

Effect of Altozar, a Juvenile-hormone Analogue on the Mustard Aphid, *Lipaphis erysimi* (Kaltenbach) O. S. BINDRA and Darshan SINGH (Department of Entomology Punjab Agricultural University Ludhiana) Received Nov. 17, 1975. *Bolyu-Kagaku*, 41, 65, 1976.

12. 幼若ホルモン同族体, Altozar の Mustard Aphid に対する効果 O. S. BINDRA, D. SINGH (Department of Entomology, Punjab Agricultural University, Ludhiana, India) 50. 11. 17 受理

幼若ホルモン同族体の1つである Altozar の Mustard Aphid に対する効果は、1令幼虫に対して、2 μ l/ml までの範囲での生存率および奇型発現率は第2図のとおりであり、3令幼虫に対して、0.5 μ l/ml の施用で、次世代出生率は第2表の結果を与えた。

Interest in the possibility of using juvenile-hormone as an insecticide has opened a new area of exploitation of chemicals for pest control. Unlike the insecticides, this hormone produces morphogenetic effects, inhibits the ability to reproduce and indirectly causes mortality. White¹⁾ reported morphogenetic changes and mortality in first, third and fourth instars of the cabbage aphid, *Brevicoryne brassicae* (Linnaeus) on exposure to the juvenile-hormone. Thus, its analogues may be used effectively in preventing the build up of pest populations. In fact, Stall *et al.*²⁾ found that depending upon the species, 0.01% (*Myzus persicae* Sulzer) or 0.001% (*Macrosiphum pisi* (Kaltenbach)) spray of ZR-512 gave 100% control when applied to the plants. Further, they reported that extra nymphal instars were produced and the third-instar nymphs developed into intermediate forms that were sterile and died of congestion.

The aphids, because of having many generations every year, seem to be favourable targets for control through juvenile-hormone analogues. The potential of a juvenile-hormone analogue, Altozar (ZR-512) was tested as a control agent of the mustard aphid, *Lipaphis erysimi* (Kaltenbach), a key pest of *Brassica* oilseeds and vegetables.

The experiments were done on potted radish plants in the 4-leaf stage. These were sprayed using a specially-fabricated small atomizer (Fig. 1). The fluid was sprayed as fine droplets using compressed air for propulsion. The atomizer was suitable for spraying as little as 0.1ml of the fluid. The spray volume was desired to be small as the diluent was acetone, which is phytotoxic

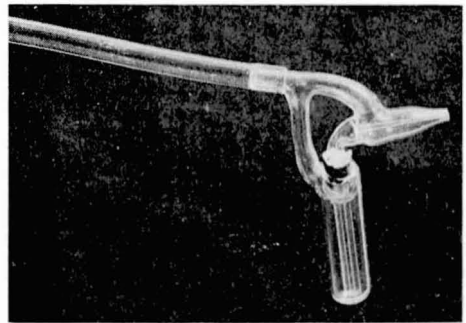


Fig. 1. Atomizer ($\times 0.5$)

if sprayed in large amounts. A single plant was sprayed with 0.5ml of spray-fluid. Young aphid nymphs of about the same size were released on the lower leaf surface with a fine camel-hair brush after disturbing them, so that they withdrew their proboscis from the leaf. These were later covered with a small leaf cage (dia. 4.5 cm). The aphids were shifted to a new leaf of the same plant after 3 days. Observations on mortality and deformity were taken daily. The exuviae were also removed daily.

Morphogenetic effects of Altozar: The treated aphids, on attaining adulthood, appeared somewhat darker than the untreated ones. Microscopic examination of these treated adults revealed complete absence of the marginal dorsal sclerites, which were very prominent in the normal aphids. Wings were badly affected. These were curled and not fully developed.

