Inhibition of Seed Germination and Growth of Blackgram (Vigna mungo (L.) Hepper) due to Oxidative Damage as Induced by Phenolic Compunds

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Three phenolic compounds were tested for their effects on seed germination, seedling growth, membrane damage and antioxidant enzymes activity in blackgram (Vigna mungo (L.) Hepper) under laboratory conditions. The effects of gallic, p-coumaric and phydroxy benzoic acids were tested in four concentrations (0.5, 1, 2 and 4 mM). At 4 mM concentration, all the phenolic compounds exerted most significant reduction in germination and growth processes than other concentrations. A similar trend has been observed in chlorophyll content, soluble protein content, and nitrate reductase (NR) enzyme activity. Enhanced contents of thiobarbituric acid reacting substances (TBARS), hydrogen peroxide and lipoxygenase enzyme activity were observed in all concentrations when compared to control without phenolic compounds. The same trend was also observed in activity of different antioxidant enzymes viz., superoxide dismutase, catalase and peroxidase. Seedlings received phenolic acid treatments accumulated more proline and total free amino acids than control plants. All the phenolic compounds at higher concentration significantly reduced the growth, NR activity and antioxidant enzymes activity over control. Among the three phenolic acids tested, p-hydroxy benzoic acid was found to be highly inhibitory than pcoumaric and gallic acids. The susceptibility at higher concentrations may be attributed to reduced antioxidant enzymes activity and more membrane damage.