INTERNATIONAL JOURNAL OF PLANT PROTECTION
VOLUME 9 | ISSUE 1 | APRIL, 2016 | 52-57

● e ISSN-0976-6855 | Visit us : *www.researchjournal.co.in*

IJPP

RESEARCH PAPER

DOI : 10.15740/HAS/IJPP/9.1/52-57

Seasonal incidence of *Dipha aphidivora* Meyrick (Pyralidae: Lepidoptera) in Bhadra command areas

■ MYTHRI[1], S.V. HUGAR* AND S. PRADEEP[2]

Agricultural Research Station, University of Agricultural Sciences, DHARWAD (KARNATAKA) INDIA
[1]Raitha Samparka Kendra, Annigeri, DHARWAD (KARNATAKA) INDIA
[2]University of Agricultural and Horticultural Sciences, SHIMOGA (KARNATAKA) INDIA

ARITCLE INFO

Received : 14.10.2015
Revised : 09.02.2016
Accepted : 23.02.2016

KEY WORDS :
Seasonal incidences, *Dipha aphidivora*, SWA, Sugarcane, Weather

ABSTRACT

Investigation on the seasonal incidences of *Dipha aphidivora* Meyrick (Pyralidae: Lepidoptera) and its natural enemies from June 2005 to May 2006 undertaken at Agricultural Research Station, Honnavile, Bhadravathi and Shimoga district revealed an incidence ranging from 1.6 to 7.2 larvae per plant recorded at Shimoga district (Location I, Shettihalli), 1.1 to 7.9 larvae per plant at Shimoga district (Location II, Honnavile), 0.7 to 6.9 larvae per plant at Bhadravathi taluk (Location III, Barandur) and 1.2 to 6.5 larvae per plant at Bhadravathi taluk (Location IV, Tadsa). The highest incidence of 7.2, 7.9, 6.5 larvae per plant was observed during October month at Shimoga district, (Location I, Shettihalli), (location II, Honnavile) and Bhadravathi taluka (Location IV, Tadsa) and 6.5 larvae per plant was observed during September month at Bhadravathi taluk (Location III, Barandur). The lowest population of 1.6 and 1.1 larvae per plant was recorded during July month at location I, II, 0.7, and 1.2 larvae per plant was recorded at location III and location IV. The *D. aphidivora* population had two peaks in a year one at October and another at January. The correlation between the *D. aphidivora* population and weather parameters revealed that the incidence of *D. aphidivora* was negatively correlated with minimum temperature, maximum temperature and rainfall and positively correlated with relative humidity in all the four locations. The correlation between *D. aphidivora* population and SWA population showed significant positive correlation at location I, location III and location IV and non-significant negative correlation at location II. The natural enemies recorded on *D. aphidivora* were the field lizards and an unidentified bird, which devoured *D. aphidivora*. No parasites were recorded on *D. aphidivora.*

How to view point the article : Mythri, Hugar, S.V. and Pradeep, S. (2016). Seasonal incidence of *Dipha aphidivora* Meyrick (Pyralidae: Lepidoptera) in Bhadra command areas. *Internat. J. Plant Protec.*, **9**(1) : 52-57.

***Corresponding author:**
Email: hugars2000@gmail.com

INTRODUCTION

Sugarcane (*Saccharum officinarum* L.) is the most important cash crop and it has an important position in the agrarian economy of India. It provides the

employment opportunities to more than half a million people, either skilled or semi skilled workers, mostly from rural areas and also gives some fuel as a byproduct along with a large number of high-cost, value-added products (Shrivastava *et al*., 2011). It has a lion's share in accelerating industrialization process and bringing socio-economic changes in rural areas (Pandey, 2007). It is the second largest agro-processing industry, costs almost Rs. 30000 crore, after textiles in India. The area which occupied with sugarcane is around 4.4 million hectares and an average productivity is 68 tonnes/ha. India is one of the major producer as well as consumer of sugar. It produces 18.9 million tonnes of sugar which is nearly 11.8 per cent of the total sugar production of the world. The sugarcane crops grown in tropical and subtropical zone in India covers 40- 60 per cent of the total cane area of the country (Kumar and Sharma, 2014).

