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# Tachinids as good biocontrol agents of agricultural pests

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## ABSTRACT

Tachinids (Diptera: Tachinidae) are good biocontrol agents of agricultural and other crop plants. They are broadly divided into macro egg laying and micro egg laying individuals. Macro egg laying tachinids deposited their eggs directly on the insect pest body while, micro egg laying tachinids laid on the host plants of insect pests. In both cases, after getting the entry into the host body, eggs hatched into maggots and maggots consumed internal tissues of the pest insects by killing them when they came out by breaking the body wall of pest stages like larvae and pupae. Mostly pest larvae have been found attacked by tachinids. The diversity of tachinids and their biocontrol potential is summarized in the paper.

**KEY WORDS:** Tachinids, diversity, biocontrol potential.

## INTRODUCTION

The Tachinids are very potential biocontrol agents of several insect pests. They belong to the family Tachinidae of order Diptera which contain about 10,000 species worldwide (Irwin *et al.*, 2003). The tachinids play significant role in regulating herbivore population and stimulating ecological communities, both natural and managed. Up to date, more than 100 species of tachinids have been employed in biological control programmes of agricultural, horticultural and forest crop plants (Sathe, 2014). Tachinids occur throughout the world from nearly all terrestrial environments. Therefore, tachinids are attracting increasing attention of basic ecologists, taxonomists and the workers involved in biological control of insects. Review of literature indicates that the tachinids have been studied by Allen (1995), Belshaw (1993), Crosskey (1976), Feener and Brown (1997), Felland (1990), Monteith (1955), Roth *et al.* (1982), Shima (1989), Sathe (2012, 2014), Shendage and Sathe (2014 a, b), Sathe *et al.* (2014 a, b), etc.

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## Material and Methods

Biocontrol potential of tachinids from Kolhapur region of India has been studied by making the survey of tachinid parasitoids on insect pests at weekly interval by collecting immature stages of pests such as larvae and pupae. A very large number of pest larvae and pupae were collected from the fields and reared in the laboratory for screening the tachinids from them. Per cent parasitism was decided on the number of hosts parasitized out of hundred individuals. Different crops and pests have been surveyed for making the records of pests and their parasitoids" by one man one hour search / collection method during the years (2014-2015). The insect pests and the tachinids emerged from the pests have been identified by consulting appropriate literature cited in references.

## Results

Result recorded in table-1 and Fig 1-7 indicated that the tachinids attacked on 20 pest insects from Kolhapur region. The maximum 40.00% and minimum 2.00 % parasitism was recorded on *Spodoptera litura* Fab and *Forficula* sp. by macro egg type parasitoids respectively. Both macro egg type and micro egg type of tachinids were prevalent in the Kolhapur region of India (Table-1). In general, macro egg type tachinids were dominant in the region wherein they directly laid their eggs into the body of

