, Arunachal Pradesh, Meghalaya, Mizoram and Manipur have been the richest source of natural banana diversity. It is the most important fruit crop of Tripura next to jackfruit and pineapple with rich source of vitamins and minerals. It provides nutritional, health security and also livelihood opportunities to the rural and urban people of Tripura. Area under banana cultivation in Tripura is 13,274 ha with an annual production is 130085.20 mt with a productivity of 9.8 t/ ha. However, maximum (70%) area of banana cultivation is under Shabri banana compared to the other varieties. Shabri banana and Mizo-Cavendish are very popular and excellent (in respect of flavour, texture, aroma and TSS) cultivars of Tripura for fresh consumption with medium plant stature. Now the production and productivity of banana is being affected by several pests and diseases. About 19 insect pests have been found associated with banana from planting to harvesting in India [12]. Banana leaf and fruit scarring beetle *Basilepta subcostatum* (Jacoby) (Coleoptera: Chrysomelidae) is considered as one of the most economically important pests in Eastern India which is reported to occur in West Bengal and some other parts of India also [6]. The peak incidence was in April and continued till end of the rainy season [15] and the extent of damage inflicted upon banana crop by this pest has been reported to be around 80 per cent and in case of severe infestation, the percentage of infested orchards, and intensity of the pest have

been recorded up to 100 per cent [13]. As the beetle population causes serious damage (by scars) on leaves and banana peel, has tremendously influenced on both quantity and quality of banana which reduces the market acceptability. It is a serious pest of north-east India which causes 19.3 per cent damage of fruit yield [1]. Scanning of literature pertaining to this aspect revealed that, studies related to population dynamics and damage potential of banana leaf and fruit scarring beetle, *Basilepta subcostatum* Jacoby on local and wild banana genotypes of Tripura are lacking. In this background, the present investigations are planned.

Materials and methods

The experiment to assess the population dynamics and the damage potential of banana leaf and fruit scarring beetle, *Basilepta subcostatum* Jacoby on different local and wild banana genotypes of Tripura was laid out in RBD with 8 treatments (5 local and 3 wild cultivars), 3 replication (each replication has 18 plants) and spacing 2x2 m^2 at Banana orchard of College of Agriculture, Tripura (23°54"49' N-Latitude, 91°19"09' E-Longitude Altitude 12.80 m above mean sea level).

Table 1: Details of Banana genotype for assessment of population dynamics and the damage potential by *Basilepta subcostatum* Jacoby.

Treatment	Banana Cultivar	Genotype	Cultivar
1	Shabri	AAB	Local
2	Champa	AAB	Local
3	Gopi	AAB	Local
4	Katch Kela	ABB	Local
5	Mizo-Cavendish	AAA	Local
6	Attia Kela	BB	Wild
7	Kanai Basi	AA	Wild
8	*Musa flaviflora*	--	Wild

The natural population and scars of *B. subcostatum* on eight banana cultivars were recorded at fortnightly intervals during February, 2018 to January, 2019. Beetle population was observed from four youngest leaves of randomly selected 7 plants in each replication. The beetle populations were recorded by counting the beetles on leaves and also inside whorl of crown leaves during morning hours and the average number of beetle / plant was worked out. Total number of scars made by the beetles was also counted from 10 cm^2 leaf surface area of top, middle and lower portion of three youngest leaves of the 7 randomly selected plants (each replication) and the mean scars per 10 cm^2 leaf area was worked out.

Correlation studies with weather parameter

The data on the mean no. of beetle population per plant and mean no. of scars per 10 cm^2 leaf area were subjected to correlation studies to know the relationship between pest incidence and weather parameters prevailed in Tripura by using SPSS (Statistical Package for Social Sciences) software.

