International Journal of Advanced Life Sciences (IJALS)

ISSN 2277 – 758X

Nikendra Kumar, IJALS, Volume (13) Issue (3) August - 2020. RESEARCH ARTICLE

Host plant and treatment influence on population of sugarcane leafhopper in tropical field conditions

Nikendra Kumar

Research Scholar, Jai Prakash University, Chapra (Bihar), India

E-mail : nikuraj96@rediffmail.com

Corresponding Author

Nikendra Kumar

***Jai Prakash University, Chapra (Bihar), India**

E-mail : nikuraj96@rediffmail.com

Article History

Received on 26 June, 2020

Received in revised form 18 July, 2020; Accepted 15 August, 2020

Abstract

Sugarcane plant hopper *Pyrilla perpusilla* causes vast damage to the crop by sucking cell sap from the leaves. It is the problematic pest in sugarcane fields of north Bihar. The pest is found gregariously on the under surface of the leaves where they suck up plant sap that causes yellowing and eventually drying of leaves. Under low infestation yellow patches appear on the leaves. Photosynthesis is reduced resulting in the reduction of sucrose content. Hoppers secrete a sweet substance called honey dew that coats the leaves and attracts a blackish fungus, which reduces photosynthesis resulting in yield loss. The objective of study is to evaluate pest outbreak in different varieties of sugarcane fields. The various strategies were implied to minimize pest population limited to optimum level to use in place of pre-applied traditional approaches.

Keywords : Biological, Cultural, *Pyrilla perpusilla*, Sugarcane, Sustainable management, North Bihar and blackish fungus.

Introduction

Sugarcane is an important cash crop of agricultural and GDP respectively. This is a major pest in local fields. The insect in both larval and adult stage are capable to get cell-sap from several alternate plants as sugar cane and extensive loss observed, which reduces yield through cane-juice quantity and quality (Kumar and Yadav, 2006).

The infestation causing leaf discoloration and poor growth in sugarcane to raise crushing problems in crashers (Kumarasinghe and Wratten, 1996). There early outbreak affecting yield, and later one mostly upon juice quantity (Puri and Siddharth, 2001). These losses can only be reduced through Various Integrated Pest Management (IPM) treatments to fields throughout standing plant prior to harvesting for sugar and allied industry. There IPM may be fruitful to control pest outbreaks in normal conditions with consideration of modern techniques to improve natural resistance and some traditional approaches when applied in combination of treatments.

The IPM is desirable approach, which intends to integrate all possible control measures to keep the insect below an economic threshold level. The previous researches recommending pest control in sugarcane fields through IPM techniques are sustainable to the environment (Singh *et al.*, 2001; Verma *et al.*, 2002). There sugarcane genotypes having hard mid-rib, erect and narrow leaves, are preferable to cultivation. The biological control has been reported as major practice in Haryana, India (Madan, 2001) through ecto-parasitoid which is capable to control sugarcane leafhopper in both laboratory and field colonization. (Rajak, 2007 and Gangwar *et al.*, 2008). Wasim (2007)

reported chemical control as more effective than biological control of sugar cane leafhopper. Chemical control was a more effective method in comparison to the biological control of the management of *P. perpusilla* in sugarcane (Wasim, 2007).

The cultural practice is insufficient for *pyrilla* as insects feeds upon plant-parts for their development (Brar *et al.*, 1983), wherever it promoting ecto-parasite abundance upon insect eggs clarify their direct impact upon insect community (Mohyuddin and Qureshi, 1999; 2000) and also improves the aeration and sugarcane productivity (Kathiresan, 2004). The present study was designed to evaluate suitable control measures to the local sugarcane fields and awareness to local farmers.

Materials and Methods

Studies were carried out to screen out the material for the final investigations. Experiments were laid out in a Randomized Complete Block Design (RCBD), in the Kamla Rai College, Gopalganj. The objective of this study was to screen out the resistant and susceptible varieties, on the basis of *pyrilla* population, for the final investigations. Six commercial varieties and advanced lines of the sugarcane were sown on February 15, 2014. The experiment was repeated thrice, with a plot size of 13m×3.05m and a row to row distance of 0.76m, in a randomized complete block design. No plant protection measures were applied to treat the optimum conditions, for the pest attack. All the recommended agronomic practices, were applied, during the experiment.

Ten leaves were selected, randomly, from each plot, to check the population density of test insect, per leaf. Observations were taken, on a weekly basis. Three genotypes, each showing resistant, susceptible and intermediate response were selected for further experiments. There were nine genotypes, in total, to be selected. The size of the plot was kept at 13m x 4.58 m and a row to row distance was kept to be 0.76 m. There were five rows, in each plot, for each variety. The data, regarding the *pyrilla*-population, were recorded.

