

Interactive effect of high temperature and reduced soil moisture availability on the morpho-physiological traits and glyphosate susceptibility of windmill grass (*Chloris truncata* R.Br.)

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Summary Susceptibility to herbicides is not a constant trait of a species; rather, it varies with variation in both environmental and intrinsic factors. Therefore, two windmill grass (*Chloris truncata* R.Br.) biotypes with differential glyphosate tolerance were exposed to continuous ambient [aT – 28/20 ± 2°C] and elevated temperature [eT – 34/24 ± 2°C] in combination with either high [HSM – 90-100% of soil water holding capacity (WHC)], moderate (MSM – 50-60% of soil WHC) or reduced (RSM – 20-30% of soil WHC) soil moisture availability to quantify changes in their morpho-physiology and susceptibility to glyphosate. The primary objective was to illustrate the importance of combining multiple stressors to partially explain weed's herbicide tolerance in relation to climate change. In the current study, we demonstrated that the glyphosate susceptible biotype showed 4.9 times more tolerance to glyphosate at RSM under eT

(LD50 = 600.5 g a.i. ha⁻¹) as compared to HSM under aT (LD50 = 123.1 g a.i. ha⁻¹). On the other hand, glyphosate within the recommended rate (740 g a.i. ha⁻¹) was insufficient to suppress (>80%) tolerant biotype at both MSM and RSM under eT. Plants of both biotypes grown under hot, dry conditions produced fewer, smaller, and thicker leaves with increased leaf chlorophyll content and reduced stomatal conductance. The morpho-physiological changes, particularly in leaf surface characteristics, in response to RSM under eT, could have possibly impacted collectively on non-target-site mechanisms of herbicide tolerance (e.g., herbicide interception, distribution, absorption, translocation, and metabolism) and thus reduced glyphosate efficacy on *C. truncata*.

Keywords Chemical weed control; fallow weed management; climate change; herbicide efficacy