METHOD FOR THE HARDENING OF SOFT TECHNICAL GRADE FATS FOR SOAP MAKING

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Toilet soap contains usually about 80% of fatty feed-stock. The typical soap feed-stock consists of about 80% of fat with titre above 40°C (technical grade tallow) and 20% of palm kernel or coconut oil [2]. Recently, due to the shortage of fats, the soap feed-stock composition has been modified in some extent. Refined lower grade fats are used as the high titre substitutes of tallow, whereas the synthetic acids or surfactants are used to substitute the vegetable oils.

Results presented here refer to the experiments on the utilization of the hardened soft fats in soap feed-stocks. There are actually available various methods for fat hardening, and some information on the application of soft fats, hardened to the defined melting and solidifying points, in soap feed-stocks has been already reported. Pokorny [3] reported the optimal charasteristics of various grades of fats used in soap making.

In the work presented here another solution of the problem has been chosen.

In our method hardened soft fats with iodine value below 10 have been used as the addition to the non-hardened fats to get a feed-stock with the desired titre [5]. Assessing of the effect of polyunsaturated fatty acids, geometrical isomers [6], and titre of soap feed-stocks on such applicational properties of soap like slushiness and solubility was a subject of our study.

Following raw materials were used to prepare feed-stocks:

a) A blend of hardened and soft lard.

Basing upon the measurements of the solidifying point (titre) of liberated fatty acids, it has been stated that the addition of high hardened lard with iodine value below 10 to the soft lard, gives a possitive effect of the titre increase, comparing to the expected mean value of

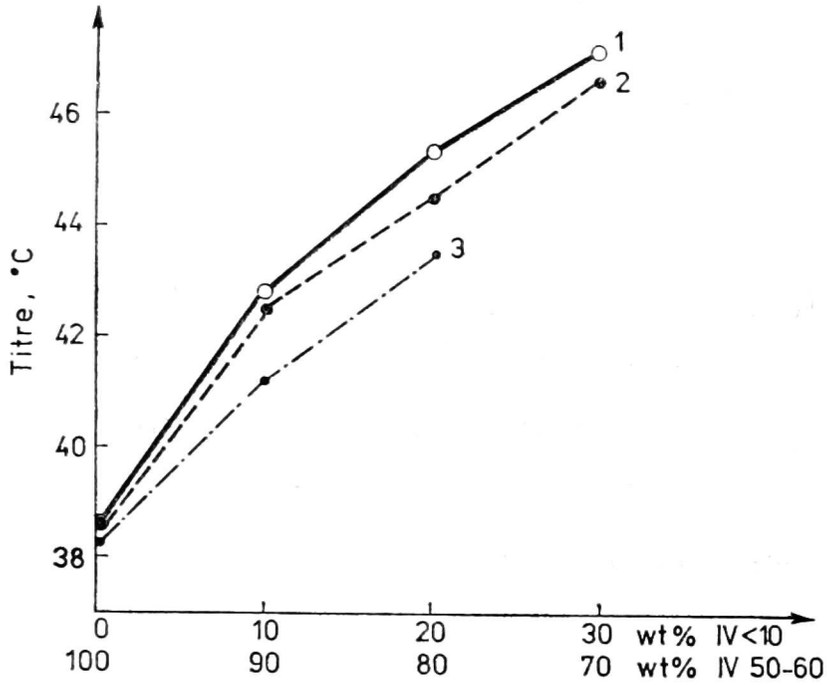

Fig. 1. Effect of the proportion of hardened lard on the titre of blend

titre (Fig. 1). This effect was used to estimate the proportions of these two components. Desired level of titre can be achieved with the precision kept within the limits of 1°C. Characteristics of the hardened lard used in soap feed-stocks prepared by the blending method is given in Table 1.

