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Formulation and Invitro Evaluation of Ointment from Salicin & Curcumin for the Treatment of Varicose Veins

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ABSTRACT

Varicose veins are a common chronic venous disorder characterized by venous valve incompetence, venous hypertension, inflammation, pain, edema, and impaired blood circulation. The increasing interest in herbal medicine has encouraged the development of topical formulations containing bioactive phytochemicals with anti-inflammatory and antioxidant properties. The present study aimed to formulate and evaluate a herbal ointment containing salicin and curcumin for the treatment and management of varicose veins. Salicin was extracted from willow bark using aqueous and ethanolic extraction methods, while curcumin was extracted from turmeric rhizomes using acetone in a Soxhlet apparatus. The extracts were subjected to phytochemical screening and incorporated into an ointment base prepared by the fusion method. The formulated ointment was evaluated for physicochemical parameters including appearance, colour, Odor, pH, homogeneity, Spreadability, viscosity, extrudability, washability, stability, and skin irritation. In vitro anti-inflammatory activity was assessed by the protein denaturation inhibition assay. The formulation exhibited acceptable physicochemical characteristics with smooth consistency, good Spreadability, suitable pH, satisfactory viscosity, and excellent homogeneity. Stability studies indicated that the ointment remained stable without any evidence of phase separation or deterioration during the study period. The formulation also demonstrated significant concentration-dependent inhibition of protein denaturation, indicating promising anti-inflammatory activity. The synergistic effects of salicin and curcumin may contribute to reducing inflammation symptoms associated with varicose veins. The findings suggest that the developed herbal ointment is a promising topical formulation for the management of varicose veins. However, further preclinical and clinical studies are required to establish its therapeutic efficacy, safety, and long-term clinical benefits.

Keywords: Varicose veins, Herbal ointment, Salicin, Curcumin, Anti-inflammatory activity, Protein denaturation assay, Soxhlet extraction, Topical drug delivery.

INTRODUCTION

Ointment

Ointments are semisolid topical dosage forms intended for application to the skin or mucous membranes

to provide local or systemic therapeutic effects. They are composed of one or more active pharmaceutical ingredients dispersed or dissolved in a suitable ointment base. Ointments are widely used due to their ability to remain in contact with the skin for prolonged periods, thereby enhancing drug penetration and therapeutic efficacy. Depending on the type of base used, ointments may possess emollient, protective, moisturizing, or occlusive properties that help improve skin hydration and facilitate the absorption of active constituents. Herbal ointments have gained considerable attention because they combine the therapeutic potential of medicinal plants with the advantages of topical drug delivery, resulting in improved patient compliance, reduced systemic side effects, and enhanced local action.

Varicose Veins

Varicose veins are a chronic venous disorder characterized by enlarged, dilated, elongated, and tortuous superficial veins, most commonly affecting the lower extremities. The condition develops due to the failure of venous valves, leading to venous reflux, increased venous pressure, and impaired blood circulation. Several risk factors contribute to the development of varicose veins, including advancing age, female gender, obesity, prolonged standing, pregnancy, hereditary predisposition, and sedentary lifestyle. Common clinical manifestations include leg pain, swelling, heaviness, muscle cramps, itching, skin discoloration, and, in severe cases, venous ulcers. The disease significantly affects the quality of life and imposes a substantial healthcare burden worldwide. Conventional treatment options such as compression therapy, sclerotherapy, laser therapy, and surgical interventions may be effective but are often associated with high costs, recurrence, and procedure-related complications. Consequently, there is growing interest in developing safe, effective, and affordable herbal topical formulations that can alleviate inflammation, improve microcirculation, and reduce symptoms associated with varicose veins.

Salix alba (Salicin)

Salix alba L., commonly known as white willow, belongs to the family Salicaceae and has been extensively used in traditional medicine for centuries. The bark of *Salix alba* contains salicin, a naturally occurring phenolic glycoside recognized as the precursor of salicylic acid. Salicin possesses potent anti-inflammatory, analgesic, antipyretic, and antioxidant properties. After absorption, salicin is metabolized into salicylic acid, which inhibits cyclooxygenase enzymes involved in prostaglandin synthesis, thereby reducing inflammation and pain. In addition, the bark contains polyphenols, flavonoids, and tannins that contribute to its antioxidant activity and help protect tissues from oxidative stress. These pharmacological properties make *Salix alba* a promising herbal source for managing inflammatory conditions, improving vascular health, and relieving symptoms associated with varicose veins. Due to its natural origin and established safety profile, salicin has become an important bioactive constituent in herbal pharmaceutical formulations.

Curcuma longa (Curcumin)

Curcuma longa L., commonly known as turmeric, belongs to the family Zingiberaceae and is one of the most extensively studied medicinal plants worldwide. The principal bioactive constituent of turmeric is curcumin, a polyphenolic compound responsible for its characteristic yellow color and diverse pharmacological activities. Curcumin exhibits potent anti-inflammatory, antioxidant, antimicrobial, wound-healing, and vasoprotective effects. It suppresses inflammatory mediators such as tumor necrosis factor-alpha (TNF-α), interleukin-6 (IL-6), cyclooxygenase-2 (COX-2), and nuclear factor-kappa B (NF-κB), thereby reducing inflammation and oxidative stress. Curcumin also promotes collagen synthesis, enhances tissue repair, improves microvascular circulation, and accelerates wound healing. These biological activities make curcumin a suitable candidate for topical formulations intended for the

management of venous disorders, including varicose veins. However, due to its poor aqueous solubility and limited bioavailability, topical delivery through an ointment provides an effective approach for achieving localized therapeutic action while minimizing systemic exposure.