Percent (%) fruit damage per bunch (or Percent bunch damage)

Fruit damage (%) per bunch was calculated at harvesting stage from randomly selected 7 plants in each replication and the mean percentage of damage was calculated. The data was subjected to DMRT (Dunken Multiple Range Test) statistical analysis by using SPSS software.

$$\text{Percent (\%) fruit damage per bunch} = \frac{\text{No. of Infested finger / Bunch}}{\text{(Percent bunch damage) Total no. of finger in a bunch}} \times 100$$

Results and Discussion

Incidence of scarring beetle observed in banana orchard of College of Agriculture, Tripura once in a fortnight from February, 2018 to January, 2019 and results are presented in Table 2 to 7. The sign of the presence of this pest was irregular patches on unfurled and furled leaf. The beetle lived within the roll of the central leaf, flower bracts and fed the epidermis of leaves and causing scars on them.

Table 2: Incidence of *B. subcostatam* on different local banana cultivars of Tripura during 2018-19.

Observation	Shabri (AAB)		Mizo-Cavendish (AAA)		Champa (AAB)		Katck Kela (ABB)		Gopi (AAB)	
SMW	Mean no. of Beetle/ plant	Mean no. of scars/ 10 cm^2 of leaf	Mean no. of Beetle/ plant	Mean no. of scars/ 10 cm^2 of leaf	Mean no. of Beetle/ plant	Mean no. of scars/ 10 cm^2 of leaf	Mean no. of Beetle/ plant	Mean no. of scars/ 10 cm^2 of leaf	Mean no. of Beetle/ plant	Mean no. of scars/ 10 cm^2 of leaf
5	7.48	11.33	9.70	11.50	3.96	4.30	4.75	6.24	4.20	5.94
7	8.72	11.55	11.26	12.32	4.68	4.80	5.32	6.96	4.80	6.27
9	8.01	10.45	12.23	13.63	5.40	7.56	6.08	8.04	5.00	6.71
11	9.26	10.12	12.70	15.00	5.22	6.66	5.70	7.80	6.00	7.15
13	9.79	11.75	12.80	16.00	6.30	9.90	7.41	9.48	6.80	8.14
15	10.86	13.03	12.70	14.00	7.20	10.62	7.79	10.32	7.00	9.13
17	13.88	16.66	13.32	15.50	7.56	8.78	8.93	11.76	7.80	10.01
19	15.13	18.16	15.20	18.10	8.64	9.18	9.88	12.84	9.20	11.22
21	16.38	17.16	17.50	20.00	9.00	10.56	10.64	13.92	9.00	11.55
23	16.91	20.13	19.30	21.50	10.08	11.60	12.35	16.08	10.40	12.32
25	17.62	21.23	20.41	23.00	9.72	12.30	12.73	16.44	10.80	12.76
27	17.80	22.00	23.92	27.00	10.44	12.60	13.11	16.92	12.00	13.42

29	17.09	23.65	23.34	28.70	10.16	12.60	13.68	17.64	11.20	13.75
31	18.51	25.85	23.14	29.40	11.02	13.30	11.78	15.36	11.60	13.97
33	22.25	27.50	21.92	30.50	10.44	14.80	13.49	17.40	11.40	13.53
35	19.05	19.25	20.68	31.30	10.80	15.70	14.06	18.72	11.60	14.08
37	21.72	25.19	23.04	*32.20*	11.34	16.30	14.82	19.08	12.20	14.74
39	17.27	24.53	24.81	35.00	13.52	17.80	13.30	17.40	12.00	14.52
41	15.31	19.25	22.68	25.50	10.80	16.23	13.68	18.24	10.60	12.98
43	12.46	16.50	17.76	24.60	9.90	15.45	12.35	16.32	10.40	11.44
45	12.10	15.84	14.80	22.20	9.36	11.32	10.07	13.68	8.40	10.56
47	11.04	14.30	14.43	19.60	6.84	9.30	9.50	12.60	8.00	9.02
49	10.68	12.60	13.32	17.80	4.50	6.80	6.46	8.52	6.40	8.36
51	10.50	11.00	12.95	17.00	3.60	6.30	5.70	7.44	4.00	5.72
1	8.19	9.35	12.77	16.00	2.88	4.40	3.80	5.28	4.20	5.94
3	7.12	8.36	11.10	15.50	2.52	4.20	2.85	3.96	4.00	4.95
Average	13.66	16.20	16.84	21.26	7.92	10.51	9.62	12.63	8.42	10.31

