This invention relates to a process of bleaching glycerides and more particularly to a bleaching process that produces glycerides with improved color properties that are retained over relatively long periods of time. The process is especially adapted for the treatment of monoglycerides.

It is desirable, and in some instances essential, that fatty glycerides be light in color so that products made therefrom, such as soaps, shortenings, partial glyceride esters, etc. will in turn have as little color as possible.

Producers of soaps, edible fats products, etc. must, in the absence of other provisions, use relatively high grade stocks to provide light colored products, or if they use low grade stocks which are usually very dark in color, they must employ a bleaching process to remove the discoloration. The latter alternative is usually that which is employed. The demand for glycerides is generally so high and the competition for high grade stocks so keen that the producer frequently must resort to the more plentiful and less expensive low grade stocks and depend rather on the efficiency of his bleaching operation to produce a light colored product.

The present invention relates to such a bleaching process. More particularly it relates to a process of bleaching glycerides and other higher fatty acid esters by heating them with a suitable bleaching agent of the oxidizing type and then stabilizing the resultant bleached glycerides with a suitable reducing agent. The invention particularly relates to such a process as applied to monoglycerides.

It has already been proposed to bleach triglyceride esters with oxidizing agents and it has also been proposed to remove color from vegetable oils by using reducing agents.

The difficulties with the bleaching processes of the prior art have been that the glycerides are only temporarily bleached thereby. After they have been permitted to stand for a period of time they revert to substantially their original state of discoloration, especially when in the liquid phase. It is, accordingly, an object of this invention to provide a decolorization process for glycerides, and particularly for monoglycerides, that results in very stable glyceride esters which even after prolonged periods of storage reveal little, if any, reversion to their original discoloration.

Surprisingly, it has been discovered that it is possible to produce a color-stabilized glyceride ester product, and especially a color-stabilized monoglyceride ester product by first bleaching with a suitable bleaching agent of the oxidizing type followed by treating the bleached esters with a suitable reducing agent.

In order to indicate still more fully the nature of the present invention, the following examples of typical procedure are set forth with the understanding that this is by way of illustrating only, and not by way of limiting the scope of the invention.

Lard monoglycerides that had been carbon-bleached to a color of 10 in a Lovibond 5/4° cell, and which could not by this treatment be further bleached were intimately contacted at 75°-80° C. with 2% by weight of a solution of hydrogen peroxide of the standard commercial 30% H₂O₂ concentration for 20 minutes to give a product of 2.0 red color. The lard monoglycerides, after this treatment with hydrogen peroxide followed by heating to drive off the excess peroxide, exhibited no stability even with the known, normally excellent oxidation inhibitors, such as propyl gallate, in the well-known Swift stability test.

However, these same hydrogen peroxide-bleached lard monoglyceride esters, when subsequently treated with sodium bisulfite in the form of a saturated water solution thereof, the treatment taking place shortly after the bleaching step and before any appreciable color had been redeveloped in the bleached esters, for the purpose of removing the excess hydrogen peroxide and decomposing the color forming bodies, had a stability of 80 hours which is more than five times the stability normally required. The temperature of the stabilizing treatment is preferably about 75°-80° C. Preferably, sufficient sodium bisulfite or other reducing agent is employed to insure the presence of at least a molecular equivalent thereof with respect to the hydrogen peroxide initially employed for the bleaching operation.

In another experiment, coco monoglycerides having an original Lovibond color of 3.5 red were intimately contacted with 0.25% by weight of a 30% H₂O₂ solution to give a bleached monoglyceride product having a color of 1.5 red. Although the color of this bleached product was good, color reversion began after a relatively short time so that the effect of the bleaching operation eventually was rendered nugatory. However, upon treating another sample of freshly bleached product with an aqueous solution of sodium bisulfite in amount slightly in molecular excess relative to the H₂O₂ employed in the bleaching operation, a stabilized bleached monoglyceride ester product was obtained that retained its low
color from 5 to 8 times as long as in the absence of the bisulfite treatment. Other bleached esters were similarly prepared. The amount of hydrogen peroxide required varied with the color of the ester after the preliminary carbon or other bleach, as well as with the color required in the final product. The fatty esters that may be treated by the process of the present invention include the natural fatty acid esters, such as fats or fatty oils suitable for employment in the soap-making or edible-fats industries, or any other fatty acid esters, whether of a polyhydric alcohol, such as glycerol or the glycols, or of a monohydric alcohol, or mixtures of such esters. Of especial importance are esters of fatty acids of about 8 to 26, and preferably about 12 to 28, carbon atoms per molecule of fatty acid. Such fatty esters include coconut oil, palm oil, olive oil, cottonseed oil, corn oil, soya bean oil, tung oil, wool fat, tallow, whale and fish oils, etc., as well as the alkyl esters of the fatty acids corresponding to these oils, such as the methyl and ethyl esters. However, the invention is especially desirable in connection with the production of color-stabilized monoglyceride esters of high molecular weight fatty acids of the type indicated above.

