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Field Performance of Some Promising Sugarcane Clones against Major Insect Pests

M.E. Reza*, M. Begum, M.N.A. Siddiquee, M.I. Ara and M.A. Rahman
Entomology Division, Bangladesh Sugarcrop Research Institute, Ishurdi, Pabna, Bangladesh

ABSTRACT

A field experiment was conducted to observe the infestation levels of three promising sugarcane clones viz., I 91-05, I 84-05, Isd 18 (T_2) and two standard varieties Isd 33 and Isd 37 against some major insect pests of sugarcane at two localities viz., Ishurdi and Thakurgaon. Results revealed that (pooled data) early shoot borer infestation was very low at both locations. Black beetle infestation was higher at Ishurdi which ranged from 4.00 to 6.25 per cent. Infestation due to top shoot borer ranged from 7.22 to 11.14 percent with lowest (10.42%) in I 91-05 clone at Ishurdi and 5.39 to 12.35 percent with lowest (6.38%) at Thakurgaon. Stem borer infestation (stalk basis) ranged from 22.74 to 28.57 percent with lowest (24.16%) and 12.99 to 23.45 percent with lowest (13.49%) in I 94-05 clone at Ishurdi and Thakurgaon, respectively. Stem borer infestation on internode basis varied from 23.00 to 26.58 percent with lowest (23.00%) in I 91-05 clone at Ishurdi and 17.17 to 23.01 percent with lowest (14.99%) in I 94-05 clone Thakurgaon. Rootstock borer infestation ranged from 35.88 to 45.32 percent at Ishurdi whereas higher infestation was observed at Thakurgaon which ranged from 79.72 to 87.34 percent with the lowest (35.88% & 79.72%) infestation in clones I 94-05 and I 91-05, respectively. The clones I 94-05 & Isd 18 (T_2) showed better performance due to mealy bug infestation both at Ishurdi and Thakurgaon. Scale insect infestation ranged from 6.38 to 14.24 percent and 11.81 to 26.73 percent at Ishurdi and Thakurgaon, respectively. This study revealed that, the clone I 94-05 showed best performance against major insect pests of sugarcane.

Key words: Performance, infestation, insect pests, sugarcane clones

INTRODUCTION

Sugarcane (*Saccharum officinarum* L.) is one of the most important cash-cum industrial crop in Bangladesh. It is a long durable crop which requires 12-16 months from planting to harvesting. Various factors are responsible for low yield of cane in Bangladesh compared to other sugarcane growing countries of the world. So far about 70 species of insect pests have been identified and reported to feed on sugarcane in Bangladesh, (Anon., 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). The most damaging pests are early shoot borer (*Chilo infuscatellus* Snellen), top shoot borer (*Scirpophaga excerptalis* Walker), stem borer (*Chilo tumidicostalis* Hampson), rootstock borer (*Emmalocera depressella* Swinhoe), scale insect (*Melanaspis glomerata* Green) and mealy bug (*Saccharicoccus sacchari* Cockerell). Losses in yield

* Corresponding author: M.E. Reza, Scientific Officer
e-mail: elmureza@gmail.com

incurred due to borer attack was estimated to be 22-33% by early shoot borer (Patil and Hapase, 1981), 12.29-43.67% by top shoot borer (Alam *et al.*, 2006), 18.01-28.73 percent (Abdullah e*t al.*, 2006) and 12.01-34.51% (Alam *et al.*, 2006) by stem borer, 10.07-55.28%% (Alam *et al.*, 2006) 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). 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 right chemical insecticides are not always available and also expensive. Moreover, it creates environmental hazards. Continuous use of insecticides causes development of resistance to the target pests. 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 tolerant to major insect pests would be more economic to cultivate by the sugarcane growers in Bangladesh. Therefore, continued efforts is needed to identified develop clones resistant to major insect pests. In the present study three promising clones have been evaluated to observe the infestation against major insect pests of sugarcane.

MATERIALS AND METHODS

The field experiment was conducted at the experimental farm of Bangladesh Sugarcrop Research Institute (BSRI), Ishurdi, Pabna and Regional Sugarcrop Research Station (RSRS) farm, Thakurgaon during three continitive cropping seasons of 2009-2010, 2010-2011 and 2011-2012. The experiment was laid out in randomized complete block (RCB) design with three replications. The plot size was 6m × 5m. Blocks were 2m apart with a border of 1m. The BSRI bred sugarcane clones viz., I 91-05, I 94-05, Isd 18 (T_2) and two standard varieties Isd 33 and Isd 37 were included to compare their infestation level. 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 pest infestation in all the three seasons at both the locations. No pest control measure was applied.