SMW- Standard Meteorological Weeks

Incidence of *B. subcostatam* on local banana cultivars

Shabri banana: The incidence of *B. subcostatum* on Shabri was noticed throughout the year i.e. from 5th standard (std.) week, 2018 and to 3rd std. week 2019 (Table 2). The beetle population was ranged from 7.12 to 22.25 per plant with average of 13.66. Whereas, the maximum beetle population (22.25/ plant) was observed on 33rd SMW (Standard Meteorological Week) i.e. Aug. 3rd week. The mean number of scars per 10 cm^2 leaf ranges from 8.36 to 27.50 with mean no. of 16.20. The maximum leaf damage was also observed on 33rd SMW.

Mizo-cavendish banana

From Table 2 it is clear that, during 39th std. week the maximum number of mean beetle population were recorded 24.81/plant. The mean population was ranged from 9.7 to 24.81 per plant. The average leaf damage from Feb. 2018 to January 2019 was 21.26 scars per 10 cm^2 leaf. While during 39th std week, the maximum damage was 35.00 scars per 10 cm^2 leaf.

Katch kela

The maximum beetle population on Katch Kela (14.82/ plant) was recorded during 37th std. week with average population of 9.62 per plant (Table 2). The maximum scares of 19.08 per 10 cm^2 leaf was also recorded at 37th std week which coincided with a mean leaf scars of 12.63/10 cm^2.

Champa

The population density of *B. subcostatum* on Champa ranged from 2.52 to 13.50 per plant with mean no. of 7.92/ plant (Table 2). The maximum appearance and the highest infestation of the beetle were noticed during 39th standard week. The maximum no. of scares per 10 cm^2 leaf was recorded on 17.80 at with mean scares of 10.51.

Gopi

The average beetle population on Gopi ranged from 4.00 to 12.20 per plant with average of 8.42 beetles per plant (Table 2). The incidence of beetle population observed throughout the year. The highest incidence of beetle was noticed at 37th std. week and the maximum leaf scars was also recorded at the same week i.e. 14.74 no. of scars/10 cm^2 of leaf with average scars of 10.31.

Incidence of *B. subcostatum* on wild banana cultivars

Attia kela

The first appearance of banana leaf and fruit scarring beetle was started during 13th std. week and persisted on Attia Kela upto 47th standard week (Table 3). The mean no. of beetle population per plant varied from 0.00 to 2.10 per plant with the mean population 0.67.

Table 3: Incidence of *B. subcostatam* on different wild banana cultivars of Tripura during 2018-19.

Observation	Attia Kela (BB)		Kanai Basi (AA)		*Musa flaviflora*	
SMW	Mean no. of Beetle/ plant	Mean no. of scars/ 10 cm^2 of leaf	Mean no. of Beetle/ plant	Mean no. of scars/ 10 cm^2 of leaf	Mean no. of Beetle/ plant	Mean no. of scars/ 10 cm^2 of leaf
5	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00
13	0.20	0.46	0.00	0.00	0.00	0.00
15	0.50	1.14	0.00	0.00	0.00	0.00
17	0.60	1.32	0.30	0.45	0.00	0.00
19	0.70	1.54	0.20	0.32	0.20	0.38
21	0.60	1.32	0.30	0.57	0.40	0.64
23	0.80	1.77	0.60	1.13	0.60	0.94
25	1.40	3.08	1.20	2.27	1.00	1.30
27	1.60	3.52	2.00	3.78	1.20	1.45
29	1.00	2.20	1.10	2.08	1.40	1.50
31	1.50	3.35	0.00	0.64	0.40	0.73
33	1.30	2.98	0.00	0.00	0.00	0.64
35	1.00	2.23	0.00	0.00	0.00	0.00
37	2.00	4.46	1.60	3.02	0.00	0.00
39	2.10	4.67	0.80	1.50	0.20	0.38

