Antagonistic and synergistic effect of 2,4-D on herbicides of different sites of action in weed control

Jingbo Li[1,2], Heping Han[1], Qin Yu[1] and Stephen Powles[1]
[1] Australian Herbicide Resistance Initiative (AHRI), School of Plant Biology, The University of Western Australia, Crawley, Western Australia 6009, Australia
[2] Collaborative Innovation Center for Field Weeds Control, Hunan University of Humanities, Science and Technology, Loudi 417000, China
(jingbo.li@uwa.edu.au)

Summary Tank mixing herbicides of different sites of action is practiced for broader spectrum weed control, reducing herbicide application cost and delaying resistance evolution. For example, the auxinic herbicide 2,4-D is often tan mixed with herbicides of ACCase, PSII or EPSPS inhibitors for grass and broadleaf weed control. However, sometimes tank mix can have synergistic or antagonistic effect on grass weed control. We have found that tank mix of 2,4-D amine and diclofop-methyl or clodinafop greatly reduces grass weed control (e.g. ryegrass and wild oats). In contrast, tank mixing 2,4-D with atrazine or metribuzin enhances grass weed control (e.g. ryegrass, wild oat, goose grass). Our previous studies demonstrated that antagonism of diclofop-methyl by 2,4-D is due to 2,4-D induced enhanced diclofop metabolism via gene over expression of herbicide metabolizing enzymes (P450, GST, GT etc). Our current studies reveal that synergism of metribuzin by 2,4-D is associated with enhanced metribuzin translocation. In addition, reduced efficacy of glyphosate grass weed control when tank mixing with 2,4-D have been experienced by WA farmers and reported elsewhere. We also found that tank mixing 2,4-D (amine) with glyphosate (potassium salt) compromises barnyard grass control, especially for glyphosate-resistant populations. Based on our observation, we hypothesize that 2,4-D antagonism to glyphosate is likely due to reduced glyphosate uptake/translocation, as has been reported in Johnson grass (*Sorghum halepense* (L.) Pers.). Experiments are under way to testify this. As 2,4-D has multiple, unpredictable effects on other herbicides, hence care must be taken when tank mixing herbicides with 2,4-D.

Keywords 2,4-D, tank mix, herbicide translocation.