BIOCATALYSTS | BRAIN Biotech Group

Oil & Fat Modification

Superior Efficiency and Purity: Unlocking the Benefits of Plant Oil Hydrolysis with Lipomod® 70MDP

The Value of Oil Hydrolysis

Plant-derived oils are composed primarily of triacylglycerides (TAGs), which consist of three fatty acid chains esterified to a glycerol backbone. Fatty acids are organic compounds composed of a hydrocarbon chain with a carboxyl group at one end. The fatty acid chains can vary in length and degree of saturation. Due to their versatility and functionality, they are the fundamental building blocks in the food, cosmetic and oleochemical industry.

Oil hydrolysis is essential for the efficient production of downstream oleochemicals and involves breaking down the triglyceride structure into glycerol and free fatty acids. These valuable free fatty acids can then be extracted and utilised in a wide range of products with applications in nutrition, cosmetics, detergents and pharmaceuticals. The process of liberating fatty acids from the glycerol backbone presents a valuable side stream in the separation and recovery of glycerol. Glycerol serves as a key raw material for producing a variety of chemicals valuable in the manufacture of resins, plastics and other industrial products.

Achieving Optimal Oil Hydrolysis

Optimised oil hydrolysis requires the precise combination of lipase with the desired positional and fatty acid specificity, and optimal pH and temperature conditions for the enzyme and oil substrate.

The success of oil hydrolysis can be measured by the free fatty acid (FFA) content. The greater the FFA content the more the triglyceride structure in the oil has been broken down. Figure 1 demonstrates superior hydrolysis of different plant-derived oils using Lipomod® 70MDP compared to a commercially available lipase for oil hydrolysis.

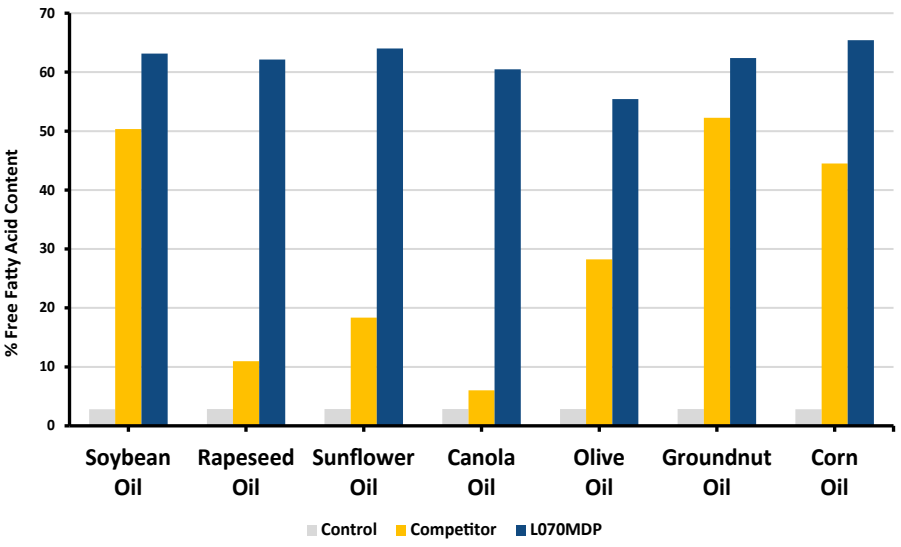

Figure 1 – Free Fatty Acid content of different plant oils with (i) control with no enzyme, and following hydrolysis for 16 hours at 40°C with an oil to water ratio of 2:1, with a dosage of 0.01% of (ii) commercially available competitor lipase for fat splitting, and (iii) Lipomod® 70MDP.

Impact of Oil Composition

Fatty acids are the building blocks of triglycerides and can be classified into three categories: (i) saturated fatty acids (Lauric acid C12.0 and Palmitic acid C16.0), (ii) mono-unsaturated fatty acids (Oleic acid C18.1), and (iii) poly-unsaturated fatty acids (Linoleic acid C18.2 and Linoleic acid C18.3). Plant oils are characterised by unique compositions of different fatty acids. Lipomod® 70MDP was developed with a precise combination of lipase activity with the aim of being effective in achieving high levels of hydrolysis in a broad range of edible plant oils with varying fatty acid compositions. Achieving greater levels of hydrolysis of triglycerides results in a higher percentage of free fatty acids and maximising the glycerol recovery for use as a valuable raw material in the food, personal care and oleochemical industry.

