

Susceptibility of Some Promising Sugarcane Clones to Major Insect Pests of Sugarcane

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ABSTRACT

The field experiment was conducted to evaluate the susceptibility of five promising sugarcane clones viz., I 82-98, I 98-98, I 110-98, I 139-98 and I 142-98 and one standard variety Isd 29 against some major insect pests at Ishurdi and Thakurgaon during the cropping seasons 2002-2003, 2003-2004 and 2004-2005. Results revealed that (pooled data) those clones encountered very low infestation by early shoot borer which ranged from 0.57 to 1.07 percent at both locations. Black beetle infestation was higher at Ishurdi which ranged from 7.58 to 12.54 percent whereas it varied from 0.76 to 1.53 percent at Thakurgaon. Infestation due to Top shoot borer ranged from 12.18 to 26.31 percent at Ishurdi and 31.29 to 38.68 percent at Thakurgaon with the lowest infestation in the clone I 110-98 compared to standard variety. Stem borer infestation ranged from 6.40 to 12.90 percent and 46.31 to 57.38 percent (stalk basis) at Ishurdi and Thakurgaon respectively. Rootstock borer infestation ranged from 22.38 to 33.86 percent at Ishurdi and 63.46 to 77.57 percent at Thakurgaon showing the lowest infestation in standard variety at both locations. Infestation due to scale insect ranged from 6.79 to 13.62 and 14.81 to 24.95 percent at Ishurdi and Thakurgaon respectively. Mealy bug infestation was observed which ranged from 15.86 to 27.72 percent at Ishurdi and 16.54 to 35.65 percent at Thakurgaon. White grub population ranged from 2.29 to 3.56 and 1.78 to 4.67 (5 clumps/plot) at Ishurdi and Thakurgaon respectively among the test clones and standard variety.

Keywords: Susceptibility, insect pests, sugarcane clones

INTRODUCTION

So far about 70 species of insect pests have been identified and reported to feed on sugarcane in Bangladesh (BSRI, 1973-78; 1992). Among various factors, insect pests inflict considerable losses which are estimated to be around 20% in cane yield and 15% in sugar recovery (Avasthy, 1983). It is reported that the most damaging pests are early shoot borer, top shoot borer, stem borer, root stock borer, mealy bug, and scale insect. Losses in yield incurred due to borer attack was estimated to be 22-33% by early shoot borer (Patil and Hapase, 1981), 21-48% by top shoot borer (Karim and Islam, 1977), 8.2-12.6% by stem borer (Khanna *et al.*, 1957), 8.55% (Miah *et al.*, 1986) and upto 10% (Gupta and Avasthy, 1952) by rootstock borer. The loss in yield due to scale insect was estimated as 43% (Khanna, 1957) and 24.1% by mealy bug (Kalra and Sidhu, 1964). Seventeen species of white grubs have so far been recorded in sugarcane field in Bangladesh causing damage every year (BSRI, 1981; 1984), but all of them are not equally important in respect of damage. Among these, *Brahmina* sp., *Holotrichia* sp., *Anomala* sp. and *Adoretus versutus* are most damaging. The yield loss due to white grubs was found to be 23.07 to 38.17 tha^{-1} (Miah *et al.*, 1983). Different pest management practices namely cultural, mechanical, biological and chemical methods have been recommended to control these pests. Among these, farmers of Bangladesh are mostly oriented with chemical control operation as it gives immediate and effective control of a pest. But recommended chemical pesticides are

not always available and it is expensive. Moreover, it creates environmental hazards. Continuous use of pesticides (sub lethal dose) causes development of resistance to the target pest. On the other hand, use of resistant varieties seems to be the most important method of pest management. As most of the major sugarcane pests are monophagous, there is a good scope to develop resistant sugarcane clones for their management. Selection of insect resistant clones is the first step towards developing management approach. Clones having high sugar yield potential with considerable tolerance to major insect pests' attacks would be more economic to cultivate by the sugarcane growers in Bangladesh. Therefore, efforts need to be continued among the researchers to develop clones resistant to major insect pest. In the present study five promising clones have been evaluated to observe their susceptibility against major insect pests of sugarcane.

