Stability of EPSPS Gene Copy Number in Glyphosate Resistant Amaranthus palmeri

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Amaranthus palmeri is a type of weed known for being a threat to the genetically modified crops cotton and soybeans because of its resistance to the chemical herbicide, glyphosate. Glyphosate is a competitive inhibitor of 5-enolpyruvylshikimic acid-3-phosphate synthase (EPSPS), a critical enzyme in the shikimate pathway. It blocks the binding of PEP to EPSPS which also binds shikimate-3-phosphate, inhibiting the production of the protein EPSPS. The shikimate pathway leads to the production of aromatic amino acids tryptophan, tyrosine, and phenylalanine that are needed for plant growth. Agricultural companies are searching for how Amaranthus palmeri has developed resistance to glyphosate. It has been discovered that resistant plants have anywhere from five to 160 more copies of the EPSPS gene than susceptible plants. Early work has shown that the number of EPSPS copies can vary within a plant and the copy number of the offspring do not always correlate with the parents. This project seeks to establish whether EPSPS gene copy number is stable between clonal vegetation and through generations or if they are inherently unstable. To do this, quantitative PCR will be used to count the EPSPS gene copy number. Two sample T-tests and an ANOVA test will be used to compare all the vegetative clones to see if there are significant differences in gene copy number. A regression analysis will be used to see if the parental copy number correlates with offspring number. It was hypothesized that copy number is not stable; it varies between vegetative clones and through generations.

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