

The Interactions between Rapeseed Lipoxygenase and Native Polyphenolic Compounds in a Model System

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The seeds of rapeseed are a biological material in which various biochemical processes occur during post-harvest processing. Many of these processes are catalyzed by enzymes like lipoxygenase. The formation of hydroperoxides by lipoxygenase activity may reduce the quality of raw materials and foodstuffs. Natural antioxidants determine lipid stability in stored seeds and account for an adequate nutritive value of produced oils. Rapeseed is characterized by high content of phenolic compounds, their content is tenfold comparing to other oilseeds. Those phenolic compounds may modify the activity of lipoxygenase. The focus of the present investigation is to study inhibition of lipoxygenase activity by rapeseed native polyphenols and the interaction between those compounds and enzyme.

The enzyme and polyphenolic compounds (polyphenols, phenolic acids) were extracted from rapeseed (*Brassica napus*) varieties *Aviso* and *PR45DO3*. The total phenolic compounds concentration in tested rapeseed was 1.485–1.691 mg/100 g d.m. and the free phenolic acids content in both rapeseed varieties was about 76 µg/100 g d.m. The isolated proteins showed lipoxygenase activity. Prooxidant properties of phenolic compounds in the presence of lipoxygenase and linoleic acid were observed rather in the case of extracts containing a relatively high concentration of miscellaneous polyphenols. Antioxidant properties were recorded in the case of phenolic acid extracts which contain only 1.4–1.9% of phenolics present in raw phenolic extracts. We propose that the prooxidant effect of phenolic compounds comes from quinone and oxidized polyphenols formation. The observed antioxidant activity of phenolic acid extracts is probably due to their ability to scavenge free radicals formed from linoleic acid. However, reduction of lipoxygenase ferric to ferrous ions, which prevent the activation of the enzyme and inhibited its activity, was also observed.