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Rumki H Ch Sangmaa) ICAR-National Research
Centre for Orchids, Pakyong,
Sikkim, Indiab) ICAR-Research Complex for
NEH Region, Umiam,
Meghalaya, India**Geetanjali Pradhan**ICAR-National Research Centre
for Orchids, Pakyong, Sikkim,
India**RK Singh**ICAR-National Research Centre
for Orchids, Pakyong, Sikkim,
India

Seasonal incidence of aphid, *Macrosiphum luteum* (Hemiptera: Aphididae) on *Epidendrum radicans* in Sikkim Himalayas

Rumki H Ch Sangma, Geetanjali Pradhan and RK Singh

Abstract

Seasonal incidence of aphid, *Macrosiphum luteum* was studied on orchid, *Epidendrum radicans* under polyhouse conditions. The lowest mean population of 6.03 aphids (mean of thirty plants) was recorded during 17th Standard week in April and highest population was recorded in 48 Standard week with a mean population of 94.7 aphids, respectively. The minimum and maximum temperature recorded during 17 Standard week in April, 2017 ranged from 14 °C and 23.71 °C respectively, minimum and maximum relative humidity ranged from 45.14% to 65.71% and rainfall recorded 1.87 mm. The maximum temperature recorded during 48th standard week was 18.29 °C and a minimum of 6.71 °C and maximum Relative Humidity of 68.21% and a minimum of 46.14 % with a precipitation of 0.10mm. The maximum temperature of the day has positive correlation ($r=0.018$) with the population of aphid.

Keywords: Abiotic factors, Orchid, *Epidendrum radicans*, aphid, *Macrosiphum luteum*, seasonal incidence

Introduction

The North eastern region of India comprises of eight states, i.e., Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura are considered as the most important biodiversity hotspot of the Indian sub-continent. The region has about 876 orchid species in 151 genera which constitute nearly 70% of total orchid flora of the country [1]. Due to wide altitudinal variations, different topographical features, soil characteristics and wide climatic factors, Northeastern region of India is also a hub to many orchid floras. Arunachal Pradesh has the highest number of orchid species in the country (622) followed by Sikkim (543 species) and Meghalaya with nearly 389 species. Assam is blessed with 290 species Nagaland with near about 246 species of 63 genera and Tripura with 57 species [2]. The state of Manipur has near about 280 species of orchids [3].

Orchid (*Epidendrum* sp.) is a diverse neotropical genus that has flowers characterized by a frilly or fringed lip. This feature is occasionally diagnostic to distinguish between species. The diagnostic characteristic of *E. radicans* is its tendency to sprout roots all along the length of the stem; other crucifix orchids only produce roots at the base [4]. The common names of this orchid include ground rooting epidendrum, fire-star orchid, rainbow orchid and reed-stem epidendrum. The orchid is native to Southern Mexico, Costa Rica, El Salvador, Honduras, Nicaragua, Panama and Columbia growing as a common roadside weed at middle elevations in Central America. It is a sympodial orchid with long, cane-like stems, each with a terminal dense inflorescence bearing small and spectacular bright orange and yellow coloured flowers. The orchid is widely cultivated as an ornamental as potted plants and cut flowers [5]. The orchid *Epidendrum radicans* is found to be infested by several insect and non-insect pests like shoot borer, *Peridaedala* sp., mite *Tetranychus urticae*, aphids (*Macrosiphum* sp and *Toxoptera aurantii*), scales insects (*Lecanium* sp., *Coccus hesperidum*, *Diaspis boisduvali*), mealybug, thrips, *Dichromothrips nakahari* Mound, grasshopper, snails and slugs. Based on weekly monitoring of orchid plants, the incidence of aphid was not observed since 2014 until in 2016, when the epidendrum orchids were found to be severely infested with aphids under polyhouse conditions. The insect feeds on the tender growing portion of the plant including new shoots, flower buds and flowers. The aphids secrete honey dew as a result of which the infested portions turn blackish in colour due to development of sooty molds. *Macrosiphum luteum* was first reported to infest the orchid, *Vanda coerulea* [6]. Besides Epidendrum, this

