

Tolerance Status of Some Sugarcane Varieties to Major Insect Pests

M.N.A. Siddiquee*, M. Begum, M.A. Rahman, M.I. Ara and M.E. Reza

Entomology Division, Bangladesh Sugarcrop Research Institute, Ishurdi, Pabna, Bangladesh

ABSTRACT

A field experiment was conducted to evaluate recent released ten BSRI bred sugarcane varieties viz. Isd 16, Isd 20, Isd 33, Isd 34, Isd 36, Isd 37, Isd 38, Isd 39, Isd 40 along with BSRI Akh 41 as a tolerant one to major insect pests at Ishurdi, Pabna during the cropping season 2012-2013. The characteristics of tolerance was measured by observing their infestation level against some major pests. The lowest infestation of early shoot borer (0.26%) and black beetle (2.79%) was observed in Isd 33 and Isd 37. Isd 36 top shoot borer, stem borer and rootstock borer infestation recorded as 11.10%, 12.75% and 15.43%, respectively. The lowest infestation of scale insect and mealy bug were 8.64 and 8.96 per cent in variety Isd 40, suggesting their better tolerance to major insect pests. While the highest infestation of early shoot borer 1.34%, black beetle 5.94%, top shoot borer 20.55%, stem borer 26.41% was found in Isd 34. Rootstock borer infestation 26.78% in Isd 40, 17.53% scale insect infestation in Isd 33 and 14.28% mealy bug was found in variety Isd 16, revealed their higher susceptibility to those insect pests. The lowest infestation of top shoot borer, stem borer and rootstock borer was found in the sugarcane variety Isd 36, indicating its higher tolerance to those insect pests.

Key words: Tolerance, insect pests, sugarcane variety

INTRODUCTION

Sugarcane is an important commercial crop in the tropics and serves as the main source of white sugar and goor (jaggery) in 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). 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 (Anon., 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

* Corresponding author: M.N.A. Siddiquee, Senior Scientific Officer
e-mail: nasbsri17@yahoo.com

damaging. The yield loss due to white grubs was found from 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 which is environment friendly also. As most of the major sugarcane pests are monophagous, there is a good scope to develop resistant sugarcane varieties for their management. Selection of insect resistant varieties is the first step towards developing IPM approach. Varieties having high sugar yield potential with considerable tolerance to major insect pest attack 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 pests. In the present study ten commercial varieties have been evaluated to observe their tolerance against major insect pests of sugarcane.

MATERIALS AND METHODS

The trial was conducted at the experimental farm of Bangladesh Sugarcrop Research Institute (BSRI), Ishurdi, Pabna during the cropping season of 2012-2013. 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 and had a border of 1m. The BSRI bred sugarcane varieties like Isd 16, Isd 20, Isd 33, Isd 34, Isd 36, Isd 37, Isd 38, Isd 39, Isd 40 and BSRIAk 41 considering tolerant 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 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 to a depth of 40 cm with spade. Larval population of white grubs 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

Percent infestation of early shoot borer, black beetle and top shoot borer

During the cropping season 2012-13 significant difference was observed among the sugarcane varieties for early shoot borer, black beetle and top shoot borer infestation at Ishurdi (Figure 1). The maximum infestation (1.34%) of early shoot borer was found in Isd 34 followed by Isd 38 (1.05%) and Isd 39 (0.85%). The minimum infestation (0.26%) of early shoot borer was found in Isd 33 followed by Isd 40. The minimum infestation (2.79%) of black beetle was recorded in Isd 37 which was followed by Isd 40 and Isd 38. In case of top shoot borer, the maximum infestation (20.55%) was found in Isd 34 followed by Isd 20 (19.01%) and BSRIAKH 41 (18.58%). The present results are in similar with the findings of Begum *et al.* (2013) who found some varieties/promising clones showing infestation from 0.65 to 1.42% by early shoot borer, 1.67 to 4.59 % by black beetle and 7.95 to 21.88% by top shoot borer at BSRI farm, Ishurdi, Pabna.

