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ADELBERT WILLIAM HARVEY, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO E. R. SQUIBB & SONS, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

METHOD OF REFINING CASTOR OIL.

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To all whom it may concern:

Be it known that I, ADELBERT WILLIAM HARVEY, a citizen of the United States, residing at Pittsburgh, in the county of Allegheny, State of Pennsylvania, have invented certain new and useful Improvements in Methods of Refining Castor Oil; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to the refining of castor oil for the purpose of removing free fatty acids and other impurities therefrom whereby the taste and odor of the oil are greatly improved and it is otherwise rendered more suitable for medicinal and other purposes.

The treatment of castor oil with sodium hydroxide and with subsequent removal of the soaps from the oil has been suggested heretofore. The soaps are quite soluble in the oil and it has been proposed therefore to wash the oil with water to ensure separation of the impurities. The process of refining with sodium hydroxide and with subsequent washing has not been entirely successful, and does not produce a refined oil of the highest quality unless the process is carefully conducted and the washing is extended.

It is the object of the present invention to provide an improved process of refining castor oil which may be conducted with facility and with assurance that the impurities present in the oil and particularly fatty acids will be separated therefrom.

As the result of extended research I have discovered that the refining of castor oil may be more readily accomplished with potassium hydroxide than with sodium hydroxide, as heretofore suggested. Sodium hydroxide forms hard soaps with the fatty acids, whereas potassium hydroxide forms soft soaps therewith. The potassium soaps settle more readily from the oil and water mixtures, and are more easily washed therefrom. The use of potassium hydroxide greatly facilitates the refining operation and permits the removal of the soaps more rapidly than is otherwise possible.

I have further discovered that it is advantageous to employ soft water in washing the potassium soaps from the oil. The presence of alkaline-earth compounds in hard water employed for washing, results in the production of alkaline-earth soaps, which are so soluble in the oil that even extended washing does not result in successful removal. By the use of soft water the introduction of these alkaline-earth compounds is avoided. The soft water used may be distilled water or water softened completely by a suitable method. Thus the water may be softened by the addition of those sodium compounds which precipitate the alkaline-earth compounds from the water. The presence of a small amount of sodium salts in the water is not detrimental and the use of an excess thereof in removing the alkaline-earth compounds does not necessitate a further treatment of the water before it is used for washing.

The oil should be treated with a quantity of potassium hydroxide equivalent to or in slight excess of the amount equivalent to the fatty acids present. The proper amount of potassium hydroxide may be readily determined by analysis. The potassium hydroxide may be added in relatively concentrated form, in which case the proportion of potassium hydroxide should be carefully limited so that no considerable excess is present. Alternatively, the potassium hydroxide may be utilized in dilute solution, and in this case a decided excess of potassium hydroxide may be employed since the dilute solution of potassium hydroxide is not likely to saponify the oil as the more concentrated solution would, particularly if the temperature was materially raised. If the concentrated potassium hydroxide is used, it is preferable to conduct the process as a batch operation since the proportions of oil and potassium hydroxide must be carefully regulated. With a dilute solution of potassium hydroxide it is possible to carry on the operation continuously, the oil and potassium hydroxide mixture being treated in suitable apparatus which ensures the intimate contact of the solution with the oil. This thorough contact is an important feature in the successful operation, and in batch operations the concentrated potassium hydroxide solution must be added slowly with agitation to ensure intimate contact of the solution with all the oil.

In carrying out the invention according

to the preferred mode of operation, a sample of the oil is first analyzed to determine the fatty acid content. The oil in a suitable container, and preferably at atmospheric temperature is then treated with a measured quantity of 10 to 20 per cent potassium hydroxide solution, the amount of potassium hydroxide in the solution being equivalent to or in slight excess of the amount equivalent to the free fatty acids in the oil. The oil is stirred vigorously for 15 to 30 minutes while cold and the potassium hydroxide solution is added slowly during this period. When a thorough mixture has been obtained, the temperature is slowly raised to approximately 80 to 82° C., the maximum temperature being substantially 85° C. This temperature is maintained for about 15 minutes, when the combination of the alkali with the fatty acids will have been effected.

A considerable proportion of the soaps is soluble in the oil and must be removed therefrom by washing. The washing is accomplished with a volume of water which is four or more times the volume of oil, the water being added in small portions and being brought into intimate contact with the oil and soap mixture in any suitable manner. A counter-current washing apparatus may be employed for this purpose, and the apparatus may consist of one or more units through which the oil and water pass in opposite directions so that the oil is treated near the end of the washing operation with fresh water. Agitation followed by centrifuging is another procedure which may be used. The water used should be substantially free from alkaline-earth compounds to avoid the introduction of alkaline-earth soaps, which cannot be successfully removed from the oil. Distilled water or softened water may be used for this purpose, as hereinbefore stated.

At the completion of the washing operation, the oil is practically free from soaps but still contains some water which may be removed by blowing air or an inert gas through the oil while the latter is maintained at an elevated temperature, e. g., 80 to 82° C., or by drying the oil in a vacuum drier at corresponding temperatures.

If a continuous operation is desired it is preferable to employ a dilute solution of 1 to 3 per cent potassium hydroxide and utilize a considerable excess of this solution, based on the required potassium hydroxide to neutralize the fatty acids. The operation may be conducted in a suitable apparatus in which the oil is introduced at the bottom and flows upwardly through the dilute potassium hydroxide solution, the oil being in a relatively finely divided state so as to ensure contact of all the oil particles with the solution. The oil separates at the top after passing through the solution and may be withdrawn and thereafter subjected to the action of another dilute solution of potassium hydroxide in a separate receptacle. The washing and drying of the oil are accomplished in the same manner and with the same precautions as hereinbefore set forth. Where a dilute solution of potassium hydroxide is employed, the concentrations should be regulated to a minimum which will permit good purification, as higher concentrations in excess may produce an undesirable yellow color in the finished oil.

As a result of the operations as described, I am enabled to rapidly remove the free fatty acids, particularly ricinoleic acid, which, together with other impurities, give castor oil its disagreeable taste and odor. Consequently the taste and odor of the oil are greatly improved by the treatment described, and the resulting product is of high quality and will remain in good condition for substantially indefinite periods.

Various changes may be made in the details of the method without departing from the invention or sacrificing any of the advantages thereof.

I claim:

1. The process of refining castor oil, which comprises neutralizing the free fatty acids therein with a 10–20 per cent solution of potassium hydroxide, and washing the soaps from the oil.

2. The process of refining castor oil, which comprises neutralizing the free fatty acids therein with a 10–20 per cent solution of potassium hydroxide, and washing the soaps from the oil with water which is substantially free from alkaline-earth compounds.

3. The process of refining castor oil, which comprises neutralizing the free fatty acids therein with a 1–3 per cent solution of potassium hydroxide, and washing the soaps from the oil.

In testimony whereof I affix my signature.

ADELBERT WILLIAM HARVEY.