

BRIEF COMMUNICATION

## Contents of abscisic acid and cytokinins in shoots during dehydration of wheat seedlings

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### Abstract

Accumulation of ABA in shoots during 30-min dehydration of wheat seedlings was accompanied by the decline in the content of zeatin nucleotide and the accumulation of zeatin 9-N-glucoside. The total content of zeatin derivatives as well as the content of free base of zeatin remained almost constant.

*Additional key words:* *Triticum durum*, zeatin derivatives.

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Accumulation of ABA was many times recorded in leaves during their dehydration (e.g. Wright and Hiron 1969, Davies *et al.* 1986). Much less attention was paid to the effect of dehydration on cytokinin contents, though exogenous cytokinins are known to influence stomatal conductance (Blackman and Davies 1983, Incoll and Jewer 1987). The aim of the present study was to follow the changes in ABA and cytokinins content during dehydration of wheat seedlings.

Three-day-old seedlings of durum wheat (*Triticum durum* Desf. cv. Bezenchukskaya 139) were grown for 7 d in containers filled with 0.1 strength Hoagland-Arnon nutrient solution under a 14-h photoperiod at irradiance (PAR) of 90 W m<sup>-2</sup> (ZN and DNAT-400 fluorescent lamps) and 24/18 °C (day/night) temperature. Then plants were removed from nutrient solution and dehydrated under the same conditions. Shoots of plants (5 per sample) were weighed very quickly and immediately frozen in liquid nitrogen prior to and 15 and 30 min after the start of dehydration.

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*Abbreviations:* ABA - abscisic acid; CK - cytokinins; Z - zeatin, ZG - zeatin 9-N-glucoside, ZN - zeatin nucleotide, ZR - zeatin riboside.

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ABA and cytokinin contents were determined in whole shoots, which were homogenized and extracted with ten volumes of 80 % ethanol for 16 h at 4 °C. The precipitate was removed by centrifugation, and the supernatant fraction was reduced to aqueous phase. ABA was further purified from an aliquot of aqueous residue according to a solvent partitioning scheme (Veselov *et al.* 1992). ABA recovery measured by adding labelled hormone to plant extract was 90 %. Cytokinins in the aqueous residue were separated by TLC and immunoassayed as described earlier (Farkhutdinov *et al.* 1997).

ABA content was increased by dehydration while the treatment showed no obvious effect on the level of free zeatin base (Z) and zeatin riboside (ZR). The decrease in the content of nucleotide of zeatin (ZN) compensated for the accumulation of its 9-N-glucoside (ZG) resulted in almost constant content of the sum of zeatin derivatives in stressed plants (Fig. 1). Shoots lost about 8 % of its fresh mass during the first 15 min of dehydration and only 2 % during next 15 min which indicated gradual stomatal closure. Accumulation of ABA induced by a period of wilting was quite consistent with the findings of other authors.

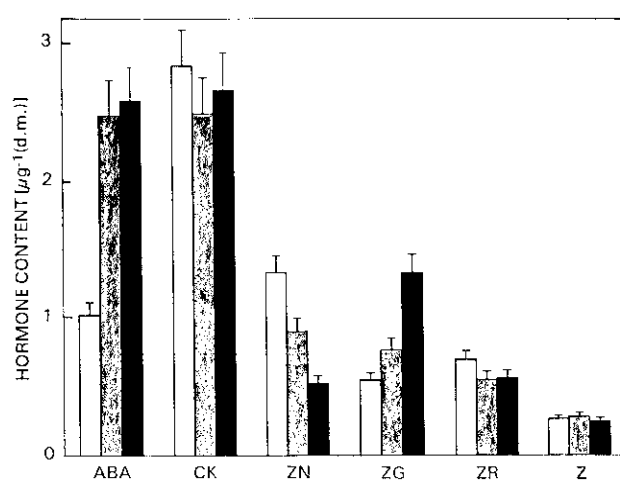


Fig. 1. Abscisic acid (ABA), sum of cytokinins (CK), zeatin nucleotide (ZN), zeatin 9-N-glucoside (ZG), zeatin riboside (ZR) and free base of zeatin (Z) contents in shoots of wheat seedlings during their dehydration lasting 0 (white columns), 15 (grey columns) or 30 (black columns) min.

Since shoots are believed to receive most of their cytokinins from roots (Horgan 1992), disturbed transpiration stream might influence cytokinin contents in shoots of stressed plants. Nevertheless, during this short period the total cytokinin concentration was not changed. However, accumulation of 9-N-glucosides in stressed plants (Fig. 1) suggested that dehydration promoted N-glucosylation of zeatin. Since the content of nucleotide of zeatin was decreased by dehydration, zeatin might derive from its nucleotide.

Exogenous cytokinins were shown to prevent stomatal closure (Blackman and Davies 1983). Consequently, we should expect the decrease in zeatin content in wilting shoots, which was not present. It was suggested that nucleotide of zeatin also might be an active form (Auer *et al.* 1992) and the stomatal closure may be controlled by the decrease in the zeatin nucleotide content in wilting shoots. Otherwise the cytokinins might be not involved in the stomatal closure or they might only prevent the complete closure of stomata.

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