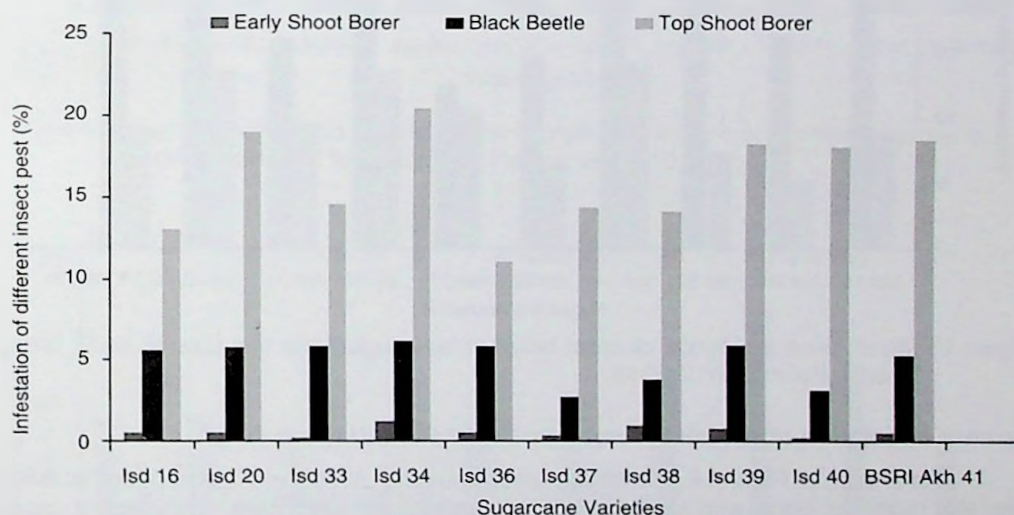


Figure 1. Percent infestation of early shoot borer, black beetle and top shoot borer of test sugarcane varieties at BSRI farm, Ishurdi, Pabna, 2012-13

Percent infestation of stem borer

Among the test varieties, percent infestation differed during July-October, 2013 (Figure 2). The cumulative percent infestation in October ranged from 12.75 to 26.41 percent. The maximum infestation of 29.56 percent was observed in Isd 34 followed by Isd 16 (25.55 percent) and minimum 12.75 percent was in Isd 36. In July, the maximum infestation was found in Isd 34 14.54 percent and the minimum was found 6.52 percent in Isd 36. Begum *et al.*, (2005) reported lower percent stem borer infestation in all the promising clones during April-September (0.13 to 7.00%) with maximum infestation from 25.63 to 50.87% in October.

Percent infestation of stem borer (stalk and internode basis)

On the basis of stalk, the maximum stem borer infestation (26.41%) was observed in Isd 34 followed by Isd 16 (25.55%) and Isd 38 (25.02%) (Figure 3). On the other hand, the highest stem borer infestation (29.56%) was found in Isd 34 on internode basis while the lowest (16.59%) in Isd 36. The present results are partially concords with the findings of Begum *et al.* (2011) who reported that stem borer infestation both on stalk and internodes basis had ranged from 10.40 to 17.95 % and 16.25 to 20.42 %, respectively.

