

EVALUATING AN ALTERED TARGET SITE VARIANT OF EPSPS FOR GLYPHOSATE RESISTANCE. R. Douglas Sammons, Murtaza Alibhai, Amanda Boland, Stanislaw Flasiński, Christina Kavanaugh, Youlin Qi, Jinsong You and Steven Reiser. Monsanto Co., 700 Chesterfield Parkway West, Chesterfield, MO 63017

The herbicide glyphosate has eleven resistant weeds globally. These weeds can be sorted into two groups where one set has a higher level of resistance requiring approximately 6-8 times the labeled use rate of glyphosate. *Lolium rigidum* (annual ryegrass) and *Conyza canadensis* (horseweed) in this group have been confirmed to have an exclusion mechanism that reduces translocation and decreases access to the chloroplast. The weaker resistance set requires 2-4 times the labeled use rate for control. *Eleusine indica* (goosegrass), *Lolium rigidum* and *Lolium multiflorum* (Italian ryegrass) in this group have variant EPSPS's where proline 106 allows substitutions of serine, threonine or alanine. These P106 variant EPSPS's have slightly altered the target site where glyphosate is positioned as a transition state mimic. Proline 106 is not in this target site but is 5 amino acids removed in a connecting alpha-helix. The double mutant T102I, P106S (~100 fold less sensitive to glyphosate) was first used to make glyphosate tolerant corn (GA21) when over-expressed by a rice actin promoter. These studies on a related EPSPS bearing T102I, P106A (~300 fold less sensitive to glyphosate) use native promoters from *Arabidopsis* and *Z. mays*, respectively, to determine the level of glyphosate tolerance. Transgenic plants expressing TIPA-EPSPS at native levels were shown to have 10-30 fold (R/S) vegetative tolerance to glyphosate (depending on the gene copy number) however they were male sterile. Therefore, weeds expressing these single P106 variants (2-8 fold less sensitive to glyphosate) should only be slightly resistant due to the decreased affinity for glyphosate unless there is an additional enabling resistance mechanism.