

# COMPARATIVE STUDY OF CREAM AND OINTMENT CONTAINING THYMOQUINONE OIL FOR ANTIBACTERIAL ACTIVITY

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## ABSTRACT:

Thymoquinone, a bioactive compound derived from *Nigella sativa* (black seed oil), has demonstrated significant antibacterial properties. This study investigates the comparative efficacy of cream and ointment formulations containing thymoquinone oil in inhibiting bacterial growth. Creams and ointments are widely used as topical applications, with different physical properties influencing the delivery and potency of active ingredients. The study assess the antibacterial activity of both formulations against common pathogenic bacteria, such as *P. aeruginosa*, *S. aureus* and *E. coli*, through in-vitro testing. By comparing the physical test, pH, spread ability, zone of inhibition, test for content uniformity and overall effectiveness. The findings of this study suggest that the cream formulation containing thymoquinone oil is a promising topical antimicrobial agent with potential applications in various dermatological conditions.

Key words: Thymoquinone, *P. aeruginosa*, *S. aureus*, *E. coli*, physical test, pH, spread ability, zone of inhibition, test for content uniformity.

## INTRODUCTION:

Nowadays the topical formulation has been gained the more attention of people for various benefits. By highlighting this we are going to formulate the cream and ointment using thymoquinone oil. Thymoquinone is a phytochemical compound found in the plant *Nigella sativa* Linn. *Nigella sativa* (N. Sativa) belongs to the family of Ranunculaceae. It is commonly known as kalonji, black caraway, black seed, black cumin. Chemical constituents of *Nigella sativa* plant includes: Nigellone, Thymoquinone (TQ), Thymohydroquinone (THQ), Dithymoquinone, thymol, carvacrol,  $\alpha$  and  $\beta$ -pinene,

d-limonene, d-citronellol. Thymoquinone has various health benefits like anti-fungal, anti-oxidant, anti-inflammatory, antimicrobial, and anticancer properties. Thymoquinone may also use for asthma, diabetes, cardiovascular diseases, and certain types of cancer. *Nigella Sativa* is native to eastern Europe (Bulgaria and Romania) and western Asia (Cyprus, turkey, Iran and Iraq), but naturalized over a much Wider area. including parts of Europe, Northern Africa and east to Myanmar. The main moto of our study is to formulate cream and ointment using thymoquinone oil.

## MATERIALS AND METHODOLOGY: OINTMENT:

INGREDIENTS	PERCENTAGE	PROPERTIES
Thymoquinone oil	2%	Medicament
Wool fat	20%	Absorption base
Liquid paraffin	45%	Hydrocarbon base
White soft paraffin	8%	Hydrocarbon base
Cetyl alcohol	24%	Emulsifying agent and vehicle
Propyl paraben	1%	Preservative

## METHODOLOGY:

Wool fat, white soft paraffin was melted in a beaker on the water bath at 90°C and then add liquid paraffin and thymoquinone oil. The above solution was filtered through coarse filter paper which was placed in a heated funnel (ointment base).



Add medicament with ointment base. The medicament was dissolved in organic solvents like ethanol and was diluted with aqueous buffer of choice.



The mixture was then incorporated with the remaining melted base. Then the formulation was poured into a suitable container.

## METHODOLOGY:

Tween 80, cetyl alcohol and wool fat was melted in a beaker A on the water bath at 70°C (oily phase). Water and glycerine was then heated in another beaker B upto 70°C (aqueous phase).



Aqueous phase was slowly added to melted oily phase with continuous stirring. Add thymoquinone (medicament), propyl paraben and stir.



The above formulation was poured into a suitable container.

## EVALUATION TEST:

1. **PHYSICAL TEST:** The colour, consistency, odour was evaluated.
2. **pH MEASUREMENT:** The pH of the ointment was depicted by using digital pH meter.
3. **SPREADABILITY TEST:** The spreadability of ointment was determined by placing 10gm of ointment between 2 glass slides.
4. **MICROBIAL LIMIT TEST:** Zone of inhibition was conducted to study the antibacterial activity of the ointment.
5. **TEST FOR CONTENT UNIFORMITY:** The content uniformity of ointment was determined by using appropriate analytical technique such as UV-Visible spectrophotometry.

## 6. CREAM:

INGREDIENTS	PERCENTAGE	PROPERTIES
Thymoquinone	5%	Medicament
Wool fat	4%	Emollient
Tween 80	20%	Emulsifying agent
Cetyl alcohol	5%	Stabilizer or Thickener
Glycerine	5%	Humectant
Propylparaben	1%	Preservative
Water	60%	Primary solvent

## EVALUATION TEST:

1. **PHYSICAL TEST:** The colour, consistency, odour was evaluated.
2. **pH MEASUREMENT:** The pH of the cream was depicted by using digital pH meter.
3. **SPREADABILITY TEST:** The spreadability of cream was determined by placing 10gm of cream between 2 glass slides.
4. **MICROBIAL LIMIT TEST:** Zone of inhibition was conducted to study the antibacterial activity of the cream.
5. **TEST FOR CONTENT UNIFORMITY:** The content uniformity of ointment was determined by using appropriate analytical technique such as UV-Visible spectrophotometry.

