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## Research Article

# Herbal Nanogel Formulations For Psoriasis: A Review Of Recent Advances And Future Perspectives

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## ABSTRACT

Allium sativum L., or garlic, is a popular herbal remedy that has been the subject of extensive research and is widely used to cure a wide range of health issues. Garlic is a well-known biological agent that has significant anti-inflammatory and antioxidant effects.[1] Because it is a rich source of antioxidants, neem (Azadirachta indica) is frequently utilized in Chinese, Ayurvedic, and Unani treatments globally, particularly in the Indian Subcontinent, for the treatment and prevention of different diseases.[2] making herbal nanogel with a bioactive ingredient (garlic, neem). to create biodegradable polymer-based nanoformulation. Carbopol 940, a more widely used and accessible gelling agent, is employed in the formulation of the Nanogel. to assess Nanogel's physical characteristics. Material: Using the Reverse Micellar Method, formulations with different polymer concentrations were created. The clarity, viscosity, spreadability, surface pH, uniformity of drug content, and skin irritation studies of the nanogel were evaluated. The advantageous substitute for oral delivery was demonstrated by the nanogel formulation. [3]

## INTRODUCTION

The word "nanogels" refers to nanoparticles that swell in a suitable solvent and are created by polymer networks that are crosslinked chemically

or physically. With their excellent permeability capabilities, high biocompatibility, high drug loading capacity, high biodegradability, and tissue-mimicking qualities, these prospective

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polymeric nanoparticulate systems have a wealth of medicinal applications. Nanogels have a great affinity for aqueous solutions, which causes them to swell or deswell in an aqueous medium. Nanogels have several benefits, such as high drug loading capacity, permeability, biocompatibility, biodegradability, and the ability to encapsulate both lipophilic and hydrophilic medications. Nevertheless, there are a number of drawbacks to nanogels, including the possibility of polymer or surfactant residues and the high cost of solvent and surfactant removal. Many delivery methods, including oral, pulmonary, nasal, parenteral, and intraocular, are available for their administration and topical route [4]. For generations, people have utilized garlic (*Allium sativum*), one of the most studied and used natural treatments, to cure a variety of health issues. Its components include sulfur-containing substances like alliin, enzymes (like alliinase), and chemicals made enzymatically from alliin (like allicin). Garlic also contains other nutrients like selenium, oligosaccharides, flavonoids, and arginine. Garlic extract applied topically may help with a variety of conditions, including psoriasis, alopecia areata, keloid scars, wound healing, cutaneous corn, leishmaniasis, viral and fungal infections, skin aging and rejuvenation, etc. [1] Psoriasis is a persistent, inflammatory, autoimmune disorder that mostly affects the skin and has a strong genetic component. The development of papules and plaques on the skin's surface that differ in size, shape, and intensity is what is known as psoriasis. Different from these other disorders, psoriasis lesions are typically circular, red, well-defined papules or plaques with a dry, silvery-white or grey scale.[5]



**Fig 1: Psoriasis [6]**

**Causes :**

**Chemical Elements:** A few examples of environmental trigger variables are chemical, ultraviolet, and mechanical traumas. The many illnesses, drug misuse, despair, anxiety, smoking, and other factors.

**Genetic Component:**

There is a specific genetic basis for the genetic component. The incidence is higher in first- and second-degree relatives of psoriasis sufferers.

**Components of Immunology:**

Psoriasis is an autoimmune disease. psoriasis lesions by increasing subcutaneous T cell activation. These include abusing drugs or alcohol, smoking, being stressed out, drinking too much alcohol, and going through stressful times.[7]

**Symptoms and Indices:**

1. Small scaling patches that are commonly seen in children
2. brittle, dry, and perhaps bleed skin
3. Recurrent rashes that are painful, blistering, or itchy and that last for a few weeks or months before disappearing[8]

**Therapy:**

1. light therapy
2. Creams and lotions
3. Injectable and oral drugs

**Effect of Psoriasis on skin :**

One skin condition that is caused by a compromised immune system is psoriasis. Your immune system attacks healthy tissue as well as germs and viruses. Your skin is attacked, which accelerates the rate at which skin cells proliferate.

