



Hydroperoxide production from linoleic acid by heterologous *Gaeumannomyces graminis tritici* lipoxygenase: Optimization and scale-up

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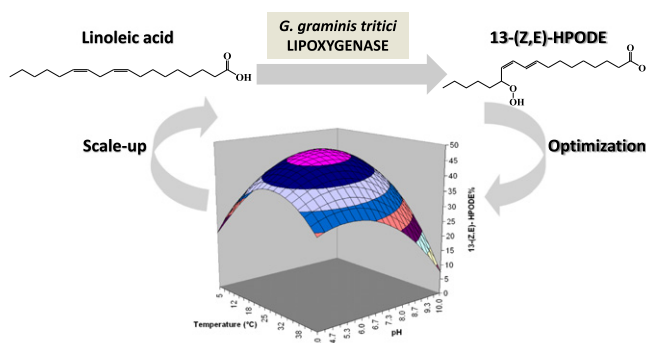
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HIGHLIGHTS

- ▶ Hydroperoxides were produced from linoleic acid by *Gaeumannomyces graminis* lipoxygenase.
- ▶ *Gaeumannomyces graminis* lipoxygenase was obtained recombinantly in *Trichoderma reesei*.
- ▶ Yield and regioselectivity were optimized using 10 g/L linoleic acid.
- ▶ The process was investigated at industrially relevant substrate concentrations.
- ▶ At 300 g/L linoleic acid, the yield was 40% and the volumetric productivity 3.6 g/(L h).

GRAPHICAL ABSTRACT



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ABSTRACT

Linoleic acid was converted into hydroperoxides by a *Gaeumannomyces graminis tritici* lipoxygenase produced recombinantly in *Trichoderma reesei*. Hydroperoxide production was optimized using a face-centred experimental design in order to study the effects of pH, temperature and time on the conversion of linoleic acid into four regioisomeric hydroperoxyoctadecadienoic acids (HPODE): 13-(Z,E)-, 9-(E,Z)-, 13-(E,E)-, 9-(E,E)-HPODE. Fitting equations described satisfactorily the system behavior and showed that reaction time was the most influencing independent variable. A set of independent variables (pH = 6.7, temperature = 23.9 °C and time = 18 h) allowed to obtain high yields of hydroperoxides (88.0%) with a good selectivity for the 13-(Z,E)-HPODE isomer (47.4%) when the initial substrate concentration was 10 g/L. The production was further investigated using industrially relevant linoleic acid concentrations (100–300 g/L) leading to HPODE yields of ~40% and the volumetric productivity 3.6 g/(L h), and a selectivity for 13-(Z,E)-HPODE of around 74%.

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1. Introduction

Plant oils containing fatty acids and their glycerides are valuable and abundant renewable raw materials. In 2006, 127 million