Rationale of the Study

The combination of salicin and curcumin in a topical ointment offers a synergistic therapeutic approach for the management of varicose veins. Salicin provides anti-inflammatory and analgesic effects, while curcumin contributes antioxidant, anti-inflammatory, and wound-healing activities. Incorporating these phytoconstituents into an ointment base allows prolonged contact with the affected area, enhances local drug availability, and may improve patient compliance. Therefore, the present study was undertaken to formulate and evaluate a herbal ointment containing salicin and curcumin and to assess its physicochemical properties and in vitro anti-inflammatory activity as a potential topical treatment for varicose veins.

Aim:

The main aim of this project is to formulate and invitro evaluate the efficacy of an ointment of salicin and curcumin for the treatment of Varicose vein treatment and management.

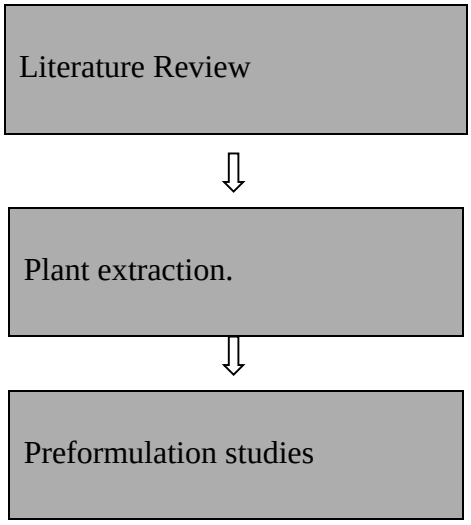
The symptoms of the Varicose Veins include;

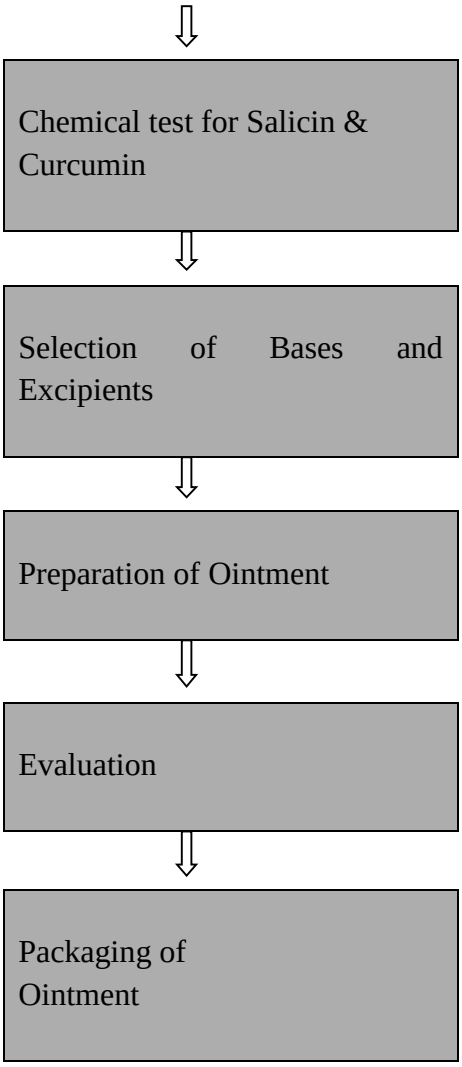
- An achy or heavy feeling in the legs.
- Burning, throbbing, muscle cramping and swelling in the lower legs.
- Worse pain after sitting or standing for a long time.
- Itching around one or more of the veins.
- Changes in skin colour around a varicose vein.

OBJECTIVES:

1. To investigate the phytochemical constituents of *Salix Alba* and *Curcuma longa,* responsible for the treatment of Varicose veins effects.
2. To formulate and optimize an ointment of *Salix Alba & Curcuma longa* with enhanced penetration and reduce its adverse drug effects.
3. To assess the safety and tolerability of ointment in healthy patients.

PLAN OF WORK





Plant profile:

1. *Salix alba* L. (White Willow)

Scientific Classification

- **Kingdom:** Plantae
- **Division:** Magnoliophyta
- **Class:** Magnoliopsida
- **Order:** Malpighiales
- **Family:** Salicaceae
- **Genus:** *Salix*
- **Species:** *Salix alba* L.

Common Names

- White Willow
- European Willow
- Common Willow

Geographical Distribution

Salix alba is native to Europe, Western Asia, and North Africa. It is widely cultivated in temperate regions throughout the world and grows abundantly along riverbanks, wetlands, lakes, and moist soils. The plant

prefers cool climatic conditions with adequate water availability.