**Table-1: Biocontrol potential of Tachinids on some insect pests**

| Sr. No | Tachinid Species | Family/Tribe | Eggs on | Pests insect | % Parasitism |
|---|---|---|---|---|---|
| 1. | *Compsilura* sp. | Exoristinae (Blondeliini) | Host | *Lymantria dispar* (L.) | 12.00 |
| 2. | *Eucelatoria* sp. | Exoristinae (Blondeliini) | Host | *Helicoverpa armigera* (Hubner) | 27.00 |
| 3. | *Lixophaga diatraeae* (Townsend) | Exoristinae (Blondeliini) | Host | *Diatraea saccharalis* (Fab.) | 17.00 |
| 4. | *Drino bohemica* Mesn. | Exoristinae (Eryciini) | Host | *D. saccharalis* | 5.00 |
| 5. | *Drino* sp. | Exoristinae (Eryciini) | Host | *D. saccharalis* | 10.1 |
| 6. | *Exorista bombycis* (Louis) | Exoristinae (Blondeliini) | Host | *Mythimna separata* (Walker)<br>*Spodoptera litura* (Fab.) | 14.00<br>40.00 |
| 7. | *Exorista mella* (Walker) | Exoristinae (Blondeliini) | Host | *Grammia* sp. | 7.00 |
| 8. | *Leschenaultia* sp. | Tachininae (Ernestiini) | Host | *Malacosoma* sp. | 3.00 |
| 9. | *Linnaemyia comta* Fall. | Tachininae (Ernestiini) | Host | *Agrotis ipsilon* (Hufnagel) | 11.00 |
| 10. | *Triarthria* sp. | Tachininae (Loewiini) | Host | *Forficula* sp. | 2.00 |
| 11. | *Archytas* sp. | Tachininae (Tachiniini) | Host | *Heliothis* sp. | 8.00 |
| 12. | *Carcelia kockiana* Townsend | Exoristinae (Eryciini) | Host | *Achea janata* L. | 3.00 |
| 13. | *Eucelatoria bryani* Sabrosky | Exoristinae (Blondeliini) | Host plants | *H. armigera* | 50.00 |
| 14. | *Eucelatoria* sp. | Exoristinae (Blondeliini) | Host plants | *Diatraea* sp. | 48.00 |
| 15. | *L. diatraeae* | Exoristinae (Blondeliini) | Host plants | *D. saccharalis* | 37.00 |
| 16.. | *Exorista mella* (Walker) | Exoristinae (Blondeliini) | Host plants | *Grammia* sp. | 16.5 |
| 17. | *Blepharipa* sp. | Exoristinae (Goniini) | Host plants | *Lymantria dispar* L. | 13.00 |
| 18. | *Leschenaultia* sp. | Exoristinae (Goniini) | Host plants | *Malacosoma* sp. | 18.00 |
| 19. | *Patelloa* sp. | Exoristinae (Goniini) | Host plants | *Malacosoma* sp. | 29.00 |
| 20. | *Blepharipa zebina* Walker | Exoristinae (Goniini) | Host plants | *Antheraea mylitta* Drurry | 20.00 |

hosts. While, micro egg type tachinids laid their eggs on host plants which entered into the body of pest insects through its food and tachinids developed on the internal tissues of the host body. In tachinids, there were 4 distinct stages of life cycle namely, egg, larvae, pupae and adult. The larval instars ranged from 4 to 5 in different species. The tachinids attacked old larval instars more than the younger instars and relatively larval parasitoids were more dominant than pupal parasitoids in the region.

## Discussion

Tachinids are of two categories. In one case they lay eggs directly on the host body and such eggs are larger in size. Another type of tachinids lay their eggs on host plant and their eggs are thus smaller in size. In this category, the eggs entered into host body through mouth or alimentary canal and after hatching the eggs, the larvae started eating internal tissues of the host body. First category tachinids lay their eggs into host body.

The parasitoid larva moults three / four time in host body. The last instar, which is fully matured break the body wall of the host and come out and spin the brownish barrel shaped cocoon. While breaking body wall of host and coming outside the host body, the host dies on the spot. Thus, tachinids help in controlling pest species.

