CODEN [USA]: IAJPBB ISSN: 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES

http://doi.org/10.5281/zenodo.3478438

Available online at: http://www.iajps.com *Research Article*

BIOLOGICAL CONTROL OF INSECT PESTS USING TRICHOGRAMMA MINUTUM AS BIOLOGICAL CONTROL AGENT AGAINST THRIPS ON ROSES

[1]Salman Aziz, [2]Iman Ali Sani, [3]Yujie Lu, [2]Shahjahan Shabbir Ahmed, [2]Nazeer Ahmed,[2]Nisar Ahmed, [2]Dawood Shahid [4]Sajid Nabi

[1]Balochistan Agriculture College Quetta, Pakistan, [2]Balochistan University of information Technology, Engineering & Management Sciences, BUITEMS, Quetta Pakistan, [3]Grain College Henan University of Technology Henan Province, Zhengzhou China, [4]University Of Balochistan Quetta, Pakistan.

Article Received: March 2019 **Accepted:** April 2019 **Published:** October 2019

Abstract:

In a natural situation, plants are incessantly being attacked by diverse kinds of pests and pathogens such as bacteria, fungi and insects. On the other hand naturally plants can stay alive with the help of natural enemies of these unwanted pests and pathogens. In this way, population developments of all players in a natural environment are measured. The objective of the study was to rear the Trichogramma minutum under laboratory conditions on eggs of Sitotroga cerelalla, gather their eggs on cards and then apply them on the Ornamentals against thrips. Trichogramma is a mini wasp belongs to family Trichogrammatidae which parasitized the eggs and adults of many pests, particularly eggs of moths and butterflies. Various species and strains of Trichogramma tag and destroy different host eggs and prefer different crop habitats and have distinct searching abilities and strength to weather conditions. In this study Trichogramma minutum was reared in laboratory on eggs of Angoumois grain moth (Sitotroga cerelalla) under 25-32°C temperature and 55-70% relative humidity.

Key Words: *Biological control, Thrips, Trichogramma minutum.*

Corresponding author:

Salman Aziz,

Balochistan Agriculture College Quetta, Pakistan.

salman.aziz31@gmail.com

QR code

Please cite this article in press Salman Aziz et al., ***Biological Control of Insect Pests Using Trichogramma Minutum as Biological Control Agent against Thrips on Rose.,*** *Indo Am. J. P. Sci, 2019; 06(10).*

INTRODUCTION:

In current decades, the awareness of harmful effects of chemical pesticides on plants and more importantly environment and human health have taken the attention of researchers to find other ways of pest control then using chemical agents. Moreover the resistance created in many pests has also resulted in the need to switch from chemical pesticides. Indicated by a report, submitted at the U.S Congress, Office of Test & Assessments (OTA), the use of biological agents could result in better control and overcoming the issues arising in outdated pest control methods **(Oliveira *et al*., 2003).**Pests have been a problem since the evaluation of life. They have been a bigger trouble since the start of agriculture and farming. With the passing time, researchers have been in search of ways to control the pest's problem. From the use of fire to the use of chemicals and poisonous plants, the discovered methods have been made more and more active. Chemical agents have been extensively used and are still leading but as we know, living species evolve themselves. Factors like increasing tolerance towards the chemical pesticides and the long term effects of such agents on environment, nature and human health (chemical pesticides making the farmed food unhealthy, and the chemicals reacting with air and generating harmful effects), have driven the attention towards a more liable and beneficial method, such as biological control method **(Blibech *et al*.,2015)**. The biological methods are the methods that use other living organisms against pests with the provision of minimal harm to the health and environment. This method is an important component of the Integrated Pest Management (IPM) **(Gardeninsects.com, 2016)**

Keeping in mind that biological enemies of pests naturally occur and prey over them. This phenomenon is called Natural Pest Control. Biological pest control uses these biological agents are used with measured parameters and some human effort to eliminate the threat of pests. These biological agents are categorized as predators, parasites and pathogens and the agents of plant diseases are called antagonists. A beneficial biological agent should have:

1. A high reproductive rate.
2. Host specific.
3. Flexible to different environmental conditions.
4. A good agent should reproduce and survive at low prey density.

A good biological agent would possess the above requirements thus making this method effective and beneficial as it would be a onetime implementation. There is no need for the reapplication of pesticide and the agents would establish themselves, giving a self-continuing form of control.