Table 1

Analysis of the lard blends used in soap feed-stocks

Determination	Reference				
	1	2	3	4	5
Colour (iodine scale)	16	16	12	5	3
Saponification value	191.1	192.6	195.5	193.7	194.4
Acid value	4.7	4.5	7.4	8.8	1.8
Iodine value	42.3	43.1	46.7	44.2	44.8
Titre, °C	42.3	42.4	42.3	43.5	43.2
Nickel content, mg/kg	11.9	8.0	3.0	3.8	10.0
Trans isomer content, %	3.0	3.3	about 1	7.2	Traces

b) Technical grade lard hardened to the titre of 41—44°C.

In the reference experiments the technical grade lard hardened by the method used for edible oils was used. Hardening was carried out to get titre not lower than 41°C. Characteristics of such product obtained in the industrial scale is following:

Iodine value 40—50
Titre 40—45°C
Trans isomers content 30—50% of elaidic acid
Nickel content 8—68 mg/kg

c) Technical grade tallow with titre of 42.5—45.0°C.

d) Coconut oil with titre of 22°C.

Soaps were prepared in the laboratory and industrial scale without any additive.

Applicational properties were studies by the determination of the slushiness and solubility values according to Boliński [1]. Slushiness value is expressed by the number of grams of water absorbed by the 1 cm^2 of soap surface under the standard conditions. Solubility value is expressed by the number of miligrams of soap which can be dissolved of 1 cm^2 of sample surface under the standard conditions. Results obtained are shown in Table 2.

Table 2

Analysis of toilet soaps made of various fatty feed-stocks

	No. of experiment								
	1	2	3	4	5	6	7	8	9
Feed-stock composition									
Proportion of the raw material, %: a	—	—	—	—	—	40	60	80	80
b	—	30	80	80	80	—	—	—	—
c	80	50	—	—	—	40	20	—	—
d	20	20	20	20	20	20	20	20	20
Characteristics of soaps									
Titre, °C	41.7	40.1	39.9	39.9	41.9	39.5	39.0	39.3	36.5
Iodine value	34.1	38.6	40.9	40.3	36.2	35.1	34.7	41.8	47.4
Trans isomer content, %	Absent	12.6	4.8	5.0	24.0		Traces		
Applicational properties of soaps									
slushiness value	83.4	72.7	93.3	87.9	66.1	80.5	88.0	122.7	128
Solubility value	24.3	22.3	24.2	23.4	11.4	27.7	28.9	24.7	27.6

Effect of the analytical characteristics on the applicational properties was determined by the partial factorial design [4]. As variables were used:

x_1 — Titre

x_2 — Iodine value

x_3 — Trans isomers content, %

Basing upon the earlier work the following levels for the center points of the design were chosen:

Titre 39.5°C

Iodine value 40

Trans isomers content 40% (calculated as elaidic acid)

Calculated effect of synergy of variables on the applicational properties is shown in Table 3.

Analytical data indicate that:

— The greatest slushiness occurs at low titre (36 - 39°C) and at high iodine value (42 - 47).

Table 3

Synergetic effect of variables on the applicational properties of soap

		X_1 Titre, °C —	X_1 Titre, °C +	X_2 I.V. —	X_2 I.V. +	X_3 Trans isomers % —	X_3 Trans isomers % +	
X_1	—			88	125	113	—	Slushiness value
	+			73	90	80	80	
X_2	—	29	20			84	69	
	+	26	24			125	90	
X_3	—	27	—	28	26			
	+	28	20	17	24			
		Solubility value						

— The lowest slushiness is observed at high titre (about 42°C) and at low iodine values (36 - 38).

— Slushiness decreases with an increase of titre at high iodine values (above 40).

— Iodine value has greater effect on slushiness than trans isomers.

The similar relationship occurs for the solubility value. Optimum slushiness and solubility values achieved at x_1 +, x_2 —, and x_3 +, x_3 —, i.e. at titre above 39.5°C and iodine value below 40. Trans isomers content had a minor effect on these properties. The lowest slushiness and solublity values, ranged from 20 to 24, were achieved for above given values of ariables. These slushiness and solubility values are similar as for the typical feed-stock (Experiment No. 1 in Table 2).

