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ORIGINAL PAPERS

Preliminary Data Regarding the Use of Camelina Oil in Some Dermatocosmetic Formulations

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Abstract

Camelina sativa is an annual plant belonging to fam. Brassicaceae, originating from S-E Europe and S-V Asia, from whose seeds high quality oil is obtained from the compositional point of view. It has a saponifiable fraction of fatty acids, of which the polyunsaturated ones are more than 55% and a non-saponifiable fraction of sterols and tocopherols. In addition to biofuel uses, camelina oil can be purified by specific technological processes and harnessed to produce products with different destinations: food supplements, feed ingredients, dermatocosmetics and pharmaceuticals. The purpose of this paper is to analyze the SPF of camelina oil in order to include it in dermatocosmetic product formulations. We analyzed spectrophotometrically 10 solutions of camelina oil in hexane, 1% -10% concentration, at wavelengths between 290 and 320 nm. The regression analysis confirms the existence of a significant linearity relationship between concentration and SPF (RSquare = 0.9967). The sun protection factor determined using the Mansur et al (1986) equation indicates values between 3.65 and 22.32 indicating the possibility of using camelina oil in dermatocosmetic formulations for sun protection.

Keywords: camelina oil, dermatocosmetic product, SPF.

Introduction

Camelina sativa is an annual plant belonging to fam. Brassicaceae (Frohlich and Rice, 2005), genus Camelina, originating from S-E Europe and S-V Asia. It is named camelina, false flax, German sesame, gold-of-pleasure, linseed dodder, Siberian oilseed or wild flax. The particular value of camelina oil is given by its content in polyunsaturated fatty acids (50- 60%), by its content in omega 3 (35-40%), and by its content in omega 6 (15-20%). Due to these properties, camelina oil is one of the richest vegetal sources of omega 3 (F. Imbrea et al, 2011). In addition to biofuel use, cameline oil can be purified by specific technological processes and harnessed to produce products with different destinations: food supplements, feed ingredients, cosmetics and pharmaceuticals (Ş. Jurcoane et al, 2011). The purpose of this paper is to analyze the SPF of camelina oil in order to include it in dermatocosmetic product formulations.

The concept of sunscreen was first proposed by austrian scientist Franz Greiter, and then sequentially adopted by many authorities in the pharmaceutical and cosmetic industry. It said about how long sun-covered skin can be sunburned until sunburn is produced compared to the time it takes for unprotected skin. SPF is a numerical evaluation system that indicates the degree of protection of the cosmetic product. It is defined that the ratio of the amount of UV energy required to produce erythema on the protected skin and the value of UV energy required to produce the same erythema on the unprotected skin.

Material and method

To analyze the photoprotective capacity of camelina oil, 10 samples of cameline oil in hexane were prepared in concentrations of between 1 and 10%. For each sample, the absorption spectra were recorded in the wavelength range 290-320 nm with 2nm step using Rayleigh-UV-2601 spectrophotometer using 1 cm cuvettes.

For the calculation of the protection factor, Mansur et al. (1986) was used:

$$SPF = 10 \sum_{290}^{320} F(\lambda) * Abs(\lambda)$$

where: SPF - the sunscreen determined by spectrophotometry

F - the correction factor whose values depend on the wavelength

Abs - Absorbance of the solution recorded at a given wavelength (λ).

The values of the correction factor F at different wavelengths are shown in Table 1.

Table 1. The values of the correction factor F at different wavelengths

λ(nm)	F
290	0,0150
295	0,0817
300	0,2874
305	0,3278
310	0,1864
315	0,0837
320	0,0180

The absorption spectra plotted for the samples under study are shown in Figure 1 and the absorbance values measured at the wavelengths required for the SPF calculation are shown in Table 2.

