OPERATIONAL AND SCIENTIFIC NOTES

CRUSTACEAN MOLTING IN THE PRESENCE OF ALTOSID® SR-10[1]

J. T. BARBER, E. G. ELLGAARD AND R. J. CASTAGNO

Department of Biology,
Tulane University,
New Orleans, La. 70118

The potential for mosquito control of insect growth regulators (IGR's) in general, and Altosid® SR-10 (active ingredient, methoprene) in particular, has received considerable attention in recent years (e.g. Schaefer & Wilder 1972). Not only is it thought to be relatively specific in terms of target organism (Miura & Takahashi 1973) but it has the added advantages of being rapidly degraded in the environment (Quistad et al. 1976 and refs. there cited) and also being active at considerably lower concentrations than the more "conventional" mosquito control materials (i.e. malathion, chlorpyrifos, etc.). While many non-target organism studies of Altosid have been conducted the majority of these have centered on possible lethal effects; there have been fewer studies on possible sub-lethal effects. In view of the fact that methoprene's success as a mosquito control agent depends upon its ability to act as a juvenile hormone analog (Henrick et al. 1973) and to prevent adult emergence from the pupal case (i.e. the final molt) it is perhaps surprising that its effects upon other organisms that undergo molt cycles under the control of juvenile hormones have not been tested. While these effects could be non-lethal, any disturbance of the normal developmental pattern in such organisms as crabs or shrimp could be potentially devastating in a delicately balanced ecosystem like the wetlands of southern Louisiana. The results of such an investigation are presented below.

Fiddler crabs (*Uca pugilator* Bosc.) were obtained from the Gulf Specimen Company of Panacea, Florida, and were maintained in individual styrofoam cups in 60% sea water. Grass shrimp (*Palaemonetes pugio* Holthuis) were obtained from a local bait shop and were also maintained in individual containers but in 10% sea water. Both crabs and shrimp were fed oatmeal, *ad libido*, twice a week and their sea water was changed after they had fed for approximately 6 hr.

Molting was induced in *U. pugilator* by the ablation of all appendages (except the first) from the right side of each crab (Fingerman and Fingerman 1974). Four samples, each of 50 crabs (equal numbers of males and females), were subjected to the following treatments: the control group was maintained in 60% sea water while each of the other 3 groups was maintained in 60% sea water plus either 0.002, 0.02 or 0.2 ppm Altosid (kindly supplied by Zoecon Corp.). The original concentration of Altosid was restored at each water change. For each crab the number of days to molt was recorded and whether or not this was accompanied by limb regeneration. Deaths were also noted. The results are shown in Table 1.

Even the highest concentration of Altosid® SR-10 used (0.2 ppm or 0.02 active ingredient, which approximates the recommended field dose) had no effect upon the number of days to molt (relative to the untreated controls) or the number of crabs that actually molted. Similarily, no effects of Altosid upon limb regeneration or mortality were observed.

Experiments utilizing *Palaemonetes pugio* were performed in essentially the same manner except molting was allowed to occur naturally (Freeman and Bartell 1975) and only one concentration of Altosid® SR-10 (2.0 ppm or 0.2 ppm methoprene) was used; this concentration is approximately 10x the recommended field dose. The average time to molt for a total of 70 shrimp was determined by daily observation. After each shrimp molted it was assigned to either a control group which was maintained in untreated 10% sea water or to an experimental group which was maintained in 10% sea water plus 2.0 ppm Altosid® SR-10. Altosid was restored to its original concentration at each water change. The average time to molt (2nd molt) for each group (each now containing 35 shrimp) was determined by daily observation.

Shrimp that had been untreated throughout took an average of 19.1 days (standard deviation, 1.47) for their 1st molt and 19.5 days (S.D., 1.39) for their 2nd molt. Shrimp that had been transferred to 2.0 ppm Altosid® SR-10 following their 1st molt, then took 21.5 days (S.D., 1.16) for their 2nd molt. It is apparent therefore that Altosid had little or no effect

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Table 1. Effect of Altosid SR-10 on molting, limb regeneration and mortality in *Uca pugilator*

Treatment	Per cent molting	Avg. No. of days to molt	Per cent regenerating limbs	Per cent mortality
Control	53	37	43	47
Altosid[R] SR-10, 0.002 ppm	57	34	51	35
" 0.02 ppm	61	38	57	41
" 0.2 ppm	51	37	45	34

upon molting in *P. pugio*, at least in terms of duration of molt cycle. It is also true that no abnormalities in molting behavior of treated shrimp were observed and that no mortalities occurred in either treated or control shrimp.

While Costlow (1977) has studied the effects of Altosid upon early developmental stages in *Rhithropanopeus harisii* (Gould) (mud crabs), the results of this investigation indicate that it is without effect upon either mature fiddler crabs or grass shrimp at least insofar as the molt cycle in these organisms is concerned. This is perhaps all the more conclusive when one considers that both the crabs and the shrimp were exposed continuously to Altosid and that, in the case of the shrimp, they were exposed to a considerably higher concentration of Altosid than could be expected to result from its use in a mosquito control operation under field conditions.

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MOSQUITOES, FISH, AND OLD TIRES

R. E. DORER

Virginia Dept. of Health,
401-A Colley Ave., Norfolk, VA 23507

Virginia Beach, for the past few years, has been developing at a rapid pace. What were farms are now housing developments, shopping centers, etc. It has been said that the population is increasing at the rate of 1,000 per month and this has been going on for the past 18 to 20 years.

Virginia Beach is located in the coastal plain with the water table only a few feet under the surface of the land. The need for fill dirt has resulted in the excavation of many borrow pits. Soil is excavated from a tract of land sometimes to a depth of 20 or 25 feet; sometimes as large as 100 acres. The groundwater is kept out of the pit when it is in operation with a small pump. When the excavation is over, the pit is allowed to fill with groundwater and thus a manmade lake is created. Developers have then sold lake front lots for a premium price. There are as many as 50 such lakes in Virginia Beach varying in size from 2 or 3 acres to 100 acres.