MATERIALS AND METHODS

The trial was conducted at the experimental farm of Bangladesh Sugarcane Research Institute (BSRI), Ishurdi, Pabna and Thakurgaon during the cropping season of 2002-2003, 2003-2004 and 2004-2005. The experiment was laid out in randomised complete block (RCB) design with three replications. The plot size was 6m x 5m. Blocks were 2m apart had a border of 1m. The BSRI bred sugarcane clones viz., I 82-98, I 98-98, I 110-98, I 139-98, I 142-98 and standard variety Isd 29 were included to compare their pest incidence status. Planting was done through conventional sett placement in the trenches. Fertilizer application, irrigation, weeding, mulching and earthing-up were done as per normal cultural practices (Anon., 1998). All the clones and varieties were subjected to natural infestation. No pest control measure was applied.

Data on the incidence of early shoot borer, *Chilo infuscatellus* Snellen and Black beetle, *Alisonotum impressicollis* were recorded in the month of March of each season. Data on the incidence of top shoot borer, *Scirpophaga excerptalis* Walker, stem borer, *Chilo tumidicostalis* Hampson, rootstock borer, *Emmalocera depressella* Swinhoe, mealy bug, *Saccharicoccus sacchari* Cockerell and scale insect, *Melanaspis glomerata* Green were recorded at harvest by counting the total and infested canes from each plot. In case of stem borer infestation 10 stem borer infested plants were randomly split to count infested internodes. For white grubs and rootstock borer, data were taken from 5 randomly selected clumps per plot. An area of 60 cm x 60 cm was dug up from a depth of 40 cm with spade. Larval population was counted in roots and in soils of these pits. In case of rootstock borer up-rooted stocks were dissected to observe their infestation. The collected data were converted to per cent infestation to measure the level of incidence and analysed for comparison by using LSD at 0.05 level for interpretation.

RESULTS AND DISCUSSION

It is evident that statistically no significant difference was observed among the clones and standard variety for any insect pest infestation and white grub population in the cropping season 2002-2003 at both locations (Table 1 & Table 2). The infestation of early shoot borer (ESB) was low which ranged from 0.47 to 1.85 percent at Ishurdi with the highest (1.85%) in I 142-98 and the lowest (0.47%) in standard Isd 29 (Table 1). No ESB infestation was observed at Thakurgaon. Black beetle (BB) infestation ranged from 2.54 to 6.43 percent at Ishurdi with the lowest (1.20%) in standard Isd 29 and the highest (6.43%) in I 98-98 whereas at Thakurgaon it ranged from 0.55 to 3.04 percent with the lowest (0.55%) in I 82-98 and the highest (2.86%) in I 142-98.

Table 1. Infestation levels of some major insect pests to promising BSRI clones, Ishurdi, Pabna, 2002-2003.

Clones/ Variety	Percent infestation (Mean)								WG population/ 5 clumps/ plot
	ESB	BB	TSB	SB (stalk)	SB (internode)	RSB	SI	MB	
I 82-98	1.60	2.83	11.37	22.67	11.28	43.05	17.62	49.09	7.00
I 98-98	1.28	6.43	14.64	22.10	11.48	50.53	12.94	29.48	8.67
I 110-98	1.19	4.77	10.51	23.80	11.50	44.42	34.40	24.85	9.67
I 139-98	1.57	5.66	13.33	8.97	15.16	35.57	19.35	41.49	9.67
I 142-98	1.85	4.62	17.53	23.10	8.23	44.94	22.75	29.61	10.00
Isd 29	0.47	2.54	8.25	12.92	10.66	20.20	15.61	32.17	6.20
LSD(5%)	NS	NS	NS	NS	NS	NS	NS	NS	NS

ESB= Early shoot borer, BB= Black beetle, TSB= Top shoot borer, SB= Stem borer, RSB= Root stock borer, SI= Scale insect, MB= Mealy bug, WG= White grub

Table 2. Infestation levels of some major insect pests to promising BSRI clones, Thakurgaon, 2002-2003.

