

Abstract

Introduction: Today, skin health and prevention of skin allergies and aging have very important position in public health. To reduce skin damage caused by the sun's ultraviolet rays, the use of sunscreens are recommended as protection agents. Sunscreens are divided into different physical, chemical and plant types. In this study, vegetable oils such as rice bran oil and raspberry seed oil, which themselves have sunscreen properties, were loaded into nanoparticles and their sunscreen effect was investigated. The nanoparticles used are chitosan-coated nanostructured lipid (NLC) carriers. These carriers are easily absorbed into the skin due to their lipid content and very small size. In addition, the chitosan coating of the carrier with its biological adhesion properties is expected to increase the durability of the product on the skin surface and increase its intradermal absorption and ultimately increase its sunscreen effect.

Materials and Methods Solvent diffusion method was used to load vegetable oils of red raspberry seed and rice bran in lipid carrier nanoparticles. Then DLS test was used to evaluate the zeta potential and particle size distribution and SEM microscopy was used to examine the morphology. The FT-IR (Spectrometer Infrared Transform Fourier) spectrum was also examined. The prepared samples were dried by the freezer dryer and the resulting powder was used to measure ultraviolet absorption by the UV-Vis spectrophotometer in the range of 290 to 320 nm. Absorption data were used in SPF calculations to evaluate the degree of sun protection. For measuring the protection ability of products against UVA radiation, the critical wavelength (CW) was measured using the surface below the UV absorption spectrum in the range of 320-400 nm. The water resistance of the products was also calculated according to the SPF measured before and after water immersion. To evaluate the stability of the sunscreen effect of the product in 15 consecutive days, the absorption of the sample was recorded by UV spectrometry and its SPF was calculated.

Results and Discussion: The results obtained from DLS and zeta potential indicate the effect of chitosan presence on increasing particle size and zeta potential. The results obtained by electron microscopy confirm the spherical and nanoparticle nature of the carrier. The SPF of each of the prepared products was calculated and the results were reported graphically. The protection of these products against long UV rays was also examined and recorded in the form of a diagram. They have also been successful in water resistance testing and have good water resistance. Also, the stability test of these samples had a positive answer and very little change was observed in their SPF.

Conclusion: Based on the results of this study, vegetable oils that are loaded in carrier lipid nanoparticles have shown more sunscreen effect than the crude oils and therefore, it was concluded that chitosan coated NLC has been able to increase this effect.

Keywords: Rice bran oil, Raspberry seed oil, SPF, Natural Sunscreen, Nanotechnology, Nanostructured lipid carriers, Chitosan.