

# EFFECT OF TRYPORIZA NIVELLA INCEDENCE ON DIFFERENT ATTRIBUTES IN CULTIVARS OF SUGARCANE

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**Abstract:** India rank 2<sup>nd</sup> in sugarcane area, with 5.01 million hectares (mha) and with a production of 352.14 million tonnes (mt) but ranked 37<sup>th</sup> in yield with 70.26 tonnes /hectares (t/ha) in the world during 2014 (FAOSTAT 2016). In India, sugarcane occupies 2. 6 per cent of the total cropped area that contributes 22 per cent in world's production (Directorate of Economics and Statistics). Low sugarcane yield in north India is a matter of concern for the farmers as well as sugar industry. Productivity of sugarcane in Bihar has been low since last 50 years (approximately – 30 – 50 t/ha) due to lack of stable and high yielding varieties. Tryporiza nivella is one of the serious insect pest of sugarcane in Motipur, Bihar. Study reveals its incidence on different attributes of sugarcane hybrid varieties and their yield.

**IndexTerms** – sugarcane, sugar yield, Tryporiza nivella.

## Introduction

India is the largest producer of sugar in the world. Sugar is the second largest industry in the country after textiles. In our country, agriculture is not an agri – business, but a way of life and sugarcane stands as an agro – industrial crop making integral component of agriculture.

Sugarcane assumes an important position in the economy by contributing nearly 01.90 per cent of the National GDP. It is cultivated in over 4 million hectares spread over a wide range of agro – ecological conditions both in tropical and subtropical regions. At present, the total production of sugarcane in the country is around 300 million tones which yields over 18 million tones of centrifuged sugar, in addition, sugarcane supports a large number of open pan sugar (Khandsari) and jiggery (Gur) units in the unorganized sector with a production of over 10 million tones of jaggery (Gur).

During the past five decades though sugarcane productivity has increased more than two fold, the sugar industry has not shown any upward trend deterioration in quality and acreage. Such condition developed in absence of suitable pricing marketing, protection from pests and transportation of sugarcane as evidenced by the disappointment of the cultivars who threatened 'rail roko agitation' (Anonymous 2002). This is the main reason that is north eastern part of the country out of the total produce only 30 – 45 per cent of the sugarcane goes to mills and 55 – 70 per cent goes to Gur industry (Anonymous 1993). Agarwala and Prashad (1956) recorded the greatest activity in 4<sup>th</sup> brood. According to Khanna (1956 – 57), their development are fastest in 3<sup>rd</sup> brood and slowest in the 5<sup>th</sup> were observed.

Singh et al reported that the incidence of top borer, T. nivella had scaped by the timely application of fertilizer coinciding with the 3<sup>rd</sup> brood of sugarcane top borer in the end of June in the same variety. They further observed that the resistant varieties under commercial cultivation viz. , CoJ 67 (Punjab), Co1007 (Madhya Pradesh) and Co1148 (Uttar Pradesh and Haryana) had encouraged on large scale to mitigate crop losses due to sugarcane top borer.

Varieties Co89029, Co89013, Bo102, B099, CoSe 84233, CoSe 84234, CoSe 84235, B091 and CoS 767 were having low to medium incidence of top and stalk borers in Bihar (Technical Report, 1993 – 94)

An early maturity variety of cane, the weight varied from 186.015gm to 610.200gm due to attack of different broods of T. nivella. Percentage infestation of leaves affected, unaffected mid- rib and length of penetrated mid – rib were 8.2 cm, 134.44 cm and 26.006 cm respectively. Out of 3<sup>rd</sup> , 4<sup>th</sup> and 5<sup>th</sup> brood was most destructive, affecting no. of internodes, girth of cane affected cane leaves and length of planted mid – rib.

Determinations of losses due to different broods of T. nivella were studied in the vicinity of Motipur. On the basis of different attributes responsible for cane yield were studied during the course of the study and data are presented in Table 1, 2, and 3.

The data were recorded by taking 20 canes from each variety of spring planted cane crop at the time of harvesting. All the infested cane were tagged during the course of study in respect of T. nivella.

