

Chemical characteristics of soap with using plum kernel oil

(*Prunus domestica* L.)

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GOAL OF THE STUDY

Plum kernel oil (*Prunus domestica* L.) is a non-traditional oil from food waste. In the present study, it is used as an alternative raw material for soap production. The aim is to study the effect of oil on the chemical properties of soap and to determine its appropriate percentage in the oil mixture to obtain 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. Oil mixtures used for soap variants

| Oil components | Oil mixtures № | | | | | |
|-----------------------|----------------|----|----|----|----|-----|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Plum kernel oil (PKO) | - | 10 | 20 | 30 | 40 | 100 |
| Palm oil (PO) | 80 | 70 | 60 | 50 | 40 | - |
| Coconut oil (CO) | 20 | 20 | 20 | 20 | 20 | - |

MAIN RESULTS FROM THE STUDY

Six soap samples (№1-6) with Plum Kernel Oil (PKO), Palm Oil (PO) and Coconut Oil (CO) in different proportions were prepared. Sample № 6 has a soft consistency and is sticky therefore it is not analyzed further.

The indicator of total fatty matter content is one of the most important for the quality of soap. The higher it is, the better the quality of the soap. Higher content provides a better effect on the skin, in terms of retention of rehydration and generally increase the cleansing effect. The highest content of FAs is observed in sample №2 - 59.57 %, followed by samples №4 and №5, which have statistically insignificant differences - 55.57 and 55.83 %.

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*a** | 52.37±0.21 | 230.00±5.00a | 10.30±0.10a | 3.27±0.06a | 0.003±0.006a |
| Sample № 2 | 23.30±0.36 | 59.57±0.35 | 286.67±5.77 | 9.87±0.06b | 2.43±0.12 | 0.017±0.006 |
| Sample № 3 | 31.07±0.21a | 52.87±0.31 | 218.33±7.64a | 9.97±0.06bc | 3.17±0.06a | 0±0a |
| Sample № 4 | 27.37±0.06 | 55.57±0.35a | 266.67±15.28 | 10.07±0.15cd | 2.87±0.06 | 0.003±0.006a |
| Sample № 5 | 29.6±0.10 | 55.83±0.21a | 185.00±13.23 | 10.17±0.06ad | 1.77±0.15 | 0.007±0.006a |

Regarding the foaming ability, the best results are in sample №2 – 290 cm³ and sample №4 – 270 cm³, which are statistically distinct. The foaming results show that soaps with CO and PO give more stable foam than soaps with PKO, probably caused by fractions of palmitic acid and myristic acid in them.

The data in Fig.1. show the percentage distribution of saturated and unsaturated FAs in the five oil mixtures. In the production of soap, the appropriate ratio of unsaturated and saturated fatty acids is about 40/60

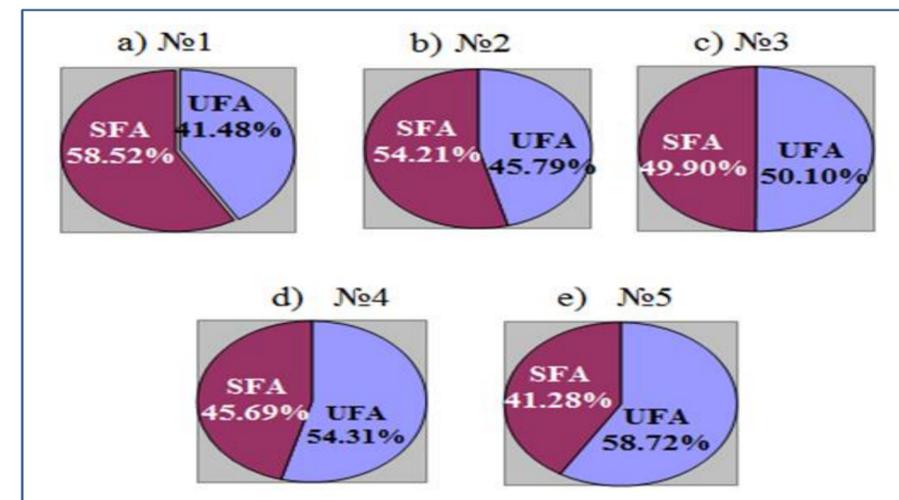


Fig. 1. Percentage comparison of unsaturated FAs and saturated FAs for oil mixtures for samples №1(a), №2(b), №3(c), №4(d) and №5(e)

CONCLUSIONS

From the study it can be concluded that plum kernel oil has the potential for use in the production of soaps by cold method. Samples of soaps containing 10, 20 and 30 % plum kernel oil have optimal values for the studied indicators determining the quality of soap. This determines the possibility of producing quality soap with the participation of plum kernel oil, in an amount of up to 30 % of the oil components and maintaining an appropriately balanced ratio between unsaturated and saturated fatty acids in the oil mixture.