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[TOP](#) > [Available Issues](#) > [Table of Contents](#) > [Abstract](#)

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Involvement of Esterase in Phytotoxicity of a New Pyrrolinone Compound, Methyl 1-[1-(3,5-Dichlorophenyl)-1-methylethyl]-2,3-dihydro-4-methyl-2-oxo-3-phenyl-1H-pyrrole-3-carboxylate, to Early Watergrass (*Echinochloa oryzicola*) and Rice (*Oryza sativa*)

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Abstract:

A new pyrrolinone compound, methyl 1-[1-(3,5-dichlorophenyl)-1-methylethyl]-2,3-dihydro-4-methyl-2-oxo-3-phenyl-1H-pyrrole-3-carboxylate (PC-1), has herbicidal activity against early watergrass (*Echinochloa oryzicola*). This compound showed good selectivity between rice (*Oryza sativa*) and early watergrass due to the introduction of a methoxycarbonyl group into the pyrrolinone structure. To elucidate the mechanism of PC-1's phytotoxicity, the effects of esterase inhibitors (triphenyl phosphate, tributyl phosphate and fenitrothion) and a cytochrome P450 monooxygenase inhibitor (1-aminobenzotriazole) on the actions of PC-1 were examined. Triphenyl phosphate and fenitrothion reduced the phytotoxicity of PC-1 in hydroponics and greenhouse tests. Porcine liver esterase converted PC-1 to 1-[1-(3,5-dichlorophenyl)-1-methylethyl]-4-methyl-3-phenyl-3-pyrrolin-2-one (PC-2) and this reaction was inhibited by triphenyl phosphate. The PC-2 content of early watergrass treated with PC-1 was 4 times that of rice. These results suggest that PC-1 is a prodrug and is converted to PC-2 by esterase, and that the amount of PC-2 produced in PC-1-treated plants is related to the sensitivity of early watergrass and rice to PC-1. © Pesticide Science Society of Japan

Keywords:

esterase, pyrrolinone, prodrug, phytotoxicity, early watergrass, rice

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