Gamma-linolenic Fatty Acid Concentration using Lipases: Hydrolysis and Esterification Process Comparison

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Gamma-linolenic acid (GLA) is an important precursor of molecules with anti-trombotic and anti-inflammatories properties. Due to this fact the GLA is applied in several clinical treatments. However, GLA amount required for good medical results is elevated reason why a concentration of the same one is interesting.

The fatty acids concentration by enzymatic techniques is an alternative to conventional processes. This allows smooth's conditions of work, diminishing the risk of spoil the fatty acid (GLA is a poly-unsaturated fatty and it is highly susceptible to oxidation).

To produce an enzymatic esterification is required a previous hydrolysis of the oil tri-glycerides. The hydrolysis can be done by chemical or enzymatic process. The enzymatic hydrolysis has the advantage of do not have secondary reactions and undesired products. Also, the lipases that produce the hydrolysis could be specific or not, promoting a total hydrolysis of fatty acids from the tri-glyceride or the selective GLA retention in the acyglicerides.

The aim of this work is determine the effectiveness to obtain a concentrate of GLA in acylglyceride phase by a selective hydrolytic process of borage oil using Lipolyve CC lipase in comparison to a total hydrolysis of the oil using the same enzyme (Lipolyve CC) with a subsequent selective esterification of fatty acids leaving the GLA in free fatty acid phase.

When the enzymatic hydrolysis of borage oil was done using Lipolyve CC (%) during 16 hours a 92% of free fatty acids is obtained with about of 22% of GLA, which are the raw material of enzymatic esterification. The esterification was carried out by Lipolase 100 T enzyme, 37°C, n-buthanol as acyl-donor, obtaining a 44.6% of GLA in the free fatty acid phase at 6 hours of process. While that hydrolysis with Lipolyve CC done during 3 hours, 1% of enzyme-sustrate ratio, the GLA concentration on acylglyceride phase was about 43.5%, which is corresponding to a more than 70% of original GLA.

In conclusion, it is possible to obtain a GLA concentrate by both processes. The esterification is a long and more expensive process in comparison to hydrolysis, but this allows obtaining a great amount of GLA available for lipid formulation.