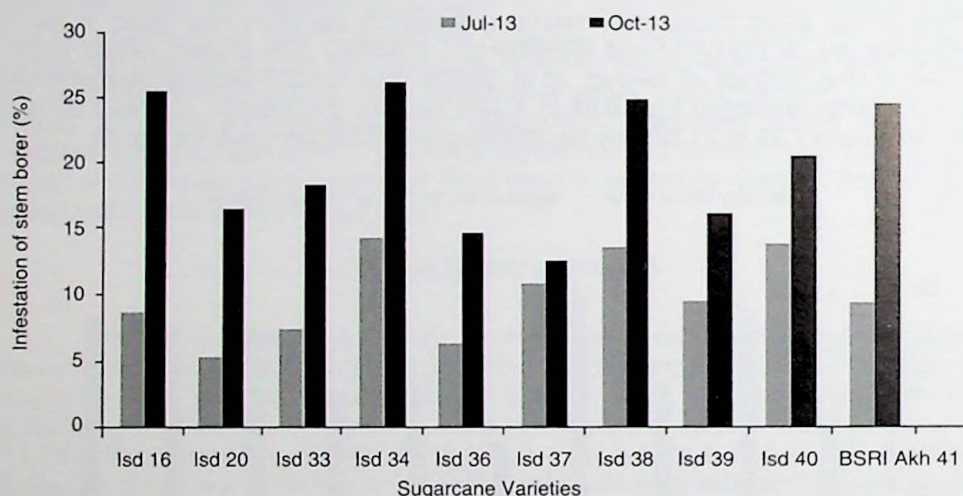


Figure 2. Month wise Incidence of stem borer in test sugarcane varieties at BSRI farm, Ishurdi, Pabna, 2012-2013.

Percent infestation of rootstock borer, scale insect and mealy bug

As shown in Figure 4 pest infestation/population in commercial varieties at BSRI farm like rootstock borer and scale insect were statistically significant in respective cases indicating difference among the varieties. Root stock borer infestation was found highest (26.78 %) in the variety Isd 40 and lowest (15.43 %) in Isd 34 followed by (16.70%) in Isd 33 and (17.07%) in Isd 39. No insignificant difference was found in rest varieties. In case of scale insect, the highest (17.53 %) infestation was found in Isd 33 and the lowest infestation (7.97%) in Isd 20 and other varieties showed above by scale insect. No significant difference was observed in mealy bug among the test varieties. Mealy bug infestation ranged from 8.03 to 14.26% The minimum infestation (8.03%) was recorded in Isd 37 followed by Isd 40 and Isd 38 and the maximum infestation was found Isd 16 (14.26%). The present results are in agreement with the findings of Abdullah *et al.*, (2006) who found some varieties/promising clones showing infestation from 4.55 to 53.58% by top shoot borer, 3.33 to 10.33% by white grub and 6.40 to 40.55 % by root stock borer at BSRI farm, Ishurdi, Pabna.

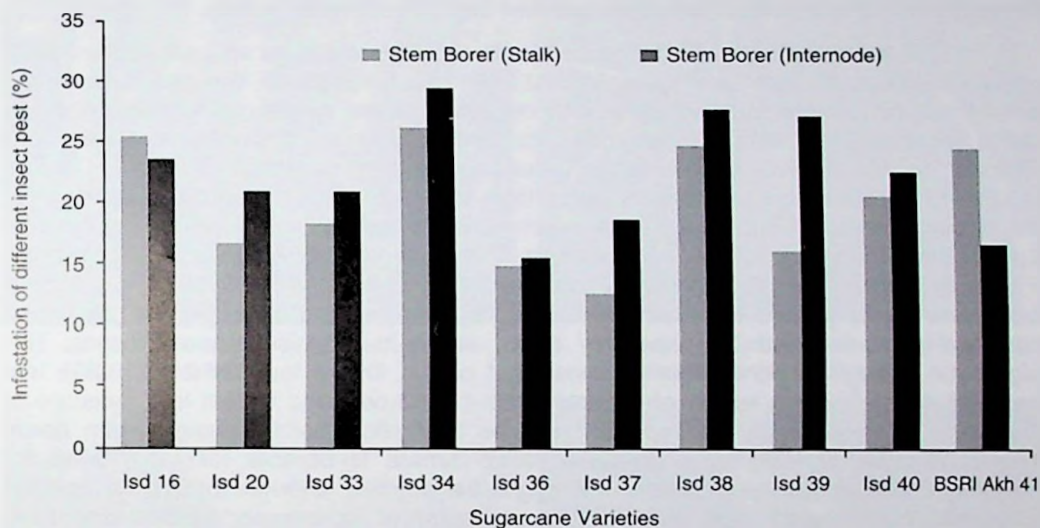


Figure 3. Percent infestation of stem borer in stalk and internodes in test sugarcane varieties at BSRI farm, Ishurdi, Pabna, 2012-13.

