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## Formulation and Development and Evaluation of Curcumin Ointment for Healing of Wounds



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### ABSTRACT

*Curcuma longa* (Turmeric) Extract is an extract obtained from the rhizomes of the plant '*Curcuma longa*' belonging to family Zingiberaceae. It of the compound named curcumin which has tremendous medical uses & has been practicing since ancient times. The objective of this study is to formulate & evaluate the ointment made from the Curcuma Longa (Turmeric) extract. The ointment has been prepared by the levigation method. After that, it is further checked for its evaluation parameters such as the colour, odour, pH, extrudability, washability, loss on drying, spreadability, solubility, etc. The formulation was also checked for its stability at respected temperatures. So, it can be used easily as a simple dosage form.



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## INTRODUCTION

Some European & North-American countries such as the USA, United Kingdom, France, Germany, Denmark, Netherlands, etc are exploring the use of herbs in the pharmaceutical field & also practicing them for many centuries. In the 21<sup>st</sup> century, various human diseases had come out with different names. These herbs are free of side effects or adverse reactions & are also effective <sup>[1]</sup>.

Wounds are common conditions in human beings. Healing of wounds is a complex biological event & the internal & external factors can lead to various complications <sup>[2, 3]</sup>. A wound may often lead to serious adverse events if not treated properly <sup>[4]</sup>. The steps in the wound healing process include first inflammation, angiogenesis, development of granulation tissues, repair of connective & epithelial tissues & at last remodeling <sup>[5]</sup>.

Treatment of wounds is important to achieve the best functional and aesthetic results in a short time <sup>[6]</sup>. Turmeric is used to heal wounds since ancient times. Turmeric is obtained from the dried roots & rhizomes of the plant 'Curcuma longa' belonging to family Zingiberaceae. Curcumin is the main component of turmeric & is responsible for wound healing properties <sup>[7]</sup>. Curcumin has a history of administration in traditional systems of India, China, and Iran <sup>[8]</sup>. The plant 'Curcuma longa' is found in abundance in countries like India, Sri Lanka, Myanmar, Thailand, Malaysia, Indonesia, China, and some African countries <sup>[9]</sup>.

More than 10 different curcuminoids are isolated from Curcumin. They are Curcumin I, desmethoxycurcumin (Curcumin II), and bisdemethoxycurcumin (Curcumin III). Sesquiterpenoids such as turmerone and curlone are components of turmeric essential oil and have biological components of turmeric essential oils. They have biological properties similar to those of curcuminoids <sup>[10]</sup>.

Curcumin improves re-epithelialization and migration of cells such as myofibroblasts, fibroblasts, and macrophages <sup>[11]</sup>. Curcumin inhibits pain and inflammation by selectively inhibiting the arachidonic acid cascade <sup>[11]</sup>.

Curcumin down-regulates the expression of enzyme and inhibits the expression of pro-inflammatory enzyme 5-LOX. It also induces down-regulation of various inflammatory cytokines such as TNF, IL-1, IL-6, IL-8, interferon and some other chemokine <sup>[12, 13]</sup>.

It is given through ointment for wound healing. Ointments can be defined as semisolid dosage forms which usually behave like viscoelastic materials when shear stress is applied. They generally contain medicaments and are intended to be applied externally to the body or the mucous membrane. [14]

## MATERIALS & METHODS

### COLLECTION OF DRY CURCUMA LONGA (TURMERIC) POWDER

The dry 'Curcuma longa' (turmeric) extract was purchased from the company Amsar Private Limited, Indore. It is orange-yellow & is stored in a cool & dark place. The turmeric extract contains 95% curcumin.

