TRANSGENERATIONAL EFFECT OF DROUGHT STRESS AND SUB-LETHAL DOSES OF QUIZALOFOP-P-ETHYL: DECREASING SENSITIVITY TO HERBICIDE AND BIOCHEMICAL ADJUSTMENT IN ERAGROSTIS PLAN

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Destaque: Transgenerational adaptation to abiotic stress in Eragrostis plana, reduces sensitivity to quizalofop.

Resumo: Eragrostis plana Ness is an invasive C₄ perennial grass in South America and very adaptable to environmental stresses. Our hypothesis is that there is a transgenerational cross-talk between environmental stresses and weed response to herbicide. This study aimed to: (1) evaluate if E. plana primed by drought stress (DRY), a sub-lethal dose of quizalofop-p-ethyl (QPE), or a combination of both drought and herbicide stresses (DRY × QPE), produce a progeny with decreased sensitivity to quizalofop and (2) investigate the potential mechanisms involved in this adaptation. A population of E. plana was submitted to treatments DRY, QPE or DRY × QPE for two generations (G). The progenies were analyzed for sensitivity to the herbicide quizalofop and biochemical, herbicide residue and transcriptomics analyses were performed. The resistance index to G₂ population, DRY (less sensitive) was >12.3-fold (50% injury or ED₅₀) and >8.5-fold (50% shoot dry mass reduction or GR₅₀), in comparison to CHK (more sensitive). In the G₂, the quizalofop-treated CHK population had reduced stomatal conductance and increased hydrogen peroxide concentration and lipid peroxidation. However, there was no change in stomatal conductance, hydrogen peroxide level, and lipid peroxidation in the quizalofop-treated DRY population. In addition, G₂ population had increased activity of the antioxidant enzymes superoxide dismutase, catalase and ascorbate peroxidase, in conjunction with the upregulation of cytochrome P₄₅₀ monooxygenases 72A31 (CYP72A31) and CYP81A12 expression, which was accompanied by reduced quizalofop-p-ethyl concentrations inside the plants. These results suggest that quizalofop is metabolized by DRY population, mainly via the cytochrome P₄₅₀ enzyme. E. plana demonstrated a capacity for transgenerational adaptation to abiotic stresses, with the population previously exposed to DRY becoming less sensitive to quizalofop-p-ethyl treatment.

Palavras-chave: South African lovegrass; acclimatization; CYP450; antioxidant enzymes

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