Comparative Susceptibility of Larval Mosquitoes Exposed Separately by Instar or in Mixed Populations to the Nematode Romanomermis culicivorax

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The mermithid nematode *Romanomeris culicivorax* has been released many times to control natural populations of larval mosquitoes. Generally, infection levels resulting from such releases were highest in second- and third-instar and lowest in first-instar hosts when all instars were present in the habitat (1,3). This contrasts sharply with well-established results from laboratory studies which showed that first- and second-instar hosts were highly susceptible to infection, third-instar hosts about half as susceptible, and fourth-instar hosts only slightly susceptible (2). The apparently reduced incidence of parasitism of first-instar hosts in field trials was attributed, in part, to continuous hatching of new mosquito larvae after the numbers of infective parasites declined (2). Additionally, it was reported in the 1977 Annual Report of the Vector Control Research Centre, Pondicherry (Indian Council of Medical Research 1978), that early instar larvae in mixed populations were less susceptible than older larvae to infection by *Romanomermis iyengari*. Therefore, laboratory tests were conducted to determine if the susceptibility of *Culex pipiens* to *R. culicivorax* infection differed in single and mixed instar populations.

Trials consisted of two replications of 100 first, second, third, or fourth instars in separate rearing containers (eight containers each with 100 larvae) and four replications of 25 larvae of each instar in a mixed population (four containers each with 100 larvae). Exposures were made in 500 ml of well water at a ratio of 10 preparasites per host. Twenty-four hours after exposure, the larvae in the four mixed populations were separated, combined by instar, held for 7 d or until pupation, whichever came first, and the incidence of parasitism determined. The trials were conducted at ambient temperatures (25–27 C) and were replicated six times.

Larvae exposed by instar showed a comparative susceptibility (Table 1) similar to that demonstrated in previous studies. First- and second-instar larvae were similiar in their susceptibility to infection, third-instar larvae were about half this susceptible, and infections were negligible in fourth-instar larvae except when exposed very early in the last instar. In contrast, when mixed larval stages of *Cx. pipiens* were exposed to

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Table 1. Comparative susceptibility of the larval stage of *Culex pipiens* exposed as a single larval stage and in mixed larval stages to *Romanomermis culicivorax*.

	Percentage parasitism by instar							
	First		Second		Third		Fourth	
Trial	Separate	Mixed	Separate	Mixed	Separate	Mixed	Separate	Mixed
1	99	17	90	76	32	46	1	0
2	77	49	96	54	40	52	9	31
3	96	5	91	48	59	49	8	13
4	88	15	97	94	85	88	7	12
5	98	57	98	88	90	95	57*	81*
6	99	64	97	90	85	96	51*	88*
$\bar{X}$	93a†	35 cd	95 a	75 ab	65 b	71 ab	22 d	38 c

*Exposed as early fourth instars.

†Values followed by the same letter do not differ significantly ($P < 0.05$) according to Duncan's multiple-range test.

the nematode, infection levels in first instars were significantly lower than in second or third instars and about the same as for the fourth instars. Infection levels of first- and fourth-instar larvae exposed in mixed larval stages were significantly different ($P < 0.05$) than first and fourth instars exposed alone under similar conditions, whereas differences were not significant for second- and third-instar larvae.

These data clearly indicated that under laboratory conditions the susceptibility of a given instar is affected by the stage of development of the mosquito population in which it is exposed. This may also be the case in nature and could be a major factor in the reduced levels of infection encountered in first-instar larvae in previously mentioned studies (1,3).

The cause of the reduced levels of parasitism in early instar mosquitoes in a population of mixed larval stages is unknown; it could be due to the larger surface area of the older hosts. The factor may be of significance in biological control.

LITERATURE CITED

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