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Comparative Study of Ornamental Fishes for Feeding Rate of Mosquito Larvae

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ABSTRACT

There are numerous diseases that spread by mosquito including dengue, malaria, chikungunya, and yellow fever. In the tropical and sub-tropical part of the world these disease have emerged as significant issue with regard to public health. *Anopheles* mosquitoes are marsh mosquitoes that prefer ground pools, irrigated areas, small streams, freshwater marshes, forest pools or any place with clean, slow moving water, are all considered prime breeding ground for egg-laying. The chemical and physical control approaches are more costly and time consuming and not safe for environment. The use of larval fishes is the most effective bio-control technique for controlling mosquito in there larval stage worldwide. So in this study larvarious ornamental fishes were selected for the study. The present study deals with the larvarious efficiency of *Kissing gourami*, compared with well-known *Gambusia affinis.* The *Anopheles* mosquito larvae collected from the Sanjivani Arts Commerce and Science College Kopergoan, Maharashtra, India. The fishes individually acclimated for 1 hour in the experimental jar. Then 150-500 larvae added into each jar and reading were taken after 10 min, 20 min, 30 min, 1 hr, 3 hr, 6 hr, 9 hr, 12 hr, and 24 hr. The comparative account of feeding rate and larvivorous potential of two different species which as *Kissing gourami>Gambusia affinis.* The relationship between feeding rate, length and weight of two different species came out as the length and weight increases, the feeding rate also increases. It was conclude that the larvivorus activity of the ornamental fishes was greater than the well-known*Gambusia affinis.*

Key words : *Biological control Gambusia affinis, Kissing gourami, Larvivorous potential*

Introduction

Ornamental fish are colorful, eye-catching fish with a variety of traits that are maintained as pets in aquariums or backyard swimming pools for ornamental purposes. Among the different types of commercially significant fishes that are sold on a national and international level, ornamental fish is one of the key products (Davis *et al*., 2019). Mosquitoes, the blood-sucking dipteran insects, are well-known worldwide vectors for the spread of many deadly diseases, and these diseases are still a major problem in almost all tropical and subtropical nations (Tolle, 2009). According to estimates, various mosquito species spread diseases to more than 700 million people annually across Africa, Mexico, South America, Central America, and the majority of Asian countries, resulting in more than one million fatalities worldwide (WHO, 2019).

Worldwide, more than 3,000 species of the family *Culicidae* of mosquitoes have been recognized. Mosquitoes are holometabolous insects that undergo a complete transformation throughout their life cycle, from egg to larva to pupa to adult. The initial three stages are aquatic and last for 5 to 13 Days, depending upon species and ambient temperature. In general, stagnant water is ideal for mosquito growth, and each species has its own unique environment

for rearing. The most popular mosquito genera are *Aedes, Culex, Anopheles* and *Mansonia*, each of which has hundreds of species with its own distinctive traits and the potential to spread a wide range of diseases (Clements,). Floodwater mosquitoes, or *Aedes,* prefer damp soil or small man-made or domestic water collection containers, such as unsealed vessels or bottles, discarded tyres, discarded coolers, or even if coconut shells, etc. to lay eggs. The most widespread type of mosquito throughout the year is the *culex,* which lays its eggs in rafts on the surface of any type of standing water (Jackson, 2004). *Anopheles* mosquitoes are marsh mosquitoes that prefer ground pools, irrigated areas, small streams, freshwater marshes, forest pools or any place with clean, slow-moving water, are all considered prime breeding grounds for egg-laying (Herrel *et al*., 2001).

Mansonia mosquitoes lay their eggs in star-shaped clusters on the underside of the leaves of aquatic plants in ponds and lakes where these plants are present, particularly floating varieties. (Chandra, 2006). Both male and female mosquitoes consume nectar, but females of some species prefer to feed on blood, particularly during breeding season when they need specific host blood proteins for the development of their eggs (Klowden, 1969). Therefore, female mosquitoes serve as a vector for the spread of disease-causing viruses, bacteria, protozoans, and nematodes between people without actually spreading disease (Mattingly, 1969). Dengue fever, yellow fever, chikungunya, epidemic polyarthritis, West Nile fever, Rift Valley fever, Japanese encephalitis, Lacrosse encephalitis, and several other encephalitis-type disorders are common viral infections spread by mosquitoes Different types of mosquitoes transmit filariasis and malaria, both protozoan and nematode diseases, respectively (Becker, *et al*., 2010; Sangeetha *et al*., 2021).

Environmental control

Environmental protection agencies have banned using of the pesticide, which were formerly used in mosquito control programmers, Compared to the previous 20 years, adulticides are now less readily available further, manufactures themselves have withdrawn some insecticide due to the high cost of carrying out the additional tests now as per the government norms in addition to the fact that the production of crop pesticide for the agricultural market is much more lucrative. The development of chemical resistance in mosquitoes as well as the adverse effects of these pesticides on non-target populations (Shinde *et al*., (2019).

Matreial and Method

Collection of fishes

The fishes were collected and identified by Bhavar fish home, opp market yard, Subhadranagar, Kopergoan, Dist. A.nagar, Maharashtra, India

The collected fishes were transferred carefully in to plastic bags with oxygen and water at about two third levels the collected species of fish were identified with the help of exotic aquarium book of William, internet site fishman.com, Encyclopedia Britannica, Inc. William Benton and many Research papers.