**Figure-1. *H. armigera* (polyphagus pests)**

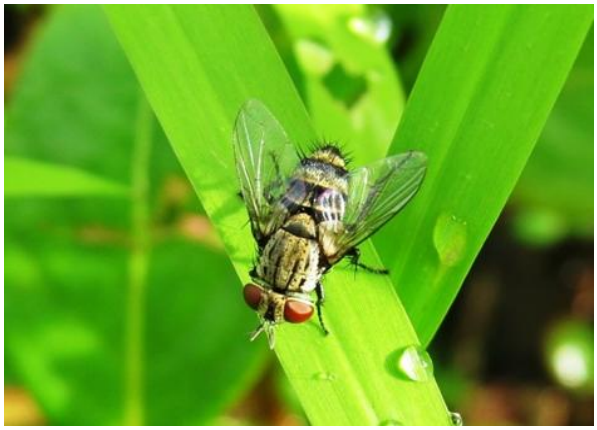


***Figure-2. Exorista* sp. parasitizing *H. armigera***

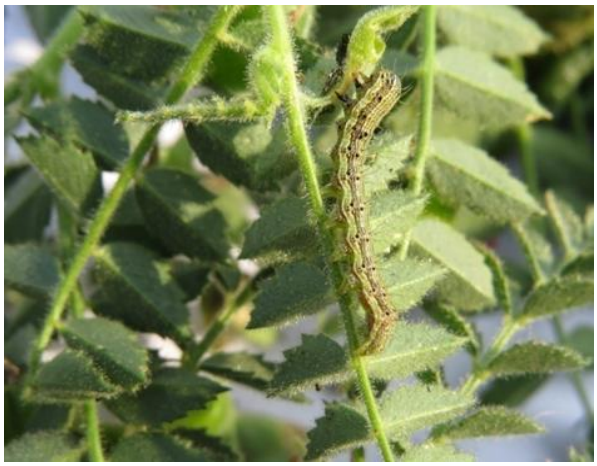


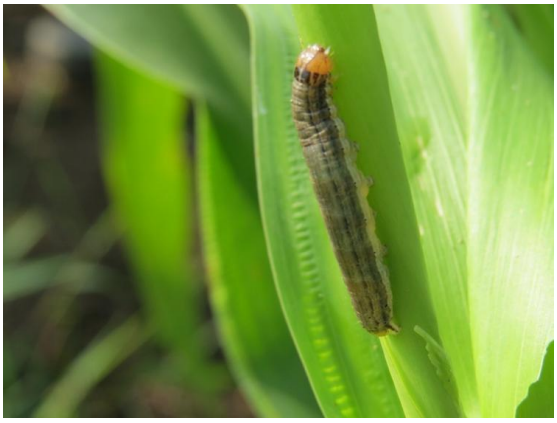
**Figure-3. *S. litura* (pest defoliator)**

According to Al-Dubai *et al.* (2012) the sex ratios of flies captured in the flower baited to control traps were subsequently related to flower density, width, depth and plant height in order to test the hypothesis that flower and plant morphology influenced their attractiveness and / or accessibility to Tachinidae (Fiedler and Landis, 2007, Sivinski *et al.,* 2011). According to Stireman *et al.* (2006), 909 tachinids were feeding on flowering plants, 28% were Phasiinae.

**Figure-4. *Exorista* sp**

**Figure-5. *Exorista* sp**

**Figure-6. *M. separata***



There was substantial evidence that increasing the floral diversity of agroecosystems enhances natural enemy diversity and abundance and ultimately the biological control of pest insects was

possible. However, some of the abundantly collected tachinids have contributed to pest suppression. (Al-Dubai *et al.,* 2012) genus *Archytas* attacked a wide variety of Lepidopteran larvae (Arnaud, 1978) and out of which some use agriculturally more economic important and mass reared for augmentative release (Mannion *et al.,* 1995). The hosts of *C. townsendi*, led 32% of the capture of Tachinidae. Sathe *et al.* (2014, 2015) recorded number of biocontrol agents on pest insects found on various agroecosystems.

Finally, it is concluded that the survey and resurveys of tachinids and their biocontrol potential be made frequently and continuously for updating the knowledge of tachinid occurrence in the region and their possible utilization in biological control of insect pests as ecologically approach of pest management. The tachinids are also good pollinating agents for increasing yield of the crops.

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## Conflict of Interests

Authors declare that there is no conflict of interests regarding the publication of this paper.