The data on the Morphological, physical and chemical plant-factors were studied from other four rows and correlated with the insect pest population. The data, regarding the *Pyrilla*-population, per leaf, were recorded, randomly, throughout the season, consistently, at an interval of 7 ± 2 days starting from May, 2017 to 2018.

Results

The mean comparison of the data, regarding the population of *P. perpusilla*, per leaf, on various selected genotypes of sugarcane revealed that the genotype CoC 671, obsessed maximum population of *P. perpusilla* and appeared to be comparatively susceptible, with a population of 17.24 pests per leaf, which differed significantly from those observed in all other genotypes. The minimum population of the pest was recorded to be 4.84, per leaf, on Co 238 (Table - 1).

Table - 1. *Pyrilla* population per leaf on various sugarcane genotypes under field conditions

Sugarcane Variety	Mean of *Pyrilla* Population	Type of Resistance
CO 0238	4.03	Resistant
COP 2061	4.56	Resistant
COP 112	6.90	Intermediate
CO 79158	7.30	Intermediate
COC 671	12.01	Susceptible
BO 138	12.37	Susceptible

Table - 2. A comparison of means regarding pysico-morphic characters in various selected genotypes of sugarcane.

Genotype	Leaf width (cm)	Leaf length (cm)	Hair density (cm^2)	Cane length (meter)	Cane dia (cm)
CO 0238	3.80	151	30.80	2.37	2.47
COP 2061	3.92	142	30.27	2.64	2.50
COP 112	4.43	128	21.57	2.58	2.49
CO 79158	4.58	131	19.03	3.46	2.68
COC 671	5.72	143	5.10	2.89	2.49
BO 138	6.16	138	6.13	2.90	2.45

Table - 3. A comparison of means for the data regarding chemical characters in various selected genotypes of the sugarcane.

Genotype	N	P	Min	Ca	Mg	Fat	CHO	Pol	Brix	CCS	Fiber
CO 0238	1.89	0.211	6.75	0.14	0.44	2.19	48.96	19.05	22.33	13.22	14.77
COP2061	1.86	0.211	6.69	0.15	0.46	2.18	48.74	19.47	20.89	12.70	14.77
COP 112	2.09	0.185	6.68	0.16	0.153	2.16	51.12	18.63	21.62	12.62	13.83
CO79158	2.19	0.168	6.70	0.15	0.165	2.18	53.68	18.46	21.34	12.97	11.92
COC 671	2.23	0.169	6.67	0.15	0.152	2.19	53.78	18.65	20.69	12.97	12.18
BO 138	2.27	0.170	NS	0.15	0.160	NS	0.90	0.40	0.51	0.31	00.18

Furthermore, it was also observed that all the genotypes, showed a similar trend, in response to the population of *P. perpusilla*, as that observed during 2015, in the preliminary screening trials.

Abundance Period of the Pest: The comparison of means for the data, regarding the population of *P. perpusilla* per leaf, at various dates of observation on sugarcane, during 2014 (Table - 2) revealed that the minimum population of the pest was recorded to be 1.07, per leaf, on May 12 and this population, increased to a significant level upto 1.84, per leaf, on June 02. The chemical constituents are shown in Table 3.

The population of the pest, was decreased down to 1.61, per leaf, on June 09 and an increasing trend, was again observed, on the subsequent dates of observation to 31.02, per leaf, on August 25. From these results, it was concluded that the month of August, was the most favorable for the development of the pest.

Discussions

Host-Plant Resistance :

All the genotypes under study differed significantly, from one another, regarding the population of *P. perpusilla*, per leaf, during both the study years. The genotypes CO 0238 and COP 2061 were found to be comparatively resistant; whereas BO 138 and COC 671 were relatively susceptible, with a minimum population range of 4.03 to 4.30 insects per leaf and 13.01 to 13.67, per leaf, respectively.

The present findings are, however, in line, but cannot be compared with those of Kishore *et al.* (2002) and Shrivastava *et al.* (2003), who studied the response of various genotypes of sugarcane for resistance / susceptibility, other than those studied in the present study.

Physio-morphic and chemical plant-resistance against *p. perpusilla*:

All the physico-morphic and chemical plant-

characters showed a significant difference between genotypes except total minerals and fat contents. Cane-diameter and leaf-length exerted a non-significant correlation with the pest population.

The present findings are in conformity with those of Kumarasinghe *et al.* (2001) who stated that spine-density is the most important character for anti-biotic resistance, against the *P. perpusilla*. Similarly, Kumarasinghe and Jepson, (2003), who reported that oviposition preference was affected by the leaf-spine density. In the present study, amongst the chemical plant characters, nitrogen, magnesium and CHO showed a highly significant and positive correlation with the pest-population; whereas, phosphorus, zinc, POL and fiber contents exerted a negative and significant correlation ($P<0.01$) with the pest-population.