### FORMULATION OF OINTMENT

**Table No. 1: Formulation of Turmeric Extract Ointment**

CONTENTS	Quantity taken in F1 (gm)	Quantity taken in F2 (gm)	Quantity taken in F3 (gm)	Quantity taken in F4 (gm)	Quantity taken in F5 (gm)
<b>Dry Curcuma longa Extract</b>	0.06 gm	0.06 gm	0.06 gm	0.06 gm	0.06 gm
<b>Lanolin</b>	0.45 gm	0.50 gm	0.55 gm	0.60 gm	0.70 gm
<b>Cetostearyl Alcohol</b>	0.45 gm	0.50 gm	0.55 gm	0.60 gm	0.70 gm
<b>Hard Paraffin</b>	0.45 gm	0.50 gm	0.55 gm	0.60 gm	0.70 gm
<b>White Soft Paraffin</b>	8.6 gm	8.5 gm	8.4 gm	8.3 gm	8.2 gm
<b>Methylparaben</b>	0.1 gm	0.1 gm	0.1 gm	0.1 gm	0.1 gm
<b>Propylparaben</b>	0.01 gm	0.01 gm	0.01 gm	0.01 gm	0.01 gm

### PROCEDURE FOR OINTMENT PREPARATION

1. First, the ointment base has been prepared by weighing the appropriate quantity of hard paraffin wax. It has been placed in the porcelain dish on a water bath. After the melting of

hard paraffin wax, the remaining ingredients such as lanolin, Cetostearyl alcohol & white soft paraffin were added.

2. Further dry Curcuma longa extract has been added to the ointment base by levigation method. First, the powder is rubbed with a small quantity of the base to forming a concentrated ointment base containing a finely divided powder uniformly distributed in it. The concentrated ointment is then diluted with the remaining quantity of the base by rubbing with a spatula.

3. At last the two preservatives that are Methylparaben & Propylparaben has been added [15].

### **EVALUATION PARAMETERS**

#### **COLOUR & ODOUR**

These are determined by the visual examination.

#### **CONSISTENCY**

Smooth & no grittiness are observed.

#### **pH**

The pH of the ointment has been determined with the help of digital pH meter. The ointment solution has been prepared by using 100 ml distilled water & set aside for 2 hrs.

[16].

#### **LOSS ON DRYING**

Loss on drying is determined to place the ointment in the petri-dish on a water bath & dried at the temperature 105°C [17].

$$\text{Percentage loss on drying} = 100 \times (\text{Wt} - \text{MW}) / \text{Wt}$$

#### □ **VISCOSITY**

The viscosity was determined by CAP- 2000 Brookfield viscometer. The test sample was taken in a clean and dry 250 ml beaker and the viscosity of the test sample was determined by the standard operating procedure of Viscometer by using spindle nos. 1 to 4. Each spindle was used for finding the viscosity of the sample at speeds of 0.3, 0.6, 1.5,3,6,12,30 and 60r.p.m. respectively. Their rheological characteristics were also tested at 250 C using Brookfield viscometer <sup>[18]</sup>.

#### □ **SPREADABILITY**

The spreadability is determined by placing the excess sample in between two slides which were compressed to uniform thickness by placing a definite weight for a specific time. The time required to separate the two slides was measured as spreadability. As less time required for separation of two slides results in better spreadability. Spreadability was calculated by the following formula:

$$S=M \times L/T$$

Where,

S= Spreadability

M= Weight tide to the upper slide

L= Length of glass slide

T= Time taken to separate the slides

#### □ **EXTRUDABILITY**

In the recent study, the method adopted for evaluating ointment formulation for extrudability was based upon the quantity in percentage ointment extruded from the tube on the application of finger pressure. More quantity extruded better was extrudability. The formulation understudy was filled in a clean, lacquered aluminum collapsible 5 gm tube with a nasal tip of 5 mm opening and applied the pressure on the tube with the help of a finger. Tube extrudability was then determined by measuring the amount of cream extruded through the tip when pressure was applied on a tube <sup>[19]</sup>.

#### □ SOLUBILITY

Soluble in boiling water, & miscible with ethanol, ether & chloroform.

#### □ WASHABILITY

The ointment was applied to the skin and then ease the extent of washing with water was checked.

#### □ NON-IRRITANCY TEST

The ointment has been applied to the skin of human being & observed for the effect.

#### □ STABILITY STUDIES

The international conference on harmonization (ICH) harmonized tripartite guidelines on stability testing of new drug substances and the product was issued on 27<sup>th</sup> October 1993 [20]. The physical stability test of the herbal ointment was carried out for four weeks at various temperature conditions like 4°C, 25°C, and 37°C. The ointment was found to be physically stable at different temperature i.e. 4°C, 25°C, 37°C [21, 22].

### RESULTS & DISCUSSION

This study was done to prepare & evaluate ointment from dry *Curcuma longa* (Turmeric) Extract. The *Curcuma longa* (Turmeric) Extract was taken in dried form.

First, the characterization of dry *Curcuma longa* (Turmeric) Extract has been done. Properties such as colour, odour, solubility, melting point, etc. have been determined of both reference & standard sample.

For the preparation of an ointment, the levigation method was used. The levigation method has been incorporated as it ensures uniform mixing of turmeric extract with the ointment base. & it also remains stable during storage. First, the powder was rubbed with a small quantity of the base to form a concentrated ointment base containing powder uniformly distributed in it. After that, the concentrated ointment is then diluted with the remaining quantity of the base by rubbing with a spatula.

The physicochemical properties were studied & showed accurate results for evaluation parameters such as spreadability, viscosity, washability, loss on drying & others.

The stability study of an ointment has also been done. The formulation has been placed at 4°C, 25°C, & 37°C. There were no changes observed.

### CHARACTERIZATION OF TURMERIC EXTRACT

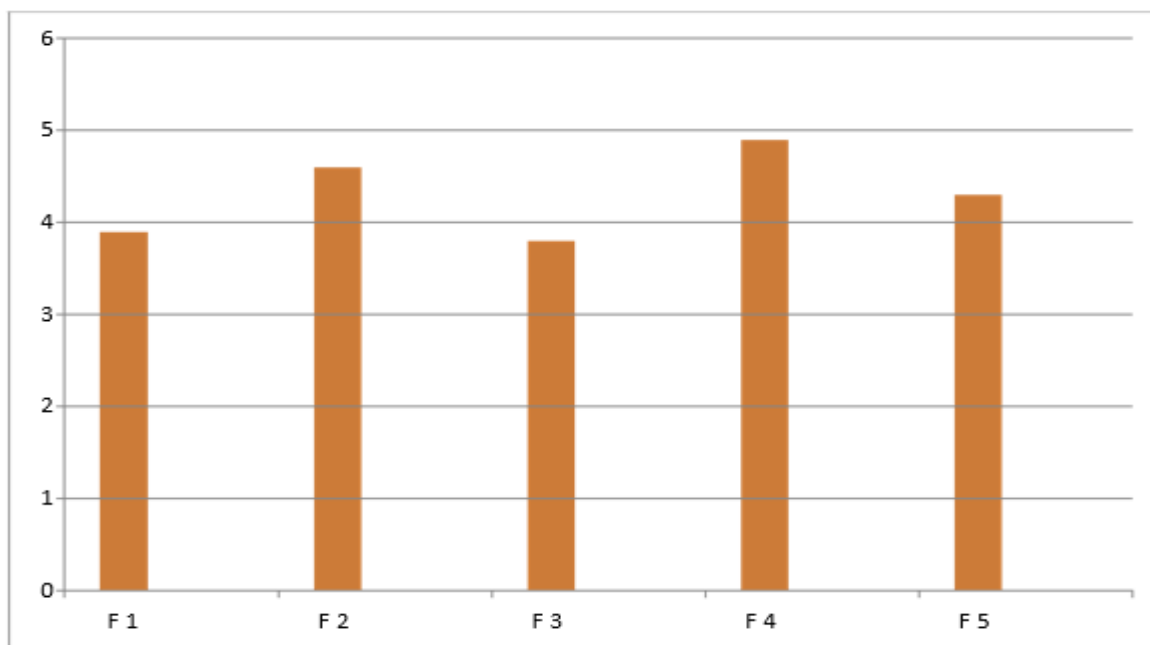
Table No. 2: Characterization of Dry *Curcuma longa* (Turmeric) Extract

Parameters	Turmeric Extract (Ref)	Turmeric Extract (Std)
Colour	Orange-yellow	Orange-yellow
Odor	Strong & Characteristic	Strong & Characteristic
Solubility	Soluble in ethanol, DMSO, chloroform	Soluble in ethanol, DMSO, chloroform
Melting Point	180 <sup>0</sup> C	183 <sup>0</sup> C

### PHYSICOCHEMICAL EVALUATION OF OINTMENT

Table No. 3: Physicochemical Evaluation of Ointment

EVALUATION	F1	F2	F3	F4	F5
<b>PARAMETERS</b>					
Colour	White	White	White	White	White
Odour	Characterstic	Characteristic	Characteristic	Characteristic	Characterstic
CONSISTENCY	Smooth	Smooth	Smooth	Smooth	Smooth
pH	6.1	5.7	5.9	6.6	6.4
LOSS ON DRYING	32 %	33%	26%	24%	27%
VISCOSITY	224 c.p	234 c.p	213 c.p	242c.p	231c.p
SPREADABILITY	5 sec	6 sec	4 sec	7 sec	4 sec
(seconds)					
EXTRUDABILITY	0.33 gm	0.46 gm	0.42gm	0.49 gm	0.45gm
SOLUBILITY	Soluble in boiling water, miscible with alcohol, ether, chloroform	Soluble in boiling water, miscible with alcohol, ether, chloroform	Soluble in boiling water, miscible with alcohol, ether, chloroform	Soluble in boiling water, miscible with alcohol, ether, chloroform	Soluble in boiling water, miscible with alcohol, ether, chloroform
WASHABILITY	Good	Good	Good	Good	Good
NON-IRRITANCY TEST	Non-irritant	Non-irritant	Non-irritant	Non-irritant	Non-irritant
STABILITY STUDIES (4 <sup>0</sup> C, 25 <sup>0</sup> C, 37 <sup>0</sup> C)	Stable	Stable	Stable	Stable	Stable



**Figure No. 1: Stability Studies of Turmeric (*Curcuma longa*) Extract Ointment**

## CONCLUSION

Since ancient times, turmeric has been used for its various medicinal properties such as anti-bacterial, anti-cancer, anti-inflammatory, anti-fungal, etc. In this study, the ointment has been formulated with different bases such as hard paraffin, Cetostearyl alcohol, lanolin (wool fat) & white soft paraffin & with preservatives such as Methylparaben & Propylparaben. From the study, it is concluded that the F4, that is, formulation 4 is more stable than other ones. By combining the turmeric extract with appropriate ointment bases & preservatives a better therapy & patient compliance can be attained.

## REFERENCES

1. Rajasree PH, Vishwanad V, Cherian M, Eldhose J, Singh R: Formulation and evaluation of antiseptic polyherbal ointment, *International Journal of pharmacy and Life Sciences* 2012, 3(10), 2021-31.
2. Gillitzer R, Goebeler M: Chemokine in cutaneous wound healing. *Journal of Leukocyte Biology* 2001; 69: 513–521.
3. Hess CT, Kirsner RS: Orchestrating wound healing: Assessing and preparing the wound bed. *Advanced Skin and Wound Care* 2003; 16: 246-257.
4. Harpal S, Kuldip S, Wound healing and tissue repair. In: *Ruminant Surgery*. 1st edition., J Singh 1993. CDS Publishers and Distributors, Delhi, India. pp. 58-71.
5. Midwood KS, Williams LV, Schwarzbauer JE: Tissue repair and the dynamics of the extracellular matrix. *International Journal of Biochemistry and Cell Biology* 2004; 36: 1031–1037.
6. Mamun MAA (2012). Comparative effect of turmeric (*Curcuma longa*) and durba (*Cynodondactylon*) on the healing of surgical wounds in cattle (*Bosindicus*). MS Thesis. Department of Surgery and Obstetrics, Bangladesh Agricultural University, Mymensingh-2202, 37-41.