Enhanced Hydrolysis of Plant Oils using Lipomod® 70MDP

Lipolysis, or the hydrolysis of triglycerides, starts with substrate binding where the lipase binds to the triglyceride substrate. In a small scale oil hydrolysis, one part of water containing Lipomod® 70MDP required for a dosage of 0.01 - 0.05% w/w oil is added to two parts of oil. For the hydrolysis stage this mixture can then be incubated for 7-20 hours at 40 - 45°C with continuous stirring. During this stage, ester bonds are hydrolysed sequentially converting the triglyceride molecule into diglycerides, monoglycerides, and glycerol facilitating the production of free fatty acids. Thermal heating of the water, enzyme and oil solution to 80°C for 20 minutes will denature Lipomod® 70MDP. Once the hydrolysis stage has finished and the enzyme has been deactivated the solution goes through a separation phase to recover the valuable free fatty acids and glycerol to complete the process.

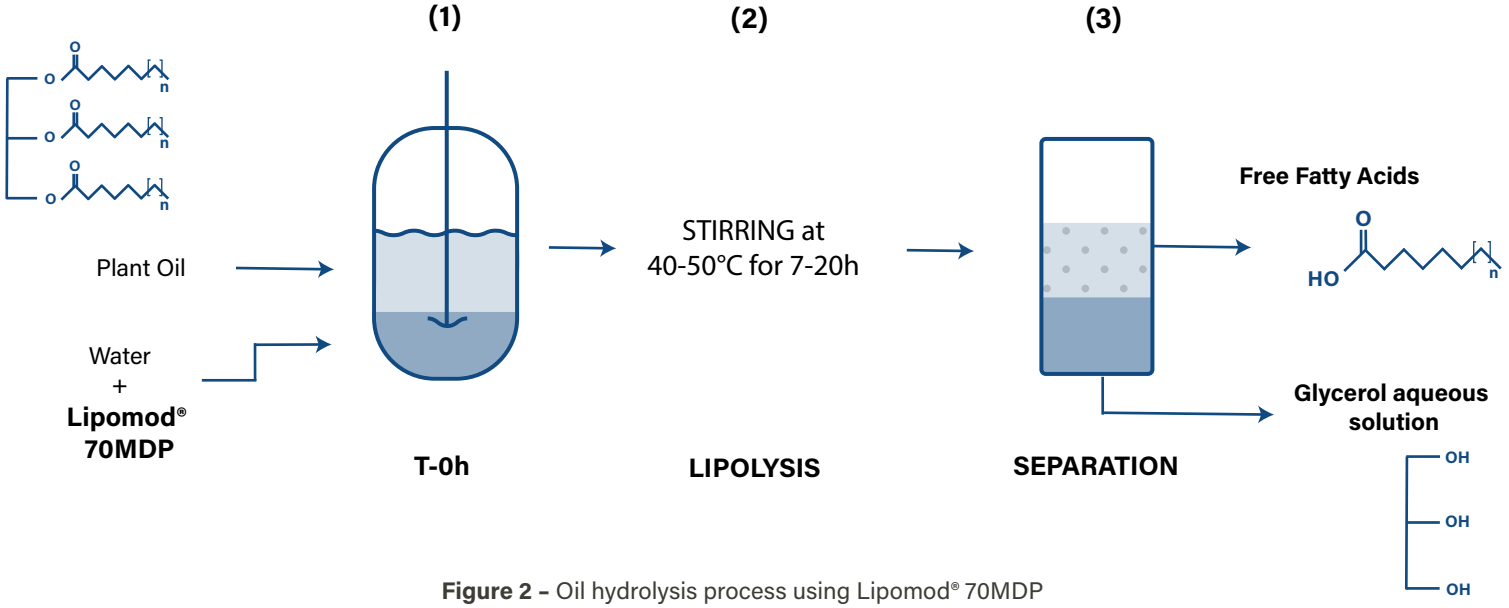

Figure 2 – Oil hydrolysis process using Lipomod® 70MDP

Lipomod®: Transforming Oils and Fats

The utilisation of lipases for modifying fats and oils presents a highly efficient and environmentally friendly alternative to traditional chemical methods. Lipases offer unique specificities allowing for precise modifications of fats and oils tailored to desired end products. Explore our Lipomod® product range and how lipase-catalysed modifications can pave the way for new and innovative applications in food, pharmaceuticals and industrial bioproducts.

Your Vision, Our Expertise: Partnering for optimal solutions

Not using one of the vegetable oils mentioned in our previous trials with Lipomod® 70MDP? Can't see results relevant for your oil hydrolysis process? No problem! Reach out to our team of experts and let us work with you in identifying an optimal solution for you. We offer a comprehensive technical application service to test our enzymes in your specific substrates. Our goal is to help you achieve optimal performance, efficiency and quality in your products to deliver your vision.