Data on the infestation of early shoot borer, and black beetle were recorded in the month of March of each season. Data on the incidence of top shoot borer, stem borer, rootstock borer, scale insect, and mealy bug were recorded at harvest by counting the total and concerned pest infested canes from each plot. In case of stem borer 10 stem borer infested plants were randomly splitted to count infested internodes. For rootstock borer, data were taken from 5 randomly selected clumps per plot. Infested rootstock borer up-rooted stocks were dissected to observe their infestation. The collected data were converted to percent infestation to measure the level of incidence and analyzed for comparison by using LSD at 0.05 levels for interpretation.

RESULTS AND DISCUSSION

It was evident that statistically no significant difference was observed among the test clones and standard varieties for stem borer (internode basis) and mealy bug infestation at BSRI, Ishurdi location (Table 1). At RSRS, Thakurgaon location, statistically significant differences were observed for all major insect pests (Table 2). The infestation of early shoot borer was highest (1.99%) in clone I 94-05 and lowest (0.19%) in clones Isd 18 (T_2) whereas at Thakurgaon, the lowest was (0.59%) in Isd 37 and highest (1.03%) in clones Isd 18 (T_2). In case of black beetle, the lowest (2.80%) infestation was observed in the clone Isd 18 (T_2) and the highest (9.36%) in clones I 94-05 whereas at Thakurgaon, the lowest (0.83%) in I 91-05 and the highest (1.11%) in standard Isd 37.

Table 1. Infestation levels of some major insect pests in promising BSRI clones (ZYT-I). BSRI, Ishurdi, Pabna, 2009-2010

Clones/ Variety	Percent infestation (Mean of three replications)							
	ESB	BB	TSB	SB (stalk)	SB (internode)	RSB	MB	SI
I 91-05	1.15abcd	7.77ab	13.47ab	53.88abc	23.46	64.20ab	17.41	13.58ab
I 94-05	1.99ab	9.36a	15.45a	40.77cd	26.28	57.74ab	15.31	20.66ab
Isd 18(T_2)	0.19d	2.80b	14.62a	44.88bcd	28.91	71.81a	21.71	35.73ab
Isd 33	0.83bcd	5.90ab	9.97b	38.40d	32.76	65.67ab	15.42	32.01ab
Isd 37	1.38abcd	5.39ab	14.42a	47.14abcd	30.68	60.52ab	28.29	32.06a
LSD (0.05)	1.212	4.602	3.739	13.13	NS	21.60	NS	17.46

ESB = Early shoot borer, BB = Black beetle, TSB = Top shoot borer, SB = Stem borer, RSB = Rootstock borer, MB = Mealy bug, SI = Scale insect, NS = Non-significant.
Figures followed by the same letter (s) are not significantly different at 5% level as per LSD test.

Top shoot borer infestation ranged from 9.97 to 15.45 and 3.84 to 11.59 percent at Ishurdi and Thakurgaon, respectively. The highest (15.45%) infestation was observed, in standard clone I 94-05. The standard Isd 33 and Isd 37 showed the lowest (9.97% and 3.84%) infestation at Ishurdi and Thakurgaon, respectively. Infestation due to stem borer (stalk basis), the lowest (38.40%) infestation was observed in Isd 33 at Ishurdi and 13.28% in clones Isd 18 (T_2) at Thakurgaon whereas highest (53.88% and 25.51%) infestation was observed in clone I 91-05 at experimental locations. The stalk basis stem borer infestation to other clones of sugarcane was reported to vary from 13.99 to 44.81% (Anon., 2001). Stem borer infestation on internode basis, the clone I 91-05 showed the lowest (23.46%) intensity at Ishurdi but highest intensity (22.14%) at Thakurgaon. Two standard (Isd 33 & Isd 37) varieties showed more intensity than other clones.