Clones/ Variety	Percent infestation (Mean)								WG population/ 5 clumps/plot
	ESB	BB	TSB	SB (stalk)	SB (internode)	RSB	SI	MB	
I 82-98	0.00	0.55	57.47	69.34	23.79	87.70	36.76	55.49	9.33
I 98-98	0.00	0.60	57.40	72.20	22.73	84.26	40.63	31.51	5.00
I 110-98	0.00	1.81	61.88	82.54	24.55	92.17	62.90	22.89	10.00
I 139-98	0.00	2.21	48.48	71.50	21.01	87.04	38.45	26.82	3.33
I 142-98	0.00	2.86	73.66	77.11	31.52	87.83	52.83	40.58	10.33
Isd 29	0.00	2.27	58.72	61.20	25.56	86.97	32.52	36.11	6.00
LSD(5%)	NS	NS	NS	NS	NS	NS	NS	NS	NS

ESB= Early shoot borer, BB= Black beetle, TSB= Top shoot borer, SB= Stem borer, RSB= Root stock borer, SI= Scale insect, MB= Mealy bug, WG= White grub

Top shoot borer (TSB) infestation ranged from 8.23 to 25.85 percent whereas the lowest (8.25%) TSB infestation was observed in standard Isd 29 and the highest (17.53%) in I 142-98 at Ishurdi. Higher TSB infestation was observed at Thakurgaon which ranged from 48.48 to 73.66 percent. Lowest (48.48%) TSB infestation was observed in I 139-98 and the highest (73.66%) in I 142-98. Stem borer (SB) infestation (stalk basis) ranged from 8.97 to 23.80 percent with the lowest (8.97%) in I 139-98 and the highest (23.80%) in I 110-98 compared to standard Isd 29 (12.92%) at Ishurdi. Higher SB infestation was observed at Thakurgaon which ranged from 61.20 to 82.54 percent (Table 2). Lowest (61.20%) SB infestation was observed in standard Isd 29 and the highest (82.54%) in I 110-98. On the basis of infested internode clone I 142-98 showed the lowest (8.23%) SB infestation with the highest (15.16%) infestation in I 139-98 at Ishurdi, whereas I 139-98 showed the lowest (21.01%) infestation with the highest (31.52%) infestation in I 142-98 at Thakurgaon and the standard Isd 29 had 25.56% infestation. Rootstock borer (RSB) infestation ranged from 20.20 to 50.53 percent at Ishurdi. Lowest (20.20%) RSB infestation was observed in standard Isd 29 with the highest (50.53%) infestation in I 98-98. Heavy RSB infestation was observed at Thakurgaon, which ranged from 84.26 to 92.17 percent among the test clones. The lowest (84.26%) RSB infestation was observed in I 98-98 with the highest (92.17%) infestation in I 110-98.

Scale insect (SI) infestation ranged from 12.94 to 34.40 percent at Ishurdi. Lowest (12.94%) SI infestation was observed in I 98-98 whereas standard Isd 29 had 15.61% infestation. Scale insect infestation was higher at Thakurgaon, which ranged from 32.52 to 62.90 percent. Lowest (32.52%) SI infestation was observed in standard Isd 29 with the highest (62.90%) infestation in I 110-98. Mealy bug (MB) infestation ranged from 24.85 to 49.09 percent at Ishurdi. Lowest (24.85%) MB infestation was observed in I 110-98 with the highest (49.09%) infestation in I 82-98. Mealy bug infestation at Thakurgaon ranged from 22.89 to 55.49 percent. The lowest (22.89%) MB infestation was observed in I 110-98 with the highest (55.49%) infestation in I 82-98. The standard Isd 29 showed 32.17% and 36.11% MB infestation at Ishurdi and Thakurgaon respectively. White grub (WG) population per 5 clumps ranged from 6.20 to 10.00 at Ishurdi. Lowest population (6.20) was observed in standard Isd 29 and the highest population (10.00) in I 142-98. WG population at Thakurgaon ranged from 3.33 to 10.33 with Lowest population (3.33) in I 139-98 and the highest population (10.33) in I 142-98. Abdullah *et al.* (2004) reported that clones viz., I 13-96, I 37-96, I 143-96, I 164-95, I 22-94 and variety Isd 28 showed 0.02 to 0.41% infestation by early shoot borer. They also reported 5.81 to 12.75% infestation by top shoot borer, 14.54 to 33.74% (stalk basis) infestation by stem borer and 10.05-22.84% infestation by rootstock borer, 10.15-41.42% infestation by scale insect and 19.88-31.86% infestation by mealy bug at Ishurdi. The test clones in the present study exhibit more or less similar results with the reported results.

