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Predation Capacity of *Culiseta longiareolata* Mosquito Larvae against Some Mosquitoes Species Larvae

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ABSTRACT

Predation capacity of *Culiseta longiareolata* larvae against *Aedes caspius*, *Anopheles multicolor* and *Culex pipiens* mosquito larvae were studied under laboratory conditions. Both the predator and the preys mosquito larvae were field collected and the preys larvae were subjected to 4th instar predaceous larvae for 24 h bioassays. Bioassays revealed that *Cs. longiareolata* larvae preyed upon all mosquito species larvae but their predation capacity was correlated with prey instar, stage and species.

Key words: *Culiseta longiareolata*, predation, predaceous mosquitoes

INTRODUCTION

Although mosquitoes are important blood sucking arthropods and are known as vectors of many important human diseases such as malaria, filarial, dengue and other diseases, a few mosquito species, in particular larval stage, preying on other mosquito larvae. The most prominent and important predaceous mosquito larvae is *Toxorhynchites* (Steffan, 1975; Trimble, 1983; Collins and Blackwell, 2000; Wijesinghea *et al*., 2009). Larvae of *Culex* mosquitoes belonging to the subgenus *Lutzia* have also been found to predate upon mosquito larvae (Appawu *et al*., 2000).

Mosquito larvae belonging to the genera *Armigeres* and *Psorophora* are also predaceous (Al-Saadi and Mohsen, 1988).

Whilst, Van Pletzen and van der Linde (1981) reported that several species of *Culiseta* including *Cs. longiareolata* mosquitoes have been implicated as virus vectors Kirkpatrick (1925) mentioned for the first time the predation behavior of such mosquito larvae against *Cx. pipiens* larvae. Blaustein and Margalit (1994) indicated that late-stage of *Cs. longiareolata* larvae prey upon tadpoles of the toad *Bufo viridis* in both field enclosure and laboratory experiments. Furthermore, field collected 4th instar larvae of *Cs. longiareolata* readily feed on 1st, 2nd and 3rd instar larvae of *Cx. quinquefasciatus* under laboratory conditions (Al-Saadi and Mohsen, 1988). Literatures indicated that since those very few studies no further information is available on their predation potential particularly against other mosquito species. In this view, the present study aimed to assess the predation capacity of 4th instar *Cs. longiareolata* larvae against *Ae. caspius*, *An. multicolor* and *Cx. pipiens* larvae.

MATERIALS AND METHODS

Field collection of both predator and preys: Population of heterogeneous mosquito immatures were collected by fine netting from various places of stagnant water within AR-Rumaylah village,

Al-Hofuf oasis, Eastern region, Kingdom of Saudi Arabia. During collections, they were placed in plastic containers half field with breeding sites water and transported to the laboratory as soon as possible (less than 2 h after capture).

In the laboratory they were identified into species by the aid of the taxonomic keys of Harbach (1985) and Al Ahmad *et al.* (2011) then maintained in small aquaria filled with water collected with larvae from breeding sites and left for the bioassays.

Laboratory bioassays: The 4th instar larvae of *Cs. longiareolata* were selected rather than other instars for bioassays based on the study of Appawu *et al.* (2000), who indicated that 4th instar larvae of the predaceous mosquito is the most voracious of all the other instars and better adapted for catching and consuming all stages of mosquito larvae.

Cs. longiareolata larvae were starved for 24 h before bioassays. During the bioassay experiments, to a single *Culiseta* larvae, 20-25 of either larvae (either 2nd or 4th instar) or pupae of field collected mosquitoes were provided as prey in white circular plastic cups (6.5 cm in diameter and 250 mL capacity) containing 100 mL distilled water. For each experiment, 4 replicates were conducted plus a free predator control cup. The number of consumed or killed mosquito larvae (prey) were recorded after 24 h.

Statistical analysis: Data were analyzed using the soft ware SPSS version 11.

