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Root morphology and nutritional status as potential indicators to improve tolerance of *Pennisetum purpureum* to chromium toxicity

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The effects of root exposure to toxic Cr(III) were verified in *Pennisetum purpureum* plants under controlled conditions. Newly propagated seedlings were placed in aerated Clark's nutrient solution, allowed to equilibrate for three days, and then transferred to fresh medium added 0, 1, 2, 3, 4 or 5 mg/L of CrCl₃. The seedlings were harvested and evaluated following a continuous 30-day-growth period (with pH kept at 4.00 or below, and solution replaced by a fresh one every four days). Adventitious roots had a marked reduction in length in response to toxic chromium, and severe stress was characterized by a crown-like shape of all roots. Root length and dry weight (DW), as well as plant growth rate, leaf area and chlorophyll SPAD level decreased sharply, according to the applied level of Cr(III). Nutritional profiles, as assessed by ICP-AES analyses, revealed substantial decreases in Fe and Mg contents, in comparison to the control, as exposure to toxic chromium was intensified. On the other hand, the effects on the other essential elements were less conspicuous. Leaves of chromium-affected seedlings showed visual deficiency symptoms of Fe (yellowing) and Mg (blade yellow spotting, which rapidly turned into necrosis). Root shape and DW were considered the most suitable parameters for estimating plant reactions to Cr(III) contamination under the studied conditions. The results suggest these two parameters are efficient indicators for selecting *P. purpureum* genotypes for tolerance to chromium toxicity.

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