

## INFLUENCE OF NANOEMULSIFICATION, ANTIOXIDANTS AND TEMPERATURE ON OXIDATIVE STABILITY OF RED RASPBERRY SEED OIL FOR SKIN APPLICATION

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In the past twenty years plant oils derived from food industry byproducts have been in focus due to the ecological and economic reasons. For example, raspberry seed oil – RSO (*Rubus idaeus*, Rosaceae), abundant with bioactive compounds such as polyunsaturated fatty acids, carotenoids, tocopherols and phenolic compounds, is recommended for antioxidant and UV-protective skincare (1). RSO application is limited by poor oxidative stability, thus this research aimed at its stabilization with nanoemulsion – NE carrier. Firstly, total carotenoid and phenolic content of RSO was determined, followed by determination of its oxidative status by tracking relevant parameters (peroxide value – PV, p-anisidine value – PA, and thiobarbituric reactive substances – TBARS) (2) during one month of storage. NEs were prepared with the polyglycerol ester-based natural surfactants by employing phase inversion composition method, with or without RSO and antioxidants: synthetic (butylated hydroxytoluene – BHT or ethylenediaminetetraacetic acid, disodium salt – Na<sub>2</sub>EDTA), or sessile oak acorn extract (*Quercus petraea*, Fagaceae). NEs' physiochemical characterization included droplet size distribution analysis, electrical conductivity and pH value measurements, followed by measurement of primary and secondary oxidation products (lipid hydroperoxides – LH and TBARS, respectively). It was found that RSOs' oxidative stability was significantly improved when stored at refrigerator after opening or by adding BHT (PV<10, PA<6, % INH TBARS >80%). NEs were semitransparent (with very small droplets <70 nm) and stable at 25 and 40°C, while drastic formation of oxidative products was avoided by employing BHT or Na<sub>2</sub>EDTA, or by using oak extract as natural stabilizer.

### References

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## PROCENA UTICAJA NANOEMULZIFIKACIJE, ANTIOKSIDANATA I TEMPERATURE NA OKSIDATIVNU STABILNOST ULJA SEMENA MALINE ZA PRIMENU NA KOŽI

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U poslednjih dvadeset godina, usled ekoloških i ekonomskih razloga u fokusu istraživanja su biljna ulja koja se dobijaju od nusproizvoda prehrambene industrije. Na primer, ulje semena maline (*Rubus idaeus*, Rosaceae), koje obiluje bioaktivnim sastojcima kao što su polinezasićene masne kiseline (linolna i linolenska), karotenoidi, tokoferoli i fenolna jedinjenja, preporučuje se za negu, antioksidativnu i UV-zaštitu kože (1). Primenu ulja maline ograničava loša oksidativna stabilnost, te je cilj ovog istraživanja bila njegova stabilizacija primenom nanoemulzije (NE), i/ili antioksidanata. Prvo je određivan sadržaj ukupnih karotenoida i fenola, a zatim oksidativni status ulja maline praćenjem relevantnih parametara (peroksidni broj – PB, p-anisidinski broj – PA i sadržaj reaktivnih supstanci tiobarbiturne kiseline – TBARS) (2), tokom mesec dana čuvanja. NE su pripremljene na bazi novijih prirodnih poliglicerilskih estara pomoću metode inverzije faza, bezili sa dodatkom ulja semena maline i antioksidanata: sintetskih (butilhidroksitoluen – BHT ili dinatrijumova so etilendiamintetrasirćetne kiseline – Na<sub>2</sub>EDTA), ili prirodnog ekstrakta žira hrasta kitnjaka (*Quercus petraea*, Fagaceae). Fizičko-hemijska karakterizacija NEs izvršena je analizom distribucije veličina kapi, merenjem električne provodljivosti i pH vrednosti, te određivanjem primarnih i sekundarnih produkata oksidacije (lipidnih hidroperoksida – LH i TBARS supstanci, redom). Nađeno je da se oksidativna stabilnost ulja maline značajno poboljšala čuvanjem u frižideru nakon otvaranja ili dodatkom BHT-a (PB < 10, PA < 6, % INH<sub>TBARS</sub> > 80%). Dobijene NE su bile polutransparentne (usled malih veličina kapi < 70 nm) i stabilne na 25 i 40°C, a drastičan porast oksidacionih produkata je uspešno inhibiran upotrebom BHT-a ili Na<sub>2</sub>EDTA, kao i pomoću ekstrakta hrasta kitnjaka kao potencijalnog prirodnog stabilizatora.

### Literatura

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