7. Li W, Wang S, Feng J, Xiao Y, Xue X, Zhang H, Wang Y, and Liang X: Structure elucidation and NMR assignments for curcuminoids from the rhizomes of *Curcuma longa*. *MagnResonChem* 2009; 10: 902-908,
8. Nishiyama T., Mae T., Kishida H., Tsukagawa M., Mimaki Y., Kuroda M., Sashida Y., Takahashi K, Kawada T, Nakagawa K, and Kitahara M: Curcuminoids and sesquiterpenoids in turmeric (*Curcuma longa* L.) suppress an increase in blood glucose level in type 2 diabetic KK-Ay mice. *J Agric Food Chem* 2005; 4: 959-963.
9. Ammon H and Wahl MA: Pharmacology of *Curcuma longa*. *Planta Med.* 1991; 57: 1 – 7.
10. Aggarwal BB, Sundaram, C, Malani, N and Ichikawa, H ();. Curcumin: The Indian solid gold. *Adv. Exp. Med. Biol.* 2007 595: 1 – 75.
11. Sidhu GS, Mani H, Gaddipati JP, Singh AK, Seth P, Banaudha KK, Patnaik GK, Maheshwari RK: Curcumin enhances wound healing in streptozotocin-induced diabetic rats and genetically diabetic mice. *Wound Repair and Regeneration* 1999; 7: 362-374.
12. Gong C, Wu Q, Wang Y, Zhang D, Luo F, Zhao X, Wei Y, Qian Z: A biodegradable hydrogel system containing curcumin encapsulated in micelles for cutaneous wound healing. *Biomaterials* 2013; 34: 6377-6387.
13. Prescott S: Is cyclo-oxygenase-2 the alpha and the omega in cancer *Clin Invest* (2000); 105(11): 1511-3.
14. Gao X, Kuo J, Jiang H: Immunomodulatory Activity of Curcumin: Suppression of Lymphocyte Proliferation, development of cell-mediated cytotoxicity, and cytokine production in vitro. *Biochem Pharmacol* 2004; 68(1): 51 -61.
15. Dr. Gaud RS, Dr. Yeole PG, Yadav AV., Gokhale SB. "Textbook of Pharmaceutics", Nirali Prakashan, 10<sup>th</sup> edition 2008; 8.
16. Mehta RM, "Pharmaceutics", Vallabh Prakashan, 3rd edition, reprint 2008; 21-25
17. Pande G, Verma K, Singh M, Evaluation of Phytochemical Antibacterial and Free Radical Scavenging Properties of *Azadirachta indica* (Neem) leaves, *International Journal of Pharmacy and Pharmaceutical Sciences* 2014, 6 (2), 444-47.
18. Indian Pharmacopoeias, vol. 2, appendix 11.2, A-135, (1996).
19. Wood JH, Catacalos G, and Liberman SV, Adaptation of commercial viscometer for Special application in pharmaceutical rheology-II, *J. Pharm. Sci* 1963; 52: 375-378.
20. Chakole CM, Shende MA, Khadatkar SN, Formulation and evaluation of novel combined halobetasol propionate and fusidic acid ointment, *International Journal of Chem Tech Research* 2009; 1: 103 – 116.
21. ICH Guidelines, Stability testing of New Drug Substances and Products, 27th October.
22. Mohanta, GP, M. Jamal, and S. Umadevi: Formulation and Evaluation of Polyherbal Wound Healing Cream. *Indian Drugs* 2007; 44: 281-281.
23. Shinde AJ, Bhise SB, Jarag RJ, and Jadhav NR.: Preparation of Creams containing Tridax Procumbens, *Curcuma longa*, and *Azadirachta indica* and its evaluation for wound healing property. *Indian Pharm.* 2005; 4: 107-110.