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Insect Growth Regulators (IGR's) Roles in Integrated Pests Management

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INTRODUCTION

Insect growth regulators (IGRs) are insecticides that mimic hormones in young insects. They disrupt how insects grow and reproduce. IGRs can control manv types of insects including cockroaches. fleas. and mosquitos. IGRs are generally low in toxicity to humans. Synthetic compounds possessing the activities of juvenile and moulting hormone of insects are called as IGR's/ JH mimics/ JH analogues/ Juvenoids. Retard the development of pest species particularly inducing effects from sterility to death. Effective only on immature insects.

Invention of

paper factor:

- Discovered by Slama and Williams, 1967.
- ▶ In Pyrrhocoris apterous.
- > Paper towel was developed from Balsam fir tree.
- Mimic the JH- kills the insects without reaching to adult stage.

Affects the insects in different ways:

- Antimetamorphic effect.
- ➢ Larvicidal effect.
- > Ovicidal effect.
- Diapause disrupting effect.
- Embryogenesis inhibiting effect

Chitin synthesis inhibitors:

- Chemicals which interferes with the biosynthesis and deposition of chitin.
- Acts on chitin synthase.
- Acts as stomach poisons and kills insects at the time of moulting and also suppress the fecundity and exhibit ovicidal and contact activity.
- Causes improper attachment of the new cuticle during moulting and produces a cuticle that lacks some of the layers.
- Larvae die from rupture of the new malformed cuticle, starvation desiccation and predation.
- Benzyl phenyl urea analogues affects the larval stage.



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Practical IGR's found in market

- **1. Methoprene (Altosid) -** Homopterans and Dipterans
- 2. Kinoprene (Enstar-IGR) mosquitoes, flies
- **3. Hydroprene** (Altozar) Lepidopterans, coleopterans, Homopterans and for few stored pests
- **4. Pyriproxifen** (**Admiral**) flies, beetles, midges and mosquitoes.
- **5. Diflubenzuron (Dimilin) -** flies, midges and mosquitoes.

Other chitin synthesis inhibitors

- Diflubenzuron (Dimilin) used in cotton, soybean, citrus, vegetables and also medical pests (mosquitoes).
- Lufenuron (Match) Lepidoptera and coleopteran on cotton, corn and vegetables.
- Buprofezin (Applaud) produces weakened exoskeleton in moulting immature both insecticides and acaricides. Used against hemipterans in rice.
- Novaluron (Rimon) used for white flies on tomato and lepidopterans.

Anti-juvenile hormones

- Tested plant extracts for antagonistic activity of JH.
- Discovered anti JH activity from bedding plant, Ageratum houstonianum.
- Identified 2 compounds Precocene-I and Precocene-II.
- As they induce precocious form of metamorphosis and their chemical structure.
- > Induce premature metamorphosis.
- Lethal activation within the corpora allata, thus destroying the glands.
- Azadirachtin liquid and dust formulations from neem seeds – disrupts molting process.

Advantages

Effective in minute quantities and hence are economical.

- Highly species specific; so non-target organisms are spared.
- Affects more than one aspect of insect development and hence effective against insects which are resistant to insecticides.
- Highly biodegradable non polluting, eco-friendly.
- \blacktriangleright Non toxic to plants and animals.
- Suitable for insects which are living in concealed environments.

Disadvantages

- They have a narrow physiological windows; hence cannot be applied at all times.
- Effective only for last larval instars and hence stages will continue to feed.
- Slow mode of action.
- > Chances of resistance development.
- ➢ Few are unstable in environment.
- ➢ High cost of chemicals.

Push-Pull Strategy or Stimulo-deterrent diversion

- ✓ A strategy where a host-plant attractant (s) and a repellent (s) are used in combination.
- ✓ Tested using a repellent inter crop and an attractant "trap" plant.
- ✓ Insects are repelled by volatiles emitted from the inter crop (push) and simultaneously attracted by volatiles from the trap plant (pull).
- ✓ The most successful work on pushpull to date has been conducted in Africa to control stem borers in maize and sorghum.
- ✓ Works not only by decreasing stem borer damage to maize, but also by enhancing the efficacy of natural enemies.

Attractants

- Chemicals which elicit oriented movements by insects towards their source.
- Also called as food lures.

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Antifeedants

- Chemicals which inhibit feeding when present in a place where insects in its absence would feed. OR
- Chemical compound which prevent feeding of insect or animal on a treated material without necessarily killing or repelling.
- 1st antifeedant Zinc salt of Dimethyl dithio carbonic acid against rodents and trees-top revent feeding on bark of trees.

Repellents

- Chemicals that cause insects to orient their movements away from a source.
- Allied materials that do not cause movement away but do prevent feeding or oviposition by insects deterrents.
- Repellents volatile chemicals activity in the vapour phase.
- Plants unattractive, unpalatable or offensive.

Advantages

- Low toxicity safe to humans, plants and domestic animals.
- Protects the desired plants and insects are not killed.
- Resistance development low.

Disadvantages

- The need to completely cover all susceptible surfaces with repeated applications.
- Possibility of increasing infestations on nearby untreated surfaces.

CONCLUSION

Most synthetic insecticides are toxic to all animals including human beings. These facts have become of deep concern to agricultural and health scientists, producers and consumers alike. Although many insecticides can be used safely, a few are persistent in the environment and a small number have multigenic, carcinogenic and teratogenic effects on human beings and domestic animals. Furthermore their magnification in the food chain sometimes threatens non-target organisms.