

## Original Research Article

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## Population Status of Sugarcane Leaf Hopper, *Pyrilla perpusilla* (Walk.) and its Natural Enemies at Kabirdham District of Chhattisgarh, India

Bhupesh Joshi<sup>1\*</sup>, V.K. Soni<sup>2</sup> and D.K. Rana<sup>1</sup>

<sup>1</sup>Department of Entomology, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh-492012, India

<sup>2</sup>SK College of Agriculture and Research Station, Kawardha (Kabirdham) Chhattisgarh-491995, India

\*Corresponding author

### ABSTRACT

Population status of sugarcane leaf hopper, *Pyrilla perpusilla* (Walk.) and its natural enemies were studied at Kabirdham District of Chhattisgarh. During the year 2016-17 and 2017-18, the population of sugarcane leaf hopper, *P. perpusilla* (Walk.) was first occurred second fortnight of July with 1.63 and 0.64 eggs, 0.07 and 0.04 nymphs and 0.04 and 0.05 adults leaf<sup>-1</sup> and gradually decreased first fortnight of January with 1.42 and 0.84 eggs, 0.80 and 0.47 nymphs and 0.32 and 0.24 adults leaf<sup>-1</sup>, respectively. Second fortnight of September peak activity was noticed with 31.27 nymphs and 5.93 adults leaf<sup>-1</sup> but in case of eggs 9.44 eggs leaf<sup>-1</sup> at first fortnight of October during the year 2016-17. Similarly, during the year 2017-18 peaks was observed first fortnight of October with 27.72 nymphs and 5.94 adults leaf<sup>-1</sup> but eggs was 9.24 eggs leaf<sup>-1</sup> during second fortnight of October. Two natural enemies viz. egg parasitoid, *Tetrastichus pyrillae* (Chrawford) and entopathogenic fungus, *Metarhizium anisopliae* (Metschn) have play role to suppress the population of *P. perpusilla*. The maximum egg parasitization by *T. pyrillae* was noticed during second fortnight of December with 43.12 and 45.19 per cent. Parasitization by *M. anisopliae* was high during the first and second fortnight of October during the year 2016-17 and 2017-18 with 11.63 and 16.31 per cent.

#### Keywords

Sugarcane leaf hopper,  
*Pyrilla perpusilla*,  
Natural enemies,  
*Tetrastichus pyrillae* and  
*Metarhizium anisopliae*

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### Introduction

Sugarcane, an important agro-industrial crop in India and is cultivated under diverse agro climatic conditions in about 84 countries of the world. In India sugarcane is cultivated in 50.32 lakh ha area, producing 3593.30 lakh tonnes with productivity of 70.86 tonnes ha<sup>-1</sup> (Anonymous, 2015a). It is attacked by various insect pests, more than 200 species of insect

and few species of non-insect pest have been recorded on the sugarcane in different part of country. Isaac (1937) listed 79 species of insects infesting sugarcane and categorized 18 as major pests and 21 as minor pests which are important limiting factors for obtaining high yield of sugarcane. Sugarcane leaf hopper, *Pyrilla perpusilla* (Walk) (Hemiptera: Lophopidae) is one of the most serious pest widely distributed on wheat, barley, oats,

maize, sorghum and numbers of grasses in many part of the country, often reaching epidemic levels in the subtropics (Gupta and Avasthi, 1957; Chaudhary and Sharma, 1990; Kumarasinghe, 1996; Rajak, 2007; Pandey *et al.*, 2008, Patre *et al.*, 2017). *P. perpusilla* feeding results in poor growth which also causes difficulty in milling of affected canes (Kumarasinghe and Wratten, 1996). Zubair *et al.*, (2006) also estimated the *Pyrilla* cause a reduction in the yield about 15-20, 10-20 and 30-35 percent, respectively. In some time the loss was 80-85 per cent. The pest remains active throughout the year with 3-4 numbers of generations with optimum activity from July to September (Shah and Saleem, 2002). *P. perpusilla* causes indirect losses. The nymphs and adults cause heavy damage to the plant and excrete thick transparent liquid known as honey dew which is good medium for the growth of black mold.