In the cropping season 2003-2004 test clones showed no statistically significant difference in infestation by ESB, BB, SB, SI, MB and WG at both Ishurdi and Thakurgaon (Table 3 & Table 4). ESB infestation ranged from 0.34 to 2.52 percent with the lowest (0.34%) in I 98-98 at Ishurdi whereas at Thakurgaon it ranged from 1.16-3.14% with the lowest (1.16%) in standard Isd 29. BB infestation varied from 5.24-12.56% among the clones with the lowest (5.24%) in I 82-98 and the highest (12.56%) in I 139-98 at Ishurdi. The infestation of BB was very low at Thakurgaon, which ranged from 0.75 to 1.73 percent. TSB infestation ranged from 12.47 to 26.09 percent at Ishurdi and 20.90 to 37.10 percent at Thakurgaon. Lowest TSB infestation (12.47%) was observed in standard Isd 29 at Ishurdi and the clone I 98-98 had the highest TSB infestation (26.09 and 37.10%) at both locations. SB (stalk basis) infestation ranged from 4.65 to 11.89 and 13.80 to 29.19 percent at Ishurdi and Thakurgaon respectively. The lowest SB infestation (4.65% & 13.80%) was observed in I 139-98 at both locations. At Thakurgaon, the highest SB infestation (29.19%) was observed in I 110-98. SB infestation on internode basis varied from 10.32 to 24.66 percent at Ishurdi and 12.56 to 24.89 percent at Thakurgaon. RSB infestation ranged from 11.25 to 31.85 and 27.83 to 64.53 percent at Ishurdi and Thakurgaon respectively. Lowest RSB infestation (11.25% & 27.83%) was observed in I 110-98 at both locations whereas the highest RSB infestation (31.85% & 64.53%) was observed in I 142-98 at both locations. Lowest SI infestations (4.81% & 2.84%) was observed in I 139-98 at both locations with the highest in standard variety (6.60% & 12.13%). MB infestations ranged from 10.34 to 22.97 percent and 5.87 to 18.24 at Ishurdi and Thakurgaon respectively. Lowest MB (5.87 and 10.34%) infestation was observed in I 139-98 and I 110-98 with the highest (22.97% & 18.24%) in I 82-98 at both locations. WG population was low at both locations. Biswas *et al.* (2004) reported that clones I 5-92, I 41-92, I 119-92, I 153-92, I 216-92 and BO 91 had very low (0.82 - 1.38%) infestation by early shoot borer. They also reported that top shoot borer infestation ranged from 16.14 - 41.16%, mealy bug infestation ranged from 26.70 - 45.81% and scale insect infestation ranged from 5.97 - 22.95%. These results have similarities with findings of the present study.

Table 3. Infestation levels of some major insect pests to promising BSRI clones. Ishurdi, Pabna, 2003-2004.

