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Actions of imidacloprid, clothianidin and related neonicotinoids on nicotinic acetylcholine receptors of American cockroach neurons and their relationships with insecticidal potency

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Abstract:

The actions of neonicotinoid insecticides on nicotinic acetylcholine receptors (nAChRs) in the terminal abdominal ganglion neurons of the American cockroach were investigated using whole-cell patch-clamp electrophysiology. Neonicotinoids possessing a nitromethylene group showed higher agonist affinity than the corresponding nitroimine analogues, whereas compounds with an acyclic guanidine moiety showed greater agonist efficacy than the corresponding cyclic compounds. Imidacloprid showed the lowest agonist efficacy of all neonicotinoids and low concentrations of imidacloprid attenuated acetylcholine-induced currents. However, such blocking actions were minimal with other neonicotinoids. The diverse actions of neonicotinoids on nAChRs, combined with target accessibility based on hydrophobicity, appears to account for their insecticidal potency on cockroaches measured in the presence of metabolic inhibitors. © Pesticide Science Society of Japan

Keywords:

imidacloprid, clothianidin, neonicotinoids, nicotinic acetylcholine receptors, whole-cell patch-clamp electrophysiology, insecticidal activity

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