Table 2. Infestation levels of some major insect pests in promising BSRI clones (ZYT-I). RSRS, Thakurgaon, 2009-2010

Clones/ Variety	Percent infestation (mean of three replications)							
	ESB	BB	TSB	SB (stalk)	SB (internode)	RSB	MB	SI
I 91-05	0.74abc	0.83	9.76abcd	25.51ab	22.14a	89.12ab	37.66ab	42.26ab
I 94-05	0.78abc	1.23	5.84cd	15.28bc	13.76ab	89.78ab	29.70ab	35.29ab
Isd 18(T_2)	1.03abc	1.80	11.59abc	13.28c	18.38ab	92.69a	30.60ab	58.66a
Isd 33	0.75abc	1.83	4.15d	23.54abc	15.81ab	86.94ab	26.10b	25.38b
Isd 37	0.59bc	1.11	3.84abcd	20.18abc	19.70ab	90.23ab	31.53ab	43.14ab
LSD (0.05)	1.284	NS	5.529	9.680	7.948	20.00	14.73	21.31

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

The lowest (57.74%) rootstock borer infestation was obtained in I 94-05 at Ishurdi whereas 86.94% in Isd 33 at Thakurgaon. The highest (71.81% & 92.69%) infestation was observed in clones Isd 18 (T_2) at both locations. Heavy rootstock borer infestation was observed at Thakurgaon, which ranged from 86.94-92.69 percent among the test clones and standard varieties. In case of mealy bug, the lowest (15.31%) infestation was observed in I 94-05 and the highest (28.29%) in Isd 37 at Ishurdi whereas at Thakurgaon, the lowest (26.10%) infestation was observed in Isd 33 and highest (37.66%) in clones I 91-05. Scale insect infestation was lowest (13.58) in I 91-05 clone and highest (35.73%) in Isd 18 (T_2) clone at Ishurdi. Heavy scale infestation was recorded in Isd 18 (T_2) has significant different among other clones. Abdullah *et al.* (2007) reported that clones viz., I 82-98, I 98-98, I 110-98, I 139-98, I 142-98 and variety Isd 29 showed 0.57 to 1.07 percent ESB infestation, 0.76 to 1.53 BB infestation at Ishurdi and 7.58 to 12.54 percent at Thakurgaon. They also reported 12.18 to 26.31 percent infestation by TSB at Ishurdi and 31.29 to 38.68 percent infestation at Thakurgaon. Author also observed 6.40 to 12.90 percent infestation by stem borer at Ishurdi and 46.31 to 57.38 percent (stalk basis) at Thakurgaon. They found 22.38 to 33.86 percent RSB infestation at Ishurdi and 63.46 to 97.57 percent infestation at Thakurgaon. Their study showed that 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.

In the cropping season 2010-2011 test clones showed no statistically significant difference in infestation by black beetle, stem borer (stalk basis), rootstock borer and scale insect except early shoot borer, top shoot borer, stem borer (internode) and mealy bug at Ishurdi (Table 3) and at Thakurgaon, no significant difference in infestation by early shoot borer and black beetle was observed (Table 4). Early shoot borer infestation was very low at both locations and it varied from 0.00-1.16 and 0.00-0.00 percent at Ishurdi and Thakurgaon, respectively, Early shoot borer infestation (0.23% to 2.92%) in different clones was reported in annual report of BSRI (Anon., 2001). Infestation due to black beetle was lowest (6.02%) was in I 94-05 clone and highest (10.97%) in standard Isd 37 at Ishurdi. The infestation of black beetle was very low at Thakurgaon, which ranged from 1.19 to 2.73 percent.

Table 3. Infestation levels of some major insect pests in promising BSRI Clones (ZYT-II), BSRI, Ishurdi, Pabna, 2010-2011

Clones/ Variety	Percent infestation (Mean of three replications)							
	ESB	BB	TSB	SB (stalk)	SB (internode)	RSB	MB	SI
I 91-05	1.03ab	7.53	12.77ab	22.58	17.67ab	27.97	33.96a	4.58
I 94-05	0.00c	6.02	11.68ab	21.34	17.84ab	28.08	28.10ab	4.52
Isd 18 (T_2)	0.89abc	7.94	12.59ab	28.85	15.47ab	26.18	30.25ab	4.51
Isd 33	0.69abc	9.38	7.11b	21.87	18.25ab	28.94	32.30a	5.72
Isd 37	1.16a	10.97	10.51ab	21.42	17.30ab	30.35	31.73ab	5.18
LSD (0.05)	0.8233	NS	6.165	NS	4.162	NS	10.90	NS

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

In case of Top shoot borer, the lowest infestation was recorded in Isd 33 at both locations whereas highest (12.77%) infestation was observed in I 91-05 clone and 9.82% in Isd 18 (T_2) at Ishurdi and Thakurgaon respectively. The infestation to other sugarcane clones of 11.11 to 28.89% and 22.22 to 38.89% was reported by BSRI in the annual report of 1997 (Anon., 1999). The clone I 191-02 had the lowest (15.86% and 21.05%) top shoot borer infestation at both locations.

