

I could not, however—in contrast to Yotsuyanagi¹—demonstrate them after fixation. My experience showed that thread-like yeast mitochondria are extremely sensitive to any type of interference with the cell, including vital staining and fixation. Great importance must therefore be attached to the analysis of their living structure. Fragments of thread-like mitochondria, as found, for example, after treating the cells with vital stains, may for a limited period remain stainable with Janus green. Their structure does not, however, correspond completely with what is found in the living cell.

RUDOLF MÜLLER

Deutsche Akademie der Wissenschaften zu Berlin,
Institut für Mikrobiologie und
Experimentelle Therapie,
Jena.
March 19.

¹ Yotsuyanagi, Y., *Nature*, **176**, 1208 (1955).

² Williams, M. A., Lindgren, S. C., and Yuasa, A., *Nature*, **177**, 1041 (1956).

³ Ephrussi, B., Slonimski, P. P., and Yotsuyanagi, Y., *Nature*, **177**, 1041 (1956).

⁴ Barer, R., *Naturwiss.*, **41**, 206 (1954).

⁵ Barer, R., Ross, R. F. A., and Tkaczyk, S., *Nature*, **171**, 720 (1953).

⁶ Ephrussi, B., Hottinger, H., and Chimenes, A. M., *Ann. Inst. Past.*, **78**, 351 (1949). Tavlitzki, J., *ibid.*, **76**, 497 (1949). Slonimski, P. P., *ibid.*, **76**, 510 (1949).

⁷ Müller, R., *Naturwiss.*, **44**, 622 (1957).

⁸ Müller, R., *Mikroskopie*, **11**, 36 (1956).

Fluoroacetamide as a Systemic Insecticide

It has previously been reported that sodium fluoroacetate is a very effective systemic insecticide against *Aphis fabae* Scop.^{1,2}. Unfortunately, its use cannot be recommended since it is a very dangerous poison, being both highly toxic and rapid in action.

As a result of the above report, related compounds have been investigated, and it has now been stated that fluoroacetamide is an active insecticide³, although no details of biological tests have been published. Fluoroacetamide is claimed to be considerably less hazardous to handle than sodium fluoroacetate because it is less toxic and acts more slowly^{4,5}. Furthermore, in rats acetamide acts as an antidote to fluoroacetamide but not to sodium fluoroacetate^{6,7}.

The biological tests were carried out as previously described^{2,7}. The test insects were the bean aphid, *A. fabae* Scop., on broad beans, the cabbage aphid, *Brevicoryne brassicae* L., the peach potato aphid, *Myzus persicae* Sulz., on young cabbage plants and the eggs and larvæ of the large white butterfly, *Pieris brassicae* L., also on young cabbage plants.

In tests in which leaves bearing *A. fabae* and *B. brassicae* were dipped, fluoroacetamide was as effective as sodium fluoroacetate, 0.001 per cent solutions containing a wetting agent giving 100 per cent kill. Both were superior to schradan. When leaves bearing eggs of *P. brassicae* were similarly dipped in 0.1 per cent fluoroacetamide solution, 85 per cent of eggs failed to hatch and 70–80 per cent of the larvæ were killed. The same concentration of sodium fluoroacetate had no effect on the number of eggs hatching but killed 98 per cent of the newly emerged larvæ. Less than 10 per cent of the fourth instar larvæ were killed following immersion for 0.5 min. at 20° C. in the 0.1 per cent fluoroacetamide solution plus wetting agent.

When poured on to the soil, for systemic action against *A. fabae*, fluoroacetamide was as immediately effective and as persistent as sodium fluoroacetate: 2 mgm. (in 20 ml. solution) applied to 400 gm. of moist compost giving 100 per cent kill. It was therefore superior to schradan. When applied in the same way against *B. brassicae* and *M. persicae*, fluoroacetamide was superior to sodium fluoroacetate. The former aphid was killed by a dose of 0.2 mgm. and the latter by 1.0 mgm. of fluoroacetamide on the same weight of compost. Applied in this way, neither compound prevented the eggs of *P. brassicae* on the leaves of young cabbage plants from hatching, but all the young larvæ were killed by a dose of 10 mgm. fluoroacetamide or 20 mgm. of sodium fluoroacetate on the soil.

When administered to broad bean plants by the cut tap-root technique², the approximate LD100 in mgm. per kgm. of fresh plant tissue for *A. fabae* was fluoroacetamide 0.09–0.9, sodium fluoroacetate 0.7, schradan 50. When taken up through the petioles of the leaves of small cabbage plants 5 mgm. of the fluorine compounds or 50 mgm. schradan per kgm. of fresh plant tissue killed all *B. brassicae*. The growth of *P. brassicae* larvæ was prevented by 20 mgm./kgm. of either fluorine compound. For schradan more than 2,900 mgm./kgm. was required.

When applied to the older leaves against all three species of aphids feeding on the younger leaves of their host plants, fluoroacetamide was as effective as or slightly superior to sodium fluoroacetate as a systemic insecticide and in varying degrees superior to schradan.

It is clear that fluoroacetamide is as effective as the more dangerous sodium fluoroacetate as a systemic insecticide. Whether or not it would be safe for use on food crops remains to be proved. A more detailed report will be published elsewhere.

W. A. L. DAVID
B. O. C. GARDINER

Agricultural Research Council
Unit of Insect Physiology,
Cambridge.
April 23.

¹ David, W. A. L., *Nature*, **165**, 493 (1950).

² David, W. A. L., and Gardiner, B. O. C., *Ann. App. Biol.*, **38**, 98 (1951).

³ Phillips, M. A., *World Crops*, **7**, 480 (1955); *Chemical Age*, **77**, 673 (1957).

⁴ Gitter, S., Blank, I., and Bergman, E. D., *Proc. Kon. Ned. Akad. Wetensch.*, **C**, **56**, 427 (1953).

⁵ Phillips, M. A., and Worden, A. N., *J. Sci. Food Agric.*, **3**, 653 (1957).

⁶ Peters, R. A., *Endeavour*, **13**, 147 (1954).

⁷ David, W. A. L., and Gardiner, B. O. C., *Ann. App. Biol.*, **40**, 403 (1953).

It may be of interest to report that we found, as preliminary to many field experiments on the systemic insecticidal activity of fluoroacetamide against aphid pests of a number of flowering plants, that cuttings of rose bushes (unidentified species), infested very seriously with *Macrosiphum rosae* L. and their cut ends dipped in solutions of the insecticide at certain concentration (with 0.05 per cent wetting agent added), gave the kills indicated (Table 1).

Table 1

Dilution	Aphid kill	Phytotoxicity
1 in 1,000	100 per cent in 8 hr.	Some signs
1 in 10,000	100 per cent in 8–10 hr.	Nil
1 in 20,000	100 per cent in 24 hr.	Nil
1 in 100,000	Some kill in 24 hr. (young insects)	Nil
	Complete kill in 72–96 hr.	