IMPROVEMENTS IN & RELATING TO FATS

This invention relates to improved fats and their preparation by transesterification under the influence of a lipase enzyme catalyst. The invention also relates to improved fats made by such processes and confectionery compositions particularly chocolate containing such fats.

In our British patent specification No. 1577933 a method is described for improving fats for confectionery purposes, by enhancing the amount of symmetrical and especially disaturated, C_{16}/C_{18} triglycerides in the fat. These triglycerides are largely responsible for the highly prized characteristics of cocoa butter and other vegetable butters used in chocolate and other confectionery. In the process described the fat undergoes transesterification under the influence of a lipase enzyme catalyst which is preferably 1,3-selective in its effect, when only the alpha or 1- and 3- fatty acid residues in the glycerides of the fat participate in the reaction. Free saturated fatty acid present for example stearic acid, participates in the reaction to replace fatty acid residues in the glycerides in the feedstock in the positions in which the

catalyst is active, and free unsaturated fatty acids are liberated from these positions. Enzyme rearrangements are equilibrium reactions and a proportion of free fatty acids, both saturated and unsaturated, is inevitably found in the reaction product. The rearranged product may be fractionated into stearin and olein fractions of higher and lower melting points.

The present invention provides an improvement in processes for the rearrangement of a glyceride composition feedstock in the presence of active lipase enzyme as rearrangement catalyst, according to which a stearine fraction is removed from the rearranged product by fractional crystallisation, preferably from a solution in a non-polar organic solvent and is recycled to the feedstock, and symmetrical triglyceride product is recovered from the olein residue of the fractionation, where necessary by removal of solvent.

Enzyme rearrangement processes carried out to recover products with high amounts of symmetrical disaturated triglycerides closely resembling the composition of cocoa butter, for use as cocoa butter substitute fats, are usually applied to feedstock containing saturated free fatty acid - usually stearic acid - or saturated glycerides. In accordance with the invention the unreacted balance of these saturated reactants may be recovered from the product and recycled to the feedstock, thereby improving the economy of the process.

The invention is especially suitable for enzyme rearrangement processes for the preparation of fat closely resembling cocoa butter, with a high proportion of symmetrical disaturated triglycerides of C_{16} and C_{18} glycerides, which are suitable for use as cocoa butter or

replacement fats. Suitable feedstock for such reactions comprises a mixture of palm oil or its fractions, with stearic acid. It is surprising that stearic acid may be recovered from the product of such reactions, in a high state of purity substantially free from glycerides and in particular, substantially free from palmitic acid and suitable for recirculation to the feedstock.

Preferably the fractionation is carried out in two stages with the recovery of stearin fractions, the first consisting of free saturated fatty acid substantially free from glycerides and the second fraction comprising much of any remaining free saturated fatty acid, together with saturated triglycerides and partial glycerides. In reactions in which saturated glycerides are used as part of the feedstock, these are recirculated.

The olein remaining consists largely of unsaturated acids and glycerides and is preferably refractionated from a polar solvent to recover triglycerides substantially free from unsaturated partial glycerides remaining in the solution and more highly unsaturated triglycerides. The stearin fraction recovered from rearrangement processes using 1, 3-regiospecific enzyme catalysts of vegetable oils and fats, particularly in reactions with saturated fatty acid and/or saturated glycerides, is rich in symmetrical disaturated triglycerides and substantially free from partial glycerides as well as saturated triglycerides and unsaturated glycerides.

Preferably the process of the present invention is carried out on a solution in a non-polar solvent in which the glyceride composition is rearranged, the fractional crystallisation step of the invention being carried out

directly from the solution of the product mass in the solvent. The fractionation may also however be carried out on the product of a solvent-free rearrangement process, by dissolving the product mass in a suitable non-polar solvent. The glyceride composition may consist of a fat or its fractionated and/or hydrogenated derivatives, mixtures of such and free fatty acids and/or partial glycerides may also be present in the feedstock; glyceride oils and synthetic glycerides may be used as feedstock.

