

NEEM OIL AND ITS TREATMENT

FOR APPLICATION IN MAKING

WASHING SOAP. BY R.L. DATTA. *1952*



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**Neem Oil and its Treatment for
Application in Making Washing Soap**

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Neem Oil and its Treatment for Application in Making Washing Soap.

Margosa oil, commonly known as Neem oil, is the oil obtained from the seed of *Melia Azadirachta*. The latter is a large evergreen tree growing wild throughout the greater part of the Indian Peninsula, and frequently planted as a homestead or avenue tree as it is believed to purify the air. The fruit gives an oil of a yellowish brown colour which appears dark-brown in a thick layer, and has a disagreeable odour resembling that of garlic. Certain medicinal properties are attributed to the oil which has accordingly some application, only very small quantities being used as an antiseptic and anthelmintic. The natural yield of the seed per annum in India is a considerably large quantity, but the only demand for the oil being for medicinal purposes, and that, too being very small, by far the larger part of the annual yield of seed is never collected at all, and therefore goes to waste. The oil is made in small quantities in some parts of the United Provinces and elsewhere, and the same is stocked by the dealers in indigenous drugs, a nominal quantity only being used by a few soap-makers to make medicinal soaps possessing the odour of the original oil.

3. There is practically no export trade in this oil-seed. An enquiry was undertaken by the Imperial Institute, London, to explore the possibilities of the export trade in Margosa seed from India and Ceylon for the purpose of expressing the oil in European countries. At the instance of that body an examination of the seed and the oil was carried out by an English firm of soap-makers. The latter reported that the crude expressed fat furnished a soap of inferior brown colour. The firm also stated that the smell of garlic given off by the seed was almost intolerable when they were heated before being crushed, and would render it quite impossible to express the fat from these seeds on a large scale in any oil mill situated in a town. A further examination of the fat itself was made by the Imperial Institute to find out whether the odour could be removed by any simple process, but without success. In the opinion of the Imperial Institute, therefore, it seemed unlikely that a market could be found in Europe for Margosa seed or oil.

3. Circumstances peculiar to India appear to warrant a closer examination of the subject. The conditions under which the oil is expressed in India are totally different from those contemplated in the above report. The oil-pressing industry in this and other similar seeds in India is not commonly confined to a town but is spread over vast rural areas, being carried on as a home industry in villages scattered all over the country. Moreover, the oil is expressed in the ghani (country oil mill) which does not require any heating up of the seed. The disadvantages attaching to the expression of the oil in Europe are, therefore, entirely absent in India.

4. Several gentlemen interested in the oil industry of the United Provinces where, as already mentioned, Neem oil is made in small quantities, were anxious to know if the oil could, with suitable treatment, be used for the manufacture of the kind of odourless washing soap commonly used by the people in India. It was reported that a very

large quantity of the oil could be produced annually if only a demand arose from the soap-makers; and further, that the cost of production would, on present calculations, be not more than half of that of any other regular soap-stock.

5. The above circumstances clearly appeared - to justify an investigation of the oil in regard to its application in soap-making, specially on the consideration that the successful evolution of a method whereby the objectionable features of the oil would be so removed or modified as to render it fit for use in common soap-making would tend to benefit the country in three ways:—

firstly, it would convert into money huge quantities of one of the commonest yearly natural products of the country which are at present simply wasted;

secondly, it would help the indigenous soap industry by opening up a new source of an abundant supply of a cheap oil yielding a soap of a hard consistency, the stocks for producing such soaps being comparatively few in India; and

thirdly, it would provide many of the workless with remunerative work.

6. The investigations made with this oil in the Industrial Research Laboratory have proved satisfactorily that in admixture with other oils and fats Neem oil, after a simple, inexpensive, preliminary treatment, can be used for the making of good quality soap both by the grained and the settled processes which can be used as well in the household as in the laundry.

