RESPONSE OF CORN TO PALMER AMARANTH, WATER, AND NITROGEN STRESSES. J. Anita Dille, Ella K. Ruf, and Dwain M. Rule. Associate Professor, Graduate Research Assistant, and Graduate Research Assistant, Department of Agronomy, Kansas State University, Manhattan, KS 66506.

Palmer amaranth is a competitive weed in corn fields and has been known to cause variable corn yield losses in the diverse environments of Kansas. If corn yield losses could be partitioned among water and nitrogen stresses, perhaps we could improve the prediction of the impact of Palmer amaranth on corn yield loss. The objective was to evaluate corn growth, yield, and yield losses when grown alone or in competition with Palmer amaranth under dryland and irrigated environments with three different nitrogen rates. Field experiments were conducted in 2005 and 2006 at the Department of Agronomy Ashland Bottoms Research Farm near Manhattan, KS. The experiment was arranged in a side-by-side design with whole plots being dryland and furrow irrigation. Within each soil moisture environment, subplot treatments were 0, 112, or 224 kg N $ha^{-1}$, and sub-subplot treatments were monoculture Palmer amaranth at 1 plant $m^{-1}$ of row, and corn with 0, 1, 4, and 8 Palmer amaranth plants $m^{-1}$ of row. Water stress occurred earlier and caused more drought-like conditions in 2006 than 2005. Corn height was impacted more by water stress than palmer amaranth when N was not limiting. Corn leaf number, LAI, and biomass were reduced with increasing water stress and were further reduced in the presence of Palmer amaranth. Corn biomass at VT in 2005 was less for dryland, less for 0 N, and less in the presence of Palmer amaranth. In the 2006 dryland environment, corn biomass at VT had a negative linear relationship with Palmer amaranth density and declined more rapidly with addition of N. In the 2006 irrigated environment, corn biomass at VT had a negative curvilinear relationship with Palmer amaranth density, and less biomass produced with each decrease in N rate. Weed-free corn grain yields in the dryland environment were approximately 48% of the irrigated environment across years. Under irrigation in both years, 0 N applied produced 36% less corn grain than high N rates. In contrast with the dryland environment in 2006, no N applied produced 47% less grain compared to high N rates. In 2005, dryland corn yield was reduced by 19% when no N was applied. In order to compare across soil moisture environments, percent corn yield loss was calculated. Only in the irrigated environment of 2006 were interactions observed in percent corn yield loss in response to palmer amaranth density with N rate. With no additional N, more corn yield loss was observed with increasing Palmer amaranth density compared to either 112 or 224 kg N $ha^{-1}$. In the drought-stressed dryland environment of 2006, maximum percent corn yield loss was estimated to be 95% compared to 62% in the 2006 irrigated environment with 224 kg N $ha^{-1}$ or 74% with 0 or 112 kg N $ha^{-1}$. In 2005, the maximum predicted percent corn yield loss with high Palmer amaranth densities, pooled across N rates, was 45% in irrigated and 54% in dryland environments and these were not different. Overall, water stress reduced corn yield potential the most (52%), followed by the addition of one Palmer amaranth plant (32 to 73%), and followed by the impact of N stress (19 to 47%). These empirical data provide a basis for improved prediction of corn yield losses in variable KS environments.

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