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A TRIAL OF COMMONEST FISH IN AFRICA IN CONTROL OF VECTOR TRANSMITTING *Wuchereria bancropti* INFECTION (Wuchereriasis or bancroftian flariasis)

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ABSTRACT

Two trials were made in this study involving single adult *T. zillii*. In the first trial, *T. zillii* was supplied with solely five hundred mosquito larvae which it ate in fifty minutes without break. After twenty four hours, a period for a complete digestion in the fish, the second trial was conducted in which five hundred mosquito larvae supplemented with 20g of fresh Earthworm were supplied to the same fish which it finished eating in two hours fifty six minutes with a break of twenty three minutes. From this study, it was observed that one adult *T. zillii* can eat ten larvae of mosquito in one minute without a food supplement hence it is efficient predator of mosquito larvae. It is therefore recommended that *T. zilli* can be introduced to where mosquito breeds for control purposes and a further research on predatory preference among different mosquito species larvae by *T. zillii*.

Keywords: Africa, Fish, Filariasis, Trial, Vector

INTRODUCTION

Infection caused by *Wuchereria bancrofti* is known as wuchereriasis or bancroftian filariasis and it is a vector-borne parasitic human infection. Different species of mosquito serve as vector transmitting the disease: *Aedes species*, *Anopheles species*, *Culex species*, and *Mansonia uniformis*. Manson in 1887, first demonstrated that *Culex quinquefasciatus* was an intermediate host of *Wuchereria bancrofti*. This was the first demonstration that arthropods could harbor an infective agent (Arora and Arora, 2010).

Since 1937, fish has been employed for controlling mosquito larvae. Manipulating or introducing an auto-reproducing predator into then ecosystem may provide sustained biological control of pest populations. The selection of a biological agent should be based on its self-replicating capacity, preference for the target pest population in the presence of alternate natural prey, adaptability to the introduce environment, and overall interaction with indigenous organisms (Chandra *et al.*, 2008).

Biological control refers to the introduction or manipulation of organisms to suppress vector populations. A wide range of organisms helps to regulate mosquito populations naturally through predation, parasitism and competition. As biological mosquito control agents, lavivorous fish are being used extensively all over the world since the early 1900s (Raghavendra and Subbarao, 2002).

Biological control, particularly using larvivorous fish, was important to malaria control programmes in the 20^{th} century, particularly in urban and peri-urban areas for immediate use in developed and developing countries (Gratz and Pal, 1988). It has very positive role to play in the integrated control methods in which both pesticides and fish or other biotic agents have their own roles (Mulla, 1961).

Biological larviciding for the control of mosquito borne diseases is feasible and effective only when breeding sites are relatively few or are easily identified and treated. Larval control appears to be promising in urban areas, given that the density of humans needing protection is higher than the limited number of breeding sites (Chandra, *et al.*, 2008).

Recognizing the high larvivorous potential of *Gambusia affinis*, this fish was purposely introduced from its native Texas (Southern USA) to the Hawiinn Islands in 1905. In 1921, it was introduced in Spain; then from there in Italy during 1920s and later to sixty other countries (Gerberich, 1985).

Gambusia affinis is a fish commonly known to predate mosquito larvae, however, this fish is commonly found in the western world and Asia, and it is a fresh water fish and at times the habitat it lives does not conformed survival of some mosquito species. This means that other fish species should be put in trial. In this study *Tilapia zillii* was tried on feeding of mosquito larvae because of its ability to share a similar habitat with more mosquito larvae as *Gambusia affinis*. It is also one of the commonest fishes found in Africa, Asia and the west (Ahmed, 2016). In addition, it is among the fastest growing species in many countries and it is highly suitable for farming in tropical climate, fresh water and brackish.

MATERIALS AND METHODS

The study was done according to Ahmed (2016) except that with a little adaptation. A rice field was used for the experiment and a single quadrat, one square metre with clear transparent fifteen metre deep water. Two trials were made in this study involving single adult *T. zillii*. In the first trial, *T. zillii* was supplied with solely five hundred mosquito larvae. After twenty four hours, a period for a complete digestion in the fish, the second trial was conducted in which five hundred mosquito larvae supplemented with 20g of fresh Earthworm were supplied to the same fish.

RESULTS AND DISCUSSION

Employing Prey – predator relationship in control otherwise biological control method needs more attention. *Gambusia affinis,* a fish commonly known to predate mosquito larvae, however this kind of fish is commonly found in the western world and Asia, and it is a fresh water fish and at times the habitat it lives does conformed survival of some mosquito species. This means that other fish species should be put in trial. In this study, the commonest fish in Africa, *Tilapia zillii* (Gervais, 1848).

