1.9 Acute toxicities and safety evaluation of chiral fipronil to *Apis mellifera* L. and *Trichogramma japonicum* Ashmead

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Abstract

Most of the chiral pesticides are used as racemic forms in agricultural production and health pest control. However, differences exist in the biological activity and toxicity of the enantiomers of chiral pesticides, and the phenomena are usually ignored during the process of environmental risk evaluation of chiral pesticides.

In this study, fipronil was selected as a model chiral pesticide, and its two enantiomers were isolated using an HPLC chiral stationary phase method (HPLC-CSP). The acute toxicities of S(+)-fipronil, R(-)-fipronil and racemic fipronil to *Apis mellifera* L. and *Trichogramma japonicum* Ashmead were investigated by the standard drop method and drug membrane method.

Results show that the 48 h-LD_{50} of S(+)-fipronil, R(-)-fipronil and racemic fipronil to *A. mellifera* are 0.00341, 0.00396 and 0.00383 μg·bee^{-1}, respectively. The 24 h-LR_{50} of S(+)-fipronil, R(-)-fipronil and racemic fipronil to *T. japonicum* were 7.56×10^{-7}, 8.06×10^{-7} and 7.29×10^{-7} mg·cm^{-2}, respectively. It is demonstrated that fipronil is highly toxic to *A. mellifera* and very highly toxic to *T. japonicum*. No obvious differences in enantioselectivity were observed for acute toxicity of fipronil to *A. mellifera* and *T. japonicum*.

Therefore, it is unlikely that the use of single enantiomer of fipronil would reduce the toxic risk to environmental organisms.