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Design of Microencapsulated Nigelle Sativa Oil Impregnated in Textile Structure

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Textiles have been used for protection from solar radiation since the time of ancient civilizations. Textile structures render unique characteristics required for sun screening apparel such as pliability, good mechanical strength, softness, esthetics, and other engineered properties. However, textiles as such may not be able to provide effective protection and theyshould be treated with ultraviolet (UV) blocking agents to ensure that the fabrics deflect the harmful UV rays. Several UV blocking agents are being developed to add or improve the UV protection function of textiles. There are opportunities for health and well-being by using cosmetotextiles in which substances that enhance skin appearance, or vitamins can be absorbed by the skin.
The aim of this article is the diffusion of Nigella Sativa oil encapsulated and impregnated in textile structures for the children of the moon.

Keywords: High-performance textiles; medical textiles; health care; human values; cosmetotextiles; anti UV textile.

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1. INTRODUCTION

At the moment, Healthcare design is interested in the problems related to the health of man and the quality of their life. It examines a care environment that can not only prevent injuries but also provide psychological support to facilitate the healing process. In addition, it is a multidisciplinary and humanistic process that uses different specialties such as designers (products, textiles, space ...), researchers, and administrators of institutions such as (hospitals, associations, laboratories, etc., and who need to combine their strengths and skills to assess the effects of innovation in product design. "Recent advances have begun to change perceptions for new ways of preventing disease, extending life, and improving health andwell-being.

Indeed, thanks to technological advances, textile design is ubiquitous in the current preoccupations of people who have specific requirements like diseases to design new fabrics and new innovative and creative methods. The aim of this article is the diffusion of Nigella Sativa oil encapsulated and impregnated in textile structures for the children of the moon.

2. STATE OF THE ART

Biofunctional textiles are materials that expert a biological effect on human skin. When the textile comes into contact with skin, such textile constitutes actives substances incorporate into the fabrics, which may break when a garment rubs the skin. This technology merges the universe of cosmetics and textiles through the process of microencapsulation. This last is a technique of cosmetotextiles [1].

Currently, there are textiles in the market that claim to be moisturizing, body slimming, energizing, refreshing, relaxing, and UV protection. Microencapsulation technology can be used in the case of essential oils, therapeutic smells, and drugs. There are many different methods to fix the microcapsules onto textile fibers and surfaces. The technology used to add some encapsulated products is widely applied in the technical, biomedical, sportswear, and protection fields.

Children must wear long clothing, covering all parts of the body, gloves, closed shoes, wide-brimmed hats, and sunglasses with sufficient UV-filtering glasses with wide side frames are essential.

3. OBJECTIVES

This current study aims to prepare and investigate ethylcellulose microcapsules, containing Nigelle Sativa oil into knitted cotton fabrics using the phase separation method. Ethylcellulose is hydrophobic polymeric coating material that can be used for extended drug release.

4. MATERIALS AND METHODS

Nigelle sativa oil is usually employed as a natural remedy to hydrate and protect the skin against different diseases.

The exceptional properties of cotton with moisture management make the fabric more comfortable to wear when in contact with the skin.

Acrylic Resin (AR) was used as a binder to make sure the microcapsules adherence to the textile support. The prepared microcapsules alone and fixed onto compressive knit were then analyzed by Scanning Electron Microscopy (SEM) [2].

Preparation of Ethylcellulose Microcapsules.

Fig. 1. Preparation of microcapsules

(a) The oily phase: 0.3 g of ethylcellulose (EC-N100 NF) and 5 ml of ethyl acetate, put in a 25 ml beaker at a magnetic stirring of 1000 rpm. Nigella oil is added with continuous magnetic stirring.
(b) The aqueous phase: 0.5 g of sodium lauryl sulphate and 50 ml of water placed in a 100 ml beaker subjected to magnetic stirring at 1000 rpm. 6 ml of ethyl acetate isadded with continuous magnetic stirring.
(c) The oily phase is then added to the aqueous phase little by little with magnetic stirring at a speed of 1000 rpm. An emulsion is obtained. The emulsion is placed in 100 ml of water under magnetic stirring at 1000 rpm for 1 hour. Ethylcellulose forms the separating layer of the microcapsules that enclose the product.
(d) The phase is rested
(e) The microcapsules are separated using the vacuum pump, and a 0.45 micron filter paper.
(f) Drying

5. RESULTS AND DISCUSSION

5.1 Sieving

This technique is widespread and inexpensive. We separated the different sizes obtained by the microencapsulation process by sieves. Below 80 microns, the classification of the particles becomes random by this technique.

5.2 Imaging Analysis

Imagery can visualize objects in two dimensions, and the analysis of images can appreciate not only the size but also the shape of the particles.

Microcapsules must be characterized to link their properties to their performance. The characterization concerns:

Size

There are different granulometric techniques to determine the size of microparticles

This study can be used for all types of microencapsulation in oil for example oil nigella. A microscopic observation using a scanning electron microscope makes it possible to determine the average size of the microcapsules obtained. The figure shows that the average size of the microcapsules of oil is of the order of 40 microns. Several factors influence the size of these microparticles, for example, the stirring speed during the formation of the microcapsules, the higher the speed, the smaller the average size. The figure shows a fairly large variation in the size of the microcapsules. This variation in size helps a difference in the release time of the active ingredient that is requested; since the mechanical behaviors of microcapsules whose size is relatively large are not identical to those of small size.