This study revealed that predation of mosquito larva by *Tilapia zillii* was successful and this implies that it is a predator of mosquito larva like the other fish species. Other fish species include the ones reported by the followings: Gosh *et al.* (2006) performed an experiment and established *Oreochromis niloticus niloticus* (Linnaeus), Nile Tilapia as strong biological agent against larval mosquitoes in the laboratory. And for the same fish species, under field conditions, revealed a significant decrease in per dip larval density after one and a half month from introduction of the fish. The larval density again increased significantly after removal of fish from mosquito breeding ground. Mathavan *et al.* (1980) carried out an experiment with *macropodus cupanus* Valenciennes, 1831 collected from rice paddy fields. The collected fishes were grouped into the three weight (W) classes (80,270 and 570mg live weight) and maintained in separate glass aquaria. They were subjected to laboratory conditions (27°C) and fed with *ad libitum* on the fourth instar larvae of the mosquito *Cx. fatigans*. To evoke different levels of hunger, individuals of each W class were deprived of food for 6, 9, 12, 24 or 48 hours before commencing the feeding experiments. Significant results were obtained which proved that fish deprived of food for equal duration, a larger individual becomes hungrier than the smaller ones. Further, prey searching activities of larger individuals increase their hunger level, Sharma and Gosh (1989) reported that *Oreochromis mossambica* (Peters), 1852, Mozambique cichlid, Tilapia was effective for controlling mosquitoes in cow dung pits when introduced against III and IV instar larvae and pupae of *Culex quinquefasciatus* and *Anopheles culicifacies* at the rate of 5 fish per square meter surface area, Ataur-Rahim (1981) reported the natural occurrence of *Aphanius dispar* in shallow channels near Riyadh successfully controlled mosquito larvae. And experiment in made artificial containers have also shown successful results. It has been reported that *A. dispar* is a suggested is a suggested larvivorous fish for the control of vectors of Bancroftian filariasis namely *C. quinquefascitus* Say 1823 in any kind of stagnant water containing organic pollution, Luis and Albert (1988) reported that in an urban area in Djibouti, the indigenous fish, *A. dispar*, effectively suppressed the breeding of *An. arabiensis* and *An. gambiae* in wells, cisterns, containers and barrels by 97 percent. Further, Fletcher *et al* (1992) reported that in an urban area in Ethiopia, the indigenous fish, *A. dispar*, effectively suppressed *An. culicifacies adanensis* breeding in wells, and studies conducted by Kumar *et al.* (1998) showed that predation by *Aplocheilus blockii* Arnold 1911 reduced the larval population of *An. stephensi* by 75 percent along the coastal belt of Goa. *A. blockii* is a potential larvivorous fish controlling the spread of chikungunya fever by controlling *Aedes albopictus* Skuse 1894. The experiment was conducted in tanks and bigger cisterns and barrels.

The rate at which the fish consumed the larvae is of great interest. This should be additional criterion to those outlined by Job (1940), tht larvivorous fish must be small, hardy and capable of getting about easily in shallow waters among thick weeds where mosquitoes find suitable breeding grounds. They must be drought resistant and capable of flourishing in both deep and shallow waters as well as living in drinking water tanks and pools without contaminating the water. They must have the ability to withstand rough handling and transportation for long distances. They should not be brightly coloured or attractive. They should be compactable with existing fish life span in that environment. They should have no food value. They must be prolific breeders, having shorter span of life cycle. Above all, they must breed freely and successfully in confined waters.

Job (1940), has additionally outlined that larvivorous fishes should be surface feeders and carnivorous in habit and should have a predilection for mosquito larvae even in the presence of other food materials. This has agreed with what was observed in this study where the fish continued to feed on the larvae even in presence of earth worm.

CONCLUSION

This study has established that the commonest fish in Africa, *T. zillii* is a successful larvivorous of mosquito larvae responsible for transmission of *Wuchereria bancrofti* and has predilection for mosquito larvae even in the presence of other food materials such as earthworm, as observed in this study.

RECOMMENDATIONS

It is recommended that *T.zillii* be employed in biological control process against mosquito larva such as those in large pools, dams, streams, lakes rice fields among others. Further research on predatory preference of this fish against different mosquito species is also recommended, as this study failed to identify the mosquito larvae type predated upon.

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