Skin typically grows and sheds in a month. It just takes three or four days to cure psoriasis. Plaques are thick, crimson areas of accumulated skin cells. Their scales are frequently silvery or white in color. Though they can appear anywhere, plaques and scales are most frequently found on the scalp, elbows, and knees.[9]

#### **Methodology :**

##### **Procedure for Extraction of Garlic :**

The Extraction of garlic is carried out with the cold maceration method .

##### **Cold maceration technique :**

Garlic extract in water 200 ml of standard distilled water and 100 g of crushed garlic paste were combined in a glass container and stirred periodically for 4 days at 3-5°C to create a uniform mixture. After filtering, the mixture was centrifuged again for 20 minutes at 10,000 rpm. To get rid of any contaminants, the supernatant was passed through Wattman filter paper grade 1 with a 0.2 mm pore size. Until they were needed, aliquots were kept at -20°C. Aqueous garlic extract

(AGE) was the filtrate that was thereby produced.[10]

##### **Formulation of Herbal nanogel :**

The formulation of herbal nanogel contain the following contents :

###### **1. Garlic Extract :**

It is used for its antioxidant , anti-inflammatory property

###### **2. Neem oil :**

It is used for its antioxidant, anti-inflammatory activity and also for its permeation enhancer activity

###### **3. Carbapol 934 :**

It is used in the formulation as polymer.

###### **4. Guar Gum :**

It act as gelling agent in the formulation.

###### **5. Ethanol :**

It is used as solvent in the formulation.

###### **6. Triethanolamine :**

It is used to balance the PH of formulation.

###### **7. Methyl paraben :**

It is used as preservative in the formulation.

#### **Formulation table :**

**Table No.1 : List of ingredients for herbal nanogel**

<b>Sr. No.</b>	<b>Ingredients</b>	<b>F1</b>	<b>F2</b>
1.	Garlic Extract	0.5 ml	0.5 ml
2.	Neem Oil	1 ml	1 ml
3.	Carbapol 934	0.5 gm	0.2 gm
4.	Guar Gum	0.5 gm	0.2 gm
5.	Ethanol	5 ml	5 ml
6.	Triethanolamine	0.1 gm	0.1 gm
7.	Methyl paraben	0.3 ml	0.3 ml



## Procedure :

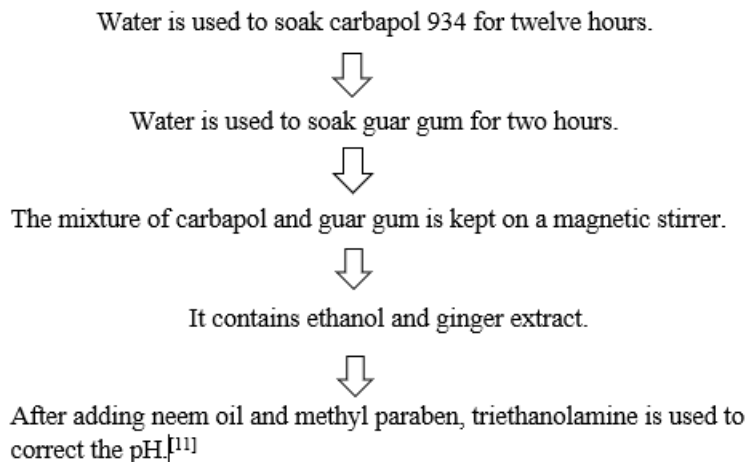


Fig 2: Gel base

Two batches were prepared using Herbal extract :



F1



F2

## Evaluation Test :

### 1. Appearance :

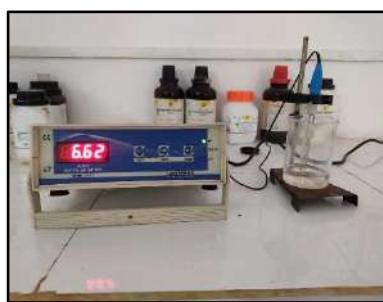
Through visual inspection, the color, texture, and smell of the nanogel were evaluated.