Copper-contents also showed a negative and significant correlation ($P< 0.05$); while the CCS exerted a positive and significant correlation ($P<0.05$) with the pest-density. Total minerals, calcium, fat and brix contents showed a non-significant correlation and a negative response with the pest-population. The present findings are in partial agreement, with those of Deepak et al. (1999), who reported the effect of cane diameter, cane-height, brix and CCS to be non-significant with the *P. perpusilla* population.

References

Brar, R.S., Avasthy, P.N. and Kishan Singh 1983. Sugarcane trash in relation to multiplication of Pyrilla and its parasitoid, *Epipyrops melanoleuca Fletcher*. *Maharashtra Sugar.*, 8: 35-37.

Deepak, K.D., Chaudhary, A.K. and Singh, A.P. 1999. Screening of some promising mid-late sugarcane genotypes against leaf hopper, *Pyrilla perpusilla*. *Crop. Res. Hisar.*, 17(1): 125 - 128.

Gangwar, S.K., Srivastava, D.C., Tewari, R.K., Singh, M.R. and Rajak, D.C. 2008. Management of *Pyrilla perpusilla* Walker in Sugarcane with Ecto-Parasitoid *Epiricania melanoleuca* Fletcher during Epidemics in Sub-tropical India. *Sugar Tech.*, 10(2): 162 - 165.

Kathiresan, G. 2004. Karumpuk kathi- a new sugarcane de-trasher. *Cooperative Sugar.*, 35(12): 939 - 940.

Kishore, P., Babu, S.R., Singh, U. and Rai, G. 2002. New sources of resistance against shoot fly, *Atherigona soccata* Rondani, stem borer, *Chilo partellus* (Swinhoe) and sugarcane leafhopper, *Pyrilla perpusilla* Walker in newly developed sorghum varieties and hybrids. *J. Ent. Res.*, 26(2): 101-112.

Kumar, A. and Yadav, P.R. 2006. Studies on biomass of sugarcane pest, *Pyrilla perpusilla* walker under Western conditions. *J. Exp. Zool.*, 9 (1): 173 - 180.

Kumarasinghe, N.C. and Jepson, P.C. 2003. Anti-xenotic effect of sugarcane leaves on feeding and oviposition by *Pyrilla perpusilla*. *Sugar Tech.*, 5(1/2): 11 - 19.

Kumarasinghe, N.C. and Wratten, S.D. 1996. The Sugarcane Lophopid plant hopper *Pyrilla perpusilla* (Homoptera : Lophopidae): a review of its biology, pest status and control. *Bull. Entomol. Res.*, 86: 485 - 498.

Kumarasinghe, N.C., Wratten, S.D. and Jepson, P.C. 2001. Morphological basis for resistance in sugarcane to *Pyrilla perpusilla* (Homoptera: Lophopidae). *Int. J. P.Manag.*, 47(2): 127-134.

Madan, Y.P. 2001. Integrated pest management in sugarcane. *Indian sugar.*, 50(12): 867 - 871.

Mohyuddin, A.I. and Qureshi, M.A. 2000. History of sugarcane *Pyrilla perpusilla* (Walk.) and its biological control based Integrated Pest Management, in Pakistan. Proc. Ann. Convention Sugar Tech. pp. 186-192.

Puri, K.D. and Sidharth, K. 2001. Effect of *Pyrilla* epidemic (1999- 2000) on Sugarcane yield and sucrose. Proc. 63rd Ann. Conv. Sugar Tech. Assoc, Ind. A60-A68.

Rajak, D.C. 2007. Colonization and Redistribution of *E. melanoleuca* Fletcher against *Pyrilla perpusilla* Walker, *Ann. Plant. Protec. Sg.*, 15: 83 - 86.

Shrivastava, A.K., Srivastava, D.C., Solomon, S., Srivastava, M.K. and Singh, I. 2003. Physio-logical characters imparting resistance to biotic and abiotic stresses in sugarcane. *Sugar-Tech.*, 5(3): 105 - 120.

Singh, S.P., Jagmohan, S., Brar, K.S. Maninder, S. and Darshan, S. 2001. Demonstration of biological control based integrated pest management on sugarcane in Morinda mill area in Punjab. *Ind. J. Sugarcane Tech.*, 16(1): 58 - 64.

Verma, A., Chandra, J. and Tanwar, R.K. 2002. Eco-friendly pest control in sugarcane. *Indian Farming.*, 51(11): 40 - 43.

Wasim, M.A. 2007. Comparison of chemical control and biological control of sucking insect pest complex of sugarcane. M.Sc. Thesis, U.A.F., Pakistan, pp. 80 - 83.

Corresponding Author : Nikendra Kumar, Jai Prakash University, Chapra (Bihar), India. *E-mail: kumarichhaya1978@ gmail.com*