The mold reduces the photosynthetic activity of the leaves and reduces about 25% of the sugar yield. The cane juice becomes high in glucose and if it is used for making gur gives a soggy mass which does not solidify properly (Chaudhry and Ansari, 1988). An early infestation during the grand growth period of cane adversely affects the yield while the late-infestation from September onwards mostly affects the sucrose contents of cane (Puri and Siddharth, 2001).

Sugarcane is cultivated as one of the major cash crops in Kabirdham, Ambikapur and Balod district of Chhattisgarh where Kabirdham contributing 20,765 hectare of area with productivity of 82.3 tonnes ha<sup>-1</sup> (Anonymous, 2017). Kabirdham is *Pyrilla* prone district of Chhattisgarh. In year 2014-15, the sugarcane crop was severely infested by *P. perpusilla* with an average 10-20 adult and 50-100 nymphs leaf<sup>-1</sup> in Kabirdham (Anonymous, 2015b). In recent decades, elevated awareness of the impacts of pesticide

on the environment and human health has resulted in efforts to reduce reliance on chemical control. Use of biological control agents is most suitable eco-friendly management strategy which minimize disturbance of the ecosystem. Long term controls of *Pyrilla* have been possible through the use of the biological control agents. These are most suitable and eco-friendly management techniques which minimize disturbance of the ecosystem (Anonymous, 2015c).

For the adaptation of eco-friendly management practices in sugarcane, the first step is to know the pest status and their natural enemies by monitoring. Hence, the present study was conducted during 2016-17 and 2017-18 at Kawardha district Kabirdham of Chhattisgarh.

### **Materials and Methods**

Fixed plot survey was conducted for the study of population status of sugarcane leaf hopper, *Pyrilla perpusilla* (Walk.) and its natural enemies during the year 2016-17 and 2017-18 at district Kabirdham of Chhattisgarh. Two blocks *viz.* Kawardha and Bodla were selected & in each block two fields were selected. From each block the *Pyrilla* occurrence was studied and similarly their natural enemy was observed on same leaf and per cent parasitization was also calculated at fifteen days interval on thirty randomly selected sugarcane leaves.

The population of *P. perpusilla* (Walk.) was observed on three leaves *i.e.* top, middle and lower leaves on 10 randomly selected plants from each location. Number of egg mass, nymph and adult of *P. perpusilla* (Walk.) was recorded on each leaf of plant. No pesticide was applied during the crop period. At each location ten egg masses of sugarcane leaf hopper were collected at fifteen days interval

than each egg mass was cut along with leaf 5 cm length. Each egg mass was kept inside the ½ kg poly bag afterwards emergence of parasitoid from the egg mass total number of eggs, parasitized egg and unparasitized eggs was counted with the help of binocular microscope. Percentage of egg parasitism of sugarcane leaf hopper was recorded by using the following formula as described by Mishkatand Khalid (2007).

$$\text{Egg parasitism (\%)} = \frac{\text{Total no. of parasitized egg}}{\text{Total no. of eggs}} \times 100$$

Parasitization by *M. anisopliae* on nymphs and adults of sugarcane leaf hopper thirty sugarcane leaves were randomly selected at fifteen days interval from each location. Percentage parasitism by *M. anisopliae* on sugarcane leaf hopper was carried out by using the following formula.

$$\text{Percent parasitization (\%)} = \frac{\text{No. of parasitized nymph and adult}}{\text{Total no. of nymph and adult}} \times 100$$

## Results and Discussion

Population status of sugarcane leaf hopper, *Pyrilla perpusilla* (Walk.) on sugarcane crop revealed that the occurrence of sugarcane leaf hopper, *P. perpusilla* commenced from second fortnight of July goes on increasing till October and then falls down in November to January.