CONCLUSIONS

Basing upon the results it has been found, that the addition (up to 40%) of lard does not affect the applicational properties of soap, comparing to the soap obtained from the typical feed-stock. The worked--out method of the lard hardening enables not only to keep up the good applicational properties, but also to decrease the nickel content

in soap. The recomended method for the feed-stock preparation is given in Figure 2.

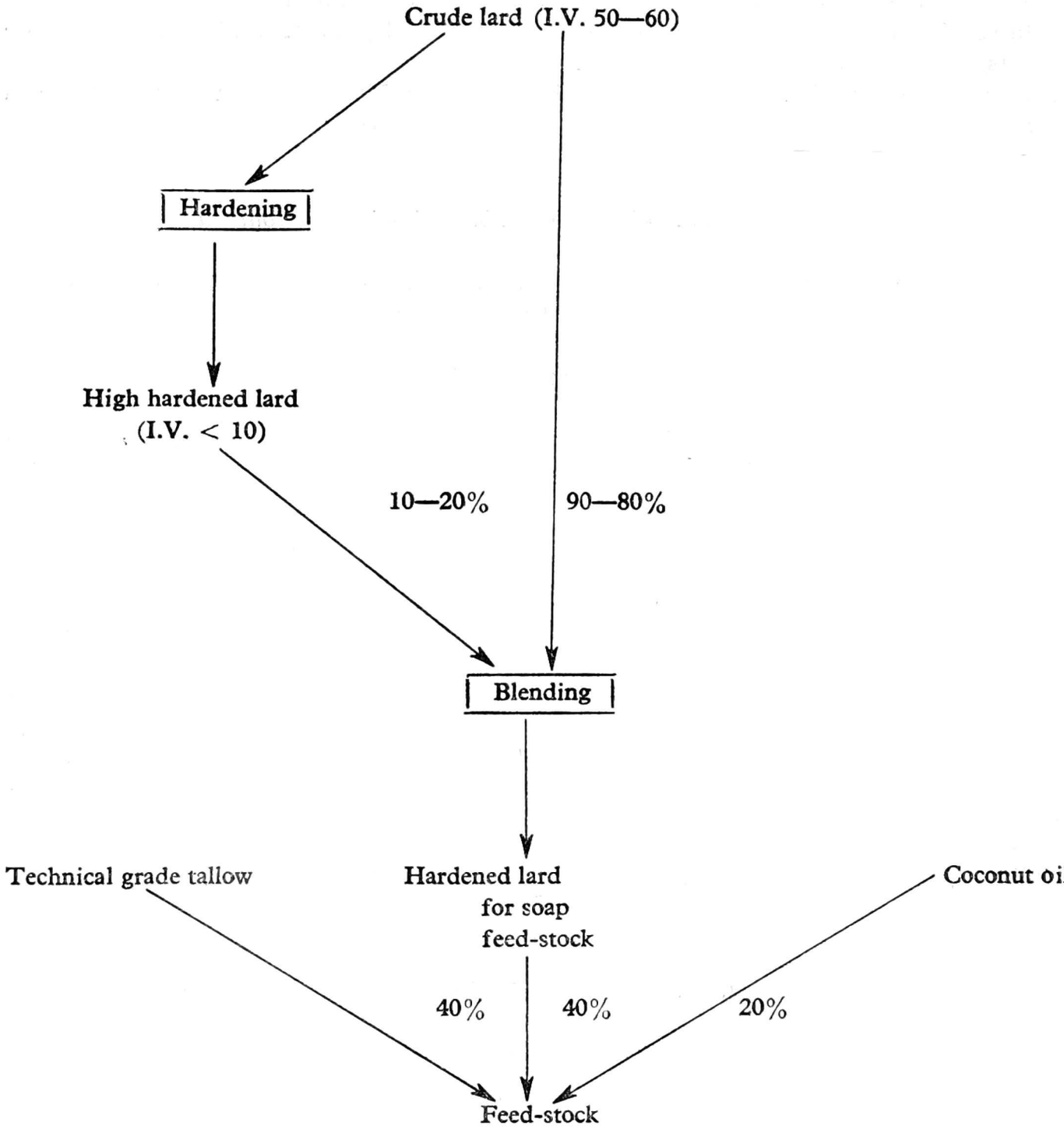

Fig. 2. Scheme of the preparation of fatty feed-stock for toilet soap

REFERENCES

1. Boliński L., Bolińska A.: Badania własności użytkowych mydeł toaletowych. TŚPK Pollena 1973, 17 (9) 428.
2. Osteroth D.: Kosmetikum Feinseife Abiss seiner Technologie. A. Hüthing Verlag, Heidelberg 1972.

3. Pokorny J.: Metody oceny przydatności utwardzonych tłuszczów do produkcji mydła. TŚP 1960, 4 (3) 155.
4. Volk W.: Statystyka stosowana dla inżynierów. WNT Warszawa 73.
5. Witwicka J., Walisiewicz-Niedbalska W.: Method of adding of the powder catalyst in the process of the hydrogenation of fatty acids and technical grade fats. Zesz. probl. Post. Nauk rol. .
6. Zajic J., Bares M., Kaufmann K.: Einfluss der Konfiguration der Fettsäuren auf die Eigenschaften von Seife FSA 1970, 72 (10) 865.

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METODA DOTWARDZANIA TŁUSZCZÓW TECHNICZNYCH MIĘKKICH DO CELÓW MYDLARSKICH

Streszczenie

Podstawowy warunek stawiany tłuszczom technicznym kierowanym do osnów mydlarskich, to odpowiednia twardość wyrażona temperaturą krzepnięcia kwasów tłuszczowych w zakresie 41 - 43°C.

Tłuszcze miękkie stosowane do wyrobu mydeł po uprzednim dotwardzaniu do określonego titru cechowały takie ujemne wskaźniki, jak brak standardowego składu, obecność znacznych i różnych ilości izomerów trans, stosunkowo wysoka zawartość niklu z katalizatora, różne przy stałym titrze zawartości kwasów wielonienasyconych.

