Popular article

ECOLOGY OF INFOCHEMICALS USED BY NATURAL ENEMIES IN TRI-TROPHIC CONTEXT

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Introduction

Info chemicals are the chemicals that transfer the information from one individual to another individual, it causing behavioural and physiological changes in the receiving organisms, as a result, natural enemies make their foraging decisions on information obtaining from different trophic levels. Parasiticides and predators of herbivores have evolved and function within a multitrophic context and their physiology and behaviour are influenced by elements from other trophic levels such as their plant food (first trophic level) and its herbivore victim (second trophic level). In order to find a host, the ecology of chemical information from the first and second trophic levels is essential (Price *et al.*, 1980). Info chemicals has divided into two groups, one is pheromones, which act on members of the same species (intraspecific interactions) and another one is allelochemicals, which act between the species (interspecific interactions).The interaction between host plants, herbivores and their natural enemies can only be understood when considered within a tri-trophic context . The sequence of responses from different information sources takes the foraging animal closer to its potential victim, and information from plants is essential for the searching process.

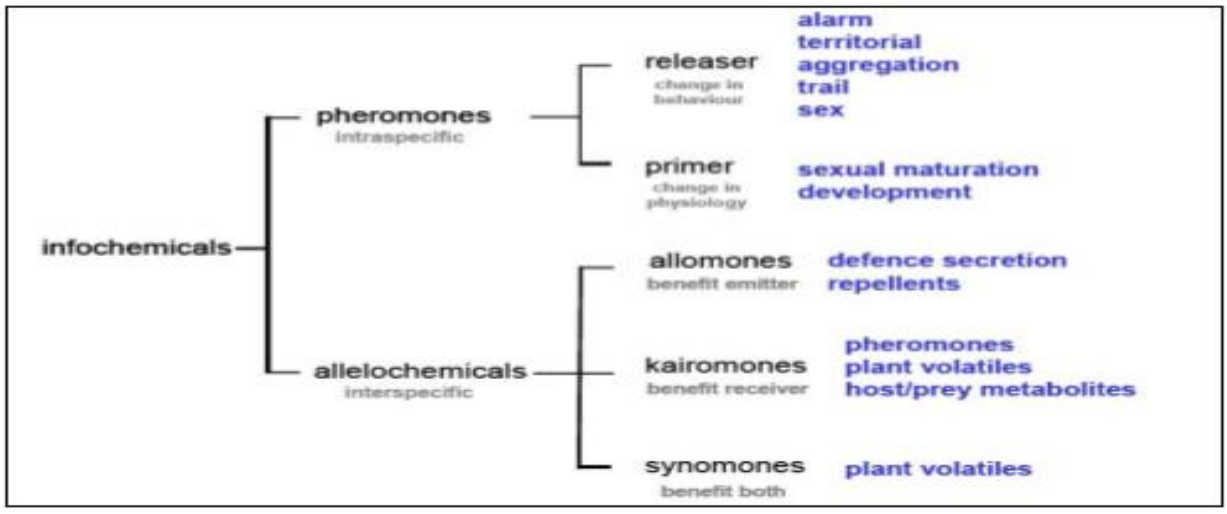

Fig.1: Use of info chemicals in insect's behavior

Chemical information in tri-trophic interactions: The importance of tri-trophic represents the searching behavior of natural enemies of herbivores, predators and parasitoids chemical information is crucial in plant volatiles-mediated searching behavior, especially over longer distances. Herbivores, food sources, species associated with herbivore presence, and interactions between these sources may all provide chemical information. Every other herbivore product may potentially provide a chemical cue for its attackers. Like feces, cuticle, exuviae, secretions of mandibular, accessory glands, pheromones, honeydew and body scales. Also, the food of the herbivore, such as flowers, leaves and herbivore-associated organisms, such as microbes, can give specific chemical information (Vet and Dickey, 1992).