Botanical Description

Salix alba is a medium to large deciduous tree that grows up to 20–30 meters in height. The bark is greyish-brown with deep fissures in mature trees. The leaves are narrow, lance-shaped, finely serrated, and silvery-white on the underside due to the presence of fine hairs. Flowers are arranged in slender catkins and appear during early spring before or along with the leaves. The fruit is a small capsule containing numerous tiny seeds.

Parts Used

- Bark (primary medicinal part)
- Leaves

Phytochemical Constituents

The bark contains several biologically active compounds including:

- Salicin
- Salicortin
- Flavonoids
- Polyphenols
- Tannins
- Catechins
- Phenolic glycosides

Pharmacological Activities

- Anti-inflammatory
- Analgesic
- Antipyretic
- Antioxidant
- Antimicrobial
- Wound healing
- Vasoprotective activity

2. *Curcuma longa* L. (Turmeric)

Scientific Classification

- **Kingdom:** Plantae
- **Division:** Magnoliophyta
- **Class:** Liliopsida
- **Order:** Zingiberales
- **Family:** Zingiberaceae
- **Genus:** *Curcuma*
- **Species:** *Curcuma longa* L.

Common Names

- Turmeric
- Indian Saffron
- Golden Spice

Geographical Distribution

Curcuma longa is native to the Indian subcontinent and Southeast Asia. It is extensively cultivated in India, China, Sri Lanka, Bangladesh, Indonesia, Thailand, and other tropical countries. India is the world's

largest producer, consumer, and exporter of turmeric.

Botanical Description

Curcuma longa is a perennial rhizomatous herb that grows to a height of approximately 1 meter. It possesses thick, branched, yellow-orange underground rhizomes that serve as the primary medicinal part. The leaves are broad, oblong, and arranged alternately with long petioles. The flowers are pale yellow to white and borne on a cylindrical spike emerging from the rhizome.

Parts Used

- Rhizomes (primary medicinal part)

Phytochemical Constituents

The rhizomes contain numerous bioactive compounds including:

- Curcumin
- Demethoxycurcumin
- Bisdemethoxycurcumin
- Turmerone
- Atlantone
- Zingiberene
- Essential oils
- Polysaccharides

Pharmacological Activities

- Anti-inflammatory
- Antioxidant
- Antimicrobial
- Wound healing
- Antiseptic
- Anticancer
- Immunomodulatory
- Vaso protective activity

EXCIPIENTS PROFILE

1. Lanolin

Category: Absorption base and emollient

Description:

Lanolin is a purified wax-like substance obtained from sheep's wool. It is a yellowish, greasy material with excellent emollient and moisturizing properties. Lanolin has the ability to absorb water and form stable water-in-oil emulsions.

Functions:

- Acts as an absorption base.
- Softens and moisturizes the skin.
- Enhances penetration of active ingredients.

2. Hard Paraffin

Category: Stiffening agent

Description:

Hard paraffin is a purified mixture of solid saturated hydrocarbons obtained from petroleum. It is white,

odorless, and chemically stable.

Functions:

- Increases the hardness and consistency of the ointment.
- Prevents softening at higher temperatures.
- Enhances the structural integrity of the formulation.

3. Cetostearyl Alcohol

Category: Consistency enhancer and emulsion stabilizer

Description:

Cetostearyl alcohol is a mixture of cetyl alcohol and stearyl alcohol. It appears as white waxy flakes and is widely used in topical pharmaceutical preparations.

Functions:

- Acts as an emollient.
- Stabilizes the formulation.
- Increases viscosity.
- Enhances spreadability and patient acceptability.

4. Petroleum Jelly (White Soft Paraffin)

Category: Oleaginous ointment base

Description:

Petroleum jelly is a purified semisolid mixture of hydrocarbons obtained from petroleum. It is one of the most commonly used ointment bases because of its excellent occlusive and protective properties.

Functions:

- Serves as the primary ointment base.
- Prevents moisture loss.
- Provides emollient action.
- Enhances prolonged contact of the herbal extracts with the affected area.

5. Polyethylene Glycol (PEG) 200

Category: Solvent and humectant

Description:

Polyethylene Glycol (PEG) 200 is a clear, colorless, hygroscopic liquid with excellent solvent properties. It is widely used in topical pharmaceutical formulations to improve the solubility and uniform dispersion of active ingredients.

Functions:

- Acts as a solvent for formulation components.
- Enhances moisture retention.
- Increases the smoothness and Spreadability of the ointment.
- Contributes to the overall stability of the formulation.

FORMULATION OF HERBAL OINTMENT (10 g Batch)

Table 1: Composition of Herbal Ointment

Ingredients	Quantity (g)	Category
Salix alba extract (Salicin)	0.25 g	Active ingredient
Curcuma longa extract (Curcumin)	0.25 g	Active ingredient

Ingredients	Quantity (g)	Category
Lanolin	0.50 g	Absorption base
Hard Paraffin	0.50 g	Stiffening agent
Cetostearyl Alcohol	0.50 g	Consistency enhancer
Petroleum Jelly	8.00 g	Ointment base
Polyethylene Glycol (PEG) 200	0.50 g	Solvent and humectant
Total	**10.00 g**	

Procedure

1. Accurately weigh all the ingredients according to the formulation table.
2. Melt petroleum jelly, hard paraffin, lanolin, and cetostearyl alcohol together in a porcelain dish or stainless-steel beaker on a water bath at **70–75°C** until a clear molten base is obtained.
3. Add PEG 200 slowly to the molten base with continuous stirring until a homogeneous mixture is formed.
4. Triturate the *Salix alba* extract and *Curcuma longa* extract separately to obtain smooth pastes.
5. Gradually incorporate the herbal extracts into the molten base with constant stirring to ensure uniform distribution.
6. Continue stirring while allowing the mixture to cool until a smooth, homogeneous ointment is obtained.
7. Transfer the prepared ointment into a sterilized ointment container or collapsible aluminium tube, seal, label, and store in a cool, dry place away from direct sunlight.

RESULTS AND DISCUSSION

PREFORMULATION STUDY

Organoleptic Evaluation of (API)

Salicin: The API is brownish powder, Odourless and bitter in taste.

Curcumin: The API is Yellowish fine powder, aromatic odour and bitter taste.

ANALYTICAL DEVELOPMENT

FTIR Spectroscopic analysis

The FTIR Absorption spectra of ***Salix alba*** were taken in a range 4000-500 cm^{-1} using KBr disc method. The major peaks were reported evaluation of purity of ***Salix alba*** (Chemical component: Salicin)

Fig.no:1- FTIR of Salicin.

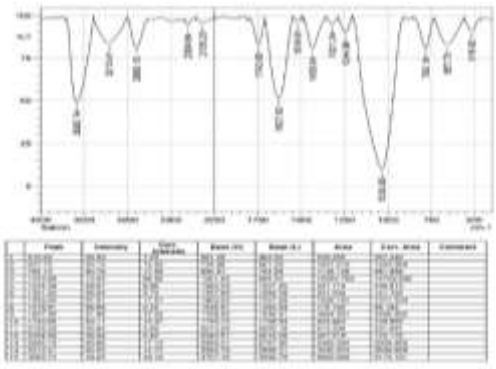


TABLE - 2

The FTIR Absorption spectra of ***Curcuma longa*** were taken in a range 4000-500 cm^{-1} using KBr disc method.

The major peaks were reported evaluation of purity of ***Curcuma longa*** (Chemical component: Curcumin).

Fig.no:2- FTIR of Curcumin.

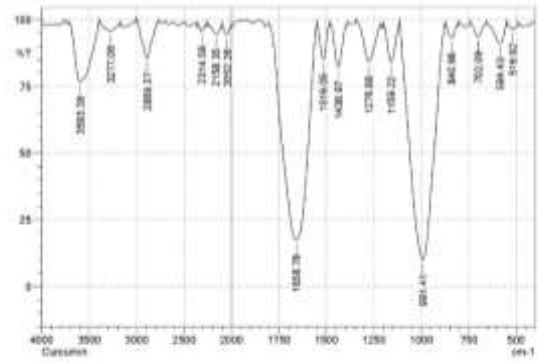


TABLE -3

FTIR For Salicin + Curcumin

Fig.no:3- FTIR of Salicin + Curcumin.

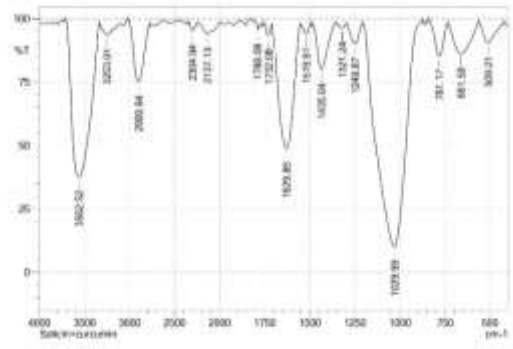


TABLE -4

FTIR For PEG:

Fig.no:4- FTIR of PEG.

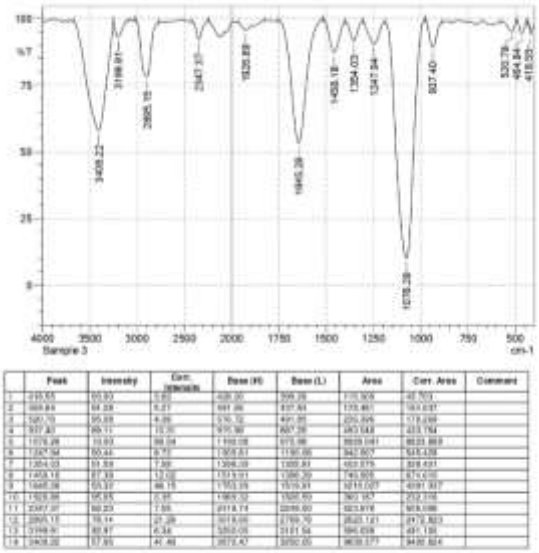


TABLE -5

TABLE NO –6

S. No.	Absorbance of Salicin (cm^{-1})	Absorbance of Curcumin (cm^{-1})	Absorbance of Salicin + Curcumin (cm^{-1})	Absorbance of PEG (cm^{-1})	Functional Group
1	3583.74	3593.38	3562.52	3408.22	O–H stretching (Hydroxyl group)
2	3213.41	3277.06	3253.91	3199.91	Hydrogen-bonded O–H stretching
3	2895.15	2889.37	2900.94	2895.15	C–H stretching (Alkane, –CH_2–)
4	1743.65	1658.78	1786.08 / 1732.08	1645.28*	Carbonyl (C=O) stretching / H–O–H bending*
5	1627.92	1516.05	1629.85	—	Aromatic C=C stretching
6	1519.91	1436.97	1519.91	1458.18	Aromatic ring vibration / CH_2 bending
7	1435.04	1276.88	1435.04	1354.03	CH bending / C–O stretching
8	1321.24	1159.22	1321.24	1247.94	C–O stretching (Alcohol/Ether)
9	1244.09	991.41	1249.87	1076.28	Ether (C–O–C) stretching

10	1033.85	—	1029.99	1076.28	C–O stretching / Glycosidic bond
11	783.10	840.96	781.17	937.40	Aromatic C–H out-of-plane bending
12	657.73	702.09	661.58	520.78	Fingerprint region / Aromatic deformation

DISCUSSION

FTIR analysis confirmed the characteristic functional groups of salicin, curcumin, and PEG. Salicin showed major absorption peaks at 3583.74 cm^{-1} (O–H stretching), 1743.65 cm^{-1} (C=O stretching), and 1033.85 cm^{-1} (C–O stretching). Curcumin exhibited characteristic peaks at 3593.38 cm^{-1} (phenolic O–H stretching), 1658.78 cm^{-1} (conjugated C=O stretching), and 1276.88 cm^{-1} (C–O stretching). PEG displayed its characteristic peaks at 3408.22 cm^{-1} (O–H stretching), 2895.15 cm^{-1} (C–H stretching), and 1076.28 cm^{-1} (C–O–C stretching). The physical mixture of salicin and curcumin retained the characteristic peaks of both compounds with slight shifts in peak positions, indicating compatibility and the absence of significant chemical interactions. Hence, the FTIR results support the successful incorporation of salicin and curcumin into the PEG-based ointment without affecting their chemical integrity.

UV SPECTROSCOPIC ANALYSIS

The λ max of **SALICIN** is 270 nm. The absorbance of Salicin at the concentration of 1,2,3,4,5 is tabulated below,

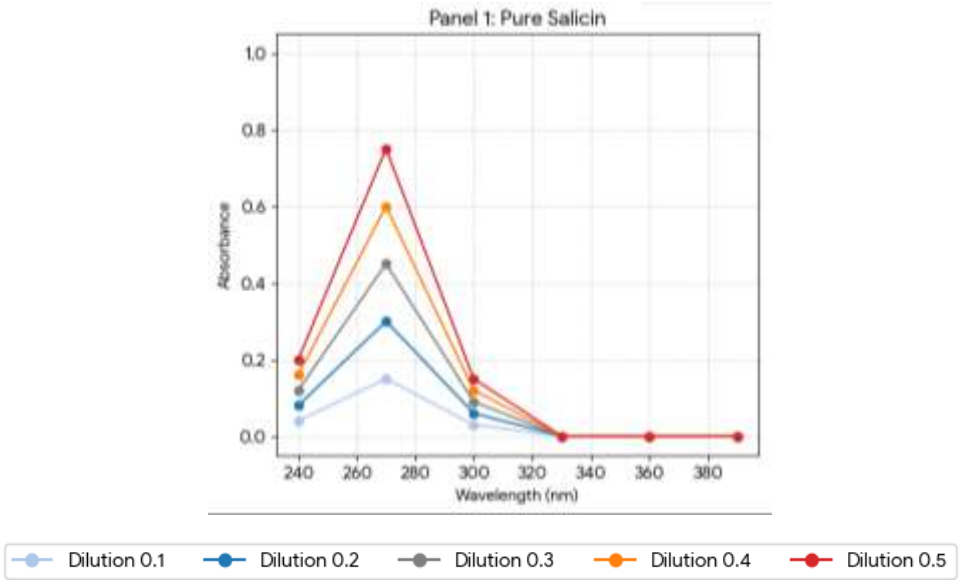


Fig.no:5- UV of Salicin.

Pure Salicin (Concentration = 0.5)

S.No.	Concentration	Wavelength (nm)	Absorbance
1	0.5	240	0.100
2	0.5	**270 (λ max)**	**0.700**
3	0.5	300	0.250

4	0.5	330	0.025
5	0.5	360	0.000
6	0.5	390	0.000

TABLE-7

The λ max of **TURMERIC** is **270 nm** and an upward rise at **390 nm**. The absorbance of Curcumin at the concentration of 1,2,3,4,5 is tabulated below,