RESULTS AND DISCUSSION

Results of the present study (Table 1) indicated that *Cs. longiareolata* larvae consumed more 2nd instar larvae of *Ae. caspius*, *An. multicolor* than the 4th instar of those species but in contrast they consumed more 4th instars larvae of *Cx. pipiens* than the 2nd instar. Statistical analysis showed that the percentage of consumed 2nd instars larvae of *Ae. caspius* is significantly different ($p<0.05$) from the 4th instar whilst this difference is not significant ($p>0.05$) in case of *An. multicolor* and *Cx. pipiens*. According to prey stage, *Cs. longiareolata* larvae significantly ($p<0.05$) consumed larval, in particularly 2nd instar *Ae. caspius* and 4th instar *Cx. pipiens*, than pupal stage. Furthermore and according to prey stage, *Cs. longiareolata* larvae significantly ($p<0.05$) consumed more *Ae. caspius* larvae compared to the other species specifically the 2nd instar larvae.

The present study indicated that 4th instar *Cs. longiareolata* larvae preyed upon *Ae. caspius*, *An. multicolor* and *Cx. pipiens* larvae but with different capacities depended on prey insatr, stage

Table 1: Predation capacity of *Culiseta longiareolata* fourth instar larvae against different mosquito species

	Percentage of consumed mosquito stages±SE		
	Larva		
Mosquito species	2nd instar	4th instar	Pupa
Aedes caspius	76±4.3^{ab}	5±1.90^{a}	0±0^{b}
Anopheles multicolor	21±7.7^{a}	11±0.58^{bc}	-
Culex pipiens	17±4.4^{b}	31±7.50^{ac}	0±0^{a}

Means with the same letter either in horizontal or vertical columns are significantly different ($p<0.05$)

and species. Larvae of the same mosquito species showed larger tendency to feed upon younger *Cx. quinquefasciatus* larvae (1st and 2nd) compared to the larger instars (Al-Saadi and Mohsen, 1988). Likewise, Kesavaraju and Juliano (2004) reported that 2nd instar larvae of *Ae. albopictus* and *Ochlerotatus triseriatus* were more vulnerable to predation by the dipteran predator *Corethrella appendiculata* than were 3rd instar. The younger preys (2nd larval stage) are usually more susceptible to predation because they are easier to capture and consume than the larger preys and if the predator continues this high predation rate against the smaller larval stage, fewer mosquitoes will reach maturity and reduction in the mosquito population will be occur (Appawu *et al*., 2000).

The predation preference of larval stage over pupal stage showed by *Cs. longiareolata* larvae against *Ae. caspius*, *An. multicolor* and *Cx. pipiens* mosquitoes in the present study is similar to previous studies of other predaceous insects such as the aquatic bug *Enithares indica* (Wattal *et al*., 1996), the *Cx. tigripes* mosquito larvae (Appawu *et al*., 2000), adult stage of the predaceous backswimmers *Anisops* sp. (Shaalan *et al*., 2007), the Shore fly *Ochthera chalybesceens* (Minakawa *et al*., 2007), the aquatic bug *Sigara hoggarica* (Alahmed *et al*., 2009). Contrarily, very few predaceous insects such as adult stage of the predaceous aquatic bug *Diplonychus* sp. (Shaalan *et al*., 2007) were reported to prey on both larval and pupal stages giving them advantage in mosquito biocontrol strategies. The hard exoskeleton of the cephalothorax, large size, spherical shape, posture (pupae usually hang to water surface) and movement of the pupae compared to larvae may make this stage less vulnerable to predation (Appawu *et al*., 2000).

Prey preference is common among predaceous aquatic insects such as mosquito larvae (Singh *et al*., 1984; Appawu *et al*., 2000). Consuming more *Ae. caspius* larvae than *An. multicolor* and *Cx. pipiens* by *Cs. longiareolata* larvae could be due to the difference in mobility of the species (Appawu *et al*., 2000). *Ae. caspius* larvae move more frequently therefore they get into contact with the predator or move into the predator's striking area whilst *An. multicolor* and *Cx. pipiens* larvae showing different postures at the surface of the water.

Although, Shaalan and Canyon (2009) reported on predation potential and capacity of some mosquito larvae as biological control agent, no information is available about how to utilize *Cs. longiareolata* larvae in this aspect. Hence, the presented results may opens the door for further studies on the capacity of this mosquito species as alternative biological control agent.

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