The collected fishes were transferred carefully in to plastic bags with oxygen and water at about two third levels.

Maintenance

Acclimatization

The fish must become acclimated to the laboratory environment for three days before the experiment. Acclimatization take place in three stages. The first step was acclimating the fish to the new environment.

Fishes were transferred to the aquarium with laboratory tap water in which the experiment has to be done, so that they can acclimatize to tap water.

Three fishes of *Kissing gourami* were introduced into a glass jar with 3 l of water and these were allowed to acclimatize.This process was repeated for control *Gambusia affinis.*

All possible precautionary measures were taken to maintain experimental fishes in the fish tank. Commercially available food pellet were given to the fishes as a food source.

The aquarium's water was regularly changed and well-aerated.

Site of Mosquito Larvae Collection

The mosquito larvae were collected from stagnant waters of Sanjivani, Art, Commerce, and Science College, Kopargoan, Maharashtra, India.

Method of Mosquito Larvae Collection
Mosquito larvae were collected with the help of dropper and beaker. The gathered larvae were carefully placed in the bottle with the small lid hole.

Identification of the mosquito larvae
In a laboratory, the physical and behavioral traits of the collected mosquito larvae were observed

Different species of mosquito: *Culex*, *Anopheles* and *Aedes.*

Methodology of experiment

Fish used in an experiment after being starved for 24 hours.

Individually introduced fish will individually acclimated for one hour in the experimental jar.

Then 150–500 larvae will add to each fish's jar.

Readings were taken after 10 min, 20 min, 30 min initially and then after 1 hr., 3 hr., 6 hr., 9 hr., 12 hr. and 24 hours, respectively.

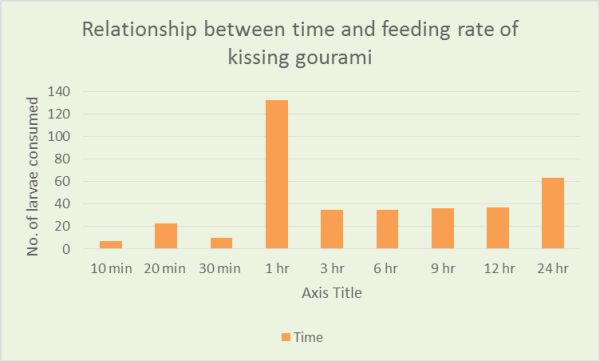
Results and Discussion

In this study result observed that the *Kissing gourami* has feeding rate 377, food consumption 11.29 and larvivorous potential 15.12. The *Gambusia affinis* has feeding rate 72. Food consumption 18.97 and larvivorous potential 3. The comparative account of the feeding rate and larvivorous potential of *Kissing gourami* > *Gambusia affinis* (Graph 1 and 2). Whereas, when the food consumption pattern was different i.e. *Gambusia affinis* > *Kissing gourami.* The relationship between feeding rate, length, of two different species came out as the length and weight increases, the feeding rate also increases.

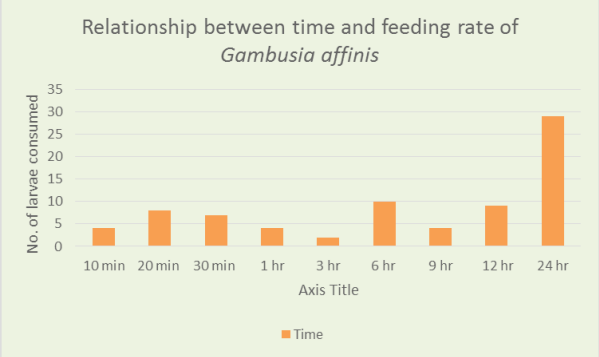
The fish *Gambusia affinis* has been extensively used as an effective predator of mosquito larvae. The fish consumed more number of larvae during the day time feeding

Mosquito larvae in a 24 hr. feeding. Bar represents mean consumption at that interval of time

Mosquito –borne diseases have been a major problem in all countries. Mosquito spread a number of diseases. To control the mosquito biological control method plays a very important role to control the mosquito. Different type of larvivorus fishes have been used in biological control of mosquito. The larvivorus fish having the ability to live in drinking water as well as other water. The comparative account of feeding rate and larvivours potential of two different species which in the present study we have taken out as come as. When the predation pattern of two different species was observed that the *Gambusia affinis* consumed the least number of larvae in initial period as compared to the *Kissing gourami.*



Graph 1. This Fig. shows predation pattern of *Kissing gourami* on the III and IV instar mosquito Larvae in 24 hr feeding. Bar represents mean consumption at that interval of time.



Graph 2. This graph shows predation pattern of *Gambusia affinis* on the III and IV instar

The relationship between feeding rate, length, and weight of two different species came out as the length and weight increases.

Conclusion

The use of larvivours fish to control the mosquito has been found to be an effective and environment-friendly. The result of present study indicate that the use of larvivours fish to control mosquito has great help in vector control.

Mosquito vector spread many diseases. Future vector management strategies will increasingly rely on biological control, according to expectations. Larvarious fish species are a great choice for preventing the development of dengue and malaria vectors in a variety of mosquito breeding areas.

The larvivorous activity of fishes will successfully detected by this experiment, and it will discover that this larvivorous activity will higher than that of the well-known *Gambusia affinis.*

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