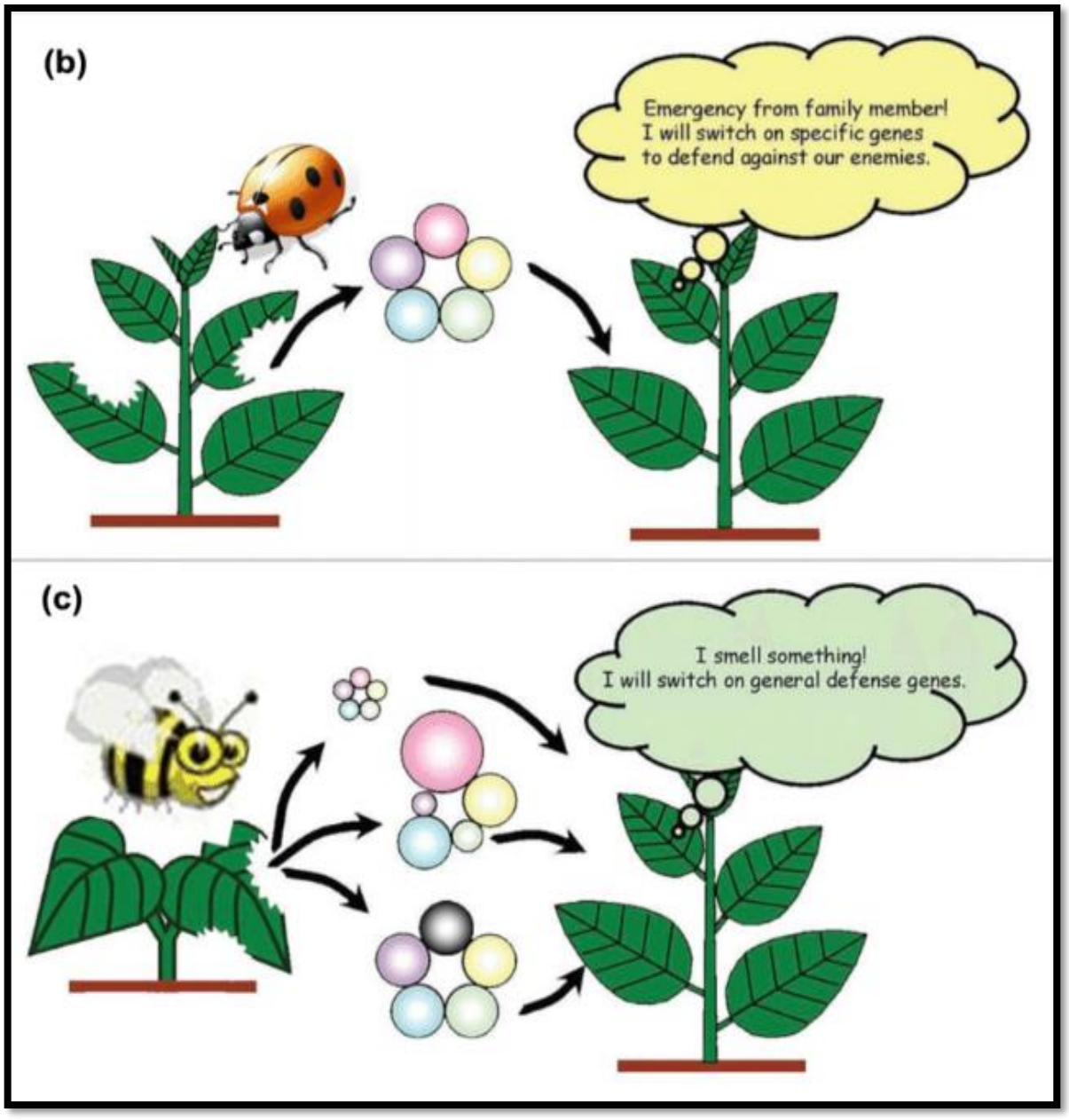

Fig.2: Chemical defensive mechanism in insect-plant interaction

Role of info chemical in pest management: The most effective techniques are use of info chemicals in monitoring of pest population and suppression of pests and determination of insect's population helps in taking need base control measure (Sheikh *et al.*, 2017). They can be used as

1. Monitoring
2. Mating Disruption Strategy
3. Mass Trapping Strategy
4. Attractant
5. Repellent
6. Push Pull Strategy

1. Monitoring: The successful practical application of semi chemicals is in monitoring the presence and abundance of pest population. The surveillance system aids in the decision-making process for pest control measures that keep pest populations below the economic threshold. It can done with by pheromones bait traps especially the sex pheromones are effective in monitoring the insects because of strong attractant and species-specific nature of pheromone attraction. The use of pheromone-based monitoring method can be used to determine population abundance and patterns, as well as the damage caused by insect pests.

2. Mating Disruption Strategy: Mating disruption is a technique by which synthetic sex pheromones are dispensed into the pest habitat in a sufficient amount to reduce the ability of a male to locate the female and thereby affecting the organism's chance of reproduction. Attractant insect pheromones, such as sex and aggregation pheromones are species-specific therefore, semi chemicals have to be identified and can be used in insect pest control programmers. Important successes of mating disruption include control of the codling moth, *Cydiapomonella* in pome fruit, and the pink bollworm, *Pectinophora gossypiella* in cotton.

3. Mass Trapping Strategy: Mass trapping has been used to control a variety of insect pests, typically in lepidoptera, coleopteran and dipteran. The concept of mass trapping includes the use of synthetic pheromones such as sex and aggregation pheromones, food source and host attractant in bait traps to suppression and eradication of pest population. To accomplish this, traps must catch a large proportion of the population in given location, and lure must be more powerful than natural sources of attraction with longer period of efficacy.

