Control of Red Rice and Sulfonylurea Herbicide-Resistant Weeds in Culture of Protox Inhibitor Herbicide-Resistant Transgenic Rice

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ABSTRACT

This study was carried out to examine controlling effect of red rice accessions and sulfonylurea herbicide-resistant weeds by Protox inhibitors, oxyfluorfen, oxadiazon, and oxadiargyl in transgenic rice cultivation of various cropping patterns (direct seeding on dry paddy, direct seeding on flooded paddy surface, 10-day old seeding, and 30-day old seeding) under greenhouses and in fields. No phytotoxicity was observed in Protox inhibitor herbicide-resistant transgenic rice lines, MX and PX by oxyfluorfen treatment in direct seeding on dry paddy, direct seeding on flooded paddy surface, and 10-day old seeding under greenhouse conditions. However, the phytotoxicity of non-transgenic rice (WT) at 20 days after oxyfluorfen foliar application at 2,350 g ai ha\(^{-1}\) under direct seeding on dry paddy and direct seeding on flooded paddy surface was 54% and 90%, respectively. On the other hand, the phytotoxicity of WT after oxyfluorfen soil application at 100 g ai ha\(^{-1}\) under direct seeding on flooded paddy surface was observed by 72%. No phytotoxicity in MX and PX was observed after oxadiazon and oxadiargyl soil application under direct seeding on flooded paddy surface, but in the case of WT, the phytotoxicity occurred at 80% after oxadiazon soil application at 480 g ai ha\(^{-1}\) and at 97% after oxadiargyl soil application at 68 g ai ha\(^{-1}\). The seedling stand rates of MX at oxadiargyl 68 g ai ha\(^{-1}\) and PX at oxadiazon 480 g and oxadiargyl 68 g ai ha\(^{-1}\) were significantly reduced compared with non-treated control in direct seeding on flooded paddy surface under field conditions. However, the seedling stand rates of red rice accessions (R2, R189, R116, and R141) as well as WT were significantly reduced by all treated rates of Protox inhibitor herbicides. Controlling effect of red rice accessions, *Scirpus juncoides*, *Monochoria vaginalis*, *Echinochloa crus-galli*, and *Rotala indica* at 43 days after soil application of Protox inhibitor herbicides in direct seeding on flooded paddy surface under field conditions was 87–96%, 78–90%, 63–100%, and 100%, respectively. Plant height and number of tiller of WT were reduced by Protox inhibitor herbicides, but the plant height and number of tiller of MX and PX were similar to those of non-treated control. Controlling effect of red rice accessions and *juncoides*, *vaginalis*, *crus-galli*, and *indica* at
16 days after foliar application at oxyfluorfen 2,350g ai ha$^{-1}$ in 10-day old seeding and 30-day old seeding under field conditions was 94–100% and 60–94%, respectively. However, the controlling effect of red rice accessions and weeds at 30 days after oxyfluorfen treatment tended to be decrease. The controlling effect was no different among red rice accessions, but the resistant level of the WT to Protox inhibitor was relatively higher than red rice accessions. Therefore, control of red rice and sulfonylurea herbicide-resistant weeds can be managed by using an integrated system which utilizes other herbicides as well as mechanical, cultural and biological weed control methods.

**Key words:** Protox inhibitor; red rice; resistant weed; transgenic rice.