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# Study of some larvicidal indigenous fishes with special reference to biological control of malaria

Zoology

**KEYWORDS :** Bichhia river, biological control, Larvicidal, Indigenous, Gambusia affinis.

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## ABSTRACT

*The vector of several diseases are mosquito which carry parasites of malaria, filaria and yellow etc. Natural enemies such as predators play an important role in the predation of vectors in natural habitat. Gambusia affinis popularly known as "Doctor fish" is well known predatory fish which can be cultured and used in vector control programme. In the present study, use of five indigenous fishes in biological control of mosquito vectors have been reported. The fishes were collected from Bichhia river and used in the laboratory to control Anopheles stephensi larvae. Laboratory experiments were completed in glass aquarium containing five different fishes including Chela bacaila, Barilius bola, Puntius ticto, Anabas testudinius and Gambusia affinis as standard. This study revealed that all the fishes are concerned with larvicidal potential. The study was also conducted with and without fish food to observe larvicidal potential and it was noticed that fish food has some effect on the predatory habit of these fishes. In the presence of fish food the predatory rate per minute per fish was found to be decreased (0.53) and in the absence of fish food the predatory rate got increased (1.05).*

## INTRODUCTION

Fish is a natural enemy of mosquito eggs and larvae and has been used as means of biological control since olden times. Several species of fresh water indigenous fishes which are known to larvicidal in M.P. and of use in the control of mosquito population. Malaria is a measure threat to the subtropical countries, which causes one million death per year. The chemical pesticides are considered no more viable because of pesticidal resistance to the mosquito vector as well as several health hazards associated with them. In our previous reports (Saxena and Saxena, 1991: Saxena et al., 1992; 1996), it was mentioned that biological agents like Notonecta, Ranatra alongwith some pesticides of plant origin were found to be quite useful for vector control. Sharma et al. (1987) and Joshi et al. (1989) have reported that predatory fishes may be used as mosquito controlling agent in fresh water bodies. Hass (1984) provided a guide for preliminary identification of larvicidal fishes with the above context. The present paper reports the larvicidal potential of four indigenous fishes alongwith *Gambusia affinis* as standard.

## MATERIALS AND METHODS

Fishes were collected locally from river Bichhia and were acclimatized in glass aquarium for 15 days period. The anopheles larvae were collected locally from the fresh water bodies by long hand dipper and kept in laboratory in enamel vowels. The larvae were fed with yeast tablets and dong biscuits (3:1). They were sorted out instar wise in different enamel treys. Individual experiment taken one fish of each species in glass beaker of 1 liter capacity to which twenty five 4th instar larvae were added. Predatory efficacy was determined after every hrs till only larvae are consumed. Each experimental set was run with three replicates with one control and one having *Gambusia* as standard fish.

## RESULTS AND DISCUSSION

Due to resistance to the pesticide of mosquito vector, number of biological agents, bio-pesticides of plant origin have been tested. The present paper is based on our laboratory experiments on five indigenous fishes as predatory against mosquito larvae causing malaria. The fishes tested for the present study for larvicidal potential includes *Chela bacaila, Barilus bola, Puntius ticto, Anabas testudinius* and *Gambusia affinis* as standard predatory fish. The fish larvicidal potential was examined individually as well as three fishes in a group. The results as shown in Tables 1, 2, 3.

**Table-1 : Predatory efficiency of fishes without fish food.**

| S. No. | Fish Name | Number of fishes | Predation on iv instar larvae | Predatory period (Minutes) | Larvae fed |
|---|---|---|---|---|---|
| 1. | Chela bacaila | 3 | 30 | 7 | 30 |
| 2. | Barilius bola | 3 | 30 | 5 | 30 |
| 3. | Puntius ticto | 3 | 30 | 10 | 30 |
| 4. | Anabas testudinius | 3 | 30 | 19 | 30 |
| 5. | Gambusia affinis | 3 | 30 | 6 | 30 |

*iv instar larvae of *Anopheles stephensi* in three replicates.

