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PREDATORY EFFICACY OF *MESOCYCLOPS LEUCKARTI* AGAINST *AEDES AEGYPTI* LARVA

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ABSTRACT
The predacious copepods have been widely reported as promising candidates for biological control of the dengue vector *Aedes aegypti*. The present study was carried out to assess the predatory efficacy of *Mesocyclops leuckarti* against *Aedes aegypti* larvae under laboratory conditions. *Mesocyclops leuckarti* is a dominant cyclopoid copepod found in the fresh water bodies of Aurangabad. We made laboratory studies of the predation rates of *Mesocyclops leuckarti* against the first and fourth instar larvae of *Aedes aegypti*. The results demonstrated that the predation rate of *Mesocyclops leuckarti* on both the instars increased with increasing prey density. We also concluded that when both the larvae instars were offered in combination the copepod actively selected the I instar over the IV instar.

KEYWORDS: Predation, *Mesocyclops leuckarti*, Aedes aegypti, instar larvae.

INTRODUCTION

Vector control with insecticides causes a manifold environmental damage in addition to evolving mosquito resistance. To reduce this nuisance, alternative control measures such as biological control is the need of the hour. Among all the natural enemies mentioned in the literature as potential candidates for mosquito control [Jenkins 1964, Roberts & Strand 1977, Roberts and Castillo 1980, Roberts *et.al.*, 1983). Predacious copepods are promising candidates for biological control of container breeding mosquitoes (Marten, 1990). Copepods do not depend on the supply of mosquito larvae for food and they exhibit a broad spectrum of diet which includes algae, protozoa, rotifers and other arthropod larvae. Before the selection of species for field releases, it is necessary to conduct laboratory evaluations of these potential biological control agents. The authors conducted laboratory trials to evaluate the predatory efficacy of *Mesocyclops leuckarti* against both I and IV instar larvae.

MATERIALS AND METHODS

The copepods were collected from the Salem Ali Lake in Aurangabad city with the help of plankton net of mesh size 100µm. Sampling was done in the morning hours of 7.00am to 8.00am (Sontakke and Mokashe, 2014). The collected samples were transported to the laboratory within one hour in insulated polyethylene containers (Ramanibai, 2014). The copepods were isolated from the water sample with the help of a medicine dropper under a stereo microscope. The identification upto species level was done with the help of standard keys of Edmonson (1992), Battish (1992) and Altaff (2004).

The eggs of Aedes aegypti were hatched in enamel bowls of 18cm diameter containing 250ml deoxygenated water. The temperature and relative humidity were maintained at 27^0C and 75 – 80% respectively.

Predation Trials

The predation experiments were performed in 500ml borosilicate dishes containing 300ml of dechlorinated tap water. In the first experiment a single adult *Mesocyclops leuckarti* was offered *Aedes aegypti* I instar larvae at four different densities of 25, 50, 75, 100. The copepod was allowed to feed for 24 hours. The difference between the number of live prey in the beginning of the experiment and the number of prey left at the end is taken as the number of prey killed by the copepod in 24 hours. In the second experiment, a single adult *Mesocyclops leuckarti* was offered *Aedes aegypti* IV instar larvae at four different propotions of 10, 20, 30 & 40. The number of live prey at the end of 24 hours were recorded. All the above experiments had 3 replicates at each density.

RESULTS

The results are shown in table 1 and 2.

With either instars, the larval predation rates of *Mesocyclops leuckarti* increased significantly with increasing prey density. The Predation rate on instar I was significantly higher than the predation rates on instar IV. The highest predation of copepods against instar I were observed at a density of 100.The highest predation rate of the copepod against instar IV were observed at a density of 40.

Table 1. Predatory efficacy of *Mesocyclops leuckarti* against *Aedes aegypti* Ist instar.

Source	df	SS	MSS	F	
Density	3	1418.25	472.75	177.28	**
Replicates	2	8.00	4.00	1.50	NS
Error	6	16.00	2.67		
Total	11	1442.25			

Table 2. Predatory efficacy of *Mesocyclops leuckarti* against *Aedes aegypti* IVst instar.

Source	df	SS	MSS	F	
Density	3	203.00	67.67	40.60	**
Replicates	2	8.67	4.33	2.60	NS
Error	6	10.00	1.67		
Total	11	221.67			

The present study shows that the number of prey killed by *Mesocydops leuckarti* increased with the increase in prey (larval) density. The instar related differences in predation are also evident. The per capita larval predation by the copepod in this study is comparable to those recorded by Brown *et.al.* (1991 a), Marten *et.al.* (1994 a) and R. Kumar et.al. (2003). In an earlier study, Kumar and Rao (1996 b) observed a negative co-relation between the prey size and the number of prey killed by Mesocyclops thermocyclopoides. Mesocyclops can effectively reduce the number of *Aedes aegypti* larvae, both in laboratory and natural settings (Russel et.al 1996). Mesocyclops could be both, a predator and a competitor for food for mosquito larvae (Riviere *at.al.*, 1987; Marten *et.al,* 1989). The results of the present study are in consonance with Williamson (1999) who confirmed that copepods are very successful as predators for small (I and II instar) mosquito larvae, but are not very good predators of larger mosquito larvae (III and IV instar). In this study, it was noticed that Mesocyclops were good biocontrol agents against *Aedes* larvae as were previously reported by Ramanibai and Kanninga (1998), under laboratory conditions. Lardeux also showed that Mesocyclops served as a good biocontrol agent against *Aedes aegypti.* The maximum predatory capacity of Mesocyclops was found to be 36% (mean value) and was concluded to be a more efficient predator of younger than of older larvae. However Marten *et.al.* (1994), reported that even a single cocepod could consume upto 90% of the I instar larvae after 24 hours. Soumare et.al. (2004), reported a low predation rate of copepods on late instar larvae and these results are in line with ours.

CONCLUSION

The results of the study showed that *Mesocyclops leukarti* is an efficient predator of *Aedes aegypti* larvae in laboratory conditions. After appropriate field trials, these copepods could be effectively used for the control of container breeding *Aedes aegypti.*

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