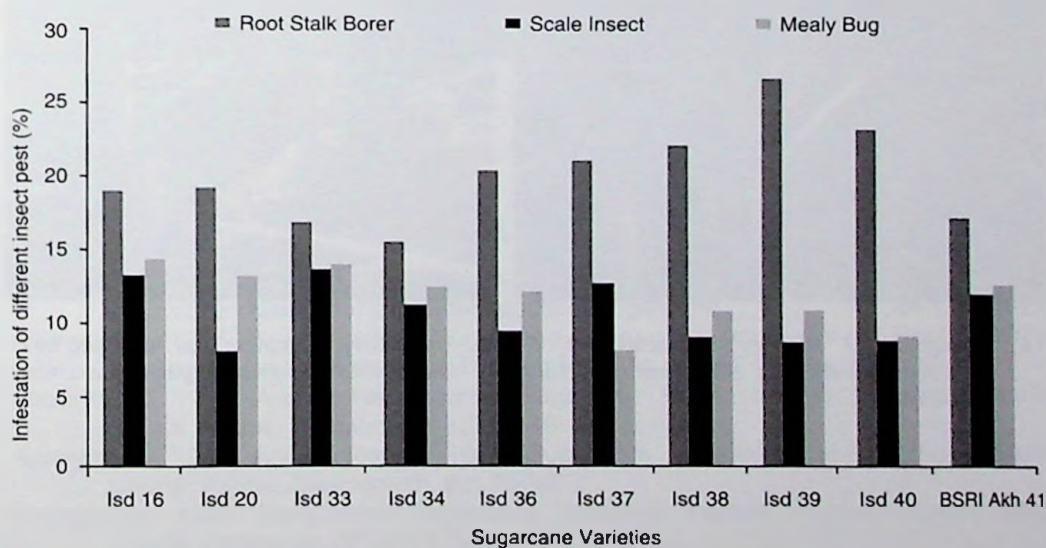


Figure 4. Percent infestation of rootstock borer, scale insect and mealy bug in test

Comparison of infestation between tolerant and susceptible variety

Due to the primary infestation, top leaves completely dried up and infested plant was visible from a distance (Figure 5A). At later infestation stage, the grown up larvae moved out of primary infested cane and migrated to the neighbouring new canes to cause secondary infestation (Figure 5B). Aerial roots came out profusely from the nodes adjacent to the damaged internodes after secondary infestation (Figure 5C). The secondary infested canes had entry holes from where excreta oozed out showing dust like damaged tissue (Figure 5D). The resistant variety Isd 36 was healthy whereas the susceptible variety Isd 34 dried up and was broken by due to the attack of stem borer (Figure 5E). The tolerant and susceptible varieties were determined based on healthy sugarcane plants (Figure 5F). There is a need for clear explanation about the reasons of tolerance of variety Isd 36 especially about some its physical characteristics. The sugarcane variety Isd 36 contain yellowish leaf colour, lowest leaf number (13.33), leaf area 415.40 cm², long length of top internode (12.93 cm) and lowest leaf moisture of sugarcane seems to play an important role as a physical barrier against stem borer. Highest number of leaf might create a micro-climate favourable for stem borer for movement mating and oviposition and might be positive enough to supply food for successful livelihood for next generation. Long length of top internode plays a negative role on stem borer infestation on sugarcane.