Clones/ Variety	Percent infestation (Mean)								WG population/ 5 clumps/plot
	ESB	BB	TSB	SB (stalk)	SB (internode)	RSB	SI	MB	
I 82-98	1.43	5.24	20.55ab*	8.04	10.32	25.92	5.86	22.97	0.33
I 98-98	0.34	6.74	26.09a	7.98	20.38	15.66	5.86	13.02	0.33
I 110-98	2.52	7.42	13.87bc	7.76	13.59	11.25	6.46	10.34	0.67
I 139-98	1.16	12.56	12.57bc	4.65	15.58	22.95	4.81	11.63	0.00
I 142-98	0.75	5.70	17.18abc	11.89	15.42	31.85	5.99	14.00	0.67
Isd 29	1.17	5.68	12.47bc	6.00	24.66	18.86	6.60	14.15	0.67
LSD(5%)	NS	NS	9.287	NS	NS	NS	NS	NS	NS

ESB= Early shoot borer, BB= Black beetle, TSB= Top shoot borer, SB= Stem borer, RSB= Root stock borer, SI= Scale insect, MB= Mealy bug, WG= White grub

* Figures followed by the same letter (s) are not significantly different at 5% level as per LSD test.

Table 4 . Infestation levels of some major insect pests to promising BSRI clones. RSRS, Thakurgaon, 2003-2004.

Clones/ Variety	Percent infestation (Mean)								WG population/ 5 clumps/plot
	ESB	BB	TSB	SB (stalk)	SB (internode)	RSB	SI	MB	
I 82-98	1.73	1.01	27.64	20.74	15.04	38.78bc*	4.45	18.24	1.33
I 98-98	2.07	1.67	37.10	21.15	16.51	31.85c	3.58	7.05	2.00
I 110-98	2.61	0.75	20.90	29.19	12.56	27.83c	8.41	11.02	2.33
I 139-98	2.13	1.55	36.70	13.80	14.41	37.56bc	2.84	5.87	2.00
I 142-98	3.14	1.73	22.31	20.98	24.89	64.53a	6.04	8.76	3.67
Isd 29	1.16	1.19	27.54	19.22	18.91	31.18c	12.13	9.10	1.67
LSD(5%)	NS	NS	NS	NS	NS	24.95	NS	NS	NS

ESB= Early shoot borer, BB= Black beetle, TSB= Top shoot borer, SB= Stem borer, RSB= Root stock borer, SI= Scale insect, MB= Mealy bug, WG= White grub

* Figures followed by the same letter (s) are not significantly different at 5% level as per LSD test.

In the cropping season 2004-2005 no significant difference in infestation by ESB, BB, SB, RSB and WG was observed at both locations (Table 5 & Table 6). ESB infestation was very low at Ishurdi whereas it was nil at Thakurgaon. Higher BB infestation was noticed at Ishurdi which varied from 14.51 to 22.28% among the clones with the lowest (14.51%) in standard Isd 29 and the highest (22.28%) in I 98-98. The infestation of BB was very low at Thakurgaon, which ranged from 0.00 to 1.23 percent. TSB infestation ranged from 12.15 to 38.21 percent at Ishurdi whereas I 110 had the lowest (12.15%) infestation, which differed significantly over standard Isd 29. Highest TSB infestation (38.21% and 21.54%) was observed in I 98-98 at both locations. TSB infestation ranged from 11.08 to 21.54 percent at Thakurgaon. SB (stalk basis) infestation ranged from 3.71 to 5.61 percent at Ishurdi and 54.47 to 65.85 percent at Thakurgaon. Lowest SB infestation was 3.71% in I 124-98 at Ishurdi and 54.47% in I 139-98 at Thakurgaon. At Thakurgaon, the highest SB infestation (65.85%) was observed in I 82-98. SB infestation on internode basis varied from 10.81 to 19.87 percent at Ishurdi and 22.75 to 33.98 percent at Thakurgaon with the highest intensity in I 98-98 (Table 6). RSB infestation ranged from 21.39

Table 5. Infestation levels of some major insect pests to promising BSRI clones. Ishurdi, Pabna, 2004-2005.