Table 4. Infestation levels of some major insect pests in promising BSRI clones (ZYT-II), RSRS, Thakurgaon, 2010-2011

Clones/ Variety	Percent infestation (Mean of three replications)							
	ESB	BB	TSB	SB (stalk)	SB (internode)	RSB	MB	SI
I 91-05	0.00	2.73	3.91bc	39.96ab	24.77ab	73.50ab	9.99ab	11.87b
I 94-05	0.00	1.67	4.23bc	21.30b	11.95b	73.69ab	9.32ab	8.54b
Isd 18 (T_2)	0.00	2.28	9.82ab	21.33b	17.63ab	79.86ab	9.42ab	10.95b
Isd 33	0.00	2.10	1.92c	36.48ab	27.02a	86.90a	6.22b	5.70b
Isd 37	0.00	1.19	4.21bc	15.91bc	18.99ab	83.46a	20.82a	33.87a
LSD (0.05)	NS	NS	3.3913	8.927	13.20	20.20	12.55	15.69

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

Stem borer infestation (stalk basis) ranged from 21.34 to 28.85 percent at Ishurdi and 15.91 to 39.96 percent at Thakurgaon. The lowest (21.34%) infestation was observed in clone I 94-05 and the highest (28.85%) in Isd 18 (T_2) clone at Ishurdi whereas at Thakurgaon, the lowest (15.91%) infestation was observed in standard Isd 37 and the highest (39.96%) in I 91-05. In case of stem borer infestation on internode basis, the standard Isd 33 had the highest (18.25% & 27.02%) infestation was observed at both locations (Table 3, Table 4). Rootstock borer infestation ranged from 26.18 to 30.35 and 73.50 to 86.90 percent at Ishurdi and Thakurgaon respectively. The lowest (26.18%) infestation

was observed in Isd 18 (T_2) clone and the highest (30.35%) in standard Isd 37 at Ishurdi whereas at Thakurgaon, the lowest (73.50%) infestation was observed in I 91-05 and the highest (86.90%) in standard Isd 33. Heavy mealy bug infestation was observed at Ishurdi (Range: 28.10-33.96%) location than Thakurgaon (Range: 6.22-20.82%). The mealy bug infestation was reported in other sugarcane clones ranged from 7.12 to 95.61% (Anon., 2001). At Ishurdi, scale insect infestation was found very low which ranged from 4.51-5.18 percent. At Thakurgaon, the lowest (5.70%) scale insect infestation was obtained in Isd 33 and the highest (33.87%) in Isd 37.

In the cropping season 2011-2012 no statistically significant difference was observed in infestation of black beetle, top shoot borer, stem borer (stalk basis), stem borer (internode basis) and rootstock borer except early shoot borer, mealy bug and scale insect among the test clones and standard varieties at Ishurdi (Table 5).

Table 5. **Infestation levels of some major insect pests in promising BSRI Clones (ZYT-III), BSRI, Ishurdi, Pabna, 2011-2012**

Clones/ Variety	Percent infestation (Mean of three replications)							
	ESB	BB	TSB	SB (stalk)	SB (internode)	RSB	MB	SI
I 91-05	1.47ab	2.75	5.03	10.47	27.86	34.27	12.76	0.98b
I 94-05	0.82 b	1.82	6.29	10.36	25.48	21.81	9.80ab	1.07b
Isd 18 (T_2)	0.70b	1.26	5.06	11.97	28.79	37.96	10.76 ab	2.49a
Isd 33	2.50a	1.94	4.57	7.96	27.42	25.33	5.46b	0.77b
Isd 37	1.08b	2.40	4.81	12.91	31.76	38.56	17.04a	2.58a
Lsd (0.05)	1.076	NS	NS	NS	NS	NS	6.948	1.011

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

At Thakurgaon, test clones showed statistically significant difference in infestation by top shoot borer, and stem borer (stalk basis) among test clones and standard varieties (Table 6). Early shoot borer infestation was very low at both locations (Table 5, Table 6). At Ishurdi, black beetle infestation varied from 1.26 to 2.75 percent among the test clones and standard varieties which were very low (Ranged from 0.35-0.70%) at Thakurgaon. Top shoot borer infestation in standard varieties Isd 33 & Isd 37 were lower (4.57% & 4.81%) than in three promising clones viz., I 91-05, I 94-05 and Isd 18 (T_2) (5.03%, 6.29% and 5.06%, respectively) at Ishurdi whereas at Thakurgaon, the lowest (8.11%) infestation was observed in Isd 37 and the highest (15.64%) in Isd 18 (T_2) clone. Biswas *et al.* (2004) 16.14-41.16% reported and Abdullah *et al.* (2004) 5.81-12.75% top shoot borer infestation when studied with some sugarcane clones.