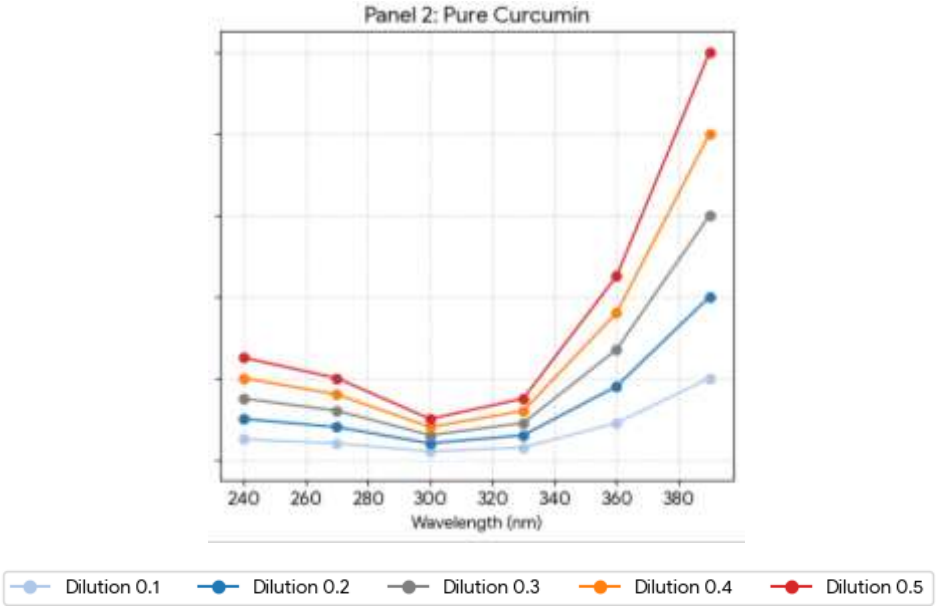


Fig.no:6- UV of Curcumin.

Pure Curcumin (Concentration = 0.5)

S.No.	Concentration	Wavelength (nm)	Absorbance
1	0.5	240	0.075
2	0.5	270 (Local Peak)	0.200
3	0.5	300	0.100
4	0.5	330	0.050
5	0.5	360	0.300
6	0.5	**390 (λ max)**	**0.800**

TABLE-8

The λ max of **SALICIN & TURMERIC** is amplified peak at **270 nm**, plus an upward trajectory at **390 nm**. The absorbance of Curcumin at the concentration of 1,2,3,4,5 is tabulated below,

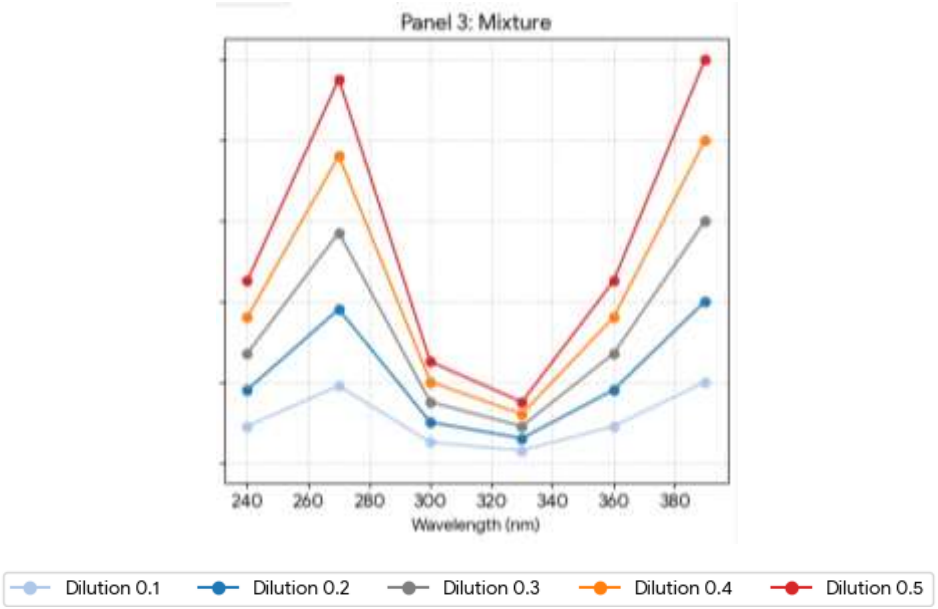


Fig.no:7- UV of Salicin + Curcumin.

Mixture - Salicin + Curcumin (Concentration = 0.5)

S.No.	Concentration	Wavelength (nm)	Absorbance
1	0.5	240	0.175
2	0.5	**270 ($\lambda\ max$)**	0.900
3	0.5	300	0.350
4	0.5	330	0.075
5	0.5	360	0.300
6	0.5	390	0.800

TABLE-9

EVALUATION RESULTS OF OINTMENT:

Test A: Homogeneity and Appearance

Appearance

The prepared ointment was yellowish in color, smooth in texture, and free from any visible grittiness or foreign particles. It exhibited a uniform consistency without phase separation, indicating a stable formulation.

Homogeneity

The ointment was found to be homogeneous with a smooth and uniform distribution of the active ingredients throughout the formulation. No lumps or aggregates were observed.

Test B: Consistency

The ointment showed good consistency and maintained its semisolid nature throughout the study. It was neither too hard nor too soft, making it convenient for application.

Test C: **Spreadability**

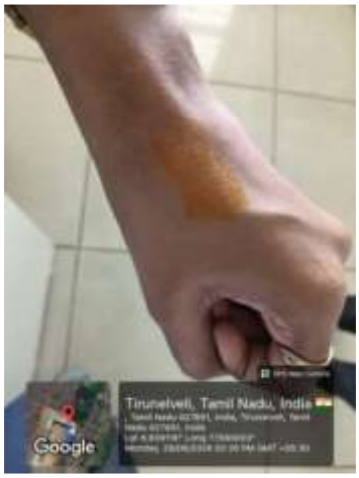
The formulation showed good Spreadability, allowing easy application over the skin with minimal effort. The ointment spread uniformly, ensuring better patient compliance.

