



Figure 1. Sagittal section of the brain (mesencephalon) of *Mystus keletius* [OT, Optic tectum; OV, Optocoel; TL, Torus longitudinalis; VC, Valvula cerebelli].

chiasma in bony fishes. The present anatomical feature, however, adds still deeper unknown role for torus longitudinalis. Nevertheless, intimate relation between the body posture and vision cannot be ruled out.

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GROWTH REGULATORY ACTIVITY OF DIMILIN^(R) AGAINST *MESOCYCLOPS THERMOCYCLOPOIDES*

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CYCLOPOID copepods occupy a key position in the freshwater food chain. Various species of *Mesocyclops* act as intermediate hosts for Guinea worm (*Dracunculus medinensis*). Hence, a study on the effect of synthetic pesticides on the cyclopid copepods has special importance. The present study deals with the effect of Dimilin^(R) on morphology, fecundity and fertility of *Mesocyclops thermocyclopoides* and its possible use in the field.

Concentrations of 1, 0.5, 0.25, 0.125, 0.0625, 0.031, 0.015, 0.0078, 0.0039, 0.0019 and 0.00097 ppm Dimilin^(R) were prepared in water. Initially the compound was dissolved in 5 ml acetone and water was then added to obtain the desired concentrations in a final volume of 250 ml. For each concentration 20 last stage copepodites were used. Parallel controls were maintained in 250 ml water containing only 5 ml acetone. All the experiments were triplicated. Results were recorded at the next moult of last copepodite stage and scoring was done to calculate the growth regulatory activity (GRA) by using the Bransby-Williams¹ formula.

There was no mortality within 48 h at any concentration except 1 ppm, at which 50% mortality was observed. At concentrations 1, 0.5, 0.25, 0.125, 0.0625 and 0.031 ppm, there was prolongation of the copepodite stage for 3 to 4 days (as against the normal moulting to adult cyclops from the last copepodite stage within 24–36 h in controls). This was followed by death without moulting in most cases. At 1, 0.5 and 0.125 ppm, however, some of the copepodite stages moulted, but could not extricate themselves from the exuvium and ultimately suffered mortality.

At all concentrations mating was observed in adult cyclops. Subsequently, the ovisacs developed unequally in the females and in some of the ovigerous females the ovisacs were deformed to a varying degree. Fecundity decreased in such females. In some of the male and female cyclops, antennules were deformed i.e. the minute hairs or setae possessing chemosensory organs were crumpled. These results are similar to those obtained by Tester and Costlow² in nauplius stages resulting

from the ovisacs of treated females of *Acartia tonsa*, in which the setae on the appendages were twisted and bent. In the present studies abnormal development was observed in the clasper-like structure of the 1st antennule in males, which helps in holding the female during copulation. However, it was not possible to check this by direct observations of spermatophores. From 1 ppm to 0.25 ppm there was a slight increase in GRA from 64.47 to 70.58%. This is because at 1 ppm there was 50% mortality, which was not scored while estimating growth regulatory activity. From 0.25 to 0.031 ppm GRA decreased in a dose-dependant manner (table 1) and an ID₅₀ value of 0.141 ppm calculated by probit analysis. At concentrations below 0.031 ppm, no morphological abnormalities could be observed, and hence they were not considered when calculating the ID₅₀. However, at lower concentrations from 0.015 ppm to 0.00097 ppm fertility was impaired, since all the treated ovigerous females laid non-viable eggs, whereas there was hatching of eggs laid by the control females.

Since Dimilin^(R) showed morphogenetic activity even at lower concentrations against *M. thermocycloides*, it may be considered for use in potable waters for anticyclops programme. However, it may

Table 1 The effect of Dimilin on morphogenic activity of *Mesocyclops thermocycloides*

Concentration (ppm)	% GRA	Statistical values
1	64.47	ID ₅₀ = 0.141 ppm
0.5	69.45	Variance = 0.0158
0.25	70.58	S. E. = 0.1257
0.125	45.56	$\chi^2 = 9.312$
		$\chi^2 = 0.05, d.f. = 9.488$
0.062	46.66	Fiducial limits =
		0.249-0.080 ppm
0.031	33.33	

The total number of copepodite stages used in all the cases was 60, and each concentration was replicated thrice.

Scoring of the resulting stages after treatment

Score	Category
3	Prolongation in the last copepodite stages.
2	Attachment of exuvium to the resulting stage.
1	Abnormal ovigerous females
0	Normal cyclops

$$\% \text{ GRA} = \frac{(a \times 3) + (b \times 2) + (c \times 1)}{n \times 3} \times 100$$

a, b, c: Number of the abnormal forms in each category; n: total number of copepodite stages exposed; 3: maximum score.

be noted that at present it has not been cleared for use in potable waters by World Health Organization. Dimilin^(R) should not be used in such waters where fishes breed and feed on cyclops since the present study has shown that even minute quantities may disrupt the life cycle of cyclops. It is also not suitable for integrated control programmes where cyclops act as an intermediate host for the fungus *Coelomomyces* sp. which is pathogenic for mosquito larvae.

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AN EXTREME LINKAGE BETWEEN INVERSIONS IN *DROSOPHILA ANANASSAE*

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CHROMOSOME inversions were detected for the first time through the suppression of crossing over in inversion heterozygotes in *Drosophila melanogaster*¹. They provide a mechanism for maintaining heterotic systems through the suppression of crossing over². Linked inversions were first reported to occur in non-random association (or linkage disequilibrium) in natural populations of *Drosophila robusta*³. Since then a number of cases of linkage disequilibrium between inversions in various species of *Drosophila* have been reported⁴⁻¹⁰. Levitan⁴ postulated that non-random association of linked inversions is maintained due to two main factors either alone or in combination: (i) suppression of crossing over between inversions, and (ii) natural selection acting against certain recombinant arrangements. However, the results obtained from various species of *Drosophila* have shown that natural selection involving epistatic interaction between widely separated loci plays an important role in maintaining linkage disequilibrium between inversions⁴⁻¹⁰. *Drosophila ananassae*, a