The data on average cane weight of BO 120, an early maturity variety varied from 186.015 g to 601. 200 g (Table 1) due to attack of different broods viz. , 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> of T. nivella including healthy one. The maximum average cane weight (545.50 g) in affected cane of T, nivella followed by 540. 00 g in 4<sup>th</sup> brood and 186.015 g in 3<sup>rd</sup> brood affected cane. The maximum average cane weight (601.200 g) was recorded in

healthy cane. It is revealed from the table that the regression coefficient was found positively correlated in respect to length of cane and number of internodes in healthy cane. These were statistically significant. Further, it is evident from the table that in case of 5<sup>th</sup> Brood attack, the length of cane, number of internodes, average girth of cane, number of affected leaves, total length of affected leaves and length of penetrated midrib were recorded as 155.46cm, 19.5, 7.4cm and 3.15, 139.59 cm and 21.10 cm, respectively. On the basis of regression coefficient, all the attributes were statically significant in respect to weight of cane while the incidence of 5<sup>th</sup> brood was recorded 19.6 per cent.

The data presented in table reveals that in case of 4<sup>th</sup> brood of *T. nivella* affected cane all attributes such as length of cane (128.30), number of internodes (15.20), average girth of cane (7.31cm), average number of leaves affected (8.20), total length affected midrib (135.44 cm) and length of prevented midrib (26.006 cm) are statistically significant in respect to cane yield, while the incidence of *T. nivella* was observed to be 16.425 per cent.

It is evident from the table that 3<sup>rd</sup> brood attack of *T. nivella* was recorded on the basis of different attributes viz., length of cane ( 61.10 cm), number of internodes ( 10.85), average girth of cane (6. 105 cm), number of leaves affected (2.15), total length affected midrib ( 128.980 cm) and length of penetrated midrib (25.108 cm) were statistically significant in respect to cane weight. The regression coefficients are presented in Table 1. The overall average incidence the course of study.

**Table 1: Effect of *T. nivella* incidence on different attributes in BO 120**

Sl. No.	Attributes	Mean value of healthy Cane			Mean Value of <i>T. nivella</i> Affected Cane (5 <sup>th</sup> brood)			Mean Value of <i>T. nivella</i> Affected Cane (4 <sup>th</sup> brood)			Mean Value of <i>T. nivella</i> Affected Cane (3 <sup>rd</sup> brood)		
		Regression			Regression			Regression			Regression		
			a	b		a	b		a	b		a	b
1	Weight of cane (g) X	601.2	-	-	545.5	-	-	450.4 1	-	-	186.01	-	-
2	Length of cane (cm) X <sub>1</sub>	180.69	18.785	3.233	155.4 6	23.407	3.35 9	128.3	316.5 31	1.043	61.1	28.864	2.57 2
3	No. of internodes X <sub>2</sub>	21.5	294.85 8	14.24 8	19.5	352.51 6	9.89 7	15.2	253.8 4	12.932	10.85	216.068	2.77
4	Av. Girth of cane (cm) X <sub>3</sub>	7.41	250.70 7	47.16 7	7.4	523.16 8	3.01 9	7.31	386.9 56	8.671	6.105	136.93	8.03 9
5	No. of leaves affected X <sub>4</sub>	-	-	-	3.15	517.54 6	8.87 6	3.2	538.0 65	- 27.392	2.15	139.259	21.7 47
6	Total length of affected midrib (cm) X <sub>5</sub>	-	-	-	139.5 9	431.81	0.81 4	135.4 4	365.4 5	0.627	128.9	204.385	- 0.14 3
7	Length of penetrated midrib (cm) X <sub>6</sub>	-	-	-	21.10 2	366.14 2	8.5	26.00 6	452.2 48	-0.072	25.108	167.979	0.71 8
8	% incidence of top borer X <sub>7</sub>	-	-	-	19.6	589.53 5	- 2.24 6	16.42 5	406.5 8	2.038	11.57	156.099	2.83

In case of BO 128, a mid – early maturity variety, the data on the average weight of cane varied from 144.850 g to 730.020 g (Table 2). These variation due to attack of different broods viz. , 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> brood of *T. nivella* including healthy one. The maximum average cane weight (728.530 g) in affected cane was recorded to be in 5<sup>th</sup> brood affected cane of *T. nivella* followed by 4<sup>th</sup> brood (592. 330 g) and 3<sup>rd</sup> brood (244.850 g) affected cane. The maximum average cane weight (730.020 g) was recorded in healthy cane. It is revealed fro the table 4 that the regression coefficient was found positively correlated in respect to length of cane and number of internodes in healthy cane. These were statistically significant.

