

# A NOTE ON THE STUDIES ON COLOURISATION OF VANASPATI WITH CHLOROPHYLL

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## ABSTRACT

This paper reports a study on the possibility of using chlorophyll as colouring matter for hydrogenated oils. The colour thus imparted although stable under ordinary conditions is heat labile and is also removed by certain common adsorbents. The Baudoin's test, however, is not effected by the presence of chlorophyll.

## Introduction

Many colouring agents, synthetic as well as natural, have been suggested from time to time for colourisation of vanaspati to check adulteration of pure ghee<sup>1-8</sup>. None of these agents however, has fulfilled the requirements and as such uptill now none has been accepted. Most of the colours so far tried can either be removed by simple physico-chemical means or are known to possess toxicity or change into toxic derivatives at frying temperatures to which hydrogenated oil is subjected during preparation of food. Chlorophyll is one of the more abundantly present natural colours and there have been a number of suggestions for its use as a colouring matter. Putambekar and Rao<sup>5</sup> and Mukerji et al.<sup>6</sup> have reported some preliminary investigations on the use of chlorophyll as a colouring matter for vanaspati but no definite conclusion seems to have been reached about its suitability as a colouring agent. Under a general programme of studies for finding a suitable colour for vanaspati, critical study was undertaken to test the suitability of purified chlorophyll isolated from natural materials, under different experimental conditions as a possible colouring matter. The results are reported in this communication.

## Materials and Methods

*Isolation of chlorophyll*<sup>9</sup>—2 lbs. of fresh *spinacia oleracea* Linn (Spinach, Palak) were subjected to extraction with 2 litres of cold acetone in a waring blender for ten minutes. The extract was transferred to 300 mls. of petroleum ether (BP 40—60°C) and the acetone layer run off. The ether layer was given successive washings with distilled water and then with 80% aqueous methanol to remove carotenoids. The petroleum-ether extract was then concentrated and adsorbed on closely packed Kieselguhr and eluted with dry acetone. The elutions were concentrated and weighed the total weight—of the extract obtained being 0.40g.

*Chlorophyllised vanaspati*—A 0.5% stock solution of chlorophyll in vanaspati was prepared and stored at 0—5°C. This solution was diluted further

with hydrogenated oil to give various concentrations for the subsequent studies.

## Results

*Stability of the green colour when chlorophyll is used 0.1% concentration in vanaspati*—This imparted a dull green colour to the hydrogenated oil. Four samples (a, b, c and d; 20 g. each) of the above were tested for the stability of green colour under the following conditions:—

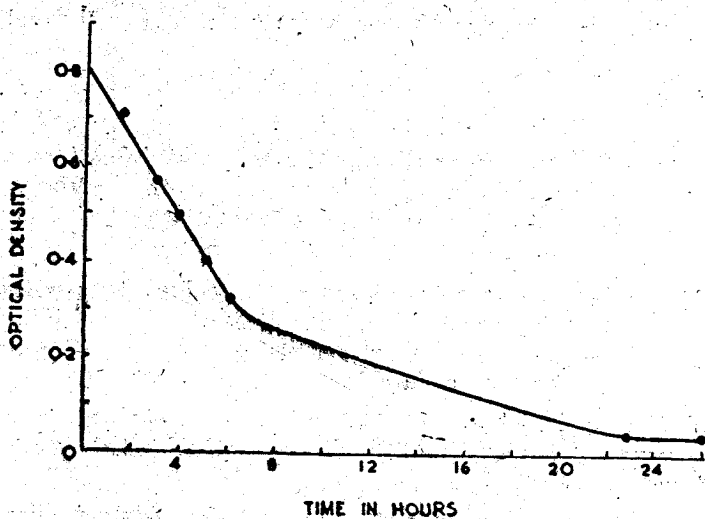
- (a) The sample was kept in the air at atmospheric temperature (40°C) in a flat bottomed shallow dish. It became brownish in one hour and the green colour was completely bleached after two hours when it assumed a dark brown appearance.
- (b) The chlorophyllised vanaspati when heated at temperatures ranging from 50°C to 90°C for one hour did not show any deterioration in colour.
- (c) The green colour persisted even when the chlorophyllised sample was treated with Norite with or without heating at 70°C.
- (d) The sample was completely bleached when heated for about 12 hours at 150°C.

*Stability of the colour when chlorophyll is used at 0.01% concentration in vanaspati*—As 0.1% concentration of chlorophyll was found to impart too deep a colour to the hydrogenated oil, a lower concentration was, therefore, tried and stability of the colour investigated. This imparted a light green colour to the fat and the colour was still distinctly perceptible when mixed with 75 parts of milk ghee.

- (a) The sample when kept in the sun in a shallow basin turned pale green in about half an hour and dark brown in two hours.
- (b) The sample retained a light green colour when heated with Norite at 105°C for one hour. Heating for 2½ hours in presence of Norite at 105°C almost completely decolourised the vanaspati. In fact the latter when mixed with equal amount of pure milk ghee did not show any green colour.
- (c) Chlorophyllised vanaspati was not decolourised when heated with ordinary wood charcoal at 105°C for twelve hours.
- (d) The sample was completely decolourised when heated at 150°C for about twelve hours. (see Fig. 1).

*Baudoin's test in presence of dechlorophyllised vanaspati*—In order to determine whether Baudoin's test can still be applicable to dechlorophyllised vanaspati, the test was applied to samples dechlorophyllised either by heating or by adsorption on Norite and tested for sesame oil after mixing with varying amounts of milk ghee.

- (i) Pure vanaspati (5 mls) gives a positive test, the time taken for the development of crimson colour being about 5—7 minutes.



Temp=150°C Concentration of chlorophyll in H. O=0.01%

FIG. 1.

- (ii) Mixture of 20 parts of dechlorophyllised vanaspati and 80 parts of milk ghee (15 ml) also gives a positive test, the time taken for the development of colour being about 10—12 minutes. 5 mls. of the above mixture, however, develop a pale red colour in about 25—30 minutes.
- (iii) 10 parts of dechlorophyllised vanaspati and 90 parts of milk ghee (sample volume 5 mls.) do not give a positive test for sesame oil.

*Baudoin's test in presence of chlorophyll*—Chlorophyll does not interfere with the performance of Baudoin's test and the coloured sample gives a positive test for til-oil.

#### Discussion

Exposure to sun light or heating at lower temperatures does not completely decolourise the chlorophyllised fat, though it gets discoloured and is easily distinguishable from pure 'vanaspati' or milk-ghee through a deep red fluorescence in ultraviolet light.

The rate of change of optical density of chlorophyllised fat with time when heated at 150°C is recorded in Fig. 1. After about twelve hours the sample gets completely bleached and is hardly distinguishable from pure vanaspati or milk-ghee. This bleached sample does not exhibit any fluorescence as reported by Putambekar and Rao <sup>5</sup> after decolourisation. This latter observation has also been reported recently by Mukherji et al. <sup>6</sup>.

Although chlorophyll is available in any quantity and besides being not harmful is perfectly edible, it suffers from the disadvantage of being relatively easily removable by simple physical means which do not seem to be very costly. Another factor to be reckoned with is the acceptance by the consumer of green coloured vanaspati, who has come to associate yellow colour

with all edible fats. Colourisation of hydrogenated fats with chlorophyll, therefore, does not seem to be a practical proposition.

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