Results revealed that during the year 2016-17 and 2017-18, the population of sugarcane leaf hopper, *P. perpusilla* (Walk.) was first occurred second fortnight of July with 1.63 and 0.64 eggs, 0.07 and 0.04 nymphs and 0.04 and 0.05 adults leaf<sup>-1</sup> and gradually decreased first fortnight of January with 1.42 and 0.84 eggs, 0.80 and 0.47 nymphs and 0.32 and 0.24 adults leaf<sup>-1</sup>, respectively. Second fortnight of September with 31.27 nymphs and 5.93 adults

leaf<sup>-1</sup> but in case of eggs 9.44 eggs leaf<sup>-1</sup> were noticed first fortnight of October as peak during the year 2016-17. Similarly, during the year 2017-18 peaks was observed first fortnight of October with 27.72 nymphs and 5.94 adults leaf<sup>-1</sup> but eggs was 9.24 eggs leaf<sup>-1</sup> during second fortnight of October (Table 1).

Variation in results regarding appearance of *Pyrilla* may be attributed to difference in area. Chaudhary *et al.*, (1987) noticed *Pyrilla* outbreak on sugarcane in Haryana. In most parts of the state the *Pyrilla* from July onwards with average populations 137.1 nymphs and adults per leaf. Chaudhary and Sharma (1990) reported that the *Pyrilla* population was maximum 12.1 adults per plant during 2<sup>nd</sup> fortnight of August, falling to 1.8 adults per plant in the 2<sup>nd</sup> week of September.

Two natural enemies viz. egg parasitoid, *Tetrastichus Pyrillae* (Chrawford) and entomopathogenic fungus, *Metarhizium anisopliae* (Metschn) has play role to suppress the eggs, nymphs and adults population of *P. perpusilla*. The egg parasitoid, *T. Pyrillae* was first appeared in first fortnight of August and gradually increasing trend of parasitization at second fortnight of December. The population was disappeared at first fortnight of January.

The maximum parasitization was noticed during second fortnight of December with 43.12 and 45.19 per cent during the year 2016-17 and 2017-18, respectively (Table 2). Similar trend of result was obtained by Miah *et al.*, (1986) who studied the alternative food and natural enemies of the sugarcane pest *P. perpusilla*. These results indicated that *P. perpusilla* could survive in areas of limited sugarcane plantation. *Tetrastichus Pyrillae* was identified as the egg parasite. Yadav and Choudhary (1987) reported that the *T. Pyrillae* was egg parasitoid of sugarcane leaf hopper, *P. perpusilla*

**Table.1** *Pyrilla perpusilla* population on sugarcane crop at Kabirdham

Date	Eggs Leaf <sup>1</sup>			Nymphs leaf <sup>1</sup>			Adults leaf <sup>1</sup>		
	2016-17	2017-18	Pooled Mean	2016-17	2017-18	Pooled Mean	2016-17	2017-18	Pooled Mean
30-Jul	1.63	0.64	<b>1.14</b>	0.07	0.04	<b>0.06</b>	0.04	0.05	<b>0.05</b>
15-Aug	2.16	2.30	<b>2.23</b>	0.21	0.57	<b>0.39</b>	0.08	0.23	<b>0.16</b>
30-Aug	3.40	3.91	<b>3.66</b>	4.18	5.56	<b>4.87</b>	1.04	1.15	<b>1.10</b>
15-Sep	6.21	4.52	<b>5.37</b>	21.87	13.56	<b>17.72</b>	4.34	3.13	<b>3.74</b>
30-Sep	8.48	5.63	<b>7.06</b>	31.27	14.84	<b>23.06</b>	5.93	4.23	<b>5.08</b>
15-Oct	9.44	6.82	<b>8.13</b>	28.59	27.72	<b>28.16</b>	4.39	5.94	<b>5.17</b>
30-Oct	6.83	9.24	<b>8.04</b>	25.34	22.46	<b>23.90</b>	4.08	4.42	<b>4.25</b>
15-Nov	4.72	4.37	<b>4.55</b>	21.02	12.26	<b>16.64</b>	2.68	3.44	<b>3.06</b>
30-Nov	4.83	2.60	<b>3.72</b>	16.40	9.67	<b>13.04</b>	2.31	2.19	<b>2.25</b>
15-Dec	3.35	1.76	<b>2.56</b>	7.77	7.91	<b>7.84</b>	1.74	1.67	<b>1.71</b>
30-Dec	3.01	1.21	<b>2.11</b>	4.17	2.79	<b>3.48</b>	1.06	0.87	<b>0.97</b>
15-Jan	1.42	0.84	<b>1.13</b>	0.80	0.47	<b>0.64</b>	0.32	0.24	<b>0.28</b>