Further it is evident from the table that in case of 5<sup>th</sup> brood attacked, the length of cane, number of internodes, average girth of cane, number of affected leaves, total length of affected leaves, length of

penetrated midrib % incidence were recorded as 214.30 cm, 24.20, 7.54 cm, 2.2, 123.93 cm, 20.5 per cent respectively. On the basis of regression coefficient all attributes were statistically significant in respect to weight of cane while the incidence of 5<sup>th</sup> brood was recorded 20.50 per cent.

The data represented in Table 2 reveals that in case of 4<sup>th</sup> brood of T. nivella affected cane, all attributes such as length of cane, number of internodes average girth of cane, number of leaves affected cane, all attributes such as length of cane, number of internodes, average girth of cane, number of leaves affected, total length of affected midrib, percentage incidence were 178.05 cm, 18.05, 7.15 cm, 7.15, 11.73 cm 1.17, 12.64 per cent respectively. The regression coefficient of all attributes were statistically significant in respect to cane weight.

**Table 2: Effect of T. nivella incidence on different attributes in BO 128**

Sl. No.	Attributes	Mean value of healthy Cane			Mean Value of T. nivella Affected Cane (5 <sup>th</sup> brood)			Mean Value of T. nivella Affected Cane (4 <sup>th</sup> brood)			Mean Value of T. nivella Affected Cane (3 <sup>rd</sup> brood)		
		Regression			Regression			Regression			Regression		
			a	b		a	b		a	b		a	b
1	Weight of cane (g) X	730.02	-	-	728.53	-	-	592.33	-	-	244.85	-	-
2	Length of cane (cm) X <sub>1</sub>	215.25	4.062	3.373	214.3	-8.701	3.44	178.05	24.036	3.461	84.195	5.851	2.838
3	No. of internodes X <sub>2</sub>	24.3	740.46	4.364	24.2	406.664	13.3	18.05	497.73	5.241	10.85	145.75	9.133
4	Av. Girth of cane (cm) X <sub>3</sub>	7.67	535.35	25.363	7.54	709.088	2.579	7.15	325.802	37.277	6.865	115.829	18.794
5	No. of leaves affected X <sub>4</sub>	-	-	-	2.2	693.964	15.712	2.05	568.794	11.482	2.35	241.26	1.527
6	Total length of affected midrib (cm) X <sub>5</sub>	-	-	-	123.93	612.716	15.712	11.73	743.703	-1.355	106.45	282.515	-0.354
7	Length of penetrated midrib (cm) X <sub>6</sub>	-	-	-	12.94	697.62	2.338	13.17	698.535	-8.061	12.124	194.955	4.115
8	% incidence of top borer X <sub>7</sub>	-	-	-	20.5	704.203	1.187	12.67	522.687	4.755	9.04	234.628	1.13

In case of 3<sup>rd</sup> brood attack of T. nivella, the different attributes viz., length of cane number of internodes, average girth of cane number of leaves affected, total length of affected midrib, length penetrated midrib and percentage incidence were recorded as 84.195 cm, 10.85, 6.865 cm, 12.124 cm and 9.04 per cent, respectively, which were statistically significant. The regression coefficients of all attributes were also statistically significant in respect to cane weight.

The same trend was observed in case of BO 91, a late maturing sugarcane variety. The data on the average cane weight varies from 301.065 g to 739.450 g due to attack of including healthy broods viz., 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> of T. nivella followed by 452.185 g and 301.065 g in 4<sup>th</sup> brood and 3<sup>rd</sup> brood affected cane of T. nivella respectively. The maximum average per cane weight (739.450 g) was recorded in healthy cane.

It is revealed from the Table 3 that the regression coefficient of length of cane, number of internodes and girth of cane were significantly correlated in respect to weight of cane

Further it is evident from the table that in case of 5<sup>th</sup> brood attacked, the length of cane, number of internodes, average girth of cane, number of affected leaves, total length of affected leaves, length of penetrated midrib % incidence were recorded as 190.57 cm, 21.95, 7.62 cm, 2.45, 107.79 cm, 16.33 cm, respectively. On the basis of regression coefficient, all the attributes were statistically significant in respect to weight of cane while the incidence of 5<sup>th</sup> brood was recorded 19.13 per cent.