7. The data regarding the proportion of kernel in the seed and the yield of oil, together with the physical and chemical constants as determined and published by the Imperial Institute, and, separately, by Lewkowitsch, may be accepted for all practical purposes, and hence no such determinations were undertaken in the Industrial Research Laboratory. The relevant data are reproduced below:—

Yield of oil.*

The seeds from India consisted of shell, 55·3 per cent. and kernel 44·7 per cent. The kernels yielded 48·9 per cent. of fat equivalent to a yield of about 23·5 per cent. on the whole seed. The seeds from Ceylon consisted of shell, 54·2 per cent. and kernel, 45·8 per cent. The kernels yielded 59·25 per cent. of fat which is equivalent to about 31 per cent. on the whole seed.

Constants†.

Specific gravity at 16°C	..	..	..	0·9142
Saponification value	..	..	..	196·9
Iodine value	..	..	..	69·6
Titer	..	..	..	42°C

The titer test published by the Imperial Institute has a value of 35·7°C for oil from India, and 40·8°C for that from Ceylon. The titer test of the commercial oil has, therefore, a value ranging from 35·7°C to 42°C.

* Imperial Institute, London.—Report on oil seeds, oils, fats and waxes, V. 575-77.

† Lewkowitsch—Analyst, 1903, 342; Chemical technology of oils and fats, Vol. II, 513.

8. On an examination of the constants reproduced it will be seen that Neem oil is a stock capable of producing a fairly hard soap, and, as such, should be highly valued, since most of the soap-stocks available from vegetable source in India are of the soft kind. The hardness of the soap from Neem oil as assessed by Webb's I. N. S. factor is 127. For the purpose of comparison the factors for some other Indian oils and fats commonly used in this country by soap-makers for producing soaps of a hard consistency are given below:—

Soap-stock.						I. N. S. Factor.
Cocoanut oil	..	..	..	..	..	250
Tallow	..	..	..	..	..	150
Bone grease	..	..	..	..	..	140
Mowha oil	..	..	..	..	..	128

Neem oil has, therefore, very nearly the same I. N. S. factor as Mowha oil. It has also been found by us that Neem soap grained on brine has a fairly high solidification point, viz., 49°C. The oil is, therefore, quite suitable for the making of grained soap, moulded or stamped, a method for the latter of which is given in this Department Bulletin No. 45.

9. Neem oil saponifies readily and the soap produces profuse lather which is slightly greasy. But the oil gives a perfect washing soap in judicious mixture with other harder and softer stocks.

10. With regard to deodorisation, it has been found after several attempts to that end that the oil does not lend itself to the usual chemical treatments with success, because the odorous element consists of an evil-smelling essential oil which remains in a state of solution in the oil itself and cannot be easily separated or decomposed. The yellow colour, also, is not easily destroyed. In the Industrial Research Laboratory the first attempt at deodorisation was to treat the oil with various strengths of sodium carbonate solution on the expectation that the odorous and colouring matters would be removed along with the free fatty or resin acids present in the oil, but, for the reason just stated, the odour and colour of the original oil remained undiminished after the treatment. A separate quantity was treated with sodium bisulphite in the presence of dilute sulphuric acid, but this method, too, was found to be ineffective for the bleaching of the colour or the removal of the odour. The latter element of the original oil was, however, found to be removable to some extent by the steam distillation of the oil, but this process by itself did not appear to be of much practical value, inasmuch as it required continued boiling for many hours, and then, too, the removal of odour was not complete. The soap made from the steam distilled oil was practically free from any odorous matter and had only a very light colour.

11. After a series of other trials it was finally found that the usual chemical or other treatments for the deodorisation and decolorisation of the oil, in so far as the requirements of the soap-maker went, were of no avail when applied to the oil itself, and that other methods must be found out to do the same effectively. Recourse was, therefore, had to methods involving a chemical change in the entire mass of the oil. The method tried was one involving the actual conversion of the oil into soap by regular saponification according to the boiling process, and it yielded good results. A portion of the volatile odorous matter was carried away by the steam in course of the boiling of the oil with caustic soda.