41	1.20	2.68	0.60	1.06	0.50	0.67
43	0.50	1.12	0.40	0.70	0.00	0.20
45	0.30	0.68	0.00	0.40	0.40	0.52
47	0.20	0.48	0.00	0.00	0.00	0.30
49	0.00	0.24	0.00	0.00	0.00	0.00
51	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00
Average	0.67	1.51	0.35	0.69	0.24	0.37

SMW- Standard Meteorological Weeks

Maximum leaf damage (scars/ 10 cm^2) of was recorded 4.67 nos. at 39th std. week. The mean nos. of scars per 10 cm^2 leaf caused by the beetle was 1.51.

Kanai Basi

The population density of *B. subcostatum* on Kanai Basi ranged from 0.00 to 2.00/plant with mean of 0.35/ plant. The first appearance of snails was noticed during 17th std. week and persisted in nursery up to 43rd std. Week (Table 3). The maximum no. of scars per 10 cm^2 of leaf (3.78%) was recorded at 27th std. week with seasonal mean of 0.69 nos. scars per 10 sq. cm of leaf.

Musa flaviflora

The incidence of banana leaf and fruit scarring beetle on *Musa flaviflora* revealed that the first appearance of beetle was noticed during 19th standard week (0.02/ plant) and persisted up to 45th std. weeks (Table 3). The population density was ranged from 0.00 to 1.40 per plant with a mean population of 0.24. Whereas, the maximum beetle damage (1.50 per 10 sq. cm of leaf) was at 29th standard week. The mean no. scars per 10 sq. cm of leaf by *B. subcostatum* on *Musa flaviflora* was 0.37. After 49th std. week onwards there was no beetle population.

Correlation of incidence of beetle population and damage (scars /10cm^2 of leaf) with weather parameters

The incidence of beetle population on different banana cultivars are correlated with meteorological parameters and their correlation coefficients are given in Table 4. It indicates significant positive relationship with all the meteorological parameters except relative humidity. The correlation studies revealed that population had positive and significant correlation with maximum temperature (r= 0.637 for Shabri, 0.583 (Mizo-Cavendish), 0.719 (Champa), 0.674 (katch Kela), 0.718 (Gopi), 0.566 (Attia Kela), 0.352 (Kanai Basi) and 0.393 (*Musa flaviflora*) and minimum temperatures (r = 0.841 for Shabri; Mizo-Cavendish- 0.796; Champa- 0.867; Katch Kela- 0.849; Gopi- 0.864; Attia Kela- 0.781; Kanai Basi- 0.528 and *Musa flaviflora*- 0.507). Also the correlation coefficient of rainfall shows significant and positive (r= 0.508 for Shabri; 0.417 (Mizo-Cavendish), 0.428 (Champa), 0.447 (Katch Kela), 0.465 (Gopi), 0.390 (Attia Kela), 0.552 (Kanai Basi) and 0.572 (*Musa flaviflora*) with the incidence of *B. subcostatum* population. While the relative humidity exhibited non-significant negative correlation for all the varieties (r= -0.338 for Shabri, -0.182 (Mizo-Cavendish), -0.305 (Champa), -0.297 (Katch Kela), -0.336 (Gopi), -0.196 (Attia Kela), -0.144 (Kanai Basi) and -0.147 (*Musa flaviflora*).

Table 4: Correlation coefficient between *B. subcostata* incidence and weather parameters on different banana cultivars (2018- 19).

Parameters	Shabri	Cavendish	Champa	Katch Kela	Gopi	Attia Kela	Kanai Basi	*Musa flaviflora*
Max. Temp.	0.637**	0.583**	0.719**	0.674**	0.718**	0.566**	0.352 *	0.393*
Min. Temp.	0.841**	0.796**	0.867**	0.849**	0.864**	0.781**	0.528**	0.507**
RH	-0.338	-0.182	-0.305	-0.297	-0.336	-0.196	-0.144	-0.147
Total Rain fall	0.508**	0.417*	0.428*	0.447*	0.465*	0.390*	0.552**	0.572**

**. Correlation is significant at the 0.01 level (2tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 5: Correlation coefficient between leaf damage (scars) by *B. subcostata* and weather parameters on different banana cultivars (2018-19).

