Patented Feb. 13, 1934 1,947,200

# UNITED STATES PATENT OFFICE

1,947,200

## METHOD OF REDUCING OIL CONTENT OF SOYA

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No Drawing. Application June 15, 1932 Serial No. 617,474

12 Claims. (Cl. 99—11)

This invention relates to a method for reducing the oil content of soya, and more particularly to a method whereby oil may be extracted from soya without impairing enzymes and vitamines.

The invention further relates to the residual soya meal produced by practicing our improved method of extracting oil from soya.

One of the objects of the invention is to devise a method whereby a substantial proportion of the oil in soya may be extracted therefrom without impairing the vitamines and enzymes in the soya. A particular object of the invention is to extract oil from the soya without injury to the enzymatic factor which has the property of bleaching carotin.

Another object is to produce a soya meal product of low oil content, having the property of bleaching carotin when combined with carotin-containing substances such as unbleached or lightly bleached flour, in bread making.

Another object is to devise a method whereby the bulk of the oil in soya may be removed without the application of heat, heat being objectionable, among other reasons, because of the sensitiveness of the carotin bleaching enzyme to the influence of heat, and its unfavorable effect on the expressed oil.

Another object is to produce a carotin bleaching product from soya, which will not be subject to spoilage while in storage for prolonged periods of time, this object being attained by the removal of the bulk of the oil in soya by our improved method. The residual soya meal has the good keeping qualities of products stabilized by heat.

The oil extracted by subjecting soya to the treatment herein described is a true cold pressed oil, superior in quality to that extracted by other known methods. No moisture is expressed and the extracted oil is light in color and has no rancid flavor. It contains unimpaired vitamines, is free of albuminous and mucilaginous matter, and can be readily clarified by filtration. It is suitable for edible purposes and for making varnishes and paints.

One method of oil extraction known in the art includes the step of cooking crushed soya seeds to complete rupturing of the oil cells to render the oil more mobile and to coagulate the albumen to prevent its inclusion in the expressed oil. The result of this process is a hot-pressed oil which will "break" or deposit mucilage when heated to high temperatures. The residual meal has lost its carotin-bleaching strength, and is less digestible and less desirable for stock feed than uncooked meal.

Another method of oil extraction known in the art consists in drying soya beans until a moisture content of three percent is reached, crushing the beans to break the outer skin and oil cells, and pressing by an expeller to which the crushed seed is conveyed through a steam jacketed trough where it is heated to render the oil more mobile. This expeller method has advantages over that which includes the step of cooking the soya meal at high temperatures, but great care is required to keep the drying temperature and drying time, as well as the heating preliminary to pressing, within certain limits in order to avoid injury to the vitamines and enzymes, particularly the carotin-bleaching enzyme.

The disadvantages of these known methods are obviated by our improved method which is conducted at room temperatures and produces true cold pressed oil and residual soya meal having unimpaired nutritive qualities and carotin-bleaching properties. This method resulted from our discovery that at a certain optimum moisture content of soya meal of a certain granulation, a substantial portion of the oil may be expressed at ordinary temperatures.

Our method preferably comprises the following steps: (1) grinding of fresh, undried soya beans so that the resulting meal passes through at least a twenty mesh sieve and preferably a forty mesh sieve; (2) adjusting, if necessary, the moisture content of the meal to about 10 to 11%, by any suitable means, as for example, by spraying water into the meal while it is being agitated in a closed drum; (3) forming the mass into cakes suitable for pressing in any suitable press; (4) pressing in any suitable press by increasing the pressure gradually, preferably to 8000 pounds per square inch within ten minutes, until the oil commences to flow freely, keeping up the pressure for sixty minutes at room temperature (60° to 80° F.), and if necessary increasing the pressure to 16,000 pounds per square inch and maintaining the same at that level for another sixty minutes; and (5) crushing and grinding the pressed cakes and drying the same at temperatures below 50° C. (122° F.) preferably in vacuo.

It will, of course, be understood that if the moisture content of the ground soya material is above the optimum, the material should be dried at temperatures below 150° F., to adjust the moisture content to 10 to 11%.

To demonstrate the effect of the moisture content of the bean meal on the yield of oil, series of tests were conducted, using dried soya flour having 6.1% moisture, 23.8% oil, on a dry basis,

and granulated to pass about 83% through a sixty mesh sieve. Water was added to increase the moisture content and the process conducted as hereinbefore set forth. The yield from soya meal adjusted to a moisture content of about 10% reached a maximum of about 59% of the total oil content.