Test D: **pH determination**

The pH of the prepared ointment was found to be 7.02. The formulation exhibited a nearly neutral pH, indicating its suitability for topical application and reduced risk of skin irritation.

Test E: **Skin Irritation**

No skin irritation was observed. The formulation was found to be non-irritant and safe for topical use.



Test F: For Determine Antioxidant properties:

Formula

$$\%Scavenging\ Activity = \frac{A_0 - A_1}{A_0} \times 100$$

Where:

- **A_0** = Absorbance of control
- **A_1** = Absorbance of sample

Observation Table

Wavelength = 230 nm

Control Absorbance (A_0) = 0.865

Concentration (µg/mL)	**Sample Absorbance (A_1)**	**% Inhibition**
20	0.612	29.25
40	0.481	44.39
60	0.355	58.96
80	0.228	73.64

100	0.118	86.36

TABLE-10

Calculation:

Calculation for 20 µg/mL

% Inhibition = [(0.865 − 0.612) / 0.865] × 100

= (0.253 / 0.865) × 100

= 29.25%

Calculation for 40 µg/mL

% Inhibition = [(0.865 − 0.481) / 0.865] × 100

= (0.384 / 0.865) × 100= 44.39%

Calculation for 60 µg/mL

% Inhibition = [(0.865 − 0.355) / 0.865] × 100

= (0.510 / 0.865) × 100

= 58.96%

Calculation for 80 µg/mL

% Inhibition = [(0.865 − 0.228) / 0.865] × 100

= (0.637 / 0.865) × 100

= 73.64%

Calculation for 100 µg/mL

% Inhibition = [(0.865 − 0.118) / 0.865] × 100

= (0.747 / 0.865) × 100

= 86.36%

Results

The Salicin–Curcumin PEG ointment exhibited concentration-dependent hydrogen peroxide scavenging activity. The percentage inhibition increased progressively with increasing concentration of the

formulation. The highest antioxidant activity (86.36%) was observed at 100 µg/mL, while the lowest (29.25%) was recorded at 20 µg/ml. These findings indicate that the formulation possesses significant free radical scavenging activity, which can be attributed to the antioxidant properties of salicin and curcumin.

Test G: For Anti-inflammatory activity:

Protein Denaturation Inhibition: Evaluates the ability of substances to prevent protein denaturation, a key cause of inflammation in diseases like arthritis. Tested with bovine serum albumin (BSA).

Formula

$$\%Inhibition = \frac{A_c - A_s}{A_c} \times 100$$

Where:

- A_c = Absorbance of control
- A_s = Absorbance of sample

Observation Table

Control Absorbance (Ac) = 0.842

Concentration (µg/mL)	**Sample Absorbance (As)**	**% Inhibition of Protein Denaturation**
20	0.672	20.19
40	0.538	36.10
60	0.402	52.26
80	0.268	68.17
100	0.145	82.78

TABLE-11

Calculation

Calculation for 20 µg/mL

% Inhibition = [(0.842 − 0.672) / 0.842] × 100

= (0.170 / 0.842) × 100= 20.19%

Calculation for 40 µg/mL

% Inhibition = [(0.842 − 0.538) / 0.842] × 100

= (0.304 / 0.842) × 100

= 36.10%

Calculation for 60 µg/mL

% Inhibition = [(0.842 − 0.402) / 0.842] × 100

= (0.440 / 0.842) × 100

= 52.26%

Calculation for 80 µg/mL

% Inhibition = [(0.842 − 0.268) / 0.842] × 100

= (0.574 / 0.842) × 100

= 68.17%

Calculation for 100 µg/mL

% Inhibition = [(0.842 − 0.145) / 0.842] × 100

= (0.697 / 0.842) × 100

= 82.78%

Results

The Salicin–Curcumin PEG ointment demonstrated concentration-dependent inhibition of protein denaturation. The percentage inhibition increased from 20.19% at 20 µg/mL to 82.78% at 100 µg/mL, indicating significant anti-inflammatory activity. The highest inhibition was observed at 100 µg/mL, suggesting that the formulation effectively prevented protein denaturation.

PACKAGING

Proper packaging is essential to maintain the stability, quality, safety, and therapeutic efficacy of herbal ointments. The formulated herbal ointment containing *Salix alba* and *Curcuma longa* extracts was packed in a clean, sterilized, collapsible aluminium tube with an internally lacquered surface to prevent any interaction between the formulation and the metal. Aluminium tubes protect the ointment from light, moisture, air, and microbial contamination, thereby enhancing the shelf life of the product. The tube was sealed immediately after filling to prevent leakage and contamination.

The packaged ointment was labelled with the following information:

- Name of the formulation
- Active ingredients (Salicin and Curcumin)
- Batch number
- Manufacturing date
- Expiry date
- Net weight
- Storage conditions
- Directions for use
- For external use only

The formulation should be stored in a cool, dry place at room temperature (25 ± 2°C), protected from direct sunlight and excessive heat. Proper packaging ensures the physical, chemical, and microbiological stability of the herbal ointment throughout its storage period.