In our study *Trichogramma minutum* as biocontrol agent was used to control insect pests in vitro as well as in Ornamentals, reared on the eggs of *Sitotroga cerelalla*. *Trichogramma* are mini wasp belongs to family Trichogrammatidae about 0.5mm long **(Laing *et al*., 1990).** The adult female lay her eggs on other moth's eggs. An individual adult female can lay up to 300 eggs depending on specie of *Trichogramma* used and size of host's egg.

The larvae feed on the egg and then emerge as adults. The larvae take 10 days to develop within the pest moth egg, which turns brown or black as the larvae pupate. The adult wasps live anywhere from 7 to 14 days, depending on temperature and moisture **(Pratissoli *et al*., 2004).**

Sitotroga cerelalla an Angoumois grain moth used in our study to rear *Trichogramma minutum* in laboratory belongs to primary category of cereal grain pests that attack cereals both in field and storage. Major crops that are affected by the Angoumois grain moth are maize, oats, barley, rice, pearl millet, rye, sorghum and wheat. The adult moth is very small, have a wingspan of about 10-20 mm and 5-7 mm long with its wings folded **(cerealella and Steve Francia, 2015).** Their whole life cycle completed in 4-5 weeks. Each Female lays 100-180 eggs on cereal seeds. The purpose to prohibit the use of pesticides because of problems faced by People ranging from minor problems like eye irritation, headache, nausea, dizziness and fatigue to severe cancer, reproductive and endocrine problems.

Review of Litrature:

Trichogrammatids are the most common class of egg parasitoid used in biocontrol worldwide**.** The genus *Trichogramma* of the family trichrogrammidea are the most successful and studied in biocontrol programs **(**Weinberg and Hassan, 1994)

The biological methods are the processes that use other living organisms against pests with the plan of lowest harm to the health and environment. This process is an important element of the Integrated Pest Management (IPM) (Integrated Pest Management: Innovation-Development Process, 2009).

Augmentation is preferred when the natural enemies of pests are not present or very less population is present (Hussey & Scopes 1985, Parrella 199

Conservation is basically a technique in which, either disadvantageous factors are decreased or advantageous conditions are given manually for the better effectiveness of the biological pesticides. There are many factors obstruct capability of natural enemies of the pests such as application of pesticides, different traditional methods etc. in another study repeated washing of leaves of citrus trees arises an increased biocontrol of California red scale due to increased efficiency of parasitoid (Debach & Rosen 1991).

Since the introduction of the European corn borer, lepidopteron to the United States in the early 1900s, several Trichogramma species have been investigated for use in its biological control *Trichogramma* species are the most studied group worldwide of egg parasitoids for biological control due to their efficiency and easy maintenance under laboratory conditions (Bureau of Plant Industry, 1994)

MATERIAL AND METHODS:

The study was conducted at BUITEMS Quetta, Pakistan for mass production of *Trichogramma minutum* on the eggs of *Sitotroga cerelalla* under controlled conditions at 25-32°C temperature and 55-70% relative humidity during the period from July to October 2015. The study was based on four major steps described below. The control percentage of all insect pests in vicinity of BUITEMS after the releases of *Trichogramma minutum* was calculated by the formula:

Control rate = killed pests / total pests * 100

Rearing of *Sitotroga cerelalla:*

The mass production of different species of *Trichogramma* on the eggs of their natural hosts is a common practice and started in 1930 in USA on the eggs of *Sitotroga cerelalla* an Angoumois grain moth (Flanders and Quednau, 1960). In this study the eggs of *Sitotroga cerelalla* is used for mass production of *Trichogramma minutum* for this purpose on 2 July,2015 wheat was taken after careful cleaning 800-1000 grains of wheat were kept in 60 glass jars along with eggs and adults of *Sitotroga cerelalla*. One large wheat grain is enough to provide sufficient food to one larva of *Sitotroga* (Hassan, S. and Gerding, P, 1994). After 28 days on 30 July, 2015 some adults were observed in two jars. Mating between newly emerged adults was started after 11 days on 10 august, then 3 days later all 60 jars have a growth. The relative humidity was maintained to 55-70% by spreading wet cotton on daily basis at 25-32°C temperature.

