

Epoxidation of oleic acid catalyzed by enzyme- a developing model for soy oil modification

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Oxyfunctionalization is greatly important for a variety of industries once the products formed serve as valuable intermediates for many synthetic routes. Epoxides offer a variety of opportunities for subsequently transformations, for example, formation of diols. The transformation of unsaturated oils like soy oil for production of diols can represent a large interest for bioplastic industries, being that the focus of the present study. The aim of the current work is the epoxidation reaction of the oleic acid catalyzed by enzyme. The next step will contemplate the using of the referred reactional model for epoxidation of the unsaturated fatty acids of the soy oil, more precisely the oleic and linoleic acids. For this first step it was selected the enzyme PSC Amano but it will be further analyzed the catalyst activity of the commercial enzymes Novozyme 435 and AY Amano as well. For the experiments there were used 10% of the enzyme PSC Amano, 2mmols of the oleic acid (MP Biomedicals) and 0,2mL of the hydrogen peroxide (H_2O_2). The reactions were performed at 25°C, 150rpm, 3 hours and by using 5mL of ethyl acetate as solvent system. These conditions were based on previous studies developed by our research group for epoxidation experiments. It was also considered the presence or absence of another acid in the reactional medium, the acetic acid, at 4mmols. The reactional products were analyzed by gas chromatography coupled to mass spectroscopic (GC-MS). The chromatographic analysis showed that, in the absence of acetic acid, the oleic acid had a conversion rate of around 42% into its epoxide. In the presence of the acid it was not observed any conversion rate. Preliminary results with the soy oil as substrate conferred around 10% of conversion using PSC amino as biocatalyst. Therefore, the reactional conditions will be rigorously analyzed in the next step of the work aiming higher conversion taxes. Experiments using the enzymes Novozyme 435 and AY Amano as biocatalyst for soy oil epoxidation did not course to the development of the lead product (both in absence and presence of acetic acid).