**Table.2** Natural parasitization of *Pyrilla perpusilla* on sugarcane crop at Kabirdham

Date	Percentage parasitization by egg-parasitoid, <i>Tetrastichus Pyrillae</i>			Percentage parasitization by ento-pathogenic fungus, <i>Metarhizium anisopliae</i>		
	2016-17	2017-18	Pooled Mean	2016-17	2017-18	Pooled Mean
30-Jul	0.00	0.00	<b>0.00</b>	0.00	0.00	<b>0.00</b>
15-Aug	0.00	0.00	<b>0.00</b>	0.00	0.00	<b>0.00</b>
30-Aug	3.27	0.00	<b>1.64</b>	0.00	0.00	<b>0.00</b>
15-Sep	15.87	0.00	<b>7.94</b>	9.50	0.00	<b>4.75</b>
30-Sep	18.86	4.13	<b>11.50</b>	3.60	0.00	<b>1.80</b>
15-Oct	18.49	19.99	<b>19.24</b>	11.63	4.16	<b>7.90</b>
30-Oct	21.31	26.43	<b>23.87</b>	6.42	16.31	<b>11.37</b>
15-Nov	17.16	30.34	<b>23.75</b>	0.00	0.00	<b>0.00</b>
30-Nov	31.35	34.15	<b>32.75</b>	0.00	0.00	<b>0.00</b>
15-Dec	38.07	44.24	<b>41.16</b>	0.00	0.00	<b>0.00</b>
30-Dec	43.12	45.19	<b>44.16</b>	0.00	0.00	<b>0.00</b>
15-Jan	0.00	0.00	<b>0.00</b>	0.00	0.00	<b>0.00</b>

Green muscardine fungus, *M. anisopliaean* ento-pathogenic fungus on nymphs and adults of sugarcane leaf hopper, *P. perpusilla* under field condition on sugarcane crop revealed that the parasitization was first appeared with 9.50 per cent parasitization in first fortnight of September and gradually increasing and reached maximum parasitization 11.63 per at first fortnight of October during the year 2016-17 but second year 2017-18 the *M. anisopliae* was first appeared with 4.16 per cent parasitization in first fortnight of October and gradually increasing and reached maximum parasitization 16.31 per at second fortnight of October (Table 2). Similar finding were found by Oblisami *et al.*, (1969) who isolated *M. anisopliae* from *P. perpusilla* proved pathogenic to another species of *Pyrilla*. Varma *et al.*, (1977) observed nymphal mortality caused by fungi in August-November. A comparative symptom of infection by *M. anisopliae* was seen on *Pyrilla*. Asre *et al.*, (1983) reported that the effectiveness of natural enemies for the control of *P. perpusilla* on sugarcane. The entomopathogenic fungi *M. anisopliae* was caused septicemia on *Pyrilla*. Varma and Singh (1987) used *M. anisopliae* as microbial pesticide against leafhopper. On the basis of pooled mean the *Pyrilla* population was first appeared in first fortnight of July with 1.14 eggs, 0.06 nymphs and 0.05 adults leaf<sup>-1</sup> and gradually increasing and reached maximum with 8.13 eggs, 28.16 nymphs and 5.17 adults leaf<sup>-1</sup> at first fortnight of October. The maximum parasitization by *T. Pyrillae* was noticed during second fortnight of December with 44.16 per cent and ento-pathogenic fungus *M. anisopliae* was high during the second fortnight of October with 11.37 per cent (Table1 and 2).

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