4. Attractant: Attract and kill technique includes the use of semi chemicals to lure an insect to a source that contains a killing agent and lead to the reduction of the insect population by killing the target insect or reducing its fitness.

5. Repellent: Repellent is a substance that inhibits or deter the insects from finding, feeding or oviposition on the host. In pest suppression, repellent is to create an odor barrier to prevent an arthropod from entering a space occupied by a potential host. It was reported that citronella oil, pine oil has been found to have repellent or oviposition deterrent properties against some insects.

6. Push Pull Strategy: Push-pull is a pest suppression strategy that combines the repellent and attractant semi chemicals to manipulate the pest and their natural enemies employing the integration of insect stimuli which makes the protected resource unpalatable and unattractive to the pests (push component) while luring them towards a more attractive source (pull component) and where the pests can be removed.

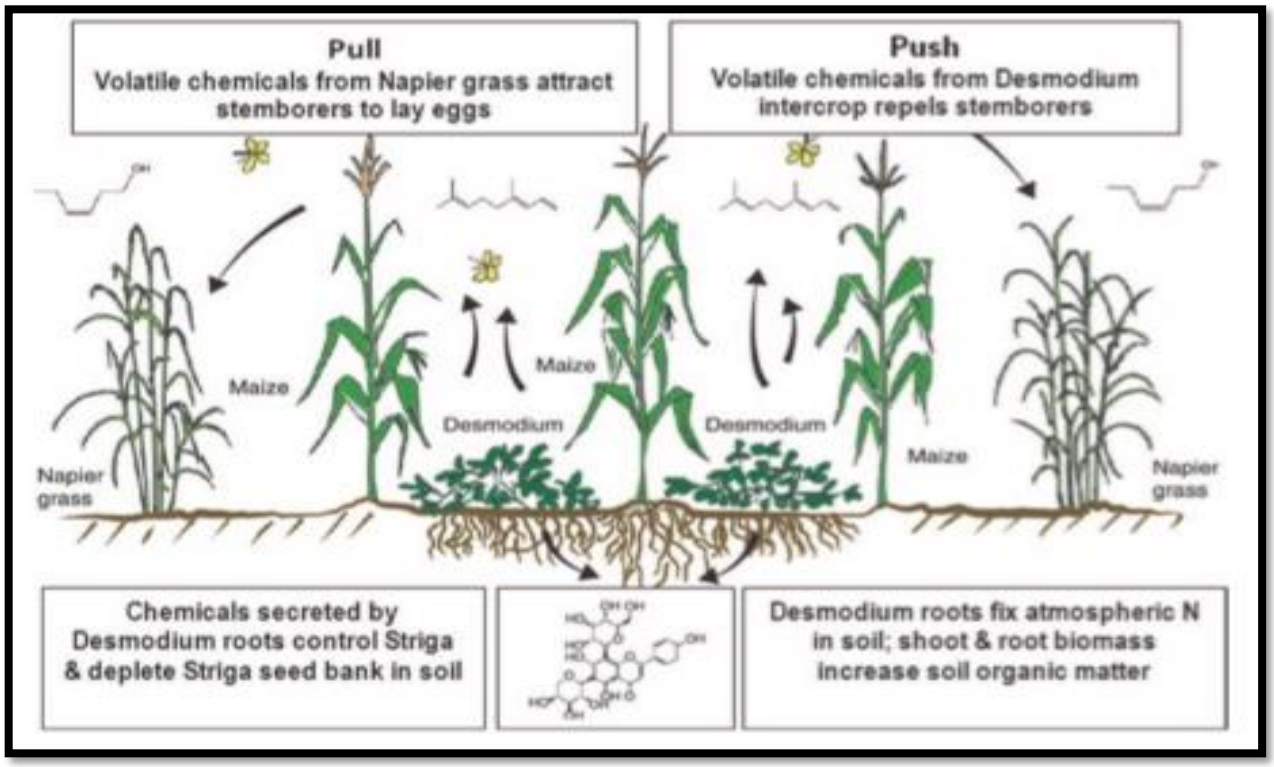

Fig.3: Push-pull strategy in Napier grass-Maize-Disodium cropping system

Conclusion

For the creation of biological control strategies, it is crucial to have a wide understanding of the various levels of interaction that occur between plants, herbivores and their natural enemies. This not only has a positive impact on pest control, but it also promotes the abundance and efficacy of the entomophilous insect guild in the natural environment. The use of info chemicals in biological control and integrated pest management strategies holds great promise for manipulating entomophilous insects and improving their efficiency in cropping systems. Therefore, sufficient data on crop wise study on tribrachic interactions is needed.

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