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Chemical characteristics of soaps obtained using red hot pepper seeds oil (*Capsicum annuum* L.)

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GOAL OF THE STUDY

The search for alternative raw materials for oils from renewable sources is current worldwide. As a potential source of such oil, hot pepper seeds are considered. The aim of this study was to determine the appropriate amount of hot pepper seeds oil in the oil mixture, which has a balanced ratio between saturated (SFAs) and unsaturated fatty acids (UFAs) and ensures the production of high-quality soap.

METHODOLOGY OF THE INVESTIGATION

Qualitative analysis of oils - saponification value, iodine value, acidity and FAs composition of used oils were determined. The ratios of the oils in the mixture are shown in Table 1.

Qualitative analysis of soaps - on the prepared soap samples by cold saponification the main indicators were analyzed – moisture content, free caustic alkali, total fatty matter content, content of unsaponified fats and unsaponifiable matter, foaming ability and pH. The results are presented in Table 2.

Table 1. Table caption

Oil components	Oil mixtures №			
	1	2	3	4
Hot pepper seeds oil (HPO)	-	5	10	20
Palm oil (PO)	80	75	70	60
Coconut oil (CO)	20	20	20	20

MAIN RESULTS FROM THE STUDY

The moisture content of the samples is between 30.87 and 33.50 %, which corresponds to data cited in the literature (18.50-35.70 %) for cold process soaps. During storage, moisture decreases significantly, which is related to the evaporation of free water in the soap and leads to a decrease in its weight.

The highest FA content is observed in the control sample № 1 – 52.37 %, and in the other three samples it is lower.

Table 2. Results of the analyzed soap samples

Samples	Moisture content (%)	Total fatty matter content (%)	Foaming ability (cm^3 after 30 s)	pH	Content of unsaponified fats and unsaponifiable substances (%)	Free alkali (%)
Sample № 1	30.87 ± 0.06	52.37 ± 0.21	230.00 ± 5.00	10.30 ± 0.10	3.27 ± 0.06	0.003 ± 0.006
Sample № 2	32.30 ± 0.36	50.60 ± 0.35	120.70 ± 4.70	10.20 ± 0.06	4.20 ± 0.05	0.03 ± 0.002
Sample № 3	33.05 ± 0.22	50.10 ± 0.31	100.30 ± 4.60	10.20 ± 0.06	4.50 ± 0.06	0.04 ± 0.001
Sample № 4	33.50 ± 0.16	49.82 ± 0.34	70.60 ± 3.20	10.20 ± 0.07	5.10 ± 0.07	0.04 ± 0.003

Regarding the foaming ability, the best results are for the control sample № 1 – 230.00 cm^3. The higher HPO content is responsible for the presence of more unsaponifiable matter in the finished soaps. These components, in turn, have a negative impact on the foaming ability of soaps.

The percentage distribution of SFAs and UFAs in the four oil mixtures is presented in Figure 1.

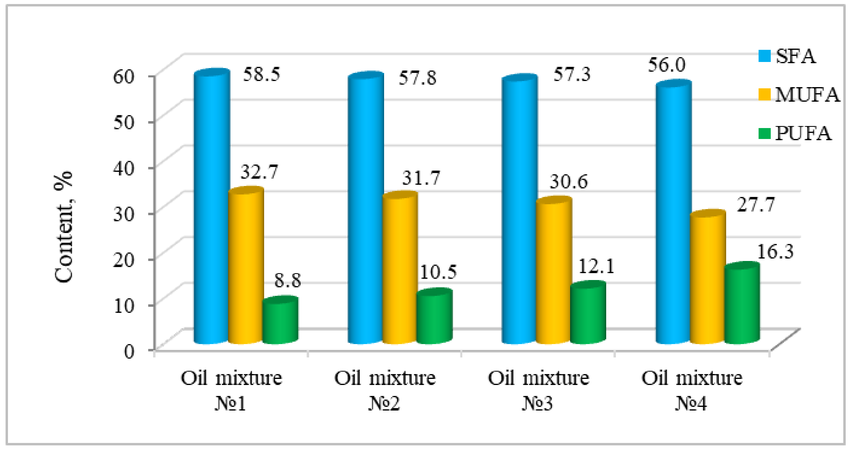

Fig. 1. Quantitative distribution of saturated, monounsaturated and polyunsaturated acids in the four oil blends.

CONCLUSIONS

The study suggests that hot pepper seeds oil holds promise for incorporation into soap production using the cold process method. Samples containing up to 10 % hot pepper seeds oil exhibit satisfactory values across investigated parameters that determine soap quality, including total fatty matter content, free alkali content, foaming ability, pH, color and content of unsaponified fats and unsaponifiable substances. This indicates the feasibility of producing high-quality soap with the inclusion of hot pepper seed oil, up to 10 % of the oil composition, while maintaining a balanced ratio between unsaturated and saturated fatty acids in the oil blend.