

Implementation of an Artificial Neural Network to Automatic Detection of Response Behavior of Chironomid Larvae After Sub-lethal Treatments of an Insecticide in Semi-Natural Conditions

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A multilayer perceptron with the backpropagation algorithm was utilized to automatically detect response behavior of *Chironomus flaviplumus* after sub-lethal treatments of an anticholinesterase insecticide, carbofuran. After the treatments of carbofuran (0.1mg/ℓ), movements of chironomid larvae were continuously observed individually in an observation cage (6cm × 7cm × 2.5cm) for four days (2 days; before treatment, 2 days; after treatment). Activity and the tracks of the partial body movement were analyzed through an image processing system. Some typical response behaviors were observed in the movement tracks of the treated specimen. The specimen's overall activities appeared to be decreased, and the irregular activities of "ventilation" were observed more frequently after treatments of the insecticide. Parameters characterizing the movement of the specimens, such as velocity and changes in directions, were used as input data for the multilayer perceptron network. Two-three input nodes were used, while 5-6 hidden nodes were assigned to the hidden layer for the training with the network. One-two output nodes were used for characterizing the response patterns. The study on response behavior of chironomids suggested a possibility of detecting chemicals in environment as a bio-monitoring tool.