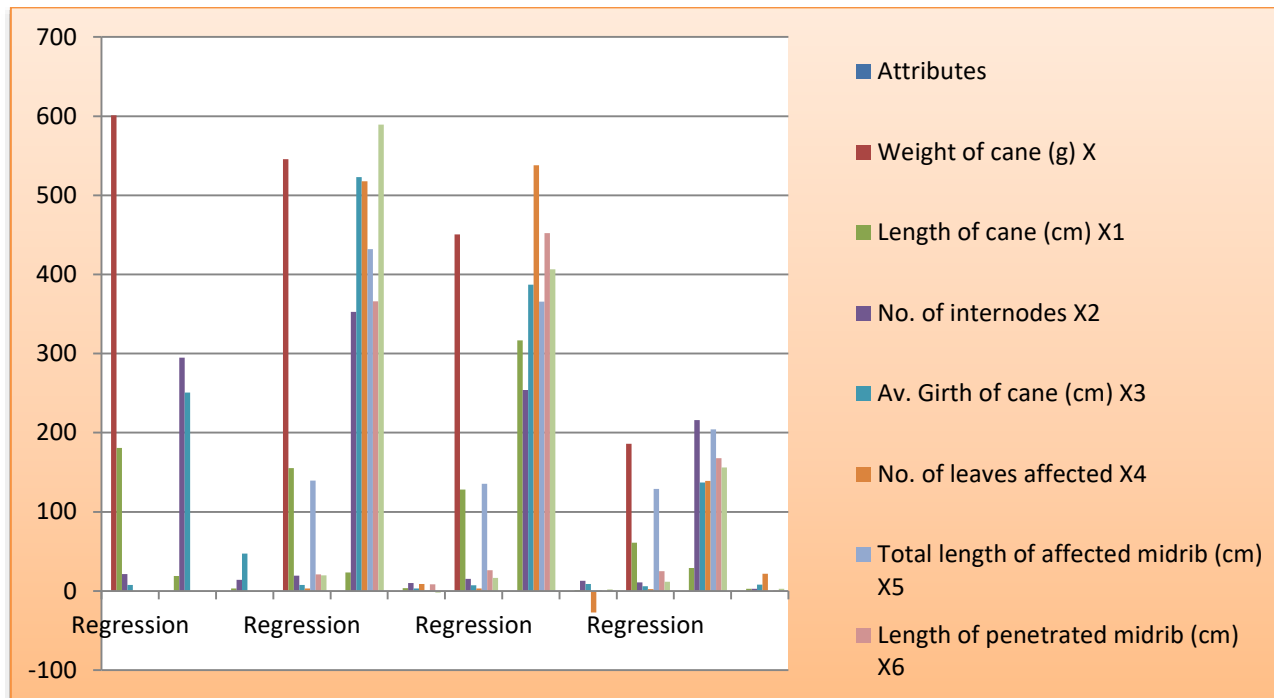
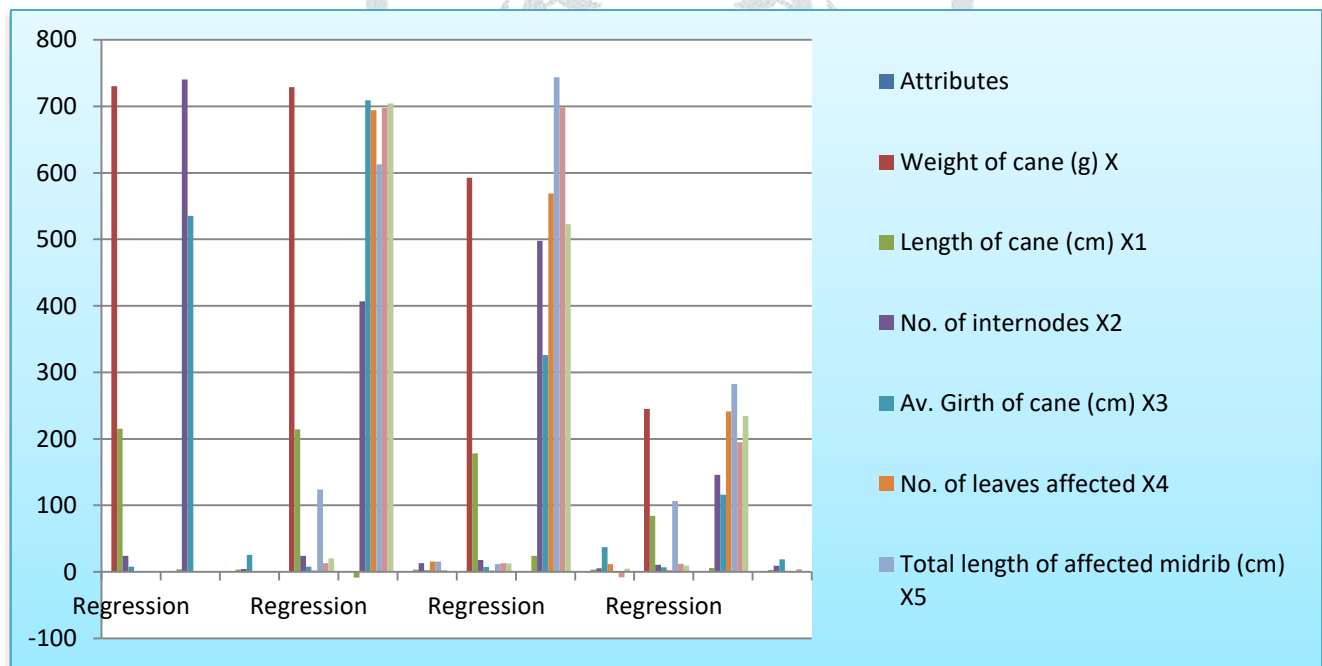
The data represented in Table 3 reveals that the cane affected by 4<sup>th</sup> brood of T. nivella all attributes viz., length of cane (166.180 cm), number of internodes (19.05), average girth of cane (7.510 cm) number of average of leaves affected (2.5), total length of affected midrib (92.548 cm) and length of penetrated midrib (18.455 cm) were statistically significant in respect to weight of cane. While the incidence of T. nivella was observed to be 14.360 per cent

**Table 3: Effect of T. nivella incidence on different attributes in BO 91**

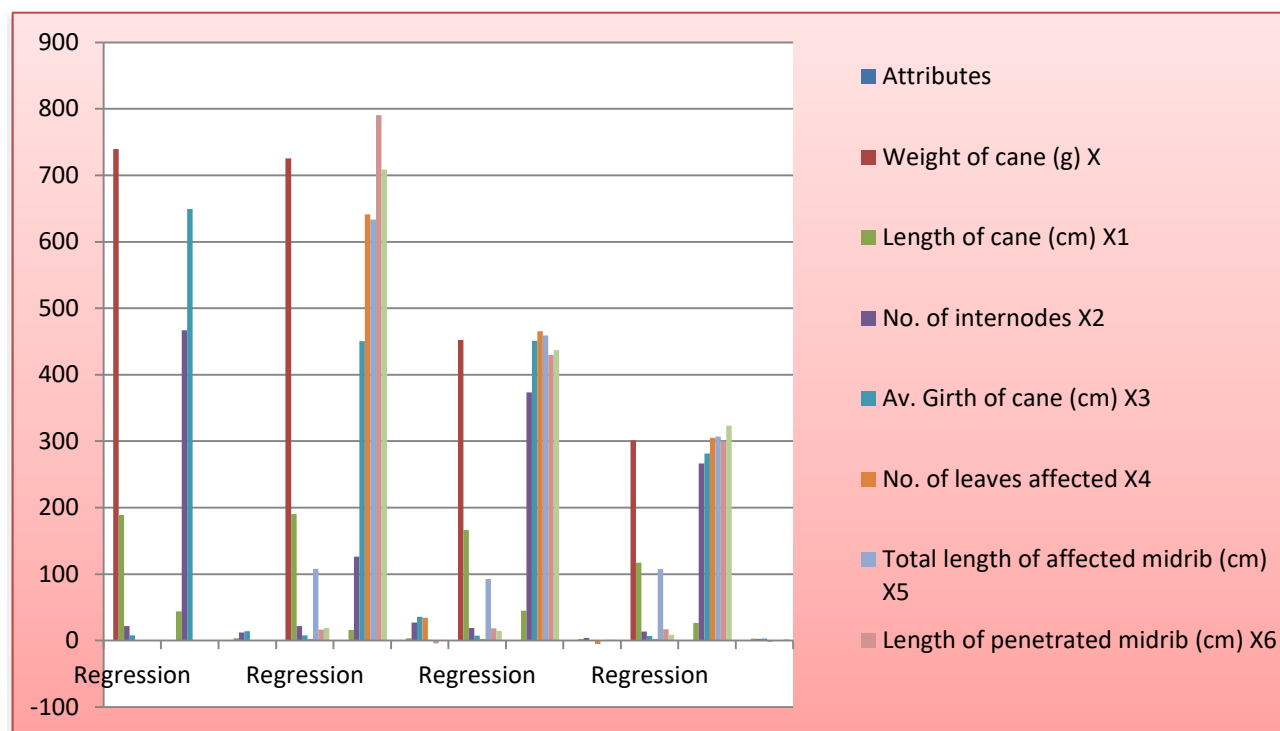
$$Y = a + bx - cx^2$$

Sl. No.	Attributes	Mean value of healthy Cane			Mean Value of T. nivella Affected Cane (5 <sup>th</sup> brood)			Mean Value of T. nivella Affected Cane (4 <sup>th</sup> brood)			Mean Value of T. nivella Affected Cane (3 <sup>rd</sup> brood)		
		Regression			Regression			Regression			Regression		
			a	b		a	b		a	b		a	B
1	Weight of cane (g) X	739.45	-	-	725.43	-	-	452.185	-	-	301.065	-	-
2	Length of cane (cm) X <sub>1</sub>	189	43.98	3.669	190.57	16.224	3.722	166.18	44.878	2.451	116.975	26.8	2.803
3	No. of internodes X <sub>2</sub>	22	466.607	12.402	21.95	126.31	27.295	19.05	373.38	4.137	13.65	266.57	2.527
4	Av. Girth of cane (cm) X <sub>3</sub>	7.75	649.435	14.184	7.62	450.412	35.823	7.51	450.9	0.362	6.92	281.228	2.867
5	No. of leaves affected X <sub>4</sub>	-	-	-	2.45	641.085	34.43	2.5	465.51	-5.33	2.3	304.78	-1.617
6	Total length of affected midrib (cm) X <sub>5</sub>	-	-	-	107.79	633.476	0.853	92.548	459.257	-0.076	107.42	306.99	-0.055
7	Length of penetrated midrib (cm) X <sub>6</sub>	-	-	-	16.33	790.44	-3.98	18.455	429.98	1.023	16.76	299.478	0.05
8	% incidence of top borer X <sub>7</sub>	-	-	-	19.13	708.491	0.886	14.36	436.748	1.075	8.815	323.365	2.272

It is evident from the table that the incidence of 3<sup>rd</sup> brood of T. nivella the regression coefficient of different attributes viz. , length of cane ( 116.975 cm), number of internodes (13.65), average girth of cane (6.920 cm) number