A. Symptom of Primary infestation of *C. tumidicostalis* showing dead heart symptom in Isd 34



B. Secondary infestation due to attack by *C. tumidicostalis* showing borer and excreta in Isd 34



C. Aerial root formation in Isd 34 due to the severe attack by



D. Secondary infestation in Isd 34 showing excreta with damaged tissue



E. Isd 36. Stem borer tolerant (left side) and Isd 34. Stem borer susceptible (right side)



F. Isd 36- Tolerant variety Isd 36 free from the attack by

Figure 5 A-F. Symptoms of insect infestation in susceptible and tolerant sugarcane varieties

REFERENCES

- Abdullah, M.; Biswas, M.M. and Siddiquee, M.N.A. 2006. Response of some promising sugarcane clones to major insect pests of sugarcane. *Sugarcane*, **56** (3): 23-28.
- Anonymous. 1973-78. Bangladesh Sugarcane Research Institute Annual Report, 1973-78. Sugarcane Research and Training Institute, Ishurdi, Pabna. pp. 123-142.
- Anonymous. 1981. Annual Report, 1981. Sugarcane Research and Training Institute, Ishurdi, Pabna, Bangladesh. pp. 67-79.
- Anonymous. 1984. Annual Report, 1984. Sugarcane Research and Training Institute, Ishurdi, Pabna, Bangladesh. pp. 79-94.
- Anonymous. 1992. Bangladesh Sugarcane Research Institute Annual Report, 1992. Ishurdi, Pabna. pp. 87-9674, 34p.
- Avasthy, P. N. 1983. Insect Pest Management for Sugarcane in India. In: Sugarcane Pest Management in India (Eds. M. Balasubramanian and A.R. Solayappan). Tamil Nadu Co-operative Sugar Federation, Madras. pp. 71-77.

- Begum, M.; Abdullah, M.; Siddiquee M.N.A.; Islam M.S.; Alam M.N.; Alam K.S. and Rahman M.H. 2013. Prevalence of some major insect pests in sugarcane clones. *Bangladesh J. Sugarcane*. **33 & 34**: 28-36.
- Begum, M.; Abdullah M.; Rahman M.A.; Siddiquee M.N.A. and Ahmed T. 2011. Field infestation of some promising sugarcane clones by for some major pests. *Bangladesh J. Sugarcane*. **32**: 73-81.
- Begum, M.; Islam K.S.; Abdullah M. and Biswas M.M. 2005. Evaluation of some promising sugarcane clones for possible resistance against some major pests. *Bangladesh J. Sugarcane*. **24-27**: 63-69.
- Gupta, B.D. and Avasthy, P.N. 1952. Biology of sugarcane borer, *Emmalocera depressella* Swinh., in the Uttarpradesh. *J. Agric. Anim. Husb. U. P.*, **2**: 19-25.
- Kalra, A.N. and Sidhu, A.S. 1964. Sugarcane Mealy bug, *Saccharicoccus sacchari* Cockerell and its control. Proc. All India Conf. Sug. Cane Res. Dev. Wkrs., **5** : 557 - 559.
- Karim, M.A. and Islam, M.N. 1977. Sugarcane insect pests and their natural enemies recorded in Bangladesh. Proceeding Annual Convention Bangladesh Society Sugarcane Technologist, 1974-76. pp. 32-68.
- Khanna, K.L. 1957. On the Coccid *Melanaspis glomerata* (Green) on sugarcane in Bihar. *Indian Journal of Sugarcane Research and Development*, **11**: 19-22.
- Khanna, K.L.; Nigram, L.N. and Puri, V.D. 1957. *Chilo tumidicostalis* Hampson, a serious stem borer pest of sugarcane in Bihar. Proceeding, Indian Academy of Sciences (B) **46** : 75-95.
- Miah, M.A.H.; Khuda, A.K.M.Q.E.; Alam, M.A.; Biswas, M.M. and Shahjahan, M. 1983. Chemical control of white grubs *Bangladesh Journal of Sugarcane*, **5**: 1-7.
- Miah, M.A.H.; Kundu, R.; Mannan, A. and Abdullah, M. 1986. Assessment of cane damage caused by root stock borer, *Emmalocera depressella* Swinhoe and effects of pesticides on the pest. *Bangladesh Journal of Sugarcane*, **8**: 1-4.
- Patil, A.S. and Hapase D.G. 1981. Research on sugarcane borers in Maharashtra. Proceedings, National Symposium on stalk borer, Karnal. pp. 165 - 175. *Indian Sugar*, **51** (8): 517-520.