## RESULTS AND DISCUSSION:

### OINTMENT:

#### PHYSICAL PROPERTIES:

The organoleptic evaluation like general colour, consistency and odour of ointment was evaluated. It was found that ointment had persistent in odour, greasy in Consistency and yellowish in colour

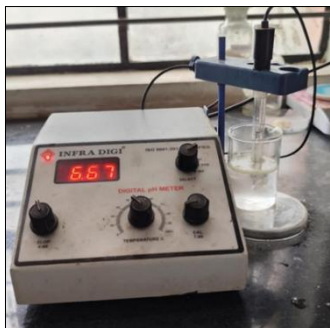


## PHYSICAL PROPERTIES OF OINTMENT

### TEST FOR PH:

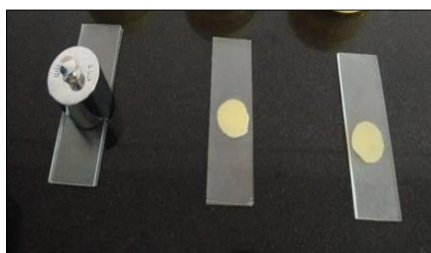
Three trials were performed. The pH of ointment in trials was found to be: I trial – 6.62, II trial – 6.52 and III trial – 6.67. The ideal pH of ointment on skin is 5.6-6.9.

The obtained result 6.59 matches the ideal pH of ointment.



### PH TEST FOR OINTMENT SPREADABILITY TEST:

The spreadability of three formulations was determined and it was observed that formulation F3 has greater spreadability as compared to other formulations. The spreadability of the ointment (F3) was found to be 15.02 cm<sup>2</sup>/sec.



### SPREADABILITY TEST OF OINTMENT

#### MICROBIAL TEST:

Microbial test was conducted to evaluate the antibacterial efficacy against a range of bacterial strains like *E. coli*, *S. aureus*, *P. aeruginosa*. The zone of inhibition was not shown in the ointment.

### CREAM:

#### PHYSICAL PROPERTIES:

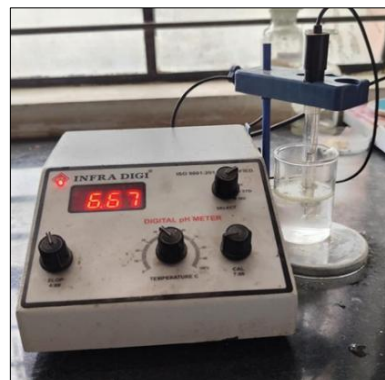
The organoleptic evaluation like general colour, consistency and odour of cream was evaluated. It was found that cream had persistent in odour, creamy in consistency and pale yellow in colour.



### PHYSICAL PROPERTIES OF CREAM TEST FOR PH:

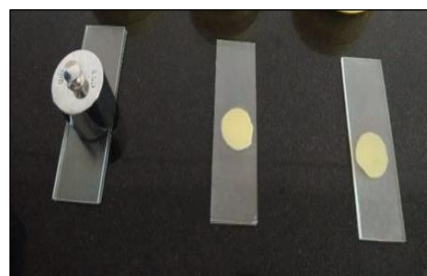
Three trials were performed. The pH of cream in trials was found to be: I trial – 6.24, II trial – 6.31 and III trial – 6.24. The ideal pH of cream on skin is 5.8-6.3.

The obtained result 6.26 matches the ideal pH of ointment.



### PH TEST FOR CREAM SPREADABILITY TEST:

The spreadability of three formulations was determined and it was observed that formulation C1 has greater spreadability as compared to other formulations. The spreadability of cream (C1) was found to be 18.03 cm<sup>2</sup>/sec.



### SPREADABILITY TEST OF CREAM

#### MICROBIAL TEST:

Microbial test was conducted to evaluate the antibacterial efficacy against a range of bacterial strains like *E. coli*, *S. aureus*, *P. aeruginosa*. The zone of inhibition was shown in the cream.

### SUMMARY:

In this work, an attempt was made to design an antibacterial cream and ointment containing Thymoquinone oil. The ultimate objective of present research work is to incorporate Thymoquinone oil into cream and ointment, which has various topical applications. Cream and ointment formulations were developed incorporating thymoquinone oil, a bioactive compound known for its antimicrobial properties. Both formulations were evaluated for their antibacterial efficacy against a range of bacterial strains like *E. coli*, *S. aureus*, *P. aeruginosa*. A comparative study was conducted to assess the relative effectiveness of the cream and ointment formulations. The cream formulation demonstrated superior antibacterial activity compared to the ointment formulation. The enhanced efficacy of the

cream may be attributed to factors such as better drug penetration, improved drug release, and enhanced skin contact time. The findings of this study suggest that the cream formulation containing thymoquinone oil is a promising topical antimicrobial agent with potential applications in various dermatological conditions.

## CONCLUSION:

This study compared the antibacterial efficacy of thymoquinone oil in cream and ointment formulations against *E. coli*, *S. aureus* and *P. aeruginosa*. Both formulations showed significant activity, but the cream was found to be more effective. This superior efficacy of the cream was likely due to better drug delivery and skin compatibility. These findings suggest the potential of thymoquinone oil-based creams for treating skin infections. Further research is needed to optimize formulation and dosage for clinical use.

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