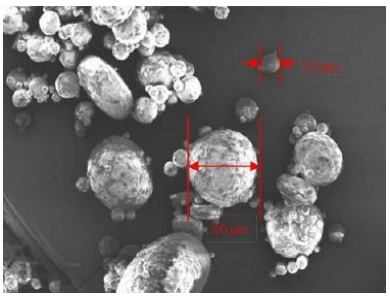

Fig. 2. Microscopic observation (SEM) of the microcapsules of the oil (300 x)

5.3 Microscopic Appearance

Microscopy techniques make it possible to determine the shape of the particles, their sizes, their homogeneities as well as their densities. The shape of the microcapsules observed by a scanning electron microscope is generally spherical in the figure below.

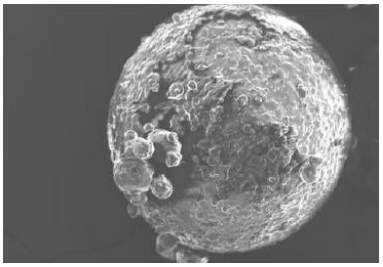

Fig. 3. Microscopic observation of the structure of the microcapsule surface (1000 x)

5.4 Effects de Nigelle sativa in Dermatology

N.sativahavea wide range of pharmacological effects; immune-stimulatory, anti-inflammatory, hypoglycemic, antihypertensive, antiasthmatic, antimicrobial, antiparasitic, antioxidant, and anticancer effects [3].

Fig. 4.Nigelle sativa plant

Our case study is the children of the moon (Xeroderma Pigmentosum) a rare autosomal recessive disease characterized by increased sensitivity to UV and sunlight. Without full and effective protection fromsunlight, patients suffer accelerated aging of the skin, burns, and pigmentation disorders and inevitably develop eye and skin lesions that can lead to multiple cancers [26-28].

Fig. 5. Frontal image of the face, showing large hyperkeratotic lesions with some induration suspicious of actinic keratosis and early squamous cell carcinoma

Xeroderma Pigmentosum affects both men and women worldwide, and its prevalence (number of people affected in a given population at a given time) ranges from 1 to 4 cases per 1,000,000 in Europe and the United 1 case for 40 to 100,000 births in Japan, the Maghreb countries and the Middle East [8-10]. Xeroderma pigmentosum is a rare orphan disease in the world, relatively common in North Africa and some Middle Eastern countries concerning high inbreeding [4].

XP is a group of diseases, with eight different genes (located on different chromosomes) that, when mutated, result in XP. There are seven classic XP groups (from A to G, see Table 1) and one for the XP variant (occurring in adulthood). It is often difficult to distinguish between the different types just based on the symptoms, but there are still some differences depending on the mutated gene (especially symptom severity and age of onset). The type C, called "classical", is the most frequent in France [5-7].

Fig. 6. This left lateral view of the face shows the diffuse nature of the hyperpigmented lentigos on the face and neck

4.5 Protection Against Lesions, Preventive Treatments

The XP treatment imposes a report on sun and UV exposures. This is to avoid maximum exposure to the sun all day long. Therapeutic patient education plays an important role in protecting all body surfaces from UV radiation. Among the practices used by these children, wearing protective clothing, sunscreens, UV-absorbing glasses, and a long haircut. Some patients wear custom hats that absorb UV [21-25].

Table 1. The seven classic XP types differ slightly in their symptoms and their severity

XPA	Very severe form with significant neurological abnormalities.
XPB	Very rare (less than 10 cases worldwide), overlap with Cockayne syndrome.
XPC	Most frequent form, absence of neurological problems.
XPD	Very heterogeneous, always accompanied by more or less significant neurological abnormalities.
XPE	Rare. Relatively mild symptoms with no neurological disturbances.
XPF	Form concerning almost exclusively the Japanese population
XPG	Very rare, it concerns only a few people, recovery with the syndrome of Cokayne.

Fig. 7. Types of protection UV

Photoprotection is the first measure introduced to prevent precancerous and cancerous lesions.

Photoprotection must be ideal, including Photoprotection clothing and places of life (habitat, car, school, work, etc.) and care, completed by sunscreen products. In addition, artificial light sources (UV) must be tested using a dosimeter and then each window in homes, classrooms in schools ... must be filtered by anti-UV [11-15].

Children must wear long clothing, covering all parts of the body, gloves, closed shoes, wide-brimmed hats, and sunglasses with sufficient UV-filtering glasses with wide side frames are essential [16-20].

6. CONCLUSION

The actors of the cosmetotextile sector are constantly innovating, always designing more products for beauty and well-being. The new regulations being put in place will better meet consumers' expectations and guarantee the quality and effectiveness of the products offered on the market.

thanks to technological advances, textile design is ubiquitous in the current preoccupations of people who have specific requirements like diseases to design new fabrics and new innovative and creative methods. The aim of this article is the diffusion of Nigella Sativa oil encapsulated and impregnated in textile structures for the children of the moon.

In this survey, the design of microencapsulated Nigelle Sativa oil impregnated in textile structure was described to be used as cometotextiles product. Furthers tests are needed to optilmise the permanence of this microencaples of Nigelle Sativa oil in textile structure.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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