About 289 different pests affect sugarcane, out of which 213 are insects and 76 are non-insect pests. Of these, about 20 are considered as major pests, 81 are minor and 188 are sporadic in occurrence. The severe outbreak of sugarcane woolly aphid (SWA), *Ceratovacuna lanigera* Zehntner is a new addition as a major pest causing notable losses in cane yield (7 to 39 %) and sugar recovery (1.2 to 3.43 %) (Patil *et al*., 2003). SWA was first time recorded in Java (Indonesia), later in West Bengal (India) (Basu and Banerjee, 1958) and subsequently in different regions (Patil *et al*., 2003; Chakravarthy and Rajanna, 2004). The nymphs and adults found on the ventral surface suck the sap resulting in tip and marginal yellowing initially, leading to drying of leaves. The excretion of honeydew causes development of sooty mould on upper surface of lower leaves with a reduction in photosynthetic area, resulting in reduction of cane internodal length, cane girth and deterioration of juice quality and quantity (Patil *et al*., 2003).

The sugarcane ecosystem is such that no methods of pest suppression would be more feasible than the biological control. There are about seven parasitoids, 30 predators and four pathogens affecting woolly aphid. Among them, *Dipha aphidivora* Meyrick (Pyralidae: Lepidoptera) commonly known as pyralid webber, is considered as one of the potential predators. Many reported the importance of predator, *D. aphidivora* in managing *C. lanigera* pest (Arakaki, 1992; Cheng *et al*., 1994; Liu *et al*., 1985; Tripathi, 1995; Rabindra *et al*., 2002; Patil *et al*., 2003; Balikai and Patil, 2003; Balikai *et al*., 2004 and Kulkarni and Kambrekar, 2005), but few recorded the seasonal activity of the predator (Pramono *et al*., 1999; Patil *et al*., 2003; Phukan *et al*., 1988 and Gupta and Goswami, 1995). Therefore, attempt was made to record the seasonal activity of *D. aphidivora* in the Badhra command areas of Karnataka.

MATERIAL AND METHODS

For studying the seasonal incidence of *D. aphidivora*, four sugarcane fields were selected at Agricultural Research Station, Honnavile, Shettihalli of Shimoga district, and Tadsa and Barandur villages of Bhadravathi taluk. Geographically Shimoga district is situated between north latitude $13^0$27'-$14^0$39' and east longitude $74^0$37'-$75^0$52' with an altitude of 650 meters above the MSL with the mean annual rainfall of 842.33mm. The studies were conducted from the first fortnight of June 2005 to second fortnight of May 2006 and the observations were recorded at fortnightly intervals.

To assess the population of sugarcane woolly aphid, ten sugarcane clumps were selected at each location and the populations of woolly aphid were recorded as number of aphids per 2.5cm^2 leaf area on top, middle and bottom leaves by using 2.5cm^2 window cut paper. Similarly, the larvae of *D. aphidivora* were counted on these plants and expressed as numbers per plant. Simultaneously, the natural enemies of *D. aphidivora* were also recorded. The meteorological data on maximum and minimum temperature, relative humidity and rainfall were collected and correlated with the population of the predator. The predator population was also correlated with SWA population.

RESULTS AND DISCUSSION

The seasonal incidence of *D. aphidivora* in location I (Shettihalli of Shimoga taluk), location II (Honnavile of Shimoga taluk), location III (Barandur of Bhadravathi taluk) and location IV (Tadsa of Bhadravathi taluk) revealed that the incidence ranged from 1.6 (during July II fortnight) to 7.2 (during October II fortnight) (Table 1), 1.1 (during July II fortnight) to 7.9 (during October II fortnight) (Table 2), 0.7 (during August I fortnight) to 6.9 (during September II fortnight) (Table 3) and 1.2 (during August I fortnight) to 6.5 (during October I fortnight) (Table 4) larvae per plant, respectively during the period of study. The *D. aphidivora* population in

Table 1 : Seasonal incidence of *D. aphidivora* in location I (Shettihalli of Shimoga taluk) during 2005–2006

