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# Integrative Approaches to Lipoma Management: Combining Herbal Remedies and Non-surgical techniques

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**A B S T R A C T :**

Lipomas are benign soft tissue tumors composed of adipose tissue, often requiring surgical intervention for removal. This project aims to develop a non-invasive, topical treatment for lipoma reduction using a novel vanishing cream formulation. The cream incorporates active pharmaceutical ingredients (APIs) including ethanolic extracts of chili peppers (source of capsaicin), onion (source of quercetin), and garlic (source of allicin), known for their lipolytic and anti-adipogenic properties. The vanishing base consists of stearic acid, lanolin, propyl paraben, methyl paraben, triethanolamine, glycerine, tea tree oil, clove oil, and rose oil to enhance permeation and stability. The permeation efficiency of the formulated cream was evaluated using a Franz diffusion cell to assess transdermal delivery. The lipoma-reducing activity was attributed to the synergistic action of capsaicin (enhancing fat metabolism), quercetin (inhibiting adipogenesis), and allicin (promoting lipid breakdown). Preliminary results indicate significant permeation of active constituents, suggesting potential efficacy in localized fat reduction. Further in vivo studies are warranted to validate the clinical applicability of this formulation as a non-surgical alternative for lipoma management.

**Keywords**: Lipoma reduction, capsaicin, quercetin, allicin, non-invasive.

## Introduction

Lipomas are benign, slow-growing tumors composed of mature adipocytes, commonly found in subcutaneous tissues. Although typically harmless, they can cause discomfort, cosmetic concerns, and, in rare cases, nerve compression, prompting the need for removal. Conventional treatment involves surgical excision or liposuction, which are invasive, costly, and carry risks of scarring and infection. As a result, there is growing interest in developing non-invasive, topical alternatives for lipoma reduction[1]. Recent research suggests that certain phytochemicals possess lipolytic and anti-adipogenic properties, making them potential candidates for transdermal fat reduction. Capsaicin, the active compound in chili peppers (Capsicum annuum), has been shown to enhance lipid metabolism by activating thermogenesis via TRPV1 receptors[2]. Quercetin, a flavonoid abundant in onions (Allium cepa)[3], inhibits adipocyte differentiation and reduces fat accumulation[4] Allicin, a sulfur-containing compound in garlic (Allium sativum)[5], exhibits anti-obesity effects by modulating lipid metabolism and promoting lipolysis[6].

This study focuses on formulating a vanishing cream incorporating ethanolic extracts of chili pepper, onion, and garlic to leverage their synergistic fat-reducing effects. The vanishing base, composed of stearic acid, lanolin, parabens (as preservatives), triethanolamine (emulsifier), glycerin (humectant)[7], and essential oils (tea tree, clove, and rose oil for antimicrobial and penetration-enhancing properties), ensures optimal skin permeation. The cream's transdermal delivery efficiency is assessed using a Franz diffusion cell, while its efficacy in lipoma reduction is evaluated based on the bioactive constituents' mechanisms of action.

By exploring a non-surgical, phytochemical-based approach, this project aims to provide a safer, cost-effective alternative for lipoma management, potentially expanding treatment options for patients seeking minimally invasive solutions.