**Table-2 : Predatory efficiency of fishes with fish food.**

| S. No. | Fish Name | Number of fishes | Fish food (mg) | Predation on iv instar larvae | Predatory period (Minutes) | Larvae fed |
|---|---|---|---|---|---|---|
| 1. | Chela bacaila | 3 | 10 | 30 | 12 | 30 |
| 2. | Barilius bola | 3 | 10 | 30 | 10 | 30 |
| 3. | Puntius ticto | 3 | 10 | 30 | 18 | 30 |
| 4. | Anabas testudinius | 3 | 10 | 30 | 19 | 30 |
| 5. | Gambusia affinis | 3 | 10 | 30 | 9 | 30 |

*iv instar larvae of *Anopheles stephensi* in three replicates.

**Table-3 : Predatory efficiency of fishes in group.**

| S. No. | Fish number | Number of prey | Number of fishes | Predatory period (minutes) | Number of prey consumed | Percent of feeding | Predatory rte/ minute/ fish |
|---|---|---|---|---|---|---|---|
| 1. | Without fish food | 100 | 4 | 18 | 76 | 76 | 1.05 |
| 2. | With fish food | 100 | 4 | 32 | 68 | 68 | 0.53 |

From the results of Table 1 when three fishes of each species were taken in the glass aquarium 30 iv instar larvae of *Anopheles stephensi*, the predatory period which was recorded showed that Barilius bola took 5 minutes period to consume thirty larvae. This was followed by *Chela bacaila* which took 7 minutes to consume all thirty larvae. The Puntius ticto however, took 10 minutes to consume thirty larvae. Thus, it seems that *Barilius bola* have high rate of predation.

Results from Table 2 showed the predatory efficacy of the fishes provided with 10mg of fish food per container per day along with iv instar larvae of *Anopheles stephensi*. It was noticed that predatory period got increased. It was found to be 10 minutes which was just double to the period of consumption of larvae in the absence of fish food in case of *Barilius bola*. However, in case of *Anabas testudinius*, the presence of fish food does not effect the predatory habit.

The results mentioned in Table 3 showed the predatory efficacy of the fishes in a group when four different fishes were taken together in a glass aquarium with and without fish food, 76% con-

sumption was noticed without fish food. While, there was only 68% consumption of prey provided with fish food. Therefore, from the results it is quite clear that predation rate per fish per minute got considerably decreased (0.53) in the container provided with fish food as compared to the without fish food (1.05).

A mosquito specially *Anopheles stephensi* caries a vector for urban malaria in India. Since chemical pesticide are not desirable because of their long term persistency in the ecosystem. Therefore, search for biological agents like indigenous fishes as per local availability was tried in the present study. The predatory behavior of all the fishes were examined separately as well as in a group with or without food. The results showed that predatory potential was suppressed when fishes were provided with larvae and fish food (68%) as compared to 76% larvicidal potential of the fishes when there was no choice except the mosquito larvae. Rate of predation was in the order : *Barilius bola* > *Gambusia affinis* > *Chela bacaila* > *Puntius ticto* > *Anabas testudinius*. Prasad and Sharma (1989) have also reported the need to indigenous fishes as biological control agents. Similarly, Jaishree and Panicker (1992) also reported the use of more than 34 indigenous fishes for larvicidal potential. Ismail (1988) also suggested laboratory cum field trial of some indigenous fishes including *Mystus* and *Rasvora* as bio-control agents. In the present laboratory, Shrivastava *et al.* (2004) have also reported mosquito larvivorous potential of some indigenous fishes. The results of the present study, therefore, suggest the use of indigenous fishes for vector control program for the following two reasons :

(1) These fishes being locally available and having edible values may be preferred by the local people for the pisciculture in ponds and other water bodies.
(2) The fish which are indigenous can be used as biological agent just like Gambusia to combat malaria nuisance being more eco-compataible.

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