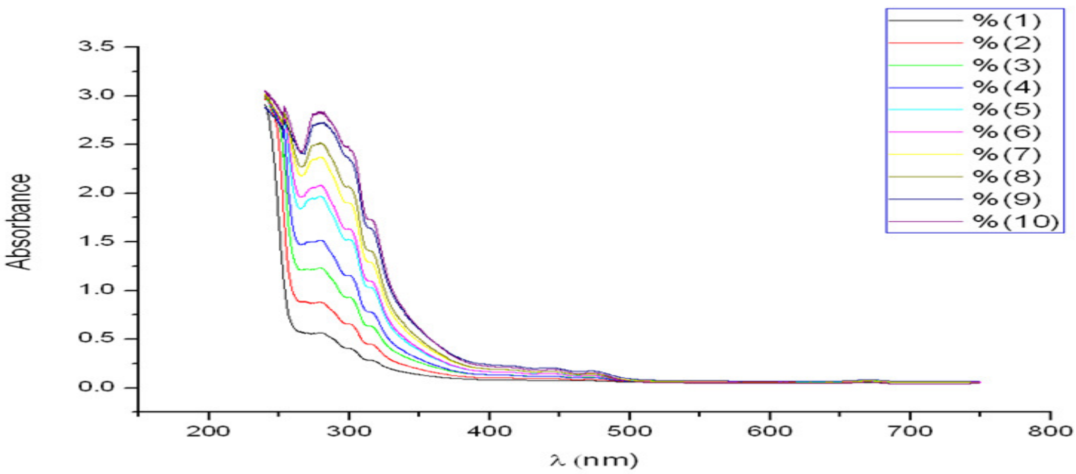

Figure 1. The absorption spectra of camelina oil in hexane for concentrations between 1 and 10%

Table 2.

λ(nm)	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
290	0.49	0.765	1.073	1.323	1.724	1.835	2.13	2.288	2.595	2.666
295	0.423	0.676	0.954	1.183	1.555	1.663	1.942	2.108	2.434	2.515
300	0.408	0.657	0.93	1.155	1.524	1.629	1.896	2.056	2.338	2.44
305	0.372	0.6	0.853	1.06	1.407	1.5	1.756	1.912	2.193	2.312
310	0.3	0.474	0.67	0.829	1.098	1.171	1.38	1.506	1.762	1.854
315	0.287	0.451	0.636	0.782	1.033	1.101	1.291	1.409	1.642	1.73
320	0.262	0.409	0.575	0.707	0.941	0.996	1.17	1.278	1.497	1.595

Using the SPF determination equation, values between 3.65 and 22.23 were obtained at concentrations between 1 and 10%, as shown in the table below.

Table 3. SPF values at concentrations between 1 and 10%

Concentration (%)	SPF
1%	3.657678
2%	5.856703
3%	8.294034
4%	10.28616
5%	13.60183
6%	14.51623
7%	16.97487
8%	18.45847
9%	21.21408
10%	22.23692

The graphical representation of the SPF variation on a concentration basis shows a linear variation of SPF depending on the concentration.

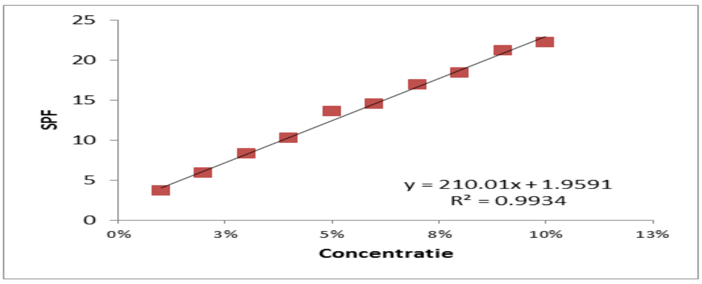

Figure 2. Graphical representation of SPF variation according to concentration.

Conclusions

Regression analysis confirms the existence of a significant linearity relationship between Concentration and SPF (SPF = 210.01 * Concentration + 1.95) on the concentration range of 1% -10%, confirmed by test statistic F used to test the regression model used (F = 1210.63; p & lt; 0.001).

In addition, the t test used to test the regression model parameters shows that the slope of the regression line b = 210.01 corresponds to a significant relationship between the two variables (t = 34.79, p <0.001). In addition, the R Square determinant is 0.9967; which indicates that 99.67% of the dependent variable variance (SPF) is determined by the variance of the independent variable (Concentration).

The sunscreen determined using Mansur et al (1986) indicates values between 3.65 and 22.32 indicating the possibility of using camelina oil in dermatocosmetic formulations for sunscreen, therefore we will continue our studies in this regard.

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