### *1.1. Mechanism of Action of Ethanolic Extracts on Lipoma Fat Reduction:*

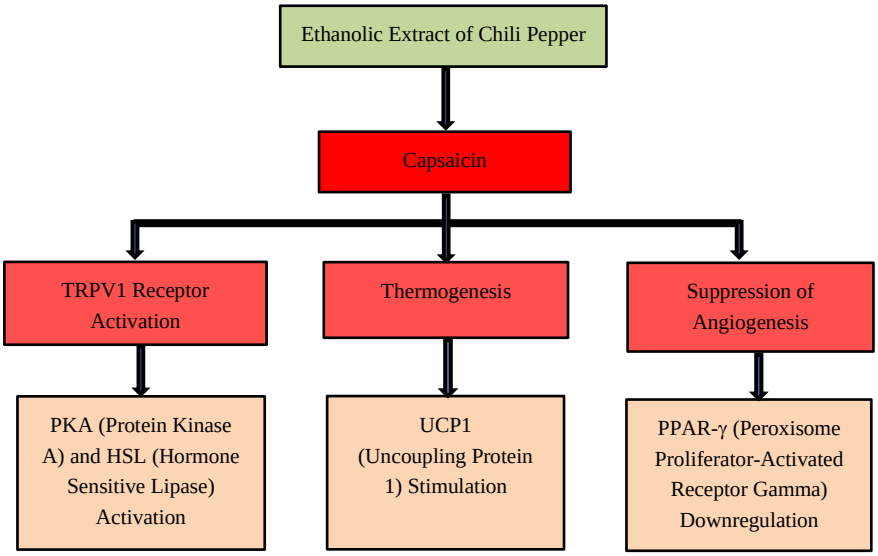



**Fig. 1 - Mechanism of action of Capsaicin[8]**

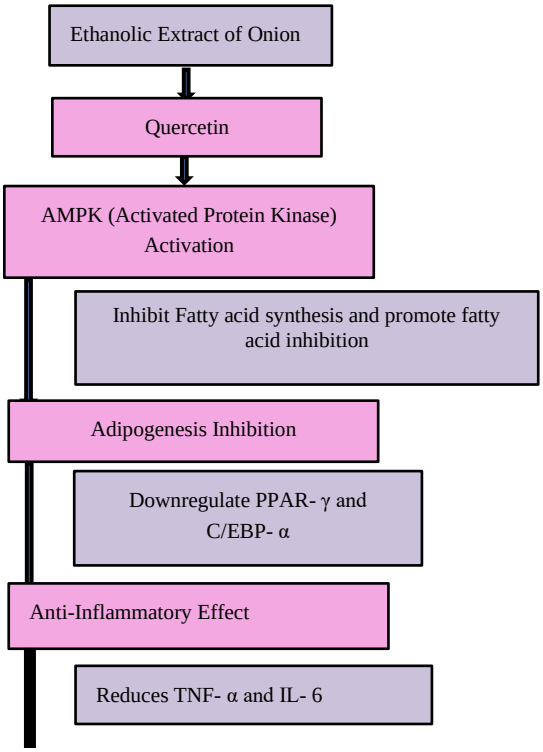



**Fig. 2 - Mechanism of action of Quercetin[9]**

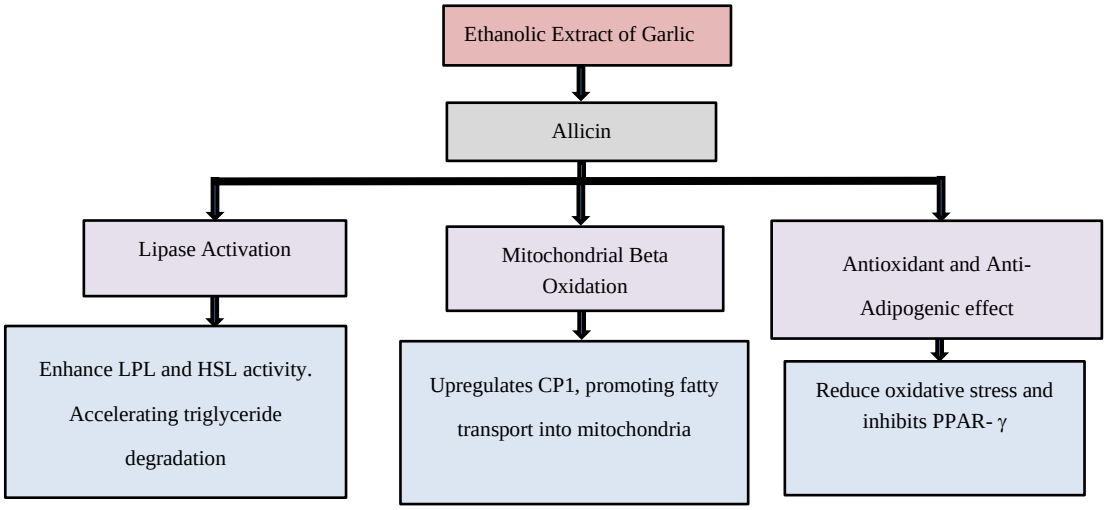



**Fig. 3 - Mechanism of action of Allicin[10]**

### *1.2. Synergistic Action in Lipoma Reduction:*

When combined in the vanishing cream formulation, these extracts work synergistically:

- Capsaicin enhances lipolysis and thermogenesis[11].
- Quercetin suppresses adipogenesis and inflammation[12].
- Allicin boosts fat oxidation and prevents lipid storage[13].

## Materials

- Each plant material was individually processed as follows:
- Onion and garlic bulbs were cut into small pieces after being peeled and properly cleaned with distilled water to remove any surface material.
- After being cleaned, the capsicum/red chilli were sliced into little pieces. The sliced materials were then air-dried under shade at room temperature avoiding direct sunlight to prevent degradation of heat- or light-sensitive phytochemicals.
- The materials were powdered and paste are formed by using a laboratory-grade mechanical grinder, and the powders were passed through a sieve to ensure uniform particle size.

### *1.3. Storage*

The raw plant material was stored separately in clean, airtight amber-coloured glass containers and kept in a cool, dry place away from light and moisture until further use in extraction and formulation processes.

### *1.4. Plant Authentication*

The plant ingredients used to make the lipoma therapy cream were Chili pepper (Capsicum annuum), onion (Allium cepa), and garlic (Allium sativum). These plants were chosen because of scientific evidence that they contain bioactive substances including capsaicin[14], quercetin[15], which have anti-inflammatory, antioxidant, and lipolytic properties and may help treat lipomas. We bought fresh garlic bulbs (Allium sativum), onion bulbs (Allium cepa), and Chili peppers (Capsicum annuum) at a nearby organic market. A botanist from the The Research Laboratory, Botany Department at SVKM's Mithibai College of Arts, Chauhan Institute of Science, and Amruthben Jivanlal College of Commerce and Economics, Mumbai, identified and authenticated the sample used in the study.

## Methods

### *1.5. Preparation of Extracts (Chili peppers, Onion, Garlic):*

Dried and coarsely powdered chili pepper, onion, and garlic are extracted using 70-80% ethanol in a 1:10 or 1:20 (w/v) ratio. The plant material is loaded into a thimble and subjected to continuous extraction in a Soxhlet apparatus for 4-5 hours at 60-70°C. The resulting extract is filtered, and dried to obtain a crude extract. This method efficiently extracts key bioactive compounds like capsaicin, quercetin, and allicin while maintaining their stability. Quality control is performed through TLC analysis to verify marker compounds.

**Fig. 4 - Extraction of chili pepper**

**Fig no. 5: Extraction of garlic**

**Fig no. 6: Extraction of onion**

### *3.2. Thin Layer Chromatography*

**a. *Analysis of capsaicin:***

Mobile phase: hexane-ethyl acetate (1:1)

Stationary phase: Silica gel G TLC plate

Spray agent: Dragendorff's reagent[16]

**Fig no. 7 - TLC of Chili pepper extract**

**Fig. 8: TLC of Onion extract**

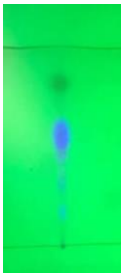


**Fig. 9: TLC of Garlic extract**

**b. *Analysis of quercetin:***

Mobile phase: toluene: ethyl acetate: formic acid (8.5: 5.5: 1)

Stationary phase: Silica gel G TLC plate

Spray agent: PEG reagent[17]

**c. *Analysis of allicin:***

Mobile phase: butanol-acetic acid-water (3:3:1)

Stationary phase: Silica gel G TLC plate

Spray agent: Ninhydrin[18]