Period of sampling	Mean no. of SWA/2.5cm^2	Mean No. of *Dipha*/plant	Temperature (C^0)			RH (%)	Rainfall (mm)
			Minimum	Maximum	Average		
June I FN	32.6	3.3	23.60	32.45	28.02	84.50	151.60
June II FN	38.4	2.8	21.53	27.94	24.73	85.41	104.80
July I FN	40.60	2.5	20.10	28.09	20.00	82.60	106.20
July II FN	49.80	1.6	19.90	28.26	24.08	83.42	252.70
Aug I FN	52.80	1.8	19.46	29.01	24.23	89.40	105.20
Aug II FN	51.11	2.5	19.68	30.53	25.10	87.75	44.04
Sep I FN	56.23	5.1	21.80	29.20	25.50	83.72	26.28
Sep II FN	59.42	5.3	20.80	29.64	25.23	82.00	12.40
Oct I FN	52.80	6.7	19.80	28.20	24.00	84.00	146.40
Oct II FN	53.26	7.2	19.65	29.04	24.30	81.00	160.20
Nov I FN	49.80	3.2	19.05	28.92	23.98	77.70	3.40
Nov II FN	36.25	3.1	17.45	28.67	23.06	76.40	5.40
Dec I FN	28.50	2.8	14.80	25.90	20.35	75.35	00.00
Dec II FN	39.46	3.4	15.56	31.50	23.53	74.42	00.00
Jan I FN	50.05	4.2	13.15	33.96	23.55	76.13	00.00
Jan II FN	36.60	4.6	18.32	31.44	24.88	71.50	00.00
Feb I FN	31.39	5.1	17.13	31.50	24.31	67.56	00.00
Feb II FN	30.10	4.1	18.23	32.93	25.58	65.70	00.00
Mar I FN	29.52	3.9	20.46	34.36	27.41	64.31	8.40
Mar II FN	26.50	3.7	22.02	34.88	28.45	66.21	0.80
Apr I FN	26.07	2.6	20.93	32.50	26.71	63.89	24.20
Apr II FN	30.10	2.2	23.40	34.10	29.14	64.72	00.00
May I FN	36.52	2.0	26.67	31.62	29.14	66.13	11.20
May II FN	27.90	4.2	21.40	35.33	28.36	65.45	48.80

FN= Fortnight RH=Relative humidity

Table 2 : Seasonal incidence of *D. aphidivora* in location II (Honnaville of Shimoga taluk) during 2005–2006

Period of sampling	Mean no. of SWA/2.5cm^2	Mean No. of *Dipha*/plant	Temperature (C^0)			RH (%)	Rainfall (mm)
			Minimum	Maximum	Average		
June I FN	29.50	2.6	24.32	31.60	27.96	82.65	51.00
June II FN	32.10	2.0	22.51	27.02	24.76	83.45	71.90
July I FN	37.50	1.4	22.36	25.45	23.89	84.29	66.40
July II FN	38.60	1.1	24.08	26.76	24.89	86.21	131.10
Aug I FN	39.10	3.1	22.02	25.57	23.79	85.50	142.90
Aug II FN	42.00	2.8	22.04	26.98	24.51	87.01	34.50
Sep I FN	49.50	6.6	23.80	26.29	25.04	83.21	42.60
Sep II FN	52.70	5.8	24.80	27.12	25.96	84.00	00.00
Oct I FN	44.40	5.6	23.71	28.60	25.87	76.50	68.70
Oct II FN	37.60	7.9	25.40	27.60	26.5	76.90	51.50
Nov I FN	33.20	4.6	24.10	33.80	28.29	76.25	00.00
Nov II FN	31.50	3.9	17.40	29.65	23.52	76.35	00.00
Dec I FN	46.20	3.4	16.50	27.40	21.95	77.59	00.00
Dec II FN	32.10	4.2	14.90	27.23	21.06	77.22	00.00
Jan I FN	28.10	4.6	14.50	29.23	21.8	61.45	00.00
Jan II FN	24.00	5.0	16.30	29.36	22.22	61.33	00.00
Feb I FN	22.20	4.3	18.40	31.20	25.05	63.51	00.00
Feb II FN	19.60	6.0	17.10	33.51	26.71	62.33	00.00
Mar I FN	22.60	4.1	18.50	34.02	26.55	64.10	42.00
Mar II FN	29.40	3.7	17.70	35.52	27.20	61.34	00.00
Apr I FN	33.88	2.6	22.50	34.21	29.06	66.40	00.00
Apr II FN	37.77	2.2	21.00	34.03	28.56	66.23	00.00
May IFN	40.10	2.0	21.20	35.63	28.53	65.10	00.00
May II FN	49.50	2.2	20.15	35.22	27.60	65.35	32.70