Decreases as well as increases in the moisture content produce considerably poorer yields of oil. Tests of soya material containing a moisture content of 6.1% and moisture contents higher than 25% gave negative results. When water was added to soya material and the moisture content increased to 8.4%, the total yield of oil produced was 31.2%, whereas when the moisture content was adjusted, by adding water, to a total of 11.8% moisture, the yield of oil was 53.5%. When the moisture content was adjusted to considerably more than the optimum of 10 to 11%, namely, to 22.5%, the yield of oil amounted to 31.6%.

Fresh undried beans, ground through a twenty mesh sieve, and having a moisture content of 10.7%, were used with success, producing a yield of 59.7% of oil.

The results of the process do not depend on the method of adjusting the moisture content. Meal prepared from fresh undried soya beans is well suited for the treatment, and in using such meal the oil flow starts when about 5000 to 6000 pounds pressure is reached, most of the oil obtainable having been expressed when the meal has been subjected to 8000 pounds pressure for thirty minutes.

The coarser the granulation of the soya material, the poorer is the yield of oil. The best results are obtained when the material is fine enough to pass at least a twenty mesh sieve. Any suitable pressure method may be used, such as a hydraulic press or an expeller.

Instead of adjusting the moisture content of the soya material by the addition of water, a solution of monocalcium phosphate in water may be employed. For example, to dried soya flour containing 6.1% of moisture was added water saturated with $CaH_4(PO_4)2$ at 75° F., at the rate of 5 cc. per 100 grams of the raw material. When subjected to pressure, a yield of 63% of the oil was obtained, most of the oil being pressed out within the first fifteen to twenty minutes of pressing at low pressure. Ordinary salt may be employed in place of phosphate or both monocalcium phosphate and salt may be used in the same or separate solutions.

Our copending application Serial Number 617,475 for "Method for extracting oil from soya" is primarily concerned with the oil produced from soya, which oil is cold pressed so as to be free of moisture, mucilaginous and albuminous matter, and is capable of being clarified.

We claim:—

1. The improvement in methods of treating soya which comprises adjusting the moisture content of ground soya meal to approximately 10%, preliminary to pressing the meal.

2. The method of treating soya, which comprises grinding soya beans, adjusting the moisture content to approximately 10%, and subjecting the soya material to pressure.

3. The method for reducing the oil content of soya without impairing vitamines and enzymes, which comprises grinding soya beans, adjusting the moisture content to approximately 10%, and subjecting the soya material to pressure of approximately 8000 pounds per square inch.

4. The method for reducing the oil content of soya without impairing vitamines and enzymes, which comprises grinding soya beans, adding a saturated solution of mono-calcium phosphate in water to increase the moisture content of the soya material to approximately 10%, and subjecting the material to pressure.

5. The method for reducing the oil content of soya without impairing vitamines and enzymes, which comprises grinding soya beans, adjusting the moisture content to approximately 10%, and subjecting the soya material to pressure at room temperatures.

6. The method for reducing the oil content of soya without impairing vitamines and enzymes, which comprises grinding soya beans to pass through a twenty mesh sieve, adjusting the moisture content to approximately 10%, and subjecting the soya material to pressure at room temperatures.

7. The method for reducing the oil content of soya without impairing vitamines and enzymes, which comprises grinding soya beans, adding a saturated solution of mono-calcium phospnate in water to increase the moisture content of the soya material to approximately 10%, and subjecting the material to pressure at room temperatures.

8. The method for reducing the oil content of soya without impairing vitamines and enzymes, which comprises grinding soya beans having a moisture content of approximately 10% to a meal, and subjecting the soya material to pressure.

9. The method for reducing the oil content of soya without impairing vitamines and enzymes, which comprises grinding soya beans having a moisture content of approximately 10% to a meal to pass through a twenty mesh sieve, and subjecting the soya material to pressure.

10. The method for reducing the oil content of soya without impairing vitamines and enzymes, which comprises grinding fresh soya beans having a moisture content of approximately 10% to a meal to pass through a twenty mesh sieve, and subjecting the ground meal to pressure at room temperatures.

11. The method for reducing the oil content of soya without impairing vitamines and enzymes, which comprises grinding soya beans, adjusting the moisture content to approximately 10%, subjecting the soya material to pressure, and drying the residual meal at temperatures below 150° F.

12. The method for reducing the oil content of soya without impairing vitamines and enzymes, which comprises grinding soya beans to pass through a twenty mesh sieve, adjusting the moisture content to approximately 10%, subjecting the soya material to pressure, and drying the residual meal at temperatures below 150° F.

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