Table 6. Infestation levels of some major insect pests in promising BSRI clones (ZYT-III), RSRS, Thakurgaon, 2011-2012

Clones/ Variety	Percent infestation (Mean of three replications)							
	ESB	BB	TSB	SB (stalk)	SB (internode)	RSB	MB	SI
I 91-05	0.29	0.70	10.11ab	4.89b	22.11	76.53	26.90	3.45
I 94-05	0.20	0.44	9.08b	3.89b	19.26	80.63	26.28	3.41
Isd 18 (T_2)	0.68	0.35	15.64a	17.77a	15.50	89.47	16.06	3.12
Isd 33	0.77	0.59	14.03a	9.50ab	20.18	68.15	25.64	4.36
Isd 37	0.28	0.49	8.11b	2.87b	17.10	83.96	16.61	3.18
Lsd (0.05)	NS	NS	6.28	8.16	NS	NS	NS	NS

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

In case of stem borer (stalk basis) the highest (12.91%) infestation was observed in Isd 37 and the lowest (7.96%) in Isd 33 at Ishurdi. At Thakurgaon, the highest (17.77%) stem borer infestation was observed in Isd 18 (T_2) clone and the lowest (2.87%) in standard Isd 37. Stem borer infestation on internode basis varied from 25.48 to 31.76 percent at Ishurdi and 15.50 to 22.11 percent at Thakurgaon. The lowest (21.81%) rootstock borer infestation was observed in I 94-05 and the highest (38.56%) in standard Isd 37 at Ishurdi. At Thakurgaon, the standard variety Isd 33 showed the lowest (68.15%) rootstock borer infestation and the highest (89..47%) in Isd 18 (T_2) clone. The lowest (5.46%) mealy bug infestation was observed in standard Isd 33 and the highest (17.04%) in standard Isd 37 at Ishurdi whereas Thakurgaon, the lowest (16.06%) infestation was observed in Isd 18 (T_2) and the clone I 91-05 showed the highest (26.90%) infestation (Table 6). Scale insect infestation was low among the test clones and standard varieties at Ishurdi which ranged from 0.77 to 2.58 percent with the lowest (0.77%) in standard Isd 33. At Thakurgaon, it ranged from 3.12 to 4.36 percent with the lowest (3.12%) in Isd 18 (T_2) clone. The scale insect infestation was reported in other sugarcane clones ranged from 4.33 to 26.67% in BSRI (Anon., 1995). 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 Isd 20 and Isd 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. The test clones and standard varieties in the present study exhibited pest incidence within the range as was reported by former authors.

From the pooled data it revealed that early shoot borer infestation was very low at both locations among the test clones and standard varieties. The infestation ranged from 0.59 to 1.34 and 0.29 to 0.57 percent at Ishurdi and Thakurgaon respectively (Table 7, Table 8). Black beetle infestation ranged from 4.00 to 6.25 percent showing the lowest (4.00%) in the clone Isd 18 (T_2) and the highest (6.25%) in standard Isd 37 whereas the same pest had 0.93 to 1.51 percent infestation at Thakurgaon. Top shoot borer infestation ranged from 7.22 to 11.14 at Ishurdi and 5.39 to 12.35 percent at Thakurgaon with the lowest (7.22%) infestation as observed in Isd 33 and the highest (11.14%) in clone I 94-05 at Ishurdi. At Thakurgaon, the lowest (5.39%) infestation was observed in standard Isd 37 and the highest (12.35%) in Isd 18 (T_2).

At Ishurdi, stem borer infestation (stalk basis) varied from 22.74 to 28.98 percent with the lowest (22.74%) in Isd 33 and the highest (28.98%) in I 91-05 whereas at Thakurgaon, stem borer infestation (stalk basis) ranged from 12.99 to 23.45 percent showing the lowest (12.99%) in standard Isd 37 and the highest (23.45%) in I 91-05. Stem borer infestation (internode basis) ranged from 23.00 to 26.58 at Ishurdi and 14.99 to 23.01 percent among the test clones and standard varieties at Thakurgaon.