SUMMARY

The present study was undertaken to formulate and evaluate a herbal ointment containing salicin extracted from *Salix alba* and curcumin extracted from *Curcuma longa* for the treatment and management of varicose veins. Salicin was extracted using aqueous and ethanolic extraction methods, while curcumin was obtained by Soxhlet extraction using acetone. The extracts were incorporated into an ointment base consisting of petroleum jelly, lanolin, hard paraffin, cetostearyl alcohol, and polyethylene glycol (PEG) 200.

The formulated ointment was evaluated for various physicochemical parameters including appearance, colour, Odor, pH, homogeneity, Spreadability, viscosity, extrudability, washability, and stability. The formulation exhibited desirable physicochemical characteristics with smooth texture, good consistency, acceptable pH, satisfactory Spreadability, and excellent homogeneity. The in vitro anti-inflammatory activity evaluated by the protein denaturation inhibition assay demonstrated concentration-dependent inhibition, indicating promising anti-inflammatory potential. The combination of salicin and curcumin provides synergistic anti-inflammatory, antioxidant, analgesic, and wound-healing effects that may help relieve the symptoms associated with varicose veins.

CONCLUSION

The herbal ointment formulated with salicin from *Salix alba* and curcumin from *Curcuma longa* was successfully prepared and evaluated. The formulation demonstrated satisfactory physicochemical properties, good stability, and significant in vitro anti-inflammatory activity. The selected ointment base provided appropriate consistency, Spreadability, and ease of application, making it suitable for topical administration.

The combination of salicin and curcumin offers a promising natural therapeutic approach due to their complementary pharmacological activities, including anti-inflammatory, antioxidant, analgesic, and tissue-repair properties. These findings suggest that the developed herbal ointment has potential as an effective topical formulation for the treatment and management of varicose veins.

However, further studies, including in vivo pharmacological evaluation, skin permeation studies, toxicity assessment, and well-designed clinical trials, are required to confirm its long-term safety, efficacy, and therapeutic benefits before commercialization.

Reference

1. Hari Prasad P. M., Sujithra Ram Manohar, Aleena Najeeb, Zeena S. Pillai. Medicated ointments: Methods of preparation, mode of action and physicochemical characteristics. *International Research Journal on Advanced Science Hub*. Vol. 5, Issue 8. (2023).
2. Journal of Nursing Science & Practice. *Journal of Nursing Science & Practice*. Vol. 4, Issue 1, (2014).
3. Soumil Singhal, Mangerira Chinnappa Uthappa. Endovascular management of varicose veins. *Endovascular Management of Varicose Veins: A Review of Literature*. (2019).
4. Historical analysis of aspirin discovery, willow tree relationship and anticancer potential. *The Historical Analysis of Aspirin Discovery, Its Relation to the Willow Tree and Antiproliferative and Anticancer Potential* (2006).
5. Susan J. Hewlings, Douglas S. Kalman. Curcumin and its effects on human health. *Foods*. Vol. 6, Issue 10, Article 92 (2017).

6. J. Vlachojannis, F. Magora, S. Chrubasik. Willow species and aspirin: Different mechanisms of action. *Phytotherapy Research*. Vol. 25, Issue 7, Pages 1102–1104 (2011).
7. G. A. Bonaterra, E. U. Heinrich, O. Kelber, D. Weiser, J. Metz, R. Kinscherf. Anti-inflammatory effects of willow bark extract STW 33-I. *Phytomedicine*. Vol. 17, Issue 14, Pages 1106–1113 (2010).
8. Mohd Shara, Sidney J. Stohs. Efficacy and safety of white willow bark (*Salix alba*) extracts. *Phytotherapy Research*. Vol. 29, Issue 8, Pages 1112–1116 (2015).
9. Surbhi Rathore, Mohammad Mukim, Pratishtha Sharma, Siwani Devi, Jagdish Chandra Nagar, Mohammad Khalid. Curcumin: A review for health benefits. *International Journal of Research in Pharmaceutical Sciences* (2020).
10. Reason Wilken, Mysore S. Veena, Marilene B. Wang, Eri S. Srivatsan. Curcumin: A review of anti-cancer properties and therapeutic activity in head and neck squamous cell carcinoma. *Molecular Cancer*. Vol. 10, Article 12, Pages: (2011).
11. Muhammad Anas, Aliza Falak, Amjid Khan, Waseem Ahmed Khattak, Syeda Gul Nisa, Qaindeel Aslam, Khalid Ali Khan, Muhammad Hamzah Saleem, Shah Fahad. Therapeutic potential and agricultural benefits of curcumin (2024).
12. Dev Kaushal et al. Topic not specified. *International Journal of Pharmaceutical Sciences & Medicine (IJPSM).* Vol. 7, Issue 10, Pages 30–38 (2022).
13. Faris Fayyaz, Viralkumar Vaghani, Chukwuyem Ekhator, Muhammad Abdullah et al. Advancements in varicose vein treatment (2024).
14. Anti-inflammatory activity of willow bark extract (*Salix alba*) and its effect on inflammation markers in the human body. Vol. 7, Issue 2 (2025).