FN= Fortnight RH=Relative humidity

Table 3 : Seasonal incidence of *D. aphidivora* in location III (Barandur of Bhadravathi taluk) during 2005 – 2006

Period of sampling	Mean no. of SWA/2.5cm^2	Mean No. of *Dipha*/plant	Temperature (C^0)			RH (%)	Rainfall (mm)
			Minimum	Maximum	Average		
June I FN	30.05	2.2	21.06	30.20	25.63	82.50	109.10
June II FN	30.99	1.3	20.55	29.20	24.87	86.35	25.40
July I FN	32.06	2.3	19.40	28.40	23.90	82.60	29.20
July II FN	35.51	2.6	21.21	28.60	24.63	84.35	61.90
Aug I FN	28.05	0.7	19.56	25.40	22.48	87.40	202.00
Aug II FN	41.09	1.4	20.61	26.62	23.61	85.75	40.00
Sep I FN	45.21	4.2	20.82	27.66	24.24	84.35	16.30
Sep II FN	52.55	6.9	20.80	28.45	24.62	83.35	44.30
Oct I FN	48.10	4.2	20.14	30.60	25.37	83.40	51.20
Oct II FN	39.50	5.8	19.75	29.66	24.70	80.60	4.10
Nov I FN	31.20	3.2	15.45	28.16	21.80	79.70	14.70
Nov II FN	30.12	3.6	14.46	29.92	22.19	76.40	00.00
Dec I FN	32.77	1.2	14.56	30.10	21.33	76.45	00.00
Dec II FN	34.44	2.2	13.19	29.75	21.47	74.35	00.00
Jan I FN	45.2	3.5	17.35	31.89	24.62	76.76	00.00
Jan II FN	35.4	3.6	17.16	33.70	25.43	75.10	00.00
Feb I FN	40.2	2.6	17.23	34.21	25.72	71.50	00.00
Feb II FN	25.5	1.8	18.46	34.53	26.49	67.86	00.00
Mar I FN	23.33	3.2	19.51	34.82	27.16	65.60	00.00
Mar II FN	31.11	3.6	20.93	35.40	28.16	63.41	00.00
Apr I FN	26.66	2.2	22.40	34.62	28.51	65.75	00.00
Apr II FN	30.00	3.1	20.87	34.23	29.05	64.83	00.00
May I FN	35.55	3.1	21.51	34.50	28.50	64.72	00.00
May II FN	41.11	2.5	20.62	35.43	28.01	64.45	54.60

FN= Fortnight RH=Relative humidity

Table 4 : Seasonal incidence of *D. aphidivora* in location IV (Tadsa of Bhadravathi taluk) during 2005 – 2006

Period of sampling	Mean no.of SWA/2.5cm^2	Mean No. of *Dipha*/Plant	Temperature (C^0)			RH (%)	Rainfall (mm)
			Minimum	Maximum	Average		
June I FN	19.20	2.1	20.53	31.60	26.06	82.45	187.40
June II FN	16.72	1.7	20.66	29.79	25.25	81.75	31.20
July I FN	21.33	1.7	20.94	28.73	24.83	84.27	41.20
July II FN	29.43	1.4	19.51	29.20	24.35	88.10	210.00
Aug I FN	31.41	1.2	16.05	28.28	22.16	83.05	28.60
Aug II FN	36.52	1.5	18.50	28.45	23.47	86.16	24.30
Sep I FN	40.10	4.2	19.54	30.52	25.03	84.50	35.60
Sep II FN	45.10	5.0	18.20	30.61	24.46	84.30	65.20
Oct I FN	51.20	6.5	19.30	31.60	25.45	84.00	9.40
Oct II FN	49.42	6.4	20.20	32.51	26.67	79.50	00.00
Nov I FN	33.21	2.6	19.10	33.15	26.12	78.40	00.00
Nov II FN	30.46	1.6	14.86	32.69	23.77	76.30	00.00
Dec I FN	26.10	2.8	15.10	33.15	24.12	77.46	00.00
Dec II FN	21.40	2.9	15.02	32.69	23.85	76.50	00.00
Jan I FN	33.10	1.9	16.3	32.73	24.50	62.10	00.00
Jan II FN	31.20	1.5	16.02	33.21	24.61	62.83	00.00
Feb I FN	22.50	2.6	17.10	33.91	25.50	61.45	00.00
Feb II FN	26.20	1.8	16.20	34.20	25.20	62.33	00.00
Mar I FN	32.66	3.2	19.20	34.80	27.00	63.50	00.00
Mar II FN	26.42	4.1	20.05	36.33	28.19	61.30	00.00
Apr I FN	34.91	2.6	22.71	38.00	30.35	64.50	00.00
Apr II FN	37.76	2.1	23.53	38.11	30.82	66.23	00.00
May I FN	26.66	1.6	24.02	35.18	29.60	65.43	00.00
May II FN	29.45	2.2	21.56	36.14	28.85	66.71	41.00