### 2. Homogeneity :

After the gels were placed in their containers, all of the formulated gels were visually inspected to ensure homogeneity. Their appearance and the existence of any aggregates were examined.

### 3. PH of Nanogel :

A digital pH meter was used to measure the pH of the solution after two grams of gel had been dissolved in 100 milliliters of phosphate buffer solution.



F1



F2

Fig 3 : PH of Herbal Nanogel

#### 4. Determination of spreadability :

An excess of gel sample 1.5g was placed between two glass slides and 1000g weight was placed on slides for 5 minutes to compress the sample to uniform thickness. The weight (50g) was added to pan. The time in seconds required to separate the two slide was taken as measure of spreadability.

It was calculated using following formula ,  
It was calculated using following formula,

$$S = m .l/t$$

Where,

S =Spreadability in g.cm/sec.

m= weight tied to upper slide in gram.

l= length of glass slide in cm (7.5 cm<sup>2</sup>)

t= time in seconds



F1



F2

Fig 4:Spreadability of Herbal Nanogel

#### 5. Skin irritation test :

The capacity to test for skin irritation was determined by putting nanogel to the back of the hands.



F1





F2

Fig 5: Skin irritation of herbal nanogel

### 6. Viscosity :

Using Brookfield, the produced gel's viscosity was measured at various RPMs and recorded. The entire speed range of 50–200 rpm was measured, with a 10-second interval between each speed increase.



F1

## RESULT :

Table No 2 : Result

Sr. No.	Parameters	F1	F2
1	Colour	Whitish	Yellowish
2	Odour	Characteristics	Characteristics
3	Appearance	Gel	Gel
4	Homogeneity	Uniform	Uniform
5	Particles	None	None
6	PH	6.62	5.58
7	Spreadability	12.5	18.75
8	Skin irritation	No irritation	No irritation
9	Viscosity	1768.2	1070.5
10	Particle size	149.2nm	142.5

## CONCLUSION



F2

Fig 6: Viscosity determination

### 7. Measurement of particle size :

The Malvern Mastersizer 2000 MS was utilized to ascertain the average size of the chosen nanogels. The average size of the particles was noted.[12]



Fig 7: Malvern Mastersizer 2000MS

A literature review serves as the foundation for research projects. Due to its numerous advantages over other drug delivery methods, the nano drug delivery technology was chosen. increased efficacy by regulated therapeutic agent administration. lower systemic toxicity due to the drug's targeted and regulated release. Improved drug loading and bioavailability; improved solubility; and medication release that is gradual. Neem oil has been discovered to be more effective than other natural penetration enhancers, despite the fact that there are many different sorts of these products. Following the choice of penetration enhancer, garlic was chosen as the medication for creating the NDDS. Comparing the Nano Drug Delivery System to other drug delivery systems, it is one of the most advantageous, safe, effective, and non-invasive ones. Compared to other topical formulations, nanogel has no advantages. It is non-oily, simple to apply and remove, and elegant in appearance. Carbopol 934, a safer and more widely used polymer, was employed in the formulation of Nanogel. It is also readily accessible. Guar gum was used as a gelling agent, ethanol was used as a co-solvent, methyl paraben was used as a preservative, and triethanolamine served as a neutralizing agent in the formulation of Nanogel. Following formulation, an evaluation of the formulation is done to determine which formulation is optimal. Formulation batches were tested for pH, spreadability, viscosity, and a number of other parameters. All of the evaluation parameters were taken into consideration for optimizing formulation batches. An optimal formulation is defined as the batch of formulations that produced the best outcomes for the majority of evaluation tests. F1 was one of the greatest formulations out of all of F1 and F2, as seen by its superior pH value, viscosity, and spreadability when compared to F2.

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