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Do plastic packages provide sufficient photoprotection for moisturizing creams?

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Background

The effect of creams depends on their appropriate quality and stability, ensuring safe use. Since active cosmetic substances are often characterized by low stability, solar radiation has a particular impact on the durability of creams, and hence the photoprotective properties of their packaging are extremely important. Thus, to limit the negative impact of the microclimate on cosmetics, manufacturers should select packaging that ensures protection against radiation, moisture, and air movements..

The study aimed to evaluate the photoprotective properties of selected plastic packaging for moisturizing creams using the hemispheric directional reflectance method.

Methods

In the study, **24 plastic packages**, divided into two categories depending on the color of the plastic material, i.e., white and blue plastic, were tested.

- white plastic (n = 18),
- blue plastic (n = 6).

The THR was measured using SOC-410 Directional Hemispherical Reflectometer (USA) within a wide wavelength range from 335 nm to 2500 nm at an angle of 20°. The SOC 410 apparatus measures the integrated surface reflectance for seven wavelength bands i.e. 335 – 380 nm, 400 – 540 nm, 480 – 600 nm, 590 – 720 nm, 700 – 1100 nm, 1000 – 1700 nm, 1700 – 2500 nm. The integrating sphere captures the reflected radiation from the tested object (in our study pharmaceutical package) integrating those reflections in all directions. Each of the selected areas within the analyzed package was measured three times.

Figure 1. On the left - directional Hemispherical Reflectometer. On the right - exemplary white plastic package of moisturizing creams with measurement areas within a plastic container.

To compare the obtained data between the analyzed areas, Statistica 13 software was used.

Results

The blue plastic showed a greater mean THR value than the white plastic in the 335-380 nm range only (0.216 vs. 0.090, respectively, $p < 0.001$). In turn, significantly higher THR was shown for the white plastic than for the blue ones in the remaining wavelength ranges, i.e., 400-540 nm (0.809 vs. 0.577, respectively), 480-600 nm (0.827 vs. 0.383, respectively), 590-720 nm (0.812 vs. 0.325, respectively), 700-1100 nm (0.744 vs. 0.530, respectively), 1000-1700 nm (0.559 vs. 0.352, respectively), and 1700-2500 nm (0.181 vs. 0.115, respectively) (p <0.001 each).

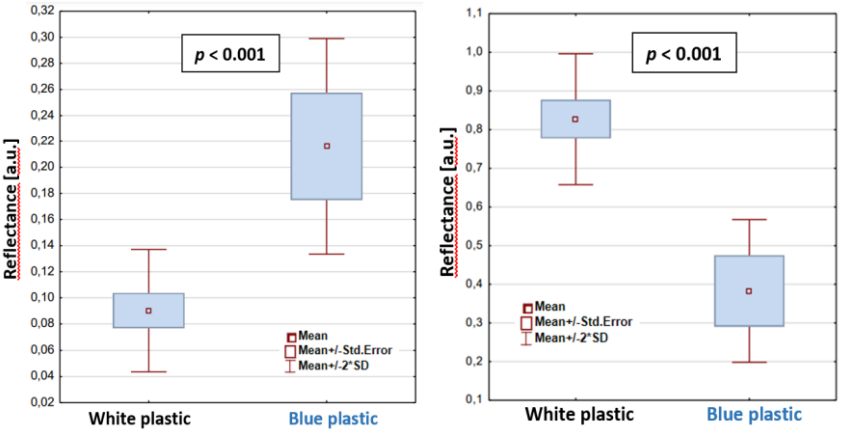

Figure 2. Average with standard deviation of directional hemipsherical reflectance for white and blue plastic packaging in the exemplary radiation ranges of 335-380 nm and 480-600 nm.

Conclusions

The best protection against visible and infrared radiation is provided by white plastic packages, while blue plastic packages showed better protection against UVA radiation.

Keywords cosmetics; hemispherical reflectance; packaging; photoprotective properties; radiation; stability

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