Correspondence

Rumki H Ch Sangmaa) ICAR-National Research
Centre for Orchids, Pakyong,
Sikkim, Indiab) ICAR-Research Complex for
NEH Region, Umiam,
Meghalaya, India

insect was also reported to infest orchids of the genera *Oncidium*, *Cattleya*, *Lycaste*, *Brassia*, *Laelia* and *Castsetum* [7]. The weather conditions prevailing in a region play an important role in occurrence and subsequent build-up of pest population. As such this small study was undertaken to know the effect of abiotic factors on the population build up of aphid on *Epidendrum radicans*.

Materials and methods

The present study was conducted at the, ICAR-National Research Centre for Orchids, Pakyong (27° 20"N X 88° 40"E), East Sikkim, India, in the potted plants under polyhouse conditions during September, 2016- April, 2017. Two year old potted plants of *Epidendrum radicans* having mostly 1 shoots per plant was taken for the experiment. Thirty randomly selected plants were tagged for taking the observations. Since the aphids infested the growing tips/shoots of the plants, visual counting of the nymphs and adults of the aphid was done from the terminal part of the plant.

Weekly meteorological data on temperature (minimum and maximum in degree centigrade), minimum and maximum relative humidity (%) and rainfall (mm) were recorded.

Statistical Analysis

The correlation coefficient between aphid population and weather parameters was done by excel.

Results and Discussion

The population of aphid, *Macrosiphum luteum* was first noticed on the plants of *Epidendrum radicans* during the first week of October (40th Standard week) with an initial population of 20.23 aphids/5 plants. The highest population was recorded in 48 Standard week (November last week) with a mean population of 94.7 aphids, when the minimum and maximum temperature ranged from 6.71 °C to 18.29 °C (mean 15.86 °C) and relative humidity ranged from 46.14 to

68.21per cent (mean 57.22%) and rainfall of 0.10mm, respectively. However, lowest mean population 6.03 aphids/plant (mean of thirty plants) was recorded during 17 Standard week in April, 2017 when the minimum and maximum temperature ranged from 14 °C and 23.71 °C (mean 18.85 °C) respectively, minimum and maximum relative humidity ranged from 45.14% to 65.71% (mean 55.42) and rainfall recorded 1.87 mm. The population of aphid gradually increased from its initial population from the 40th standard week attaining a peak population in 48 standard week and then there was a sudden decrease of aphid population. The population of aphid was in somewhat static condition from the 52 Standard week upto 12 Standard week. From 13 Standard week there was a sharp decline in aphid population (Figure.1). The coefficient of correlation of aphid population was negatively correlated with minimum temperature ($r=-0.085$) and rainfall recorded ($r=-0.345$) indicating negative relationship during the period. The aphid population was found to be positively correlated with maximum temperature ($r=0.018$) and relative humidity ($r=0.150$) indicating positive relationship during the period. The incidence of *Macrosiphum luteum* was not observed on orchids for the last two years. Very limited study is available on its seasonal incidence. The infestation of orchids by this aphid has been reported by several authors. *Macrosiphum luteum* was first reported to infest the orchid, *Vanda coerulea* [6]. High humidity and cloudy weather is known to fasten the population of this aphid on orchids [8]. The aphid population was negatively correlated with temperature sensing by Chaudhari *et al.* [9]. Similar studies conducted by Sain *et al.* [10] on population dynamic of cabbage aphid revealed a significant positive correlation between aphid population and maximum temperature. Similar studies conducted on population dynamic of *Myzus persicae* revealed significant positive correlation between aphid population and maximum temperature [11].

Table 1: Effect of abiotic factors on the incidence of aphid on orchid, *Epidendrum radicans*.

Standard Meteorological Week (SMW)	Date of observation	Temperature (°C)		Mean Relative Humidity (%)	Total rainfall (in mm)	Mean no of aphids/plant (Mean of 30 plants)
		Min.	Max.			
40	6/10/2016	17.00	25.43	65.00	3.13	20.23
41	11/10/2016	15.14	23.00	72.29	3.79	50.12
42	18/10/2016	12.00	22.83	58.50	0.00	53.28
43	25/10/2016	10.57	22.14	58.73	0.09	60.15
44	2/11/2016	9.86	21.86	48.00	0.04	63.06
45	11/11/2016	9.29	20.43	67.86	0.20	67.83
46	16/11/2016	8.00	19.86	55.22	0.00	69.10
47	21/11/2016	8.57	20.29	55.07	0.00	73.10
48	29/11/2016	6.71	18.29	57.22	0.10	94.70
49	06/12/2016	7.43	19.43	45.50	0.00	80.63
50	13/12/2016	6.00	18.71	35.15	0.00	77.33
51	20/12/2016	6.79	17.29	66.00	0.06	50.40
52	27/12/2016	4.29	15.29	47.72	1.00	29.67
1	01/03/2017	1.57	13.86	31.22	0.00	25.20
2	10/01/2017	-0.14	12.00	32.07	0.01	23.83
3	17/1/2017	3.57	16.57	23.64	0.00	26.73
4	24/1/2017	5.86	17.71	32.99	0.19	24.67
5	31/1/2017	4.00	16.86	45.36	0.00	33.03
6	7/02/2017	5.29	18.00	34.86	0.00	31.43
7	14/2/2017	4.29	18.14	43.52	0.00	33.93
8	21/2/2017	4.71	17.00	43.72	0.30	37.03
9	28/2/2017	5.57	18.86	35.79	0.01	35.87
10	3/3/2017	5.00	16.29	46.86	6.06	33.97
11	14/3/2017	4.86	15.86	43.14	0.33	33.53
12	21/3/2017	8.57	18.29	63.29	2.19	30.13
13	28/3/2017	12.20	21.60	69.20	0.24	25.02
14	4/4/2017	12.86	22.14	62.08	0.9	23.10
15	11/4/2017	11.71	22.86	39.72	1.84	14.73
16	18/4/2017	14.28	22.71	65.92	2.9	9.03

17	26/4/2017	14.00	23.71	55.42	1.87	6.33
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Table 2: Correlation coefficient of aphid population with weather parameters

Weather parameters	Correlation coefficient
Minimum Temperature (°C)	-0.085
Maximum Temperature (°C)	0.018
Average Relative humidity (%)	0.150
Total rainfall	-0.345

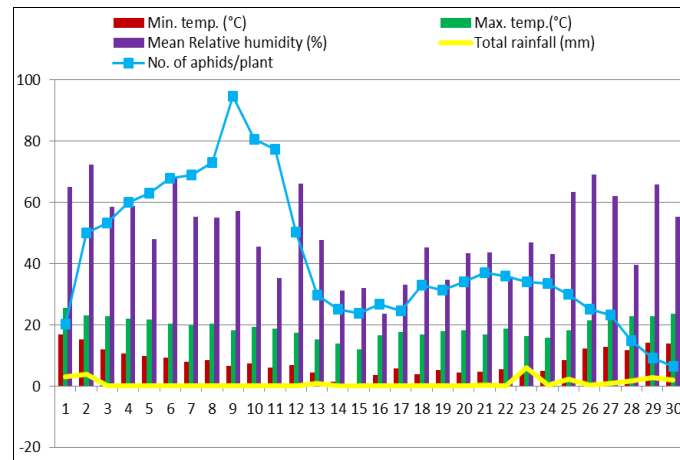


Fig 1: Effect of abiotic factors on the population of aphid on orchid, *Epidendrum radicans*

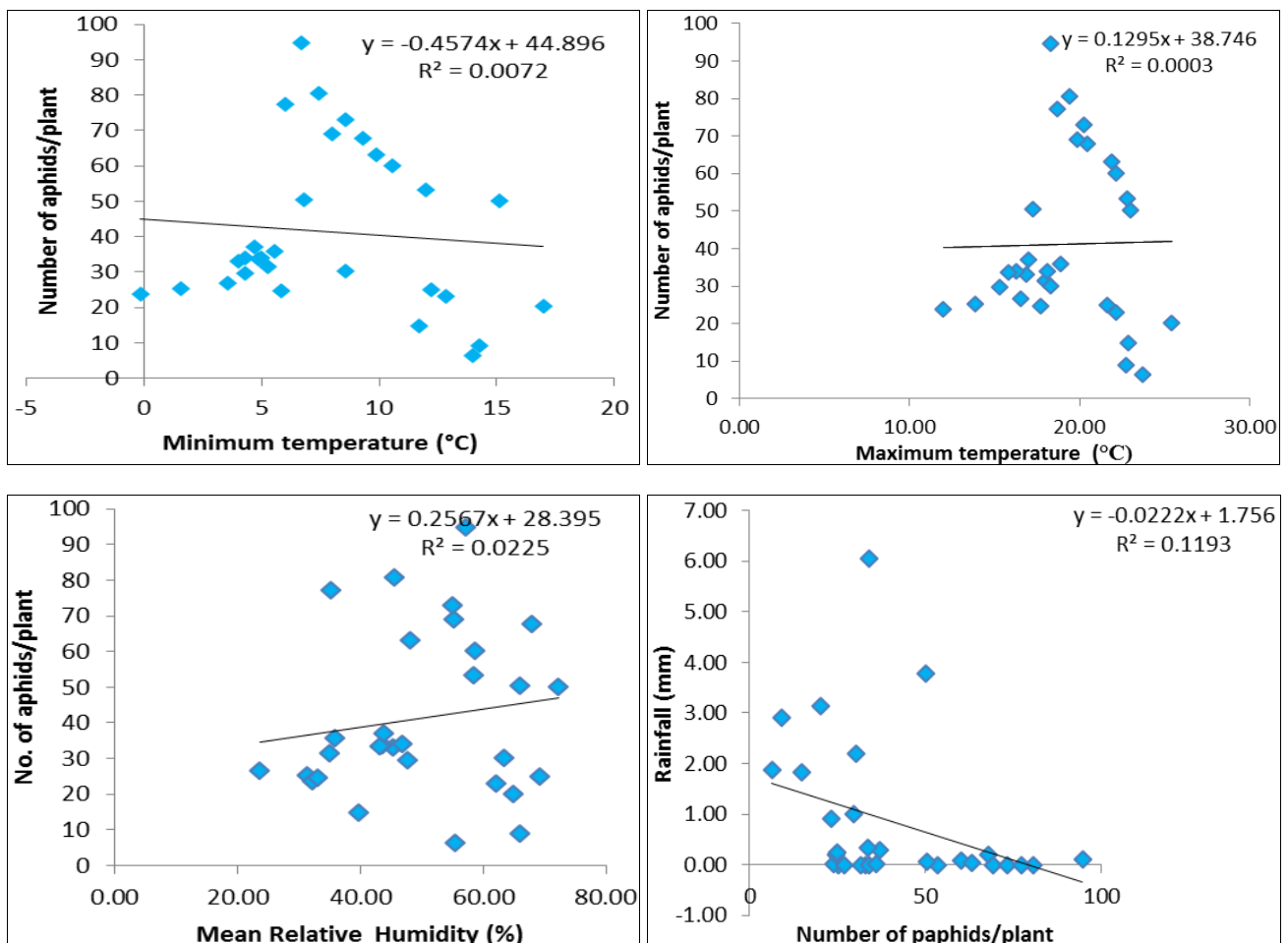


Fig 2: Relationship of aphid population with different abiotic factors

Conclusion

Thus it can be concluded that the peak population of aphid was found in 48MSW and the aphid population has a non-significant negative relationship with minimum temperature and total rainfall and a positive non-significant relationship with maximum temperature ($r=0.018$) and relative humidity ($r=0.150$).

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