

GENETICS OF GLYPHOSATE RESISTANCE IN A MISSOURI WATERHEMP POPULATION.  
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A common waterhemp population from Missouri was confirmed to be resistant to glyphosate when compared with susceptible populations from Illinois. Resistant (R) individuals from this Missouri population were then crossed with susceptible (S) individuals ( $R \times S$  and  $S \times R$ ) to produce  $F_1$  lines. The  $F_1$  lines were screened for resistance to glyphosate, and they appeared to demonstrate an intermediate level of resistance (I) relative to the parents with no dependence on the direction of the cross. Thus, resistance appears to be a nuclear inherited, incompletely dominant trait. One of the more uniform  $F_1$  lines was selected to create  $F_2$  plants ( $F_1 \times F_1$ ) as well as backcrosses to susceptible individuals ( $F_1 \times S$  and  $S \times F_1$ ). The progeny were then screened for resistance in an attempt to determine the number of genes responsible for conferring resistance by analyzing segregation ratios of the R, S, and I phenotypes.

In addition to these experiments, a crossing scheme utilizing vegetatively cloned plants was designed to rapidly obtain a homozygous R line from the Missouri population. Plants were screened for resistance with glyphosate, and 15 R individuals were selected for cloning. Cuttings were taken from these R individuals and were grown for several weeks until flowering began, at which time female plants could be identified. Eight of the cloned females were used in five different crosses (four with resistant Missouri males, and one with a sensitive male), with a clone from each of the eight females being used in each cross. Each of these crosses also contained at least one S female. Next, the progeny of these crosses were screened in order to determine which of the Missouri parents were homozygous for resistance. To find homozygous R males, progeny from the  $S \times R$  crosses were examined for uniformity, and one homozygous R Missouri male was identified. To find homozygous R females, progeny from the  $R \times S$  crosses were screened for uniformity, and two of the Missouri females appeared to be homozygous. In this way, two putative homozygous resistant lines were obtained (the two homozygous R females crossed with the one homozygous R male) and can be used in future experiments to determine the physiological and molecular basis of glyphosate resistance.