The adult aphids treated in third nymphal instar were smaller ($1.650 \pm 0.031 \times 0.861 \pm 0.035$ mm; $n=10$) than the untreated ones ($1.739 \pm 0.046 \times 0.977 \pm 0.021$ mm; $n=10$). The young

Table 1. Effect of 0.5 $\mu\text{l/ml}$ Altozar on the fecundity of third instar treated mustard aphid, *Lipaphis erysimi* (Kaltenbach)

Treatment	Pre-reproductive period (days after the last moult)	Reproductive period (days)	Post-reproductive period (days)	Adult life (days)	Average young ones per day per female	Total young ones per female
Treated (n=14)	2.5 $\pm$ 1.7	7.6 $\pm$ 8.3	3.3 $\pm$ 2.1	13.0 $\pm$ 7.9	1.7 $\pm$ 1.5	13.2 $\pm$ 14.7
Control (n=10)	1.8 $\pm$ 0.8	32.6 $\pm$ 9.6	3.6 $\pm$ 2.8	37.9 $\pm$ 11.1	2.3 $\pm$ 0.3	75.6 $\pm$ 22.6

born to these treated aphids were also smaller ($0.681 \pm 0.039 \times 0.302 \pm 0.021$ mm; $n=40$) than those born to the untreated aphids ($0.771 \pm 0.031 \times 0.337 \pm 0.017$ mm; $n=32$).

Effects of Altozar on the first-instar aphids: Altozar was sprayed at 4 concentrations on 3 plants each. Plants sprayed with acetone served as control. Ten new-born aphids per plant were released in control and the lowest dose of Altozar and 16 per plant in the 3 higher doses. Out of a total of 204 aphids, 13 died within 48 hr or escaped. These were excluded from the calculations.

There was a mortality of 42 to 59 per cent in the treatments against a mere 10 per cent in the control (Fig. 2). In the 4 Altozar treatments

Fortytwo third-instar aphids were exposed on 4 plants treated with 0.5 ml/plant of the solution containing 0.5 μl Altozar in 1 ml of acetone. Out of these, 16 (38%) died within 9 days, 12 (29%) were deformed and only 14 (33%) appeared normal.

The survivors (14 treated and 10 untreated) were released for reproducing on fresh untreated plants. Three aphids of the treated lot failed to reproduce. The reproductive period, adult life, fecundity and reproductive rate were very low in treated aphids than in untreated ones (Table 1).

The fecundity of 15 aphids from the first generation of third-instar nymphs exposed was also studied on fresh untreated plants. These had a reproductive period of 25.5 ± 8.1 days, mean daily reproduction of 2.2 ± 0.03 young ones per female, and a fecundity of 53.5 ± 17.5 . The fecundity, though still sub-normal, showed considerable increase over that of their treated mothers.

It may be concluded that Altozar had affected both the instars exposed to the treated plant surface by causing mortality, reducing adult life and fecundity of the survivors and causing morphogenetic changes. This juvenile-hormone analogue should, therefore, prove effective in checking the build-up of the mustard-aphid population.

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References

- 1) White, D.F.: *J. Insect Physiol.*, **14**, 901 (1968).
- 2) Stall, G.B., C.A. Henrick and J.B. Siddall: *Proc. Ent. Soc. Am.*, Los Angeles November 29 to December 2 (1971).

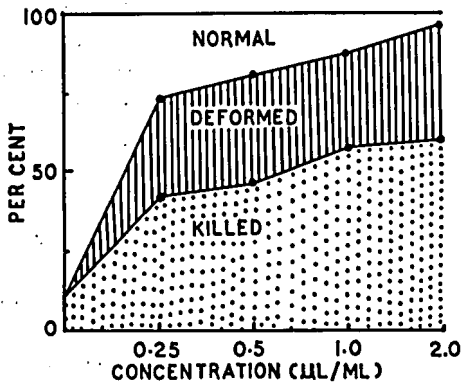


Fig. 2. Effect of Altozar on the survival of first-instar mustard aphid, *Lipaphis erysimi* (Kaltenbach)

viz. 2, 1, 0.5 and 0.25 $\mu\text{l/ml}$, respectively, only 4, 13, 20 and 27 per cent nymphs attained normal adulthood, in comparison with 90 per cent in the control. As many as 30-37 per cent adults were deformed in the Altozar treatments against nil in the control.

Effects of Altozar on the third-instar aphids: