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Review Article

Study The Evaluation Parameters, Characterization Of Zinc Oxide Lotion With Aloe Barbadensis And Neem Seed Extract

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ABSTRACT

Zinc oxide lotions have gained significant popularity in recent years due to their multiple applications in skincare, particularly in sun protection. However, the addition of natural plant extracts, such as Aloe Barbadensis and Neem Seed, to these formulations has increasingly caught the attention of researchers and consumers alike. This project aims to study the evaluation parameters and characterization of a zinc oxide lotion fortified with Aloe Barbadensis and Neem Seed extract.

INTRODUCTION

The concept of beauty and cosmetics dates back to ancient mankind's civilization. Generally, herbal cosmetics are also referred to as herbal cosmetics. Herbal cosmetics are formulated, using different cosmetic ingredients to form the base in which one or more herbal ingredients are used to cure the various type of skin ailments. The name itself suggests that herbal cosmetics are natural and free from all harmful synthetic chemicals. Instead of traditional synthetic products, different plant parts and plant extracts are used in these products, e.g. Aloe vera gel and vitamin

E. There are a rising number of consumers concerned about ingredients such as synthetic chemicals, mineral oils who demand more natural ingredients, free from harmful chemicals and with an emphasis on the properties of botanicals. Nanomaterial research has been developing rapidly and has potential in various areas, including biomedical, magnetics sciences, biosensors, optoelectronics, and catalysis. In the past years, green synthesis of nanomaterials such as silver, zinc oxide, magnesium oxide, gold cerium oxide, copper oxide and titanium dioxide has been conducted extensively due to simple

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work-up procedure, environmentally benign nature, reusable, low cost, and ease of isolation. The biosynthesised NPs are also stable, capped by the biological compound, robust, and economical compared to other NPs produced by standard techniques. ZnO is one of the most valuable nanomaterials and is potential to be used in the industry. Furthermore, ZnO has been recognized as safe to be used as a food additive by the Food and Drug Administration (FDA). ZnO possesses a wide bandgap yield (3.37 eV) and high excitation binding energy (60 meV) in which it absorbs a larger reaction of the UV spectrum and exhibits a greater photocatalytic performance than TiO₂ in the photodegradation of organic pollutants. Physical, chemical, and biological methods have been used to synthesise ZnO particles. The synthesis route determines the properties of the produced NPs in terms of its crystal growth, morphology, size, size distribution, stability, and aggregation. Due to the increasing popularity of biological methods, different sources like bacteria, fungus, algae, and plants have been used to produce ZnO NPs. Plant extract is used as an aid in the synthesis of NPs as it is cheap and safe to the environment. Various works on the use of plant extract to synthesise ZnO NPs have been reported, as listed in Table.

PLANT PROFILE:

1. Aloe Barbadensis

Botanical name:

Aloe barbadensis miller Family: Asphodelaceae.

Common names:

Aloe vera and Ghritkumari.

Cultivation:

It mainly grows in the dry regions of Africa, Asia, Europe, and America. In India, it is found mainly in Rajasthan, Andhra Pradesh, Gujrat, Maharashtra, and Tamil Nadu.

Active constituents:

Vitamins (vitamin A, vitamin C, vitamin E, and vitamin B12), enzymes, minerals, sugars, lignin, saponins, salicylic acid.

Medicinal uses:

1. Treat skin injuries (burns, cuts, insect bites, and eczemas)
2. Digestive problem



Fig no 1 Aloe Barbadensis

2. Neem Seed Extract

Synonym :-

Neem tree or Neem is also popularly known as the Nimba tree, Indian lilac, miracle tree

Biological source :-

Neem consists of the fresh or dried leaves and seed oil of Azadirachta indica J. Juss (Melia Indica or M. azadirachta Linn.).

Family:-

Mahogany

Cultivation:-

It mainly grows in the dry regions of India, Asia, Europe, and America.

Chemical constituent:-

The most important active constituent is azadirachtin and the others are nimbolinin, nimbin, nimbidin, nimbidol, sodium nimbinate, gedunin, salannin, and quercetin.

Medicinal Use :

1. Lice
2. Tooth plaque
3. Gingivitis
4. Psoriasis to repel insects



Fig no 2 Neem seeds extract

3. Zinc oxide

Zinc oxide is an inorganic compound with the formula ZnO . It is a white powder that is insoluble in water. ZnO is used as an additive in numerous materials and products including cosmetics, food supplements, rubbers, plastics, ceramics, glass, cement, lubricants paints, sunscreens, ointments, adhesives, sealants, pigments, foods, batteries, ferrites, fire retardants, semiconductors and first-aid tapes. Although it occurs naturally as the mineral zincite, most zinc oxide is produced synthetically.

Physical Properties of Zinc Oxide

Zinc white crystallises mainly in two forms viz cubic zinc blende and hexagonal wurtzite. The most common and stable structure under ambient conditions is wurtzite. Zincblende can be stabilised by growing zinc oxide on substrates which have a cubic lattice structure. The oxide and zinc centres are tetrahedral.



Evaluation Parameters :

1. pH:

5 ± 0.01 gm of the lotion was weighted accurately in a 100 ml beaker. 45 ml of water was added and dispersed the lotion in it. The pH of the suspension was determined at $27^\circ C$ using the pH meter.

2. Viscosity:

Viscosity is a measure of fluid's resistance to flow. It is to drive a spindle (which is immersed in the test fluid) through a calibrated spring. The viscous drag of the fluid against the spindle is measured by the spring deflection. Spring deflection is measured with a rotary Transducer.

3. Physical Appearance:

The visual appearance of the formulation at each stability test condition was assessed by comparing the color of the lotion to the initial color and appearance of the *C. niloticus* oil lotion. Photos were taken of each formulation, placed at the same location in the laboratory each time that appearance was evaluated. A digital camera was placed approximately 15 cm away from the formulations.

4. Stability Test:

The thermal stability of the formulation was determined by the humidity chamber controlled at $40^\circ C$ for 7 days. Here are some potential benefits of *Aloe barbadensis* (*Aloe vera*):

1. Skin health:

Aloe vera is well-known for its skin-soothing properties. It can help reduce inflammation, heal wounds, and moisturize the skin. It is commonly used to treat sunburns, acne, eczema, and psoriasis.

2. Hydration:

Aloe vera gel is hydrating and can help replenish moisture in the skin. It is often used in skincare products and can be applied topically to keep the skin hydrated and supple.

3. Digestive health:

Consuming *Aloe vera* juice or gel internally may support digestive health. It has been traditionally used to relieve symptoms of indigestion,

heartburn, and constipation, and can promote regular bowel movements.

4. Immune system support:

Aloe vera contains antioxidants and vitamins that can help support the immune system. Regular consumption may help improve overall immune function.

5. Nutritional value: Aloe

PHYSICAL APPEARANCE:

1. Aloe Barbadensis

Colour:

Light greenish

Odour:

Characteristics

Texture:

Viscous liquid

pH: Normally pH of aloe is 4.50

2. Neem seed extract :

Colour-

Dark yellowish

Odour-

Characteristics

Texture-

Rough

3. zinc oxide :

Colour –

white

Zinc Oxide formula

- ZnO

Molecular Weight of Zinc Oxide

- 81.406 g/mol

The density of Zinc Oxide –

5.6 g/cm³

Literature Survey

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Micronized zinc oxide skin protector formulation study

Micronized zinc oxide skin protector formulations comprising between about 8 % and 40 % zinc oxide. These compositions preferably comprise micronized zinc oxide, preferably obtained via a "wet" micronization process in oil, and also preferably include agents that block or screen light in the visible and/or infrared ranges, and also preferably include hydrotropes and humectants to aid in the dissipation of heat caused by the

irradiation of light in the visible and/or infrared ranges, and alleviate the photo-damage and/or heat damage associated with such irradiation. These compositions are preferably readily absorbable, transparent, non-irritating, noncomedogenic and are hypo-allergenic. The compositions may comprise additional ingredients such as biological additives (e.g., botanicals and herbals).

Reference : EUROPEAN PATENT APPLICATION Inventor: Vromen, Jacob Botany New South Wales 2019 (AU) EP1595527A2

Mechanisms of Action and Potential:

The combination of ZnO with Aloe Barbadensis and Neem seed extract in a skincare formulation can potentially offer synergistic benefits. ZnO provides UV protection, while Aloe Vera moisturizes and soothes the skin. Neem extract can contribute antimicrobial and anti-inflammatory effects, making the lotion suitable for a wide range of skin concerns. Further research may explore the specific mechanisms of action when these ingredients are combined and their long-term effects on skin health.

Neem seed extract offers several benefits, including:

1. Pest control:

Neem seed extract is an effective natural pesticide. It can repel and kill a variety of common garden pests, such as aphids, mites, and whiteflies.

2. Disease prevention:

Neem seed extract has antifungal and antibacterial properties that help protect plants from diseases caused by fungi and bacteria. It can be used to prevent diseases like powdery mildew, black spot, and rust.

3. Organic gardening:

Neem seed extract is a popular choice for organic gardeners as it is non-toxic to humans, animals,

and beneficial insects. It provides an eco-friendly alternative to chemical pesticides.

Plant growth promotion:

Neem seed extract contains natural plant growth regulators that stimulate plant growth and development. It can enhance root development, increase nutrient uptake, and improve overall plant vigor.

Soil improvement:

When used as a soil amendment, neem seed extract can improve soil structure.

Procedure for preparation of zinc oxide lotion

A preferred lotion formulation was prepared in the following manner.

- a. Cetyl or myristyl alcohol (4mg), glyceryl stearate (acid stable) (4.4mg), were combined and melted at a temperature not exceeding 70°C until homogeneous.
- b. When molten, cetyl phosphate (5mg) was added, then half of the Rose water (27.75ml) (at approximately 70°C), and the remaining rose water (27.75ml) (cold) were added while mixing.
- c. The mixture was cooled to about 50°C, and the following were added urea (19.5mg), benzophenone-4 (4mg), triethanolamine (3.25mg) 70% micronized zinc oxide in caprylic/capric triglycerides (12.5%), 70% micronized titanium dioxide in caprylic/capric triglycerides and 50% micronized iron oxide (yellow) in propylene glycol to form an emulsion.
- d. The emulsion was cooled to 40°C, followed by addition of Aloe barbadensis clear extract (4mg), Neem Seed extract (3mg), If necessary, the emulsion is homogenized.

Zinc Oxide Lotion Formulation		
COMPOUND	WEIGHT %	TYPE OF COMPOUND
Rose water	27.75	Solvent
Zinc Oxide	19.5	Uv protector



Urea	19.5	Skin Conditioning agent
Stearyl Octanoate	4.0	Emollient
Benzophenone-4	4.0	Uv absorber
Steric Acid	4.4	Emulsifying agent
Aloe Barbedensis extract	4.0	Biological additive
Neem Seed Extract	3.0	Biological additive
Oil of Melaleuca Aitemifila (Tea tree oil)	6.0	Biological additive
Cetyl Alcohol	5.0	Emulsifying agent
Triethanolamine	3.25	pH adjuster
Sodium benzoate	Nominal	Preservative

CONCLUSION :

In conclusion, the study on the evaluation parameters and characterization of Zinc Oxide lotion with Aloe Barbadensis and Neem Seed extract successful studied.

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