

LABORATORY TRIALS FOR THE CONTROL OF MOSQUITOES BY LARVIVOROUS FISH

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Eight species of these larvivorous fish were tried in the laboratory to see their effect on laboratory reared *Anopheles culicifacies* and *Anopheles stephensi* considering the recommendations of external review team. It has been proposed that Green Carp, Singhi, Daula, Silver Carp and Mori may be tried in field conditions during monsoon and postmonsoon season to see their impact on mosquito control.

Key words: Mosquito control, Larvivorous.

Introduction

Because of development of insecticide resistance in mosquito vectors and other detrimental effects of chemicals to flora and fauna there is a need to pay emphasis on applied field research for developing alternative methods for making an effective mosquito control approach. Introduction of alternative ways like clearing of water ditches, development of underground drainage system, use of eight traps, release of sterilized males, reducing the man vector contact and use of larvivorous fish in the ponds may improve malaria control programmes in the country. Larvivorous fishes have been used in foreign countries [2-6].

Since mosquito larvae are closely associated with fish in their food and habitat the larvivorous fish has thus appeared as another source for reducing larval populations in the breeding places. Use of larvivorous fish if coupled with other methods and the timely and selective use of chemicals may give promising results.

Mori (*Cirrhinus morigala*), Tilapia (*Tilapia mossambica*), Silver Carp (*Hypophthalmichthys molitrix*), Green Carp (*Ctenopharyngodon idella*), Singhi (*Heteropheustus fossilis*), Rohu (*Labeo rohita*), Daula (*China straitus*) and Kangi (*Colisa fasciata*) have been used during this trial. Green Carp, Silver Carp, Mori and Tilapia were obtained from government fisheries farm and the other fish species were collected from the field.

The present studies are aimed at selecting suitable larvivorous fish species from local environment and to see their effects as mosquito control agents. This trial is therefore being conducted with the hope that use of locally available fish species in mosquito breeding places especially the ponds and seasonal rain water collection may effectively help in mosquito and malaria control programme in the country.

Materials and Methods

Locally available four fish species were obtained from government hatchery and the other four were collected from

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the field. These fish were kept in 48 x 35 x 12 cm plastic containers. Laboratory reared anopheline larvae were provided to these fish for food.

Lots of four hundred laboratory reared *Anopheles culicifacies* and *Anopheles stephensi* were counted separately with the help of rubber pipette and were then transferred to small sized plastic containers 17.5 x 13.5 x 8.5 cm in size. Plastic containers used for the study were washed with detergent and distilled water before adding the fish. Water collected from the breeding places of the fish was provided in these containers. Natural water with and without weeds was tried during these studies. Four to five centimeter long two fish of each species were released into each of these containers and the number of alive larvae was counted after 24 hr.

Initially fourth instar larvae were used for the trials but later on second and third instar were also tried. The fish was also dissected on some occasions to see the presence of larvae in their gut. The experiment was replicated five times and with some of the fish species as more than six times.

Results and Discussion

Eight species of fish were tried in the laboratory to see their larvivorous effect on laboratory reared *Anopheles culicifacies* and *Anopheles stephensi* larvae. Green Carp gave 100% reduction with all the 2nd, 3rd or 4th instar larvae [1]. Average reduction of fourth instar *Anopheles culicifacies* larvae with other fish species was found as 98.35, 94.50, 85.00, 81.4, 85.0, 73.25, 59.00 and 100% and that of *Anopheles stephensi* as 94.6, 93.2, 83, 82, 84.2, 74.6, 60.4 and 100% with Tilapia, Singhi, Daula, Silver Carp, Mori, Kangi, Rohu and Green Carp respectively in natural water having no weeds (Table 1).

When different weeds from the same natural water were also added into the pans, *A. culicifacies* revealed 95, 89.00, 78.69, 78.36, 81.57, 69.43, 51.37 and 95.7% mortality and with *A. stephensi* it was observed as 92.9, 92.72, 79.48, 83.41, 82.85, 71, 56.24 and 98.5% mortality with Tilapia,

TABLE 1. PERCENT MORTALITY OF MOSQUITO LARVAE AFTER 24 HOURS EXPOSURE TO DIFFERENT FISH IN WATER WITHOUT WEEDS.

| Fish species | Green carp <i>C. idella</i> | Tilapia <i>T. mossambica</i> | Singhi <i>H. fossilis</i> | Daula <i>China striatus</i> | Silver Carp <i>H. molitrix</i> | Mori <i>C. morigala</i> | Kangi <i>C. fasciata</i> | Rohu <i>Labio rohita</i> |
|--------------------------|--------------------------------|---------------------------------|------------------------------|--------------------------------|-----------------------------------|----------------------------|-----------------------------|-----------------------------|
| <i>A. culicifacies</i> | 100 | 98.35 | 94.5 | 85.00 | 81.4 | 85.0 | 73.25 | 59.0 |
| <i>A. stephensi</i> | 100 | 94.6 | 93.2 | 83.00 | 82.0 | 84.2 | 74.6 | 60.4 |
| Test with water in weeds | | | | | | | | |
| <i>A. culicifacies</i> | 95.7 | 95.0 | 89.0 | 78.69 | 78.36 | 81.75 | 69.43 | 51.37 |
| <i>A. stephensi</i> | 98.5 | 92.9 | 92.72 | 79.48 | 83.41 | 82.85 | 71.00 | 56.24 |

Singhi, Daula, Silver Carp, Mori, Kangi, Rohu and Green Carp respectively (Table 1).

Upon providing second and third instar larvae Green Carp devoured all of them within first two hr, Daula and Kangi devoured within three hr, Tilapia and Mori finished all of them in five hr, Silver Carp in six hr, Singhi in 24 hr. and with that of Rohu only a reduction of 65.5% has been found.

Green Carp devoured the larvae within two hr of its release, Kangi within 3 hr, Tilapia within four hr of releasing fish into the larval lots. All the fishes except Rohu preferred second and third instar larvae and finished earlier than those of fourth instar larvae. The addition of weeds in the pans decreased the mortality considerably.

When compared, Green Carp [1] was found as eating and finishing the larvae earlier than other fish species. Daula, Tilapia and Mori took considerably longer time in eating the larvae and Silver Carp and Singhi took considerably more time than the other fishes except Rohu. Any of these fish will give good control of mosquito fauna in permanent ponds and seasonal rain water collections. Green Carp will certainly give better results than the other seven species but Daula, Tilapia and Mori will comparatively yield better results than the remaining four species. It is proposed that these fish may be encouraged in permanent ponds and seasonal rain water collections but more better results in Punjab province may be obtained with the introduction of domestic ducks and closing of scattered small sized breeding places in the plains of Punjab. The closing of breeding places may be obtained with

the cooperation of Ministry of Agriculture, Local Government and Rural Development and by involving the local community by motivating them for closing the breeding places in the vicinity of two miles radius.

Considering the present findings it has been planned that a field trial covering two or three villages will also be carried out during malaria transmission season and the entomological and parasitological data for the whole year will be recorded in every month to see the effect of larvivorous fish, domestic ducks and closing of scattered small sized breeding places on vector control and malaria transmission.

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