Opracowana technologia przygtowania tłuszczów utwardzonych do osnów mydlarskich polega na całkowitym utwardzeniu części tłuszczów miękkich, a następnie rozcieńczeniu tłuszczem nieutwardzonym do (żądanego) określonego titru. Zaletą tej technologii jest standardowość produktu, zawartość kwasów wielonienasyconych na stałym, określonym poziomie, niska zawartość niklu i izomerów trans.

Wpływ wymienionych wskaźników na jakość mydeł wykazano na podstawie analizy statystycznej wyników badań analitycznych i aplikacyjnych.

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МЕТОД ДООТВЕРЖДЕНИЯ МЯГКИХ ТЕХНИЧЕСКИХ МИРОВ ДЛЯ ЦЕЛЕЙ МЫЛОВАРЕНИЯ

Резюме

Основным условием выдвигаемым по отношению к техническим жирам направляемым в мыловаренные основы, является соответствущая твердость выраженная температурой застывания жирных кислот в пределах 41—43°C.

Мягкие жиры используемые в мыловарении, после предварительного отверждения до определенного титра, характеризовались такими отрицательными показателями, как отсутствие стандартного состава, наличие значительных и различных количеств изомеров ткансов, сравнительное высокие содержание никеля из катализатора, различное при постоянгом титре содержание многоненасыщенных кислот.

Разработанная технология подготовки отвержденных жиров для мыловаренных основ заключается в полном отверждении части мягких жиров, а затем разбавлении неотвержденным жиром до (требуемого) определенного титра. Преимуществом этой технологии является стандартность продукта, содержание многононасыщенных кислот на постоянном определенном уровне, ниское содержание никеля и изомеров трансов.

Влияние указанных показателей на качество мыл было доказано на основании статистического анализа результатов аналитических и апликационных исследований.