Clones/ Varieties	Percent infestation (Mean)								WG population/ 5 clumps/plot
	ESB	BB	TSB	SB (stalk)	SB (internode)	RSB	SI	MB	
I 82-98	0.17	20.72	26.81ab*	4.35	11.95	21.39	1.05	11.09	0.00
I 98-98	0.08	22.28	38.21a	4.60	19.50	34.90	1.58	11.99	0.00
I 110-98	0.00	18.41	12.15c	3.87	16.50	28.40	0.00	12.39	0.00
I 139-98	0.26	19.40	23.58bc	5.61	10.81	34.98	1.33	14.44	0.00
I 142-98	0.23	16.65	22.82bc	3.71	19.87	24.79	0.33	10.37	0.00
Isd 29	0.20	14.51	26.06b	3.99	11.22	28.08	4.28	14.54	0.00
LSD(5%)	NS	NS	11.77	NS	NS	NS	NS	NS	-

ESB= Early shoot borer, BB= Black beetle, TSB= Top shoot borer, SB= Stem borer, RSB= Root stock borer, SI= Scale insect, MB= Mealy bug, WG= White grub

* Figures followed by the same letter (s) are not significantly different at 5% level as per LSD test.

Table 6. Infestation levels of some major insect pests to promising BSRI clones. RSRs, Thakurgaon, 2004-2005.

Clones/ Varieties	Percent infestation (Mean)								WG population/ 5 clumps/plot
	ESB	BB	TSB	SB (stalk)	SB (internode)	RSB	SI (Ln + 1)	MB	
I 82-98	0.00	0.73	21.38	65.85	22.75	94.41	2.87a* (19.13)	33.22a	0.67
I 98-98	0.00	0.54	21.54	60.52	33.98	82.27	1.52bc (3.78)	22.46ab	0.00
I 110-98	0.00	1.23	11.08	60.41	28.11	71.82	1.44c (3.53)	15.81b	0.00
I 139-98	0.00	0.48	16.91	54.47	28.32	93.94	1.40c (3.15)	19.31b	0.00
I 142-98	0.00	0.00	12.85	62.98	30.99	80.34	1.69bc (4.57)	33.67a	0.00
Isd 29	0.00	0.49	14.57	58.51	27.20	72.22	2.02bc (8.34)	22.24ab	0.33
LSD(5%)	NS	NS	NS	NS	NS	NS	0.7734	11.90	NS

ESB= Early shoot borer, BB= Black beetle, TSB= Top shoot borer, SB= Stem borer, RSB= Rootstock borer, SI= Scale insect, MB= Mealy bug, WG= White grub.

Figures in parentheses are observed mean

* Figures followed by the same letter (s) are not significantly different at 5% level as per LSD test.

to 34.98 and 71.82 to 94.41 percent at Ishurdi and Thakurgaon respectively. Lowest RSB infestation (21.39%) was observed in I 82-98 at Ishurdi whereas the same clone had the highest RSB infestation (94.41%) at Thakurgaon. SI infestation was very low among the test clones at Ishurdi which ranged from 0.00 to 4.28 percent with the highest in standard Isd 29 whereas it ranged from 3.15 to 19.13 percent at Thakurgaon with the highest (19.13%) in I 82-98. MB infestation ranged from 10.37 to 14.54 and 15.81 to 33.22 percent at Ishurdi and Thakurgaon respectively. Lowest MB (15.81%) infestation was observed in I 110-98 at Thakurgaon, which differed significantly over clones I 82-98 and I 124-98 (Table 6). WG population was low at both locations. Abdullah *et al.* (2006) reported that clones viz., I 245-99, I 262-99, I 429-99, I 433-99,

I 446-99 and I 486-99 and varieties I 20 and I 32 showed 0.51 to 3.32% infestation by early shoot borer, 0.22 to 15.48% infestation by black beetle, 4.55 to 53.58% infestation by top shoot borer, 5.25 to 55.21% (stalk basis) infestation by stem borer, 6.40 to 40.55% infestation by rootstock borer. They also reported white grub population that ranged from 0.00 to 3.67 per 5 clumps among the test clones and standard varieties. All these reported results have similarities the infestation caused by the major insect pests in the present study.

Table 7. Pooled/mean (%) data of some major insect pests of promising BSRI clones. BSRI, Ishurdi, 2002-2005.

