

Effect of Polyamines on Glutathione Reductase Activity in Spinach

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The effects of polyamines (putrescine, spermidine and spermine) on glutathione reductase (glutathione: NADP⁺ oxidoreductase, EC 1.8.1.7; GR) activity of spinach leaves (*Spinacia oleracea* L. cv. Gladiator) were investigated under *in vivo* and *in vitro* conditions. Spinach was grown in sand culture under controlled conditions for 30 d. In *in vivo* assays 30-day-old plants were sprayed with polyamines once, and leaves were harvested 1, 5, 10 and 15 d after treatment. The three polyamines decreased the GR activity to different degrees, depending on time after application, type of compound and their concentration. In order to study whether or not polyamines can exert a direct effect on GR, the enzyme was partially purified from spinach leaves and incubated with polyamines in the reaction medium. Under these *in vitro* conditions, GR was inhibited by polyamines in a polyamine type- and concentration-dependent manner. Interestingly, spermine exerted the most intense inhibitory effect in both *in vivo* and *in vitro* experiments. It is proposed that the early decrease of glutathione reductase activity in leaves treated with polyamines can be due to a direct interaction of these compounds with the enzyme.

Key words: Glutathione Reductase, Polyamines, Spinach