All of the foregoing esters are relatively unstable and begin to revert to their original color only a relatively short while after the hydrogen peroxide treatment depending upon such factors as temperature, degree of aeration, etc., but when they are further treated with a suitable reducing agent such as sodium bisulfite to deactivate or remove the color-forming tendency of the bleached esters, they then remain stable as regards color for periods of time far in excess of normal in the absence of the stabilizing treatment described herein.

Generally speaking, the degree of improvement ranges from a factor of at least five to as high as ten to fifteen, in terms of the increase in time before redevloplment of color occurs.

What has been described above is the preferred embodiment of the invention, using sodium bisulfite as the reducing agent and hydrogen peroxide as the oxidizing agent, and showing the effect of treatment with these reagents on monoglycerides. Other suitable sulfur-containing inorganic reducing agents may be used such as potassium bisulfite, sodium or potassium sulfite, sulfur dioxide, sodium or potassium hydrogensulfite, etc., care being taken when using reducing agents other than the alkali metal bisulfites to insure that acid conditions are present so as to avoid soap formation. However, the bisulfites are generally preferred, particularly where the final treated products are to be used in edible compositions.

Other oxidizing agents may be used such as alkali metal chlorates and perchlorates, chlorine oxides such as the monoxide and dioxide, acetyl peroxide, benzoyl peroxide, etc. When using certain of these last-mentioned oxidizing agents it may be found necessary or desirable to wash the thus-bleached esters to remove degradation products of these oxidizing agents, in which case the alkali metal bisulfite or other reducing agent may be conveniently added to the washing solution to bring about the desired stabilizing action according to the present invention.

Both the step of treating the esters with the oxidizing agent and the step of treating them with the reducing agent may be carried out under a wide variety of conditions. Somewhat elevated temperatures are preferably, but not necessarily, employed. The esters while undergoing treatment are preferably subjected to efficient agitation in order to bring about effective contact between the respective phases.

While specific examples of preferred methods embodying the present invention have been set forth above, it will be apparent that many changes and modifications may be made in the methods of procedure without departing from the spirit of the invention. It will therefore be understood that the examples cited and the particular proportions and methods of operation set forth above are intended to be illustrative only, and are not intended to limit the scope of the invention.

What is claimed is:

1. A process for bleaching fatty acid esters that comprises contacting said esters with an oxidizing agent to bleach said esters and treating the bleached esters before any substantial discoloration thereof with a sulfur-containing inorganic reducing agent to remove any excess oxidizing agent and to deactivate any color-forming bodies.

2. A process for bleaching fatty acid esters that comprises contacting said esters with an oxidizing agent selected from the group consisting of hydrogen peroxide, alkali metal chlorates, alkali metal perchlorates, chlorine monoxide, chlorine dioxide, acetyl peroxide, and benzoyl peroxide for a sufficient time to bleach said esters and treating the bleached esters before any substantial discoloration thereof with a sulfur-containing inorganic reducing agent selected from the group consisting of sodium bisulfite, potassium bisulfite, sodium sulfite, potassium sulfite, sulfur dioxide, sodium hydrogensulfite, and potassium hydrogensulfite to remove any excess oxidizing agent and to decompose any color-forming bodies.

3. A process for bleaching fatty acid esters that comprises contacting said esters with hydrogen peroxide to bleach said esters and treating the bleached esters before any substantial discoloration thereof with sodium bisulfite to remove any excess hydrogen peroxide and to decompose any color-forming bodies.

4. A process for bleaching higher fatty acid monoglyceride esters that comprises contacting said esters with hydrogen peroxide to bleach said esters and treating the bleached esters before any substantial discoloration thereof with sufficient sodium bisulfite to insure at least a molecular equivalent thereof with respect to the hydrogen peroxide initially introduced to remove any excess hydrogen peroxide and to deactivate any color-forming bodies, thereby minimizing any tendency to color reversion.

5. A process as in claim 4, in which the higher fatty acid glyceride is lard monoglyceride.

6. A process as in claim 4, in which the higher fatty acid glyceride is coconut monoglyceride.

7. A process for bleaching higher fatty acid monoglyceride esters that comprises contacting said esters with hydrogen peroxide to bleach said esters and treating the bleached esters before any substantial discoloration thereof with an aqueous solution of sodium bisulfite to remove any excess hydrogen peroxide and to decompose any color-forming bodies, thereby minimizing any tendency to color reversion.

8. A process as in claim 7, in which the higher fatty acid glyceride is lard monoglyceride.

9. A process as in claim 7, in which the higher fatty acid glyceride is coconut monoglyceride.

10. A process for bleaching higher fatty acid monoglyceride esters that comprises contacting
said esters with hydrogen peroxide to bleach said esters and treating the bleached esters before any substantial discoloration thereof with sodium bisulfite to remove any excess hydrogen peroxide and to decompose any color-forming bodies, thereby minimizing any tendency to color reversal.

11. A process as in claim 10, in which the higher fatty acid glyceride is lard monoglyceride.

12. A process as in claim 10, in which the higher fatty acid glyceride is coconut monoglyceride.