

REACTION OF SPRING WHEAT CULTIVARS TO CHLORSULFURON:  
TILLERING, ABSORPTION, TRANSPIRATION AND ROOT PERMEABILITY

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*Abstract.* Cultivars of wheat differ in their sensitivities to chlorsulfuron and there are genotype by environment interactions. We studied the response of seedlings to the herbicide to determine whether the interactions may have a basis in whole-plant physiology. Tolerant (cv. Gamenya) and sensitive (cvv. Cranbrook and Kulin) cultivars were grown in a sandy soil to confirm field observations on their relative sensitivities and then in solution cultures to study herbicide absorption, transpiration and root integrity. The latter was measured as the ability to prevent an efflux of  $\text{Cl}^-$  from roots. Temperatures were controlled at 13°C/20°C (night/day) in a daylight phytotron for studies in solution culture or 13°C and 20°C root temperatures for glasshouse studies of plant growth. Inhibition of tillering was a measure of cultivar sensitivity and ranged from 89% for Kulin to 17% for Gamenya. A six-hour pulse of  $^{14}\text{C}$ -chlorsulfuron was absorbed at a rate that was the product of transpiration and herbicide concentration (0.4 to 1.0  $\mu\text{g}/\text{mL}$ ) in the solution culture. Stomatal conductances (Delta-T Devices, Mk III porometer) were inhibited  $\leq 70\%$  when seedlings with three leaves were exposed to chlorsulfuron (0.02 to 0.1  $\mu\text{g}/\text{mL}$ ) for 24 hours; inhibition was proportional to dose and greatest for sensitive cultivars. Chloride efflux from roots of Cranbrook seedlings (three leaves) was proportional to chlorsulfuron exposures (0.02 to 0.1  $\mu\text{g}/\text{mL}$ ) and was 9% of  $\text{Cl}^-$  absorbed during the 9 day exposure to the herbicide. Effluxes from Kulin and Gamenya were not increased by the herbicide exposure. The secondary effects observed were established soon after exposure of the seedlings to the herbicide and may partially explain the field-responses of seedlings to chlorsulfuron.