Protein phosphatase activity and sucrose-mediated induction of fructan synthesis in wheat

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In this work, we analyze protein phosphatase (PP) involvement in the sucrose-mediated induction of fructan metabolism in wheat (Triticum aestivum). The addition of okadaic acid (OA), a PP-inhibitor, to sucrose-fed leaves reduced fructosylsucrose-synthesizing activity (FSS) induction in a dose-dependent manner. The expression of the two enzymes that contribute to FSS activity, 1-SST (1-sucrose:sucrose fructosyltransferase, E.C. 2.4.1.99) and 6-SFT (6-sucrose:fructan fructosyltransferase, E.C. 2.4.1.10), was blocked by 1 mu M OA. These results suggest the involvement of a PP type 2A in sucrose signaling leading to fructan synthesis. OA addition to the feeding medium impaired both sucrose accumulation in leaves and the expression of sucrose-H+ symporter (SUT1). It is known that sucrose concentration must exceed a threshold for the induction of fructan metabolism; hence PP2A inhibition may result in lower sucrose levels than required for this induction. OA also induced the vacuolar acid invertase (acid INV) transcript levels suggesting that PP activity might play a role in carbon partitioning. Total extractable PP2A activity decreased during 24 h of treatment with sucrose, in parallel with declining sugar uptake into leaf tissues. In conclusion, our results suggest that PP2A is involved in sucrose-induction of fructan metabolism and may play a role in regulating sucrose uptake, but do not rule out that further steps in sucrose signaling pathway may be affected.

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