Fruit Fly Frenzy: Investigating the Development of Insecticide Resistance in Drosophila melanogaster

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The United States uses over one billion pounds of insecticides annually due to an estimated 37% of pest derived destruction in the potential crop yield of North America. However, as problems of insecticide resistance in pests becomes more prevalent, farmers increase their use of these chemicals which can detrimentally affect non-target species. Thus, understanding how insecticides affect pests and how resistance develops is crucial. Our study tested two insecticides with different mechanisms of action: an insect growth regulator (IGR) called Methoprene and a directly toxic insecticide called Permethrin. Permethrin affects insects by attacking their nerve and muscle systems and directly causes mortality, while IGRs cause a change in the growth cycle of the insect, inhibiting the flies from fully maturing. Groups of fruit flies were exposed to Methoprene or Permethrin using media made with chemical doses that were experimentally determined to affect 50% of the fly population. After reproduction, the second generation was exposed and, in the case of Permethrin, a third and fourth generation. After the second generation of exposures, the mortality rate of flies exposed to Permethrin essentially equaled the control mortality rate. Resistance developed rapidly against Permethrin, while the resistance never developed against Methoprene, and these flies died out after two generations. Our results suggest that choosing toxins that modulate reproduction rather than directly killing insects might be a better choice to slow the development of resistance.

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