Table 7. Pooled infestation (%) of some major insect pests in promising BSRI clones. BSRI, Ishurdi, 2009-2012 (Three seasons)

Clones/ Varieties	Percent pest infestation (mean of three replications)							
	ESB	BB	TSB	SB (stalk)	SB (internode)	RSB	MB	SI
I 91-05	1.22	6.02	10.42	28.98	23.00	42.15	21.38	6.38
I 94-05	0.94	5.73	11.14	24.16	23.2	35.88	17.74	8.75
Isd 18 (T_2)	0.59	4.00	10.76	28.57	24.39	45.32	20.91	14.24
Isd 33	1.34	5.74	7.22	22.74	26.14	39.98	23.86	12.83
Isd 37	1.21	6.25	9.91	27.16	26.58	43.14	30.01	13.27

Table 8. Pooled infestation (%) of some major insect pests in promising BSRI clones. RSRS, Thakurgaon, 2009-2012 (Three seasons)

Clones/ Varieties	Percent pest infestation (mean of three replications)							
	ESB	BB	TSB	SB (stalk)	SB (internode)	RSB	MB	SI
I 91-05	0.34	1.42	7.93	23.45	23.01	79.72	24.85	19.19
I 94-05	0.33	1.11	6.38	13.49	14.99	81.37	21.77	15.75
Isd 18 (T_2)	0.57	1.48	12.35	17.46	17.17	87.34	18.69	24.24
Isd 33	0.51	1.51	6.70	23.17	21.00	80.66	19.32	11.81
Isd 37	0.29	0.93	5.39	12.99	18.60	85.88	22.99	26.73

Rootstock borer infestation at Ishurdi was varied from 35.88 to 45.32 per cent but higher at Thakurgaon which ranged from 79.72 to 87.34 per cent. The lowest (35.88%) and highest (45.32%) infestation was in clones I 94-05 and Isd 18 (T_2), respectively at Ishurdi (Table 7). At Thakurgaon, rootstalk borer infestation was lowest (79.72%) in I 91-05 clone and the highest (87.34%) in Isd 18 (T_2) clone. Mealy bug infestation ranged from 17.74 to 30.01 per cent and 18.69 to 24.85 per cent at Ishurdi and Thakurgaon, respectively. The clones I 94-05 and Isd 18 (T_2) showed lowest (17.74% & 18.69%) infestation, respectively at both location. Scale insect infestation was higher at Thakurgaon which ranged from 11.81 to 26.73 percent whereas at Ishurdi, it ranged from 6.38 to 14.24 per cent (Table 7, Table 8). At BSRI location, early shoot borer and black beetle infestations in the test clone Isd 18 (T_2) were lower than standard varieties Isd 33 & Isd 37. The clone I 91-05 performed better than standard varieties Isd 33 & Isd 37 on respect to stem borer (internode basis) and scale insect. In case of rootstock borer and mealy bug, the clone I 94-05 was better than the standard varieties. At Thakurgaon, early shoot borer black beetle, top shoot borer and stem borer (stalk) infestations was less in standard Isd 37 than the test clones. The infestation of stem borer (internode) and

mealy bug in Isd 18 (T_2) were lower than standards. Rootstock borer infestation was lowest in clone I 91-05. Pest reaction to genotypes is a comparative study; it may vary with the change in the favourable conditions of the pest development.

From the above study it revealed that stem borer infestation was lowest in clone I 94-05 (24.16%) on stalk basis and lowest (23.02%) on internode basis. In clone I 94-05 rootstock borer infestation was lowest (35.88%) and also lowest mealy bug infestation (17.74%) and lowest scale insect infestation (8.75%). In clone Isd 18 (T_2) early shoot borer infestation was lowest (0.59%) and also lowest black beetle infestation (4.00%) at Ishurdi. At Thakurgaon, in clone I 94-05 early shoot borer infestation was lowest (0.33%) and also lowest black beetle infestation (1.11%), lowest top shoot borer infestation (6.38%), lowest stem borer (Stalk basis) infestation (13.49%), lowest stem borer (internode basis) infestation (14.99%), and lowest scale insect infestation (15.75%).

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