On the conversion of the oil into soap the odorous essential oil which, as already mentioned, remains in solution in the Neem oil, was deprived of its vehicle. On salting, therefore, the soap was much freed from the odour that had not volatilised in course of boiling, and the same was taken up by the spent lye. The yellow colouring matter, which is in a loose state of combination with the oil, was also largely removed by the above treatment. The larger the volume of the spent lye the more the removal of odour and colour. One such salting was not always enough, and sometimes a second course of saponification followed by salting, or, simply, the processes of dissolving the soap in water and salting it out again, was needed for securing the degree of deodorisation and decolorisation necessary for the making of washing soap. The removal of odour and colour by this method, although never complete, was yet such as to enable the oil being used in soap-making to a considerable extent. It has been found that in the making of grained soap the oil converted into soap in the above way can safely form as much as 20 per cent. of the entire regular soap-charge without making the resulting soap any the worse for odour or colour; and, where a light yellow colour is not an objection, the oil may be used to the extent of 40 per cent. without rendering the odour liable to detection in the resulting soap. The purification of the oil in the above way should, as a rule, be done before the other soap-stocks are mixed with it to make up the regular soap-charge so as not to allow the odorous and colouring matter to get permeated in a larger mass of soap-stock and thus render their elimination difficult or even impossible.

12. The behaviour of Neem oil on saponification is devoid of any extraordinary feature. On the addition of the caustic alkali a greyish yellow emulsion is formed which gradually becomes clearer as the saponification proceeds. Finally, a clear, yellow soap is produced. During the boiling much odour is given off. The longer the boil the more the removal of odour by the steam. The soap solution should not be concentrated but be allowed to remain thin at the conclusion of saponification. Salt should now be thrown into the pan and the contents boiled gently until the soap shows clear signs of breaking, which is the most favourable condition for the elimination of the colouring matter. The spent lye will have a large volume, a strong smell, and a dark brown colour—facts which show that a large quantity of the colouring matter, as well as odour, has been taken up by the lye. A further removal of colour from the soap is effected by giving it a second brine wash, as described above. The washed soap will have a pale yellow colour characteristic of many varieties of washing soap and be free from any strong odour.

13. It is not necessary in order to carry out the saponification and salting of Neem oil for the above purpose that fresh caustic lye only should be used. The spent lye of a previous soap charge, unless very deeply coloured, can very well be used for bringing about the saponification of the oil. The spent lye usually contains some unused alkali. The oil is poured into the lye in quantities which can be saponified by the free alkali present in the latter. The oil floats on the top, and, as the boiling proceeds, small quantities of it become saponified. By the time the lye becomes concentrated the saponification is generally completed, and the soap produced floats on the top in a granular form and having a yellowish colour, while the bulk of the colouring matter goes to the lye which becomes deeply coloured. After allowing some time for the settling of the lye, the latter is removed, and the soap is boiled again

with another instalment of a light coloured spent lye which, in its turn, takes up some of the colour still remaining in the soap but does not itself become as deeply coloured in the process as the earlier lye, and may be preserved for use in the initial saponification of a fresh quantity of the oil. The second saponifying process leaves the grains of soap with only a pale yellow colour and a faint odour, and fit to be mixed with the other stocks for the production of the soap for the market.

14. The process of purification over spent lye described above has been rendered possible by the fact that the oil undergoes saponification quite readily. It is noteworthy that the treatment does not involve any extra cost beyond that on fuel for double boiling for which purpose an expenditure of Re. 1 per maund of oil would be ample and thoroughly justifiable in view of the very low price of the crude oil. There is, on the other hand, a saving of cost under caustic soda and salt, inasmuch as the said ingredients necessary for saponification and graining are recovered from the spent lye which in many small factories is simply thrown away.

15. It has also been found that a further removal of the traces of odour persisting in the soap made from this oil according to the method described above is effected by allowing the soap in granular form to remain exposed to the atmosphere for a few days, or simply putting the same away in a heap for use after a few weeks.

16. Small quantities of the purified oil used in combination with other stocks distinctly improve the general properties of the soap without imparting to the same any deep tint or pronounced odour. In the production of the superior quality washing soap by the settled process, where the raw materials are as a rule selected with much care, this oil can make up 10 per cent. of the entire soap-charge. Proper advantage of the cheapness of the oil will not, however, be taken, nor its usefulness as a substitute for Mowha oil be fully utilised, until the oil is used in the manufacture of grained soap where, as already mentioned, it can easily be used up to 40 per cent. to produce soap suitable for use in the household and the laundry.

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