An important feature of the present invention is that the product of glycerides may be recovered substantially free not only from the fatty acids removed from the rearranged product in the stearin fraction, but also from partial glycerides, by removing saturated partial glycerides similarly, and unsaturated partial glycerides in a final fractionation stage, as an olein fraction separated from the desired glyceride product.

By this means partial glycerides are removed without recourse to selective absorption methods. This feature is particularly important in relation to the preparation of cocoa-butter-like fats by enzyme rearrangement using 1, 3-regiospecific enzymes, to obtain glyceride products rich in symmetrical

disaturated triglycerides of C_{16} and C_{18} fatty acids. The presence of even small amounts of partial glycerides adversely affects the melting characteristics of these products.

Hexane or other hydrocarbons are preferred as the non-polar solvent, particularly aliphatic hydrocarbons containing 5 to 10 carbon atoms, preferably remaining liquid at atmospheric pressure between 0° and 120°C. Preferably as polar solvent acetone is used to which a small amount of water (1-10% by weight) is added to improve solvent action. Other ketones of food quality may be used, or the polar solvent may comprise nitroparaffins or liquid carbon dioxide.

It should be understood that stearic acid, or longer chain saturated fatty acids eg. arachidic or behenic acid may be used in the process of the present invention. Fatty acids may also be used in the form of alkyl esters.

A wide variety of fats and glyceride oils from natural sources may be used as feedstock in the invention. The invention is particularly applicable to the preparation of hard butters for confectionery from vegetable oils and butters. These are rich in 2-unsaturated triglycerides from which by reaction with palmitic and stearic acid there may be obtained products which are symmetrical disaturated C_{16} and C_{18} fatty acid triglycerides. These confer excellent melting characteristics on the product, similar to those of cocoa butter itself. Suitable vegetable oils include olive, and palm oils. The process of the invention is particularly suitable for the preparation of SOS/POS mixtures from such sources, by reaction with stearic acid.

(13)

Suitable catalysts for use in the invention include M miehi, A. niger, R. japonicus, R.arrhizus and R. niveus. The catalyst is preferably used as described in our British patent 1577933 in active form obtained by wetting the commercially available dried form of catalyst, sufficient water being maintained in the liquid reactant phase to maintain water activity at a level at which the catalyst is active but effects minimum hydrolysis reaction. The catalyst is preferably fixed on a suitable support material e.g. inert inorganic particulate matter for example Celite (Registered Trade Mark), kieselguhr or macroreticular ion exchange resin. The reaction may be carried out batchwise or in a continuous mode, when the catalyst is preferably kept in a bed through which the reactants in liquid phase, whether or not in solution in added solvent, are passed.

CLAIMS

1. Process for the preparation of symmetrical triglycerides comprising rearranging a glyceride composition in the presence of active lipase enzyme as rearrangement catalyst, separating the rearranged product by fractional crystallisation into stearin and olein upper- and lower- melting fractions, recycling the stearin fraction for further rearrangement and recovering symmetrical triglyceride product from the olein fraction.

2. Process according to claim 1 wherein the rearranged product is fractionated in two stages to ~~separate~~ recover a first stearin fraction comprising free saturated fatty acid substantially free from glycerides ~~which is recycled~~ and ~~saturated glycerides as~~ a second ~~crop.~~ stearin fraction comprising saturated glycerides.

3. Process according to claim 1 or 2 wherein the rearranged product is separated into stearin and olein fractions by fractionally crystallising the product mass from solution in a non-polar solvent.

4. Process according to any of the preceding claims wherein the olein remaining after fractionation is refractionated from a polar solvent to recover triglycerides ~~in a stearin fraction~~ substantially free from unsaturated partial glycerides and more highly unsaturated triglycerides.

5. Process according to any of the preceding claims 1 to 4 wherein the glyceride composition undergoing rearrangement comprises vegetable oil and stearic acid.

6. Process according to any of the preceding claims wherein the catalyst is 1, 3-selective in action and is fixed on a suitable support material.

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7. Process according to claim 3 wherein the glyceride composition is rearranged in solution in a non-polar solvent from which the rearranged product is fractionated.

5

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