Parameters	Shabri	Mizo- Cavendish	Champa	Katch Kela	Gopi	Attia Kela	Kanai Basi	*Musa flaviflora*
Max. Temp.	0.618**	0.509**	0.664**	0.671**	0.707**	0.564**	0.356 *	0.486*
Min. Temp.	0.810**	0.696**	0.807**	0.843**	0.872**	0.776**	0.550**	0.588**
RH	-0.224	-0.107	-0.257	-0.302	-0.330	-0.196	-0.920	-0.151
Total Rain fall	0.441*	0.214	0.250	0.432*	0.455*	0.390*	0.551*	0.623**

** Correlation is significant at the 0.01 level (2tailed)

* Correlation is significant at the 0.05 level (2-tailed).

With rainfall. Whereas, correlation of the dependent variables with relative humidity was non-significant and negative irrespective of all varieties.

Table 6: Meteorological data recorded for the year 2018-19 at ICAR, Tripura (February, 2018 to January, 2019)

Months	Weeks Standard Meteorological (SMW)	Max Temp.(°C)	Min Temp. (°C)	Relative Humidity (%)	Total Rainfall (mm)
Feb 1st week	5	22.1	9.9	100	0
Feb 3rd week	7	25.7	10.4	98	0
March 1st week	9	30.5	18.2	93	0.6
March 3rd week	11	32.7	20.9	93	0
March 5th week	13	32.6	20.3	91	51.8

April 2nd week	15	33.1	21.1	93	3.5
April 4th week	17	32.7	20.3	89	72
May 2nd week	19	31.5	22	89	97.2
May 4th week	21	32.8	23.7	93	116.1
June 2nd week	23	34.8	24.4	95	138.7
June 4th week	25	33	24.5	95	54
July 1st week	27	32.1	24.8	91	156.7
July 3rd week	29	34.4	25.8	94	42
Aug. 1st week	31	31.6	24.7	95	31.6
Aug. 3rd week	33	34.7	25.4	93	44.8
Sept. 1st week	35	32.3	24.8	90	4.8
Sept. 3rd week	37	30.3	24.4	96	42.4
Sept. 5thweek	39	33.6	24.3	97	15.6
Oct. 2nd week	41	29.7	21.8	95	34.4
Oct. 4th week	43	32.1	18.9	96	9.4
Nov. 2nd week	45	29.1	17.2	96	32.2
Nov. 4th week	47	28.1	13.6	97	0
Dec. 2nd week	49	26.9	11.7	97	0
Dec. 4th week	51	22.9	13	98	27.8
Jan. 1st week	1	26.5	9.1	97	0
Jan. 3rd week	3	26	9.4	96	0

The data on damage infestation (scars/10cm^2 of leaf) by *B. subcostatum* in West Tripura District was correlated with the prevailing weather parameters and result presented in Table 5. Data revealed that maximum and minimum temperature exerted positive and significant relationship with the leaf damage (scars). Rainfall shows significant positive correlation in case of Shabri, Katch Kela, Gopi, Attia Kela, Kani Basi, *Musa flaviflora*, while it shows only positive correlation with leaf damage in Mizo-Cavendish (r = 0.214) and Champa (r= 0.250) cultivars and leaf damage on rest of the cultivars shows significant and positive correlation.

Percent (%) fruit damage per bunch (or Per cent bunch damage)

Beetle feeds on the skin of newly emerged young and tender fruits, upper and lower surface of the flower bracts causing innumerable scars on them. Scars on the fruits grew bigger as the fruit matured and fruits become disfigured. Infested fruits got spotted and severe scarring of fruit skin led to under developed fruit. The damage potential of *B. subcostatum* on different local and wild banana bunch (Table 7) ranged from 2.20 per cent to 87.53 per cent.