Clones/ Varieties	Percent infestation (Mean)								WG population/ 5 clumps/plot
	ESB	BB	TSB	SB (stalk)	SB (internode)	RSB	SI	MB	
I 82-98	1.07	9.60	19.58	11.69	11.18	30.12	8.18	27.72	2.44
I 98-98	0.57	11.82	26.31	11.56	17.12	33.70	6.79	18.16	3.00
I 110-98	1.24	10.20	12.18	11.81	13.86	28.02	13.62	15.86	3.45
I 139-98	1.00	12.54	16.49	6.40	13.85	31.17	8.50	22.52	3.22
I 142-98	0.94	8.99	19.18	12.90	14.51	33.86	9.69	17.99	3.56
I 29	0.61	7.58	15.59	7.64	15.51	22.38	8.83	20.29	2.29

Table 8. Pooled/mean (%) data of some major insect pests of promising BSRI clones. Thakurgaon, 2002-2005.

Clones/ Varieties	Percent infestation (Mean)								WG population/ 5 clumps/plot
	ESB	BB	TSB	SB (stalk)	SB (internode)	RSB	SI	MB	
I 82-98	0.58	0.76	35.50	51.97	20.53	73.63	20.11	35.65	3.78
I 98-98	0.69	0.94	38.68	51.29	24.41	66.13	16.00	20.34	2.33
I 110-98	0.87	1.26	31.29	57.38	21.74	63.94	24.95	16.57	4.11
I 139-98	0.71	1.41	34.03	46.59	21.25	72.85	14.81	17.33	1.78
I 142-98	1.05	1.53	36.27	53.69	29.13	77.57	21.15	27.67	4.67
I 29	0.39	1.32	33.61	46.31	23.89	63.46	17.66	22.48	2.67

All the clones/varieties tested were exposed to the natural pest infestations in the same location for consecutive three years at both locations. It is revealed from the pooled data that lower infestation by ESB was observed in tested clones/variety which ranged from 0.59 to 1.07% and 0.58 to 1.05% at Ishurdi and Thakurgaon respectively (Table 7 & Table 8). Higher black beetle infestation was observed at Ishurdi which ranged from 7.58 to 12.54 percent showing the lowest (7.58%) in standard I 29 and the highest (12.54%) in I 139-98 whereas the same pest had 0.76 to 1.53 percent infestation at Thakurgaon. TSB infestation ranged from 12.18 to 26.31 and 31.29 to 38.68 percent at Ishurdi and Thakurgaon respectively where the lowest infestation (12.18% and 31.29%) was observed in the clone I 110-98 and the highest infestation (26.31% and 38.68%) in the clone I 98-98. The test clones had higher SB infestation which ranged from 46.31 to 57.38 percent at Thakurgaon showing the highest infestation (57.38%) in I 110-98 and the lowest infestation (46.31%) in standard I 29. SB infestation at Ishurdi varied from 6.40 to 12.90 percent with the lowest infestation (6.40%) in I 139-98 and the highest (12.90%) in I 142-98. SB intensity ranged from 11.18 to 17.12 and 20.53 to 29.13 percent among the clones/variety at Ishurdi and Thakurgaon respectively. RSB infestation was higher at Thakurgaon which ranged from 63.46 to 77.57 percent whereas at Ishurdi it ranged from 22.38 to 33.86 percent among the test clones/variety showing the lowest in standard I 29 at both locations (Table 7 & Table 8). SI infestation ranged from 6.79 to 13.62 percent and 14.81 to 24.95 percent at Ishurdi and Thakurgaon respectively among the clones/variety. MB infestation ranged from 15.86 to 27.72 percent and 16.57 to 35.65 percent at Ishurdi and Thakurgaon respectively among the clones/variety. White grub population ranged from 2.29 to 3.56 and 2.33 to 4.67 per 5 clumps among the test clones/variety at Ishurdi and Thakurgaon respectively. Pest reaction to genotypes is a comparative study; it may change with the change in the favourable conditions of the pest development.

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