

Is behaviour of freshwater damselfly larvae affected by pesticides?

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The risk that pesticides pose to the environment is assessed by experimentally testing at which concentration it is lethal to a tested animal due to direct toxicity. Animals can, however experience negative effects of pesticides even when not killed by the substance. These are sub-lethal effects and can form disadvantages for the animal in the ability to produce offspring. In addition, other stress factors, present under natural conditions such as predators, competitors or food scarcity could make the sub-lethal effect of the pesticide even worse. Therefore, pesticide concentrations that are not lethal, could be sufficient to indirectly influence mortality or success in reproducing. A second factor which is often ignored in studies is that several types of pesticides could occur in nature at the same time. Hence, an unexplored area of research is the potential effects that pesticide combinations can have on animals compared to the single effect of each pesticide occurring alone.

This study investigated the sub-lethal effect of two pesticides on aquatic larvae of the Blue-tailed damselfly (*Ischnura elegans*). The two pesticides used are called imidacloprid and deltamethrin. Both pesticides were tested alone and in combination in the laboratory. "Sub-lethal" effects were defined as decrease in performance of foraging behaviour. These changes in foraging behaviour were determined by observing a larva after being exposed to one or both pesticides for 14 hours. The observation was repeated two days later to check for possible recovery of the larva. To compare the effects of different pesticides and to compare it with the combination, each specific "treatment" was given to a number of larvae. Thereby, all treatments (imidacloprid, deltamethrin, combination or control) were repeated several times and could be statistically compared. Larvae from the "control" treatment were not exposed to any pesticide and therefore counted as a baseline for "normal behaviour" to which other treatments could be compared.

Results show that even low concentrations of deltamethrin can significantly decrease behavioural performance. Interestingly, results also suggest that some behavioural characteristics could potentially be affected stronger when larvae are exposed to a pesticide combination compared to a single pesticide treatment. However, this could not be truly shown by statistical analysis. Another important finding during observations was that after two days, all behavioural effects due to pesticides disappeared. This shows a strong recovery potential of the larvae even in the treatments which were affected the strongest. This can be a huge advantage for animals in nature, though conditions in natural streams and ponds are likely to be less favourable compared to laboratory conditions. Indeed predators or food scarcity could hamper the potential to recover. Therefore sub-lethal effects of pesticides should be seriously considered when assessing the risks that pesticides pose to natural ecosystems.