FN= Fortnight RH=Relative humidity

location I (Table 1) and location II (Table 2) had two peaks in the year and the population in location III (Table 3) and location IV (Table 4) had one peak during the year. This reveals that predator is host dependent, which occur in large numbers during September to October months when the aphid population is also high on the crop.

In location I (Shettihalli of Shimoga taluk), *D. aphidivora* population had a non-significant negative correlation (Y=5.445+(-0.090) X, p=0.40, r =-0.17) with minimum temperature (Table 1) and non-significant positive correlation (Y=3.221+0.013X, p=0.82, r=0.04,) with maximum temperature (Table 1). *D. aphidivora* incidence showed a non-significant positive correlation (Y=3.470+0.002X, p=0.93, r = 0.01) with relative humidity and non-significant negative correlation (Y=3.671+ (-0.004) X, p=0.22, r=(-0.25)) with rainfall (Table 1).

In Location II: Honnavile (Shimoga district), the *D. aphidivora* population had (Y=5.530+(-0.009) X, p=0.38, r=(-0.02)) non-significant negative correlation with minimum temperature (Table 2) and non-significant negative correlation (Y=5.933+(-0.067) X, p=0.92, r=(-0.14)) with maximum temperature (Table 2). The incidence of *D. aphidivora* showed a non-significant positive correlation (Y=5.097+(-0.016) X, p=0.68, r =(0.08)) with relative humidity and non-significant negative correlation (Y=4.302+0.0128X, p=0.13 r=-0.31) with rainfall (Table 2).

In Location III: Barandur (Bhadravathi taluk), the population of *D. aphidivora* had a non-significant negative correlation (Y=1.6751+0.6674) X, p=-0.51, r = (-0.12)) with minimum temperature (Table 3) and non-significant negative correlation (Y=2.269+0.0221X, p=0.82, r=(-0.04)) with maximum temperature (Table 3). The incidence of *D. aphidivora* showed a non-significant positive correlation (Y=1.881+0.014X, p=0.69, r=0.08) with relative humidity (Table 3). The incidence of *D. aphidivora* showed a non-significant positive correlation (Y=3.169+0.007 X, p=0.22, r=0.25) with rainfall (Table 3).

In Location IV: Tadsa (Bhadravathi taluk), the *D. aphidivora* population had a non significant negative correlation (Y= 1.800+0.1830X, p=-0.092, r= (-0.06)) with minimum temperature (Table 4) and non significant negative correlation (Y= 4.005+ (-0.0524X, p=0.12, r=-0.06) with maximum temperature (Table 4). The incidence of *D. aphidivora* showed a non-significant positive correlation (Y=1.781+0.026X, p=0.43, r=0.16) with relative humidity (Table 4). *D. aphidivora* incidence had a non significant negative correlation (Y= 2.3797+(-0.014)X, p=0.73, r=-0.13) with the rain fall (Table 4).

D. aphidivora population was negatively correlated with minimum temperature, maximum temperature, relative humidity and rainfall at all the four locations and positively correlated with relative humidity. This may due to change in climatic factors in different locations. These results are in conformity with the findings of Phukan *et al*. (1988) who reported that one peak in the population of *D. aphidivora* in the month of October. This may be due to change in climatic factors. The natural enemies recorded on *D. aphidivora* are the field lizards and an unidentified bird that predated *D. aphidivora*. The literature pertaining to this finding is almost lacking. This reveals that further research should be taken in this aspect.

REFERENCES

Arakaki, N. (1992). Seasonal occurrence of the sugarcane woolly aphid, *Ceratovacuna lanigera* Zehntner (Homoptera: Aphididae) and its predators in sugarcane fields of Okinawa Island. *Appl. Entomol. & Zool.,* **27**: 99-105.

Balikai, R.A., Kotikal, Y.K. and Patil, R.K. (2004). Sugarcane white woolly aphid situation in Bijapur and Bagalkot districts of northern Karnataka and its management. Paper presented in *the National Symposium on aphids* "*Aphids in Agriculture and Forestry*", University of Kalyani, Kalyani-741 235, West Bengal, 24-25 November, 2004, p. 26.

Balikai, R.A. and Patil, R.K. (2003). Sugarcane white woolly aphid situation in Bijapur district and its management. *Paper Presented in MOA, GOI Sponsored State Level Collaborative Training Course on Woolly aphid Management in Sugarcane* organised by the University of Agricultural Sciences, Dharwad from 19-23 December, 2003, pp. 26-27.

Basu, A.N. and Banerjee, S.N. (1958). Aphids of economic plants of West Bengal. *Indian Agric.,* **2** : 89-112.

Chakravarthy, A.K. and Rajanna, D. (2004). Sugarcane woolly aphid, *Ceratovacuna lanigera* Zehntner (Homoptera: Pemphigidae) in South Karnataka. *Insect Environ.*, **9**: 185-187.

Cheng, W.Y., Wang, Z.T., Hung, T.H. and Hung, J.K. (1994). Factors and their effect on the occurrence of sugarcane woolly aphid. *Report of Taiwan Sugar Research Institute,* **145**: 1-24.

Gupta, M.K. and Goswami, P.K. (1995). Incidence of sugarcane woolly aphid and its effect on yield attributes and juice quality. *Indian Sugar,* **44** : 883-885.

Kulkarni, K.A. and Kambrekar, D.N. (2005). Predator on sugarcane woolly aphid. *The Hindu*, January 8.

Kumar, Ajay and Sharma, Pritee (2014). Climate change and sugarcane productivity in India: An econometric analysis. *J. Soc. & Development Sci.*, **5** : 111-122.

Liu, Z.C., Sun, Y.R., Wang, Z.Y. and Liu, G.F. (1985). The role of biological control in integrated management of sugarcane insect pests. *Natural Enemies of Insect Kunchong Tiandi*, **7** : 216-222.

Pandey, A.P. (2007). Indian Sugar Industry -A Strong Industrial Base for Rural India. MPRA Paper, 6065

Patil, R.K., Ramegowda, G.K., Rachappa, V., Lingappa, S. and Tippannavar, P.S. (2003). Record of woolly aphid, *Ceratovacuna lanigera* Zehntner (Homoptera: Pemphigidae) on sugarcane in Northern Karnataka. *Insect Environment*, **9**: 57-58.

Phukan, E., Datta, S.K. and Smarifulaph, M. (1988). Population build up of sugarcane aphid, *Ceratovacuna lanigera* Zehntner. *Co-operative Sugar*, **19**: 311-312.

Pramono, D., Suhartawan, H., Samoedi, D., Singh, V. and Kumar, V. (1999). Seasonal fluctuation of white sugarcane aphid, *Ceratovacuna lanigera* Zehntner (Aphididae: Homoptera) in South Sulawesi. *Proceedings of the XXIII-ISSCT-Cogress*, New Delhi, India, **2**: 542-552.

Rabindra, R.J., Mohanraj, P., Poorani, J., Jalali, S.K., Joshi, S.S. and Ramani, S. (2002). *Ceratovacuna lanigera* Zehntner (Homoptera: Aphididae), a serious pest of sugarcane in Maharashtra and attempts at its management by biological means. *Indian J. Appl. Entomol.*, **16**: 171-172.

Shrivastava, A.K., Shrivastava, A.K. and Solomon, S. (2011). Sustaining sugarcane productivity under depleting water resources. *Curr. Sci.*, **10**(06) : 748-754.

Tripathi, G.M. (1995). Record of parasite and predator complex of sugarcane woolly aphid, *Ceratovacuna lanigera* Zehntner in Nagaland, *Indian Sugar*, **44**: 883-885.