

## HIGH TEMPERATURE INCREASES 2,4-D METABOLISM AND RESISTANCE IN PALMER AMARANTH (*AMARANTHUS PALMERI*)

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**Destaque:** Temperature stress increases the resistance of Palmer amaranth to the 2,4-D herbicide as a result of metabolism-based

**Resumo:** Palmer amaranth (*Amaranthus palmeri* S. Watson) is a troublesome weed in the US and populations have developed resistance to several herbicide sites of action, including 2,4-D. A 6-way resistant Palmer amaranth population (KCTR) was found to exhibit metabolic resistance to 2,4-D mediated by cytochrome P450 activity. Herbicide efficacy and level of resistance are known to be influenced by plant growth temperature. The effect of temperature on 2,4-D resistance Palmer amaranth is unknown. Our objectives of this research were to a) determine the effect of heat stress on the level of 2,4-D resistance in KCTR compared to a known 2,4-D sensitive Palmer amaranth (MSS) and b) investigate the metabolic profiles of 2,4-D under heat stress in Palmer amaranth. Experiments were performed in separate growth chambers, maintained at two temperatures regimes: high temperature (HT) (34/20 C d/n) and low temperature (LT) (24/10 C; d/n). When MSS and KCTR plants were 8-10 cm tall, they were treated with 140, 280, 560 (field recommended dose), 1120 and 2,240 g ai ha<sup>-1</sup> of 2,4-D and an untreated control was included. Each treatment contained six replicates. Dry biomass was recorded at 4 weeks after treatment (WAT) and the data were analyzed using R. For 2,4-D metabolism experiment, 8-10 cm tall MSS and KCTR plants (5 replicates) grown at HT and LT, were treated with 10 µl [<sup>14</sup>C] 2,4-D. Above ground tissue was harvested at 24 h after treatment (HAT) and frozen. The tissue was processed and resolved into either parent 2,4-D or its metabolites by reversed-phase high-performance liquid chromatography (HPLC). The results indicate that HT stress increased the level of resistance with more metabolism of 2,4-D in KCTR compared to MSS. To increase the efficacy of 2,4-D and better control of Palmer amaranth, 2,4-D applications can be made when the temperature is cooler.

**Palavras-chave:** Temperature stress; P-450 activity; Auxinic herbicides