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Role of Signals, Mimicry, Polyphenism in Insect Defence

Abhishek B. M.[1], Nagendra Kumar[2] and Anil Kumar[2]
[1]Ph D, Resaerch Scholar, Department of Entomology, PGCA, RPCAU, Pusa, Smastipur, Bihar
[2]Assistant professor & Scientist, Department of Entomology, PGCA, RPCAU, Pusa, Smastipur, Bihar

SUMMARY

Insects are the most success full organism to survive with evolutionary history of 350 million years (Cambrian period). It is mainly due to their key features like exoskeleton, small size, ability fly, higher reproduction and easy dispersal etc. Among them various defence mechanism adapted and developed were helps to protect themselves from natural enemies. It includes bright color pattern in lady bird beetles, crypsis in leaf insects, and mimicry of ants like bees, alarming and offensive secretions and polyphenism of oak moth.

INTRODUCTION

Communication is an exchange of information between emitter and receiver through signals. Communication can be occur within a species (Intra-specific) or between the species (Intra-specific) for reproduction, resources finding, identify themselves and enemies. Insect uses tactile (Touch), Acoustic (sound), visual and chemical signals for communication. These signals induce behavioral changes in receiver that avoid or repel or resist the predation by natural enemies. Aposematism, mimicry, crypsis, alarming and defensive secretions and polyphenism are the important insect behavioural defensive mechanisms.

Role of signals in Defensive Mechanism

Visual signals- Type, intensity and patterns of colors offers a varying degree of protection from predator and parasitoids.

Aposematism

Aposematism helps to advertise them as dangerous or unpalatable by the use of bright colouration. Caterpillars of Cinnabar moths have alternating orange and black bands down their bodies. Also, feeding on ragwort plants leads to accumulation of alkaloid poisons and passed from caterpillar to pupa and adult. The caterpillars advertise the fact that they are poisonous if eaten through their aposematic colouration. Colour pattern was the most effective single deterrent used by seven-spot ladybird, *Coccinella septempunctata*) against bird predator (Japanese quail, *Coturnix coturnix japonicus*) (Marples *et al.* 1994).

Crypsis

Insect mimic or blend with their environment to escape from eyes of natural enemies. Leaf insects resemble leaves. Death's-Head Hawk moth show exhibits olfactory crypsis with bee pheromones avoids attack from the bees while steeling honey.

Visual Signals

Mimicry

Insects show similar visual appearance of better protected insect to avoid the predation.

Batesian mimicry

Batesian mimicry is a type of mimicry where a palatable insect (Mimic) mimics a poisonous or unpalatable one (Model). Predators can find out unpleasant organism but they unable distinguish the mimic from the poisonous/unpalatable organism, the mimics are also avoided. Drone fly (*Eristalis tenax*) mimics the honey bees.

Müllerian mimicry

Mullerian mimicry is mutually benefitted interaction between insects in which both the species are unpalatable and mimic each other to avoid predation. Many butterflies in the Heliconius genus are Mullerian mimics

Acoustic signal

During simulated attacks, 45% of 38 genera and 33% of 61 species of silk and hawkmoth caterpillars (Bombycoidea) produces sonic display such as - clicks, chirps, whistles and vocalizations sounds which are used to frighten, warn or even trick predators (Bura *el al.* 2016).

Chemical communication

Insect have highly evolved semiochemicals that conveys specific chemical messages between insect and insect and plant and insect. Insect can communicate within the species (pheromones) and with other species (Allemones) to convey specific information. Alarm, Aggregation,allomone pheromones are exploited in various way to avoid the enemies (Nesreen and El-Ghany. 2020). European bee, *Apis mellifera* L., releases sting alarm pheromone immediately after sting which helps to easily locate their enemies. When Giant hornets (*Vespa mandarinia japonica*) enters the bee hive, bees releases alarm and aggregation pheromone to form a bee ball around hornet and increase the temperature up to 47°C to kill it (Wager and Breed. 2000).

Polyphenism

Polyphenism is one of the defence mechanism in which two or more distinct phenotypes are produced by the same genotype (Simpson *et al.*, 2011). The genus *Nemoria arizonaria* caterpillars are known for seasonal mimics of their host plants i.e., oak. This moth completes two generations each year, one in spring and the other in summer. Spring generation caterpillars mimic the oak flowers, where summer generating caterpillar mimics oak twigs.

CONCLUSION

Every insect have developed their own way of defensive mechanism to defend their natural enemies. Defensive behavior of insects is mainly depends on habit, habitat and behavior of prey and its natural enemies and various environmental factors.

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