EVOLUTION OF LIPOXYGENASE ACTIVITY DURING STORAGE OF POTATO TUBERS
(SOLANUM TUBEROSUM L. cv. BINTJE)

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The lipoxygenase pathway is a cascade of enzymatic reactions that catalyses the
transformation of fatty acids into a wide range of compounds involved in essential
physiological processes in plants. Lipase hydrolyses lipids furnishing free fatty acids
afterwards, lipoxygenase (E.C. 1.13.11.12) catalyses the addition of molecular oxygen on
polyunsaturated fatty acids containing a (Z)-1, (Z)-4-pentadiene structure, mainly linoleic
and linolenic acids in plants. Depending on botanical origin and on reaction conditions,
variable amounts of 13 and or 9-hydroperoxides of fatty acids are formed by lipoxygenase.
The hydroperoxides can be transformed enzymatically or not in a variety of molecules (e.g.
jasmonic acid, traumatic acid, green note aldehydes and alcohols, colheleic and colnelic
acids). The fatty acids hydroperoxides can also be reintegrated in the membranes
decreasing its flexibility. In potato tubers, the main lipoxygenase isoform is Lox-1 which
forms mainly 9-hydroperoxides. Lipoxygenase, a key enzyme in lipid peroxidation, has
been extensively studied but little is known about its implication during storage of potato
tubers. In our study, we particularly focussed on the determination of lipoxygenase activity
during storage of potato tubers (Solanum tuberosum L. cv. Bintje stored at 2 °C during 10
months). The presence of lipoxygenase was determined in two different ways: by
measuring m-RNA content (northern blot) and by determining lipoxygenase activity in
potato tuber extracts. The same potato samples were submitted to reducing sugars and fatty
acids profile determination to evaluate changes occasioned by the storage at low
temperature. Our experiments reveal that lipoxygenase activity clearly increases at the
beginning of storage (58 days after harvesting) and also after a long period of storage (249
days after harvesting). This last result is correlated with lox-1 m-RNA level for the end of
the storage period but not for the beginning. During the storage, reducing sugar
centration increases while double bound index decreases revealing membrane damages.