of leaves affected (2.3), total length of affected midrib (107.420 cm), length of penetrated midrib ( 16.760 cm) were statistically significant in respect to weight of cane which were presented in Table 3. The overall average incidence of T. nivella was recorded to be 8.815 per cent in course of study.

**Graph showing Effect of *T. nivella* incidence on different attributes in BO 120****Graph showing Effect of *T. nivella* incidence on different attributes in BO 128**



Graph showing Effect of *T. nivella* incidence on different attributes in BO 91

**CONCLUSION:** In September all the varieties registered the maximum infestation in all types of sugarcane. An early maturity variety of cane, the weight varies from 186. 015 g and to 610. 200 g due attack of different broods of *T. nivella*. Percentage infestation of leaves affected, affected midrib and midrib, and length of penetrated midrib were 8.2, 135.44 cm and 26.006 cm respectively. Out of 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> broods, 3<sup>rd</sup> was marked the most harmful affecting number of internodes, girth of cane, affected leaves and length of penetrated midrib.

Yield loss due to infestation by 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> broods also confirms the above findings. In respect to B128 yield, early maturity variety, the minimum (0.024 %) loss per cane was met in 5<sup>th</sup> broods attack while in 4<sup>th</sup> and 3<sup>rd</sup> it was 18.661 and 66.51 respectively.

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