

Direct And Indirect Effect Of Parasitoids On Their Hosts

Mounika Jarpla*¹ and Malireddi Prasanna²

¹Ph.D scholar, Department of Entomology, Navsari Agricultural University, Navsari, Gujarat

²M. Sc, Department of Entomology, Navsari Agricultural University, Navsari, Gujarat

Corresponding Author: mounikajarpla13@gmail.com

Manuscript No: KN-V1-01/019

Abstract

Insect parasitoids are the important group of natural population mainly kill their hosts by depositing eggs followed by the growth of offspring (Reproductive mortality) and by direct feeding (Host feeding). However, parasitoids can also have negative affect on their hosts (Nonreproductive effects) such as non consumptive effect, pseudo parasitism, immune defense, mutilation and Aborted parasitism. Behavioural interactions can have a detrimental effect on host fitness by reduced feeding time, investment in defense or injury from failed attacks. Parasitoid involves a series of process that allow it to find, select, parasitize and alter the host physiology. During this process, numerous mechanisms can result in a variety of outcomes that affect fitness of both parasitoid and host, even if the encounter does not end with successful parasitoid offspring development.

Keywords: Reproductive effect, Nonreproductive effect, Host feeding, non-consumptive effect, aborted parasitism

INTRODUCTION

Parasitoids are small insects whose immature stages develop either within or outside of other insects (hosts), ultimately leading to the death of the host. These Parasitoids can have both direct (Reproductive effect, host feeding) and indirect effect (Non reproductive effect) on their hosts, which can vary depending on the specific parasitoid species and the host species involved. The success of the parasitoid's reproductive cycle depends on the successful development of its larvae within the host. Once the parasitoid larvae complete their development, they pupate and emerge as adults, ready to reproduce and lay their own eggs on new hosts. Additionally, there are non-reproductive effects, including behavioral changes in hosts, evolutionary pressures, and potential indirect effects on ecosystems.

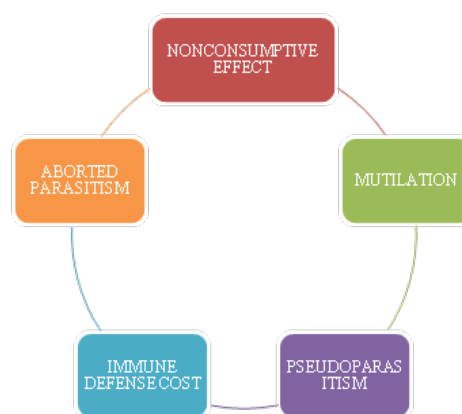
DIRECT EFFECT:

Egg Laying: The primary effect of parasitoids is that parasitoids lay eggs in or on the host. These eggs will eventually develop into the parasitoid larvae, which feed on the host's body (Reproductive Effect).

Ex: *Goniozus nephantidis* killing the *Opisina arenosella* by reproducing on it.

Host Consumption: As the parasitoid larvae develop, they consume the host's tissues, including internal organs and fluids, which provide them with essential nutrients for growth and development.

Ex: Direct consumption of *Diaphori nactri* nymph internal fluids by *Diaphorencyrtus aligarhensis* parasitoid.



INDIRECT EFFECT:

Parasitoids can also have detrimental effects on their hosts by neither developing on host nor direct feeding but through non reproductive effects such as Non consumptive effect, Immune defense cost, Pseudoparasitism, Mutilation and Aborted parasitism.

Non-consumptive Effect: It does not involve the direct consuming or feeding on the host. These effects can include changes in the host's behavior. When hosts recognise the presence of parasitoids, they develop costly defensive tactics which can occur before parasitoids insert their ovipositor into the host.

Ex: Effect of *A. ervi* and *A. colemani* wasps on *Acyrtosiphon pisum* aphid by dropping or walking away from plant

Mutilation: Before laying eggs, female parasitoids may insert ovipositor in their host to assess the suitability of their progeny. During this process, may cause mechanical damage to the host.

Ex: Over stinging by hymenopteran parasitoids causes mutilation and surplus killing of hosts

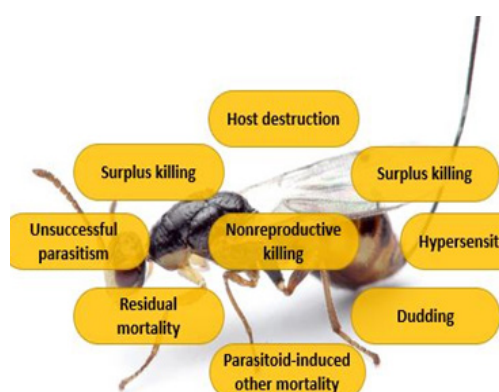
Pseudoparasitism: Before laying eggs, female parasitoids may insert ovipositor in their host to assess the suitability of their progeny. During this process, injection of venom, viruses, teratocytes, or other biological or chemical factors occur.

Immune defense cost: Encapsulation is one of the common defense mechanism developed by the host's immune system in response to parasitoid eggs.

Ex: Reduction of fitness in *Drosophila* adults by forming cellular melanotic capsule surviving parasitization by a cynipid wasp

Aborted parasitism: It occurs when developing parasitoids die for reasons other than the activation of the host immune system and their host also dies as a result of actions of the immature parasitoid before its death.

Ex: Abortion of *Halyo morphahalys* eggs induced by parasitoid *Telenomus podisi*



REFERENCES:

Abram, P. K., Brodeur, J., Burte, V. and Boivin, G. (2016). Parasitoid-induced host egg abortion: an underappreciated component of biological control services provided by egg parasitoids. *Biological Control*, 98, 52-60.

Carton, Y. and David, J. R. (1983). Reduction of fitness in *Drosophila* adults surviving parasitization by a cynipid wasp. *Experientia*, 39(2), 231-233.

Cebolla, R., Vanaclocha, P., Urbaneja, A. and Tena, A. (2018). Over stinging by hymenopteran parasitoids causes mutilation and surplus killing of hosts. *Journal of Pest Science*, 91(1), 327-339.

Ento, C. N., Raghavaiah, G., Babu, T. R., Prasad, K. H., KoteswaraRao, S. R., Krishnayya, P. V., Manjula, K., Ramu, P. S., Sridevi, K. and Upendhar, S., *Insect Ecology and Integrated Pest Management, Rajendranagar, Hyderabad-500 030*.

Ingerslew, K. S. and Finke, D. L. (2017). Mechanisms underlying the non consumptive effects of parasitoid wasps on aphids. *Environmental Entomology*, 46(1), 75-83.

Münster-Swendsen, M. (1994). Pseudoparasitism: detection and ecological significance in *Epinotiatedella* (*Tortricidae*). *Norwegian journal of agricultural sciences. Supplement*, (16), 329-335.

Rohrig, E., Shirk, P. D., Hall, D. G. and Stansly, P. A. (2011). Larval development of *Diaphorencyrtus aligarhensis* (Hymenoptera: Encyrtidae), an endo parasitoid of *Diaphorinacitri* (Hemiptera: Psyllidae). *Annals of the Entomological Society of America*, 104(1), 50-58.