1. Physiological Studies of Some Polyamines on Wheat Plants Irrigated with Waste Water. I. Osmolytes in Relation to Osmotic Adjustment and Grain Yield

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Abstract:

A pot experiment was conducted to evaluate the beneficial effect of grain presoaking in spermine (0.15 mM), spermidine (0.30 mM) and their interaction on tolerance of wheat (Triticum aestivum L. cv Sakha 94) plants irrigated with waste water mostly polluted by heavy metals. Osmotic pressure (OP), some osmolytes concentration and grain yield were determined. Waste water at all examined concentrations caused marked increases in OP, osmolytes [proline, organic acids, chloride and heavy metals (Cd^{++}, Pb^{++}, Cu^{++}, Ni^{++} & Zn^{++})] content in flag leaves of wheat plants at heading and anthesis stages. On the other hand, waste water stress induced marked decreases in total soluble nitrogen (TSN), total soluble sugars (TSS) and ions (Na^{+}, K^{+}, & Ca^{++}) as well as grain yield. Exogenous application of polyamines either spermine, spermidine or their interaction mitigated the deleterious effects of waste water on wheat plants. The effect was more pronounced with spermine + spermidine treatment. The applied polyamines increased the osmotic pressure, TSN, TSS, proline, organic acids and ions (Na^{+}, K^{+}, & Ca^{++}) concentration as well as grain yield. The osmotic pressure appeared to depend mainly on proline, organic acids, chloride and heavy metals content, where there is positive correlations between OP and proline, organic acids, and heavy metals. The economic yield (grain yield) was positively correlated with TSN, TSS and ion contents but negatively correlated with proline, organic acids, chloride, heavy metals and OP.

Keywords: Grain yield; wheat; osmotic pressure; osmoprotectants; polyamines; Triticum aestivum; waste water

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2. AMELIORATING EFFECT OF KINETIN ON PIGMENTS, PHOTOSYNTHETIC CHARACTERISTICS, CARBOHYDRATE CONTENTS AND PRODUCTIVITY OFCADMIUM TREATED *SORGHUM BICOLOR* PLANTS

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ABSTRACT

The objective of this study was to investigate the effect of solid rench with three different concentrations of CdCl2 on pigments content, photosynthetic activity, carbohydrate contents and productivity of *Sorghum bicolor* L. cv. 'Dorado' plants throughout various stages of plant growth and development. Also particular interest was focused on the effect of grain presoaking with kinetin to ameliorate the toxicity effects exerted by the different levels of CdCl2. In the majority of cases, grain pretreatment with kinetin increased photosynthetic pigments, photosynthetic activity, Hill reaction as well as carbohydrate contents in leaves of cadmium treated sorghum plants. In general, the observed decrease in yield and yield attributes of sorghum plants in response to Cd2+ treatments was accelerated particularly when grains were presoaked in kinetin. The ameliorating effect of kinetin was more pronounced at 1 mMCdCl2. Grain priming with kinetin increased grain biomass (i.e. fresh and dry weights), carbohydrates, protein and ion contents in yielded grains of cadmium treated sorghum plants. Cadmium treatments altered the balance of growth bioregulators in developed grains of sorghum plants. Thus, CdCl2 at all the used concentrations exerted a significant decrease in growth promotor levels with an increase in growth inhibitory substances equivalent to abscisic acid. On the other hand, grain priming with kinetin increased the growth promotory substances and reduced abscisic acid levels.

Key words: cadmium, carbohydrates, kinetin, photosynthetic activity, pigment, sorghum,yield

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3. Kinetin-induced modification in growth criteria, ion contents and water relations of sorghum plants treated with cadmium chloride

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The objective of this study was to investigate the effect of soil drench with three different concentrations of CdCl2 on growth criteria, ions content and water relations of *Sorghum bicolor* plants. Also particular interest was focused on the effect of grain presoaking with kinetin in order to ameliorate the toxicity effects exerted by the different levels of CdCl2. In general, the results showed, that the observed suppression in growth criteria (i.e. root length, root fresh and dry weights, plant height, shoot fresh and dry weights, cumulative leaf area as well as root/shoot ratio), ions content (i.e. K+, Na+, Ca2+ and Cd2+), water relations (i.e. total leaf conductivity, transpiration rate and relative water content) in response to CdCl2 was relieved either partially or completely when grains were presoaked in kinetin (50 ppm). The alleviating effect of kinetin for Cd2+ toxicity was more pronounced in response to 1 mM CdCl2 treatment.

Key words: cadmium, growth, ions content, kinetin, sorghum, water relations

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4. Bioconversion of poultry wastes. I--Factors influencing the assay and productivity of crude uricase by three uricolytic filamentous fungi

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Abstract

The optimum temperature for biomass yield and uricase production by uricolytic fungi, Aspergillus terreus, A. flavus and Trichoderma sp. was at 30 degrees C. The time required for maximum production of uricase and biomass yield was 4 days for two Aspergillus species and 6 days for Trichoderma sp. The optimum pH was at 6.4 for A. terreus and pH 6.6 for A. flavus and Trichoderma sp. The maximum fungal biomass yield was achieved in medium supplemented with 4% poultry waste. The best carbon sources for the production of uricase and mycelia yield were glycerol, sucrose and maltose by A. terreus, A. flavus and Trichoderma sp., respectively. Uric acid was found to be the best nitrogen source for production and activity of uricase by the three tested fungi. The addition of some vitamins to the culture media increased the maximum biomass yield of all the isolates, although no significantly increased uricase production was found.

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5. Effects of water stress on growth, pigments and (CO2)-C-14 assimilation in three sorghum cultivars

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Abstract:

The effects of drought on growth, pigments and (CO2)-C-14 assimilation were studied in three sorghum cultivars. Water stress applied either at the vegetative or at the reproductive stage was found to reduce relative growth and net assimilation rates. Root growth was less affected by water stress and in certain cases it was increased; consequently, the root/shoot ratio was improved. The sensitivity to drought stress was greater at the reproductive than at the vegetative stage. Dorado was the most drought-tolerant and Giza 15 the least drought-tolerant cultivar, as determined by calculation of the drought susceptibility index for total green leaf area and shoot dry weight. Short-term water stress in the vegetative phase (7 days) improved the chlorophyll content in leaves, and long-term stress in the vegetative and reproductive phases reduced chlorophyll content. Carotenoid content, in general, was not changed by drought stress. (CO2)-C-14 photoassimilation indicated that soluble, insoluble and consequently total photosynthates were reduced at the end of the stress period at both stages. Drought plus defoliation appeared to increase both chlorophyll content and (CO2)-C-14 photoassimilation, to a certain extent, as compared with drought alone.

Keywords: defoliation; drought; pigments; sorghum; (CO2)

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