

Adoption of bio-intensive IPM

for sustainable sugarcane production

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Sugarcane is a long duration agro-industrial crop. It remains in field whole year where it faces vagaries of nature i.e. all season of the year. As it is repository of sweetness, it is attacked by insect pests. These attack sugarcane from planting to harvest which include borers, sucking pests, defoliators and subterranean pests. Out of these, about one dozen major insect pests are responsible for causing heavy losses of sugarcane throughout different crop growth stages. According to an estimate, cane yield declines by 20-25% and sugar recovery about 1-2 unit due to infestation of these pests. Bio-intensive integrated pest management (BIPM) involving proactive and reactive strategies facilitates to achieve sustainable yield and quality and monetary benefits to farmers and sugar mills and brings out healthy environment.

Keywords: Bio-intensive IPM, Insect pests, Natural enemies, Sugarcane

SUGARCANE area, production and productivity figures have steadily increased over the decades alongside the growth of sugar industry. Cultivated in two broad agro-climatic regions of the country, namely tropics and subtropics characterized by moderate or ideal and extremes of climatic conditions, sugarcane will continue to remain a major agro-industrial crop of the country despite several limitations. The significant growth in sugar industry and expansion of sugarcane cultivation brought in their wake biotic stresses. Amongst these, insect pests, though ranking behind diseases, inflict considerable losses in terms of cane yield as well as sugar output.

Bio-intensive IPM incorporates ecological and economic factors into agricultural system design and decision making and addresses public concerns about environmental quality and food safety. It is to provide guidelines and options for the effective management of pests and beneficial organisms in an ecological context. The flexibility and environmental compatibility of a bio-

intensive IPM strategy make it useful in all types of cropping systems. The bio-intensive integrated approaches for pest management utilizes components such as proactive strategies (cultural methods) viz., crop rotation, summer ploughing, intercropping, pruning, mulching, spacing, planting date, trap cropping, use of resistant cultivars etc. Other component is reactive strategies such as predators, parasitoids, entomopathogens, botanicals pesticides, physical and mechanical methods.

Bio-intensive IPM for sugarcane

Proactive measures

- Deep summer ploughing should be done to expose resting stages of insect like white grub and termites.
- Rotten FYM should be used to avoid termite infestation.
- Use tolerant cultivar for borers.
- Select healthy insect free setts to avoid scale insects.
- Early planting should be done to escape early shoot borer infestation.
- Flood irrigation at the time of

planting help to stop termite attack.

- Close interval irrigation reduce incidence of early shoot borer.
- Mulching with cane trash at the early stages also has been reported to reduce the incidence of ESB and help in conserving moisture.
- Avoid excessive use of nitrogen to minimize pyrilla, sugarcane wooly aphid and stalk borer infestation. So application of fertilizers should be balanced.
- Detrash the crop on September and October to reduce incidence of scale insects, mealy bugs, stalk borers and plassey borers.
- Propping of cane help to reduce borers incidence.
- Drain excess water from the field to reduce incidence of plassey bores.
- Keep the fields free from weeds because many weeds are alternate hosts of insect.
- Avoid continuous ratoons because continuous monocropping increase incidence of sugarcane press.
- Intercropping sugarcane with spices and cowpea reduces insect infestation. Other crops such as green gram and black gram reduce

infestation of insect pests.

- Paired or wider row planting of sugarcane helps to reduce woolly aphids.

Reactive measures

Mechanical and physical strategies

- Locate and destroy the termite colony by burning of crop residues on top of termite mounds is a common practice to suffocate these pests.
- Collect and destroy the termite affected setts from the field.
- Light earthing up of the tillers at the early stages of the crop reduces the incidence.
- The egg masses and also the infested portions of plants may be collected and destroyed during the brood emergence period.
- Removal and destruction of dead hearts (apical damaged shoot).
- Cutting the affected tillers as close to the ground as possible and destroying them.
- Detrashing of canes and burning of the trash with a view to destroying the larvae and pupae attached with the leaf-sheaths
- Removal of sprouts from the stubble in April once, helps in reducing the pest buildup.
- Collection of moths through light traps to reduces pest population of insect pest of sugarcane.
- Removal of cane tops showing primary infestation of plassey borers.

Biological strategies

- Release of *Isotima javensis* parasites

is found successful against top borer.

- Inundative releases of the egg parasitoid *Trichogramma chilonis* or *Trichogramma japonicum* @ 50,000/ha at 10 days interval after appearance of borers.
- Release of the lepidopteran ectoparasitoid *Epiricania melanoleuca* @ 4,000 – 5,000 cocoons or @ 4-6 lakh eggs/ha to checks its multiplication of pyrilla.
- Release of *Dipha aphidivora* larvae @ 1,000/ha and *M. igorotus* larvae @ 2,500/ha against woolly aphid.

Adopt following procedure to enhance natural enemies

- Reducing or eliminating insecticide applications to avoid killing natural enemies.
- Staggering harvest dates in adjacent fields or rows to insure a constant supply of hosts (prey), or providing shelter.
- Over-wintering sites, or alternative food sources to improve survival of beneficial species.
- Avoidance of cultural practices which are harmful to natural enemies.
- Use such cultural practice which favours survival and multiplication of natural enemies.
- Provision of food like pollen and nectar for adult stages of natural enemies.
- Suppression of ant to increase the efficiency of predators.
- Go for trap cropping for increasing the efficiency of predators and parasitoids.

Bio-pesticides

- Application of *Verticillium lecanii* or *Metarhizium anisopliae* (1×10^9 CFUs/ml) at 2-3 litre/ha for control of sucking pests.
- Application of *Beauveria bassiana* (1×10^8 CFUs/g) at 3 kg/ha mixed with soil for control of white grub and termites.

Bio-intensive IPM is important to maintain balance of pests and beneficial organisms in an agro-ecological system. The natural balance of agro ecosystem is disturbed due to regular cultivation of monocropping with indiscriminate use of pesticides. Therefore, it is need of the hour to strike a balance appropriation of various interventions of different strategies for suppression of insect pests. This concept envisages habitat modification for beneficial organisms, maintaining uncultivated lands for diversity of flora and fauna, developing entomophagous parks for food and shelter to diverse beneficial insects. Mass emergence devices for laboratory reared natural enemies, reduced direct mortality or interference to natural enemies. The botanicals microbial pesticides may have added advantage in BIPM. This bio-intensive approach needs changing in research and education priorities in order to emphasize ecology-based pest management and redesign management programs to promote bio-intensive IPM.

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