Public Abstract
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Title:IDENTIFICATION OF NONTARGET-SITE MECHANISMS OF GLYPHOSATE RESISTANCE IN ROOTS AND POLLEN OF *AMARANTHUS* AND *AMBROSIA*

Glyphosate-resistant (GR) *Amaranthus* and *Ambrosia* species are problematic in annual crops. Identification of GR biotypes and resistance mechanisms allow appropriate and timely management decisions. The objectives of this research were to: a) develop *in vitro* pollen germination assays and assess glyphosate resistance expression in pollen; b) determine expression of 5-enol-pyruvyl-shikimate-3-phosphate synthase (EPSPS) in pollen and identify target-site based mechanisms of resistance; and c) characterize root growth and 14C-glyphosate translocation in GR and glyphosate-susceptible (GS) common waterhemp (*Amaranthus rudis*). Agarose based pollen germination media resulted in 25 to 30% pollen germination. Pollen tube growth was reduced up to 93% at a glyphosate concentration of 30 mM in both GR and GS biotypes. Pollen tube growth assays did not discriminate between GR and GS biotypes when adding glyphosate to the media. EPSPS and corresponding transcript were expressed in pollen of all plant species tested. A proline 106 to serine mutation in EPSPS was expressed in leaves and pollen of GR *Ambrosia* species. Up to 283- and 160-fold additional genomic copies of EPSPS were detected in GR Palmer amaranth (*Amaranthus palmeri*) leaves and pollen, respectively. Target-site mutation and gene amplification contribute to resistance in *Ambrosia* species and Palmer amaranth, respectively. Following application of glyphosate, GR common waterhemp rapidly produced 4-fold more adventitious roots than GS plants near the soil surface. Absorption and translocation of 14C-glyphosate was similar between biotypes. Glyphosate resistance in common waterhemp appears to be mediated by modified movement, and the rapid proliferation of adventitious roots is one of the initial responses contributing to plant survival.