SPECIALTY FAT FOR NON-HYDROGENATED SOFT SPREAD

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MPOB INFORMATION SERIES • ISSN 1511-7871 • JULY 2018 MPOB TT No. 642

Oils and fats are major ingredients of margarine. Palm oil being the most versatile oil is becoming an important raw material and the choice for producing margarine and shortening. However, high percentage of non-hydrogenated palm oil and palm stearin have been found to possess post-crystallisation which is not favourable in margarine and shortening. The post-crystallisation might be due to the transformation of *beta* prime to *beta* form of crystal networking after texturisation.

Alternatives to overcome this phenomenon include blending of hydrogenated oils that could increase the rate of crystallisation, controlling the di-acyl glycerol (DAG) content which may affect the melting properties and using high pressure pin-rotor that could increase the rate of crystallisation. Several studies were conducted to tackle the post-crystallisation issues such as the effects of emulsion temperatures, throughput speed, tube-cooler temperatures and pin-worker speed.

THE INVENTION

A non-hydrogenated palm-based specialty fat with improved post-crystallisation property for a soft table margarine was produced using high speed pin-rotor (HSPR) coupled with double stage homogeniser (DSH) unit. The formulation containing palm oil key ingredient was formulated to contain a balanced ratio of 1:1:1 in their saturated, monounsaturated and polyunsaturated fatty acids, thus mimicking oils and fats ratio as recommended by the American Heart Association (AHA). The soft spread has desired texture at chill temperature storage (*Figure 1*). Medium speed HSPR and low pressure DSH produced the best consistency of product stored at 5°C-15°C in such a non-hydrogenated formulation (*Figure 2* and *Table 1*). This coupled process was able to enhance the completion of crystallisation activities during processing. The use of non-hydrogenated palm oil in soft spread formulation had greatly reduce the problem of post-crystallisation.

TABLE 1. SOLID FAT CONTENT (%) DEVELOPED IN THE NON-HYDROGENATED SOFT SPREAD DURING STORAGE

	Day (solid fat content, %)									
Temp 5°C	**0**	**1**	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**
Pressure 1 DSH	14.6	13.4	17.9	15.0	14.2	13.2	13.6	13.8	10.4	10.1
Pressure 2 DSH	14.9	17.7	18.4	14.5	14.6	13.6	14.3	14.1	10.1	11.2
Pressure 3 DSH	13.7	17.2	17.5	14.3	14.3	13.4	13.8	13.7	10.5	12.2
Temp 10°C										
Pressure 1 DSH		16.6	16.4	13.1	13.6	13.3	13.3	13.1	11.2	12.6
Pressure 2 DSH		15.2	16.0	13.4	13.3	13.3	13.5	13.8	10.2	12.1
Pressure 3 DSH		14.5	15.7	13.0	13.5	13.1	13.1	13.5	10.0	11.9
Temp 15°C										
Pressure 1 DSH		11.7	11.6	11.8	10.9	10.9	10.9	10.1	8.3	8.3
Pressure 2 DSH		10.4	11.1	11.3	10.4	10.4	10.0	9.7	8.5	8.4
Pressure 3 DSH		10.2	11.0	10.9	10.5	10.5	10.4	9.9	7.7	8.3

ISSN 1511-7871
9 771511 787001

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Figure 1. Non-hydrogenated soft spread.

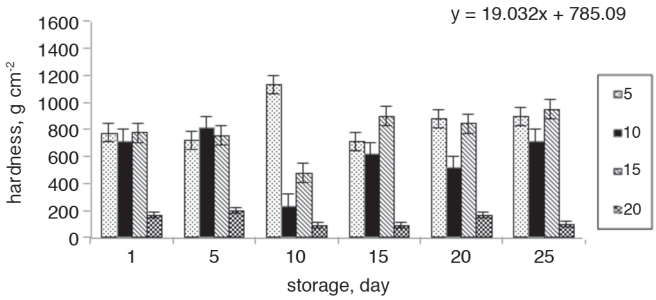

Figure 2. The hardness (g cm^{-2}) of margarine as a function of storage (day).

NOVELTY

- Soft spread contains a balanced ratio of 1:1:1 of saturated, monounsaturated and polyunsaturated fatty acids mimicking oils and fats ratio as recommended by the AHA.
- Maximum use of palm oil of more than 50%.
- The post-crystallisation problem in non-hydrogenated palm-based soft spread was minimised.
- Non-hydrogenated soft spread.
- *Trans*-free formulation.

ECONOMIC ANALYSIS

The estimated expenditure and other economic evaluation are shown in *Table 2*. This economic evaluation is based on the assumption that the soft spread is sold at RM 2.90 tub^{-1} (ex-factory price) and consistent production capacity of 5 400 000 tubs yr^{-1}. Current prices of soft spread are RM 4.00 to RM 6.50 tub^{-1}. Target markets are local, including small and medium enterprises, and overseas margarine manufacturers.

TABLE 2. ECONOMIC VALUES OF NON-HYDROGENTED SOFT SPREAD

Cost (materials), RM tub^{-1}	1.90
Selling price, RM tub^{-1}	2.90
Capital expenditure, RM	5 610 000
Net present value (NPV), RM	97 654 566
Benefit to cost ratio	1.19
Payback period, year	4.60
Internal rate of return (IRR), %	32.51

CONCLUSION

Non-hydrogenated soft spread produced via this modified process has a great commercial value for its cost effectiveness and its performance is comparable to other commercial soft spread.

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