Table 7: Percent (%) fruit damage per bunch (or percent bunch damage) by *B. subcostatam* on local and wild banana cultivars of Tripura during 2018- 2019.

Sl. No.	Genotypes / Cultivars	Percent (%) fruit damage per bunch (or percent bunch damage)
1	Shabri	87.53 * (69.32) a
2	Champa	65.86 (54.24) c
3	Gopi	52.60 (46.63) d
4	Katch Kela	58.50 (49.89) cd
5	Mizo-Cavendish	78.13 (62.11) b
6	Attia Kela	5.53 (13.60) e
7	Kanai Basi	3.47 (10.73) ef
8	*Musa flaviflora*	2.20 (8.52) f
S.Em±		1.96
C.D. @ 5%		5.93
C.V. (%)		7.66

Figures in the parenthesis are arc sin** transformed values, Values in the column followed by common letters are non significant at p = 0.05 as per DMRT.

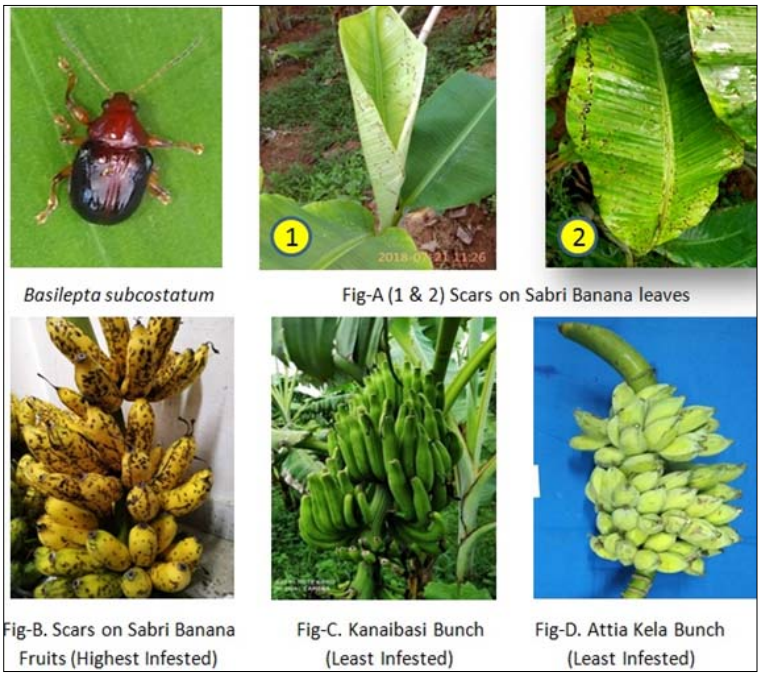
Among the different cultivars the Shabri bunch was recorded significantly highest damage of 87.53 per cent. The second highest bunch damage was recorded on Mizo-Cavendish, 78.13 per cent. The damage on Champa, katch Kela and Gopi bunches were 65.86, 58.50, 52.60 per cent; respectively were another three next preferred hosts. Whereas, least bunch damage noticed on the rest of the banana genotypes *viz.*, *Musa flaviflora*, Kanai Basi and Attia Kela which recorded 2.20, 3.47, 5.53 per cent, respectively. The per cent bunch damage is significantly differed with Attia Kela and *Musa flaviflora*. But there is no significant difference of bunch damage between Kanai Basi and Attia Kela or *Musa flaviflora*.

