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Sugarcane Borers and Their Management

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Sugarcane *(Saccharum officinarum L.)* is one of the most important cash crops cultivated across tropical and subtropical regions of the world. It is a primary source of sugar, jaggery, alcohol, and biofuel, making it central to the economy of several countries, particularly India and Brazil. However, sugarcane cultivation faces several biotic constraints, with borers being the most destructive group of insect pests. These pests damage the crop by boring into shoots, stalks, and internodes, thereby reducing plant vigor, juice quality, and sugar recovery. The most common borers include the Top Borer (*Scirpophaga excerptalis*), Early Shoot Borer (*Chilo infuscatellus*), Internode Borer (Chilo sacchariphagus indicus), and Stalk Borer (*Chilo auricilius*). Losses due to these pest range between 15–30% annually, and in severe infestations, yield loss may even exceed 40%. Their cryptic feeding habit inside the stalk makes control difficult, necessitating an integrated pest management (IPM) approach involving cultural, biological, and chemical measures. This article provides a comprehensive account of sugarcane borers, their damage symptoms, economic significance, and management practices with emphasis on sustainable and eco-friendly control strategies.

Introduction

Sugarcane is grown on over 25 million hectares worldwide, with India occupying the second position after Brazil in both area and production. It is a crop of high industrial value, providing raw materials for sugar factories, distilleries, paper, and co-generation industries. Beyond sugar, the crop plays a critical role in rural employment and farm economy.Despite its importance, sugarcane productivity is constrained by a wide range of insect pests, among which borers are the most damaging. Unlike surface feeders, borers remain concealed inside the stalks, rendering chemical control measures less effective. These pests are widely distributed and active during most stages of crop growth, starting from the seedling stage to maturity. The concealed habit of borers, their overlapping generations, and continuous availability of host plants make them particularly difficult to manage. Therefore, their control must rely on Integrated Pest Management (IPM), which incorporates cultural practices, natural enemies, and judicious chemical interventions to reduce pest pressure while maintaining environmental safety.

Major Sugarcane Borers

1. **Top Borer (*Scirpophaga excerptalis*)**

- **Nature of Damage**: Attacks the growing points of young canes (2–4 months old).
- **Symptoms**: Produces "dead hearts" where the central shoot withers and can be pulled out easily. Affected shoots fail to produce tillers. Later infestations may cause boreholes in midribs and mid-stalk regions.
- **Impact**: Heavy mortality of shoots leading to poor crop stand and significant yield reduction.

2. **Early Shoot Borer (*Chilo infuscatellus*)**

- **Nature of Damage:** Major pest of newly planted cane (1–3 months old).

- **Symptoms**: Dead hearts similar to top borer damage, but the shoots do not regenerate. Entry holes at the base of shoots may be visible, and frass is often extruded outside.
- **Impact**: Loss of tiller population; in severe cases, replanting may be required.

3. **Internode Borer (*Chilo sacchariphagus indicus*)**

- **Nature of Damage**: Attacks during mid-crop stage (4–7 months).
- **Symptoms**: Bores into the internodes producing reddish tunnels filled with frass. External symptoms include boreholes and exuded frass. Infested stalks become fragile and break easily.
- **Impact**: Directly reduces sucrose content and juice purity. Considered the most damaging among borers due to its impact on sugar recovery.

4. **Stalk Borer (*Chilo auricilius*)**

- **Nature of Damage**: Affects both early and late stages of crop.
- **Symptoms**: Creates longitudinal tunnels within stalks, making them hollow. Infestation is often confused with internode borer but is more extensive.
- **Impact**: Reduces both cane yield and quality. Infested stalks are unsuitable for milling.

Symptoms of Infestation

- **Dead Hearts**: Common in early shoot and top borer infestation; central shoot dries and detaches easily.
- **Shot Holes**: Small circular feeding marks on leaves before larvae bore inside.
- **Reddish-brown Tunnels**: Visible when stalks are split; filled with excreta.
- **Stunted Growth**: Reduced plant vigor, poor tillering, and reduced girth.
- **Cane Breakage**: Due to weakened stalks in internode and stalk borer infestations.
- **Low Sugar Content**: Juice from infested canes has poor quality and reduced recovery.

Economic Importance

- Average losses due to sugarcane borers are estimated at 15–20%, but severe outbreaks can cause 30–40% yield reduction.
- Loss in sucrose recovery can range from 2–4%, significantly affecting mill output.
- Infested stalks are prone to secondary infections (fungal and bacterial rots).
- Indirect costs include replanting, additional inputs, and reduced ratoon crop productivity.

Integrated Management Strategies

1. **Cultural Practices**

- **Timely Planting**: Planting in recommended seasons helps the crop escape peak borer incidence.
- **Trash Mulching:** Application of cane trash around the base prevents early shoot borer entry.
- **Irrigation Management:** Regular irrigation strengthens plants and discourages borer survival.
- **Balanced Fertilization**: Excess nitrogen favors pest buildup; integrated nutrient management ensures crop resilience.
- **Destruction of Dead Hearts**: Manual removal of infested shoots prevents larval carryover.
- **Crop Rotation**: Avoiding continuous sugarcane cultivation reduces pest carryover.
- **Use of Resistant Varieties**: Adoption of varieties tolerant to borers (e.g., CoJ 64, Co 0238) helps reduce damage.

2. **Biological Control**

- **Parasitoids**: Trichogramma chilonis (egg parasitoid) effectively suppresses borer populations. Cotesia flavipes (larval parasitoid) is used against internode borer.
- **Predators**: Earwigs, spiders, and ants naturally feed on borer larvae and pupae.
- **Pathogens**: Beauveria bassiana and Metarhizium anisopliae (fungi) infect and kill larvae. Bacillus thuringiensis (Bt) formulations are effective against early instar larvae.

- **Augmentative** Releases: Large-scale release of parasitoids is a proven strategy in IPM programs.

3. Chemical Control

- **Soil Application**: Granular insecticides like chlorantraniliprole or fipronil applied during planting or earthing up.
- **Foliar Sprays**: Systemic insecticides (chlorantraniliprole, flubendiamide, lambda-cyhalothrin) for managing exposed larval stages.
- **Precautions:** Apply only at economic threshold levels (5–10% dead hearts or 5% internode infestation). Rotate insecticides to avoid resistance. Adhere to safe waiting periods before harvest.

4. Integrated Pest Management (IPM) Approach

- Regular field monitoring and use of pheromone traps for early detection.
- Combination of cultural, biological, and chemical practices to minimize pest damage.
- Avoiding over-reliance on pesticides to protect beneficial organisms.
- Farmer training and awareness on identifying early symptoms and implementing IPM practices.

Conclusion

Sugarcane borers continue to be a major constraint in achieving high productivity and quality in sugarcane cultivation. Their cryptic feeding inside stalks and overlapping generations make management challenging. However, an Integrated Pest Management (IPM) approach that combines cultural, biological, and need-based chemical methods offers the most effective and sustainable solution. Preventive measures such as timely planting, use of resistant varieties, and field sanitation, combined with large-scale releases of biological control agents like Trichogramma, can significantly suppress pest populations. Chemical control should be restricted to severe outbreaks and always used in rotation to prevent resistance. By adopting holistic management strategies, farmers can minimize crop losses, enhance sugar recovery, and promote environmentally safe sugarcane production. This not only ensures profitability for growers but also sustains the sugar industry in the long run.

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