Rearing of Trichogramma

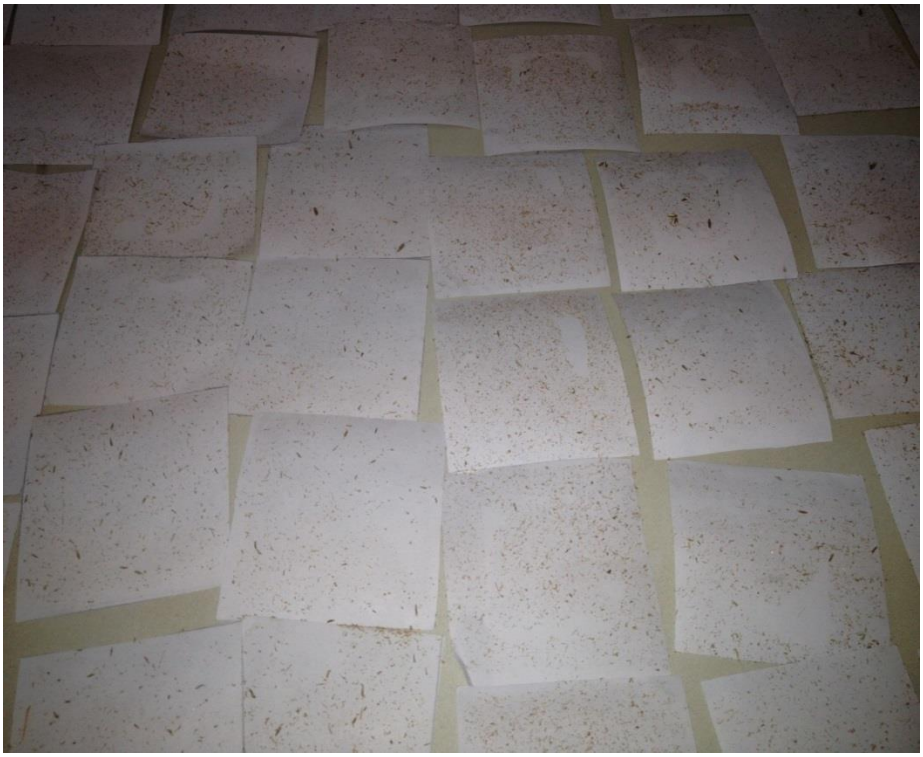
On 18 September, 2015 four commercially prepared cards of eggs of *Trichogramma minutum* were shifted in four glass jars out of 60 jars the temperature and humidity were maintained same. There were approximately 100 eggs per card. After two weeks we found 100% control because all the *Sitotroga* were killed in four jars which means the wheat in these jars contain eggs of *Trichogramma minutum.*

Figure 7: Rearing of *Trichogramma minutum*

FIG: This figure show mass production of *Trichogramma minutum* on the eggs of *Sitotroga cerelalla*

Collection of eggs of *Trichogramma:*

For collection of eggs of *Trichogramma* on 5 October a thick coat of glue was applied on five hundred fifty 3*3 sized cards and the eggs were sprinkled equally in a single layer with the help strainer. Each card have approximately 250 to 300 eggs. Allowed the cards to dry after drying the cards were placed in a polythene bag and refrigerated to delay the emergence of adults.



Releasing cards in the field

On 9 October early in the morning the cards stapled randomly under the side of leaves to avoid direct exposure of eggs from sun in the vicinity of BUITEMS. *Trichogramma* releases on cards in eggs stage. In two to three days larvae convert into adults and search out eggs of the pests then destroy them. Two observations were taken with the interval of 10 days. First observation of pest control checked on 19 October and second on 29 October.

RESULTS AND DISCUSSION:

Release of Trichogramma minutum against thrips on roses

Before applying any treatment the average of thrips count per rose plant was 225, in 2000 plants of roses thrips count estimate was 450000. After applying treatment, the control percentage was 80% calculated by the formula

Control rate = killed thrips / total thrips * 100

Because after 1st observation average of thrips count per rose plant was reduced to 45. After 2nd observation 10 days later the control percentage was 90% calculated with same formula because the average of thrips count per rose was more reduced to 1 per plant of rose. The graphs below represent the total number of thrips in 2000 plants of roses, thrips dead and alive after 1st and 2nd observation.

Figure 15: Effect of *Trichogramma minutum* on thrips on six different types of plants under study after 1st observation

REFERENCES:

1. Akhter, T., Jahan, M. and Bhuiyan, M. (2013). Biology of the Angoumois Grain Moth, Sitotroga Cerelalla (Oliver) On Stored Rice Grain in Laboratory Condition. *Journal of the Asiatic Society of Bangladesh, Science*, 39(1).
2. Bushra, S. and Aslam, M. (2014). Management of Sitotroga cerelalla in stored cereal grains: a review. Archives of Phytopathology and Plant Protection, 47(19), pp.2365-2376.
3. Blibech, I., Ksantini, M., Jardak, T. and Bouaziz, M. (2015) Effect of against Prays oleae Insect Pest. Advances in Chemical Engineering and Science, 5, 362-372.
4. Bryan, M. D., R. J. Dysart and T. L. Burger. 1993. Releases of Introduced Parasites of the Alfalfa weevil in the United States, 1957-88. USDA APHIS Misc. Publ. No.1504. 203 pp.
5. Bureau of plant industry. (1994): Trichogramma Manual for farmer's training. Department of Agriculture. Manila, Philippines.
6. CABI. (2007). *Sitotroga cerelalla* (Angoumois grain moth) datasheet. Crop Protection Compendium, 2010 Edition. CAB International Publishing. Wallingford, UK.
7. Cônsoli, F., Parra, J. and Zucchi, R. (2010). [Progress in biological control]. Heidelberg: Springer.
8. Caltagirone, L. (1981). Landmark Examples in Classical Biological Control. Annual Review of Entomology, 26(1), pp.213-232.
9. Cerelalla, S. and Steve Francia, (2015). Sitotroga cerelalla: huji.ac.il. [online] Plant Pests of the Middle East. Available at: http://www.agri.huji.ac.il/mepests/pest/Sitotroga_cerealella/ [Accessed 20 Jan. 2016].
10. Debach, P., and D. Rosen. 1991. Biological Control by Natural Enemies. Cambridge Univ. Press, Cambridge, UK. pp440
11. Flanders, S. and Quednau, W. (1960). Taxonomy of the genus Trichogramma (Hymenoptera, Chalcidoidea, Trichogrammatidae). Entomophaga, 5(4), pp.285-294.
12. Gardeninsects.com, (2016). Garden Insects. [online] Available at: http://www.gardeninsects.com/about.asp [Accessed 20 Jan. 2016].
13. Hussey, N. W.and N. Scopes. 1985. Biological pest control: the glasshouse experience. Cornell Univ. Press, Ithaca.
14. Hassan, S. and Gerding, P., 1994. Production of the Angoumois grain moth Sitotroga cerelalla (Oliv.) as an alternative host for egg parasites Producción y utilización de Trichogramma para el control biológico de plagas. Chillán: Taller International, pp.20-26.

15. Hoffmann, M., Ode, P., Walker, D., Gardner, J., van Nouhuys, S. and Shelton, A. (2001). Performance of Trichogramma ostriniae (Hymenoptera: Trichogrammatidae) Reared on Factitious Hosts, Including the Target Host, Ostrinia nubilalis (Lepidoptera: Crambidae). Biological Control, 21(1), pp.1-10.
16. Integrated Pest Management: Innovation-Development Process. (2009).Biological Control and Integrated Pest Management, [online] p.207. at https://www.citethisforme.com/cite/journal/autocite [Accessed 22 Jan. 2016].
17. Laing, J.E. and Eden, G.M., 1990. 2.0 Mass-production of Trichogramma minutum Riley on factitious host eggs. Memoirs of the Entomological Society of Canada, 122(S153), pp.10-24.
18. Oliveira, H., Zanuncio, J., Pratissoli, D. and Picanço, M. (2003). Biological characteristics of Trichogramma Mexicali (Hymenoptera: Trichogrammatidae) on eggs of Anagasta kuehniella (Lepidoptera: Pyralidae). Braz. J. Biol., 63(4), pp.647-653.
19. Pratissoli, D., Oliveira, H., Gonc¸alves, J., Zanuncio, J. and Holtz, A. (2004). Changes in Biological Characteristics of Trichogramma pretiosum (Hym. Trichogrammatidae) Reared on Eggs of Anagasta kuehniella (Lep: Pyralidae) for 23 Generations. Biocontrol Science and Technology, 14(3), pp.313-319.
20. REZNIK, S., VOINOVICH, N. and VAGHINA, N. (2009). Effect of temperature on the reproduction and development of Trichogramma buesi (Hymenoptera: Trichogrammatidae). Eur. J. Entomol., 106(4), pp.535-544.
21. Suh, C. P. C., Orr, D. B., & Van Duyn, J. W. (1998). Reevaluation of Trichogramma releases for suppression of heliothine pests in cotton. In P. Duggar, & D. Richter (Eds.), *1998 proceedings Beltwide Cotton Conference, January, San Diego, volume 2*. (pp. 1098-1101). National Cotton Council of America.
22. Weinberg, E. and Hassan, S. (1994). Biological control with egg parasitoids. Wallingford, UK: CAB International on behalf of the International Organization for Biological Control of Noxious Animals and Plants.