The perusal of literature revealed that the reviews pertaining to the incidence of *B. subcostatum* on different local (Shabri, Champa, Katch Kela, Gopi) and wild (*Musa flaviflora*, Kanai Basi and Attia Kela) banana genotypes are not available. Hence, the present study under Tripura climatic condition to be first of its kind. The investigation on the occurrence of the beetle population on different local and wild cultivars in Tripura revealed that the peak infestation (scars/ 10 cm^2 leaf) and maximum number of beetle population were found during 27th SMW (July 3rd week) to 39th SMW (Sept 5th week). The mean beetle population and mean scars/ 10 cm^2 of leaf were maximum in Mizo-Cavendish (16.84 beetle/ plant and 21.26 scars/ 10 cm^2) followed by Shabri cultivar (13.66 beetle/ plant and 16.20 scars/ 10 cm^2) (Fig. A). While the minimum beetle population and scars/ 10 cm^2 of leaf was noticed on *Musa flaviflora* (0.24 beetle/ plant and 0.37 scars/ 10 cm^2), Kanai

Basi (0.35 beetle/ plant and 0.69 scars/ 10 cm^2) and Attia Kela (0.67 beetle/ plant and 1.51 scars/ 10 cm^2). Due to low and scattered rainfall in February, 2018 and January, 2019 the incidence of beetle population was very less. Further, higher number of beetle, *B. subcostatum* recorded from July, 2018 to Sept. 2018 due to higher amount of total rainfall received during that period. Gradually the population and scares decreased from the first fortnight of October, 2018 in case of the five most infested varieties *viz.* Shabri, Mizo-Cavendish, Champa, Katch- Kela and Gopi. The present finding is in lined with the results of the earlier workers who also found August- September months to be the peak period for scarring beetle incidence in Bihar (Mukherjee) [9] and West Bengal (Konar *et al.*) [8]. The present finding is also conformity with Bhagabati and Deka [4] who reported the beetle population reach its minimum during January and February due to less rainfall during those months. Also the finding is in partial agreement with the result of Mishra *et al.* [11] who reported the highest population (32.2 beetles/plant) and scars (28.4 scars/5cm2) on Dwarf-Cavendish in Assam during second fortnight of August, 2011. Likewise Singh *et al.* [16] reported the extensive damage by the scarring beetle to leave as well as fruits during kharif season. Correlation study reveals that maximum temp., minimum temp, and rainfall exerted positive and significant effect but the relative humidity exerted negative impact both on beetle population and their damage (scars). It is an indication that weather condition plays a crucial rule in increasing the severity and incidence of pest. This finding corroborates with Das and Baruah [7] who endorsed the maximum and minimum temperature and rainfall were significant and positive and relative humidity was non-significant and negative with respect to beetle population as well as number of scars on leaf. The study conducted by Ahmad *et al.* [3] worked out the correlation coefficient for beetle population and weather parameters and pointed out that the crucial role of climatic factor with the pest population development. Mishra *et al.* [11] reported positive and significant correlation with various meteorological parameters except morning relative humidity. The highest bunch damage (Fig. B) was recorded on Shabri followed by Mizo- Cavendish and Champa. However, the lowest damage (Fig. C & D) was recorded on the wild types banana *viz*. *Musa flaviflora*, Kanai Basi and Attia Kela. Literature regarding the extend of bunch damage is also not available. Hence, it going to be the first study carried out on the estimation of *B. subcostatum* on local and wild banana genotypes of Tripura. However Such findings are somewhat related to the findings of Ahmad *et al.* [2] and Mukherjee [10] who revealed that the extent of damage by banana scarring beetle, *Nodostoma* (Basi*lepta*) *subcostatum* has been approximately 30 per cent of the banana bunches during rainy season in Bihar and Sen and Prasad [14] who reported that *N. viridipennis (*another species of scarring beetle) was found to be the most destructive pest on different varieties of banana, Shabri, Champa, Amritasagar etc grown in Bangladesh.

Conclusion

Experimental results indicated that out of eight varieties evaluated, the least infested genotypes were *Musa flaviflora* followed by Kanai Basi and Attia Kela. It indicates these three genotypes can be used as resistance source for future crop improvement programme. This study will also helpful to predict the incidence of *B. subcostatum* on different local and wild banana genotypes of Tripura and to create proper integrated pest management programme (IPM) for its seasonal control.



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