## References

1. Arnaud P. H. Jr. A Host-Parasite Catalog of North American Tachinidae (Diptera). USDA Misc. Publ. 1319. 860 (1978).
2. Al-Dobai, S., Reitz, S. and Sivinski, J. Tachinidae (Diptera) associated with flowering plants: estimating floral attractiveness. *Biological Control*, **61**: 230–239 (2012).
3. Allen G. R. The biology of the phonotactic parasitoid, *Homotrixia* sp. (Diptera: Tachinidae), and its impact on the survival of male Sciarasaga quadrata (Orthoptera: Tettigoniidae) in the field. *Ecol. Entomol.,* 20:103–10 (1995).
4. Belshaw R. Tachinid flies. Diptera: Tachinidae. Handbooks for the identification of British Insects. London: *R. Entomol. Soc. London,* 10, Part 4a(i). 170 (1993).
5. Boettner, G. H., Elkinton, J. S. and Boettner, C. J. Effects of a biological control introduction on three nontarget native species of saturniid moths. *Conservation Biology,* **14**: 1798–1806 (2000).
6. Crosskey R. W. A taxonomic conspectus of the Tachinidae (Diptera) of the Oriental Region. *Bull. Br. Mus. Natl. Hist. Entomol. Suppl.,* 26. 357 (1976).
7. Feener D. H. Jr, Brown B V. Diptera as parasitoids. *Ann. Rev. Entomol.,* 42: 73–97 (1997).
8. Felland C. M. Habitat-specific parasitism of the Stalk Borer (Lepidoptera: Noctuidae) in Northern Ohio. *Environ. Entomol.,* 7:162–66 (1990).
9. Fielder, A. and D. Landis, Plant characteristics associated with natural enemy abundance at Michigan native plants. *Environmental Entomology,* 36, 878–886 (2007).
10. Irwin, M. E., Schlinger, E. I. and Thompson, F.C. Diptera, true flies pp. 692- 702. In:
11. Goodman, S. M. and Benstead, J. P. The Natural History of Madagascar, University of 18
12. Chicago Press, Chicago & London, 1728 (2003).
13. Mannion, C. M., Carpenter, J. E. and Gross, H. R. Integration of inherited sterility and a parasitoid, *Archytas marmoratus* (Diptera: Tachinidae), for managing *Helicoverpa zea* (Lepidoptera: Noctuidae): acceptability and suitability of hosts. *Environmental Entomology,* **24**: 1679–1684 (1995).
14. Monteith L. G. Host preferences of *Drino bohemica* Mesn. (Diptera: Tachinidae) with particular reference to olfactory responses. *Can. Entomol.,* 87: 509–30 (1955).
15. O' hara, J. E. World Genera of the Tachinidae (Diptera) and their Regional Occurrence Version. 4.0, University of Guelph (2008).
16. Roth J. P, King E G, Hensley S D. Plant, host, and parasite interactions in the host selection sequence of the tachinid *Lixophaga diatraeae. Environ. Entomol.,* 11:273–77(1982).
17. Sathe, T. V. Biodiversity of tachinid flies (Diptera: Tachinidae) from Western Maharashtra. *International Journal of Plant Protection,* **5**: 368–370. 2012.
18. Sathe, T. V. Recent Trends in Biological pest control. Astral Int. Pvt. Ltd, Daya publishing house New Delhi 1-204 (2014).
19. Sathe, T. V., Bhoje, P. M. and Desai, A. S. Floral host plants of tachinid flies (Diptera: Tachinidae) from Kolhapur- 26 The Tachinid Times Issue 28, 2015 Kolhapur and Satara districts, India. *Journal of Entomological Research*, 38: 183–188 (2014a).
20. Sathe T. V., Anna Gophane and Nilam Shendage Colour attractivity and occurrence of some cell sap sucking pests on crop plants. ISSN (online): 2320-4257. Biolife, 3(2):540-546 (2015).
21. Sathe, T.V., Jadhav, B.V., Desai, A.S., Shendage, N., Kamble, C. and Jadhav, A.D. Ecology, ethology and control of green stink bug *Plautia affinis* Dallas (Hemiptera: Pentatomidae) on mulberry *Morus alba* L. varieties V-1 and M-5 from Kolhapur. Biolife **2**: 1347–1353(2014).
22. Sathe, T. V., P. M. Bhoje, A. S. Desai and Nilam Shendage. Diversity of Tachinids from agroecosystems of Kolhapur district. *Recent Trends in Biological pest control*, 19, 132-135 (2014b).

23. Shendage Nilam and T. V. Sathe, Biology of *Eucelatoria bryani* Sabrosky (Diptera: Tachinidae), a larval parasitoid of *Helicoverpa armigera* (Hubn.). (Noctuidae: Lepidoptera). *Recent Trends in Biological pest control*, 18, 126-131 (2014a).
24. Shendage, N. and Sathe, T.V. Biology of *Actia monticola* Mall (Diptera: Tachinidae), an internal larval parasitoid of *Tarache notabilis* (Walker) (Noctuidae: Lepidoptera). *Global Journal for Research Analysis*, 3 (6): 15–16 (2014b).
25. Shima H. Parasitic way of life in tachinid flies. *Insectarium,* 26:4–9; 46–51; 88–94; 120–26 (1989).
26. Sivinski, J., Wahl, D., Holler, T., and S. Al-Dobai. Conserving natural enemies with flowering plants: estimating floral attractiveness to parasitic Hymenoptera and attractions correlates to flower and plant morphology. *Biological Control,* 58, 208–214 (2011).
27. Stireman, John, O. III, O' hara, J. E. and Wood, D. M. Tachinidae: Evolution, Behavior and Ecology. *Ann. Rev. Entomol.,* **51:** 525-555 (2006).

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