### *3.3. Formulation Table:*

**Table 1 - Formulation Table.**

| Ingredients | Quantity (for 20g) | Percentage | Role |
|---|---|---|---|
| Stearic acid | 3.8 gm | 10.86 % | Emulsifying agent, thickener |
| Lanolin | 0.46 gm | 1.31 % | Emollient, moisturizes skin |
| Propyl paraben | 0.020 gm | 0.06 % | Preservative |

| | | | |
|---|---|---|---|
| Triethanolamine | 0.204 ml | 0.58 % | Emulsifier |
| Glycerine | 0.8 ml | 2.29 % | Humectant |
| Methyl paraben | 0.036 gm | 0.10 % | Preservative |
| Tea tree oil | 0.10 ml | 0.29 % | Antiseptic, anti-inflammatory |
| Ethanolic extract of chili pepper | 0.10 ml | 0.29 % | Boosts fat breakdown (lipolysis) & circulation |
| Ethanolic extract of onion | 0.2 ml | 0.57 % | Helps with fibrosis & tissue remodelling |
| Ethanolic extract of garlic | 0.10 ml | 0.29 % | Reduces abnormal fat, anti-inflammatory |
| Rose oil | 0.10 ml | 0.29 % | Fragrance |
| Purified water | 15 ml | 42.86 % | Vehicle |

**1. Oil Phase (Heat to 70–75°C):**
Mix and heat:

1. Stearic acid (3.8 gm)
2. Lanolin (0.46 gm)
3. Tea tree oil (0.10 ml)
4. Propyl paraben (0.020 gm)
5. Chili extract (0.10 ml)

**2. Aqueous Phase (Heat to 70–75°C):**
Mix and heat:

1. Triethanolamine (0.204 ml)
2. Glycerine (0.8 ml)
3. Methyl paraben (0.036 gm)
4. Onion extract (0.2 ml)
5. Garlic extract (0.10 ml)
6. Purified water (15 ml)

**3. Emulsify:**
Slowly add aqueous phase to oil phase with continuous stirring, then add Rose oil (0.10 ml) and mix gently until uniform.

***3.4. Formulation Procedure:***

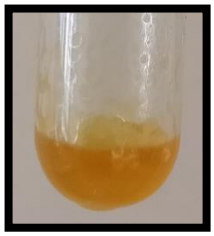
***3.5. Evaluation Test:***

***3.5.1. Phytochemical Analysis:***

***a] Chili peppers***

**Table 2 - Phytochemical Analysis of chili pepper[19].**

| SR.NO. | TEST | OBSERVATION | INFERENCE |
|---|---|---|---|
| 1 | **Alkaloids:**<br>The dried extract was heated with 2% hydrochloric acid on a boiling water bath. The mixture was cooled, filtered and treated with Mayer's reagent. | Turbidity or the presence of a yellow precipitate. | **Fig. 10 - Alkaloid test(**Positive)<br>  |
| 2 | **Tannins:**<br>About 1 ml distilled water and ferric chloride solution (one to two drops) were added to 0.05ml of the extract solution. | Blue-black precipitate. |  <br>**Fig. 11 - Tannins test** (Positive) |
| 3 | **Saponins:**<br>About 2 ml test solution, 2 ml of distilled water was added and then the solution was mixed well by shaking. | Frothing |  <br>**Fig. 12 - Saponins test** (Positive) |
| 4 | **Phytosterols:**<br>The extract was dissolved in few drops of acetic acid with the addition of three drops of acetic anhydride and two to three drops of concentrated sulfuric acid. | Bluish green colour | (Negative)<br>  <br>**Fig. 13 - Phytosterol test** |
| 5 | **Carbohydrate:**<br>0.5 g of the extract was dissolved in 5 ml distilled water and filtered. 2-3 drops of an alcoholic solution of alpha-napthol were mixed to the filtrates. | Violet ring at the interphase | Positive<br>**Fig. 14 - carbohydrate** |

| | | | |
|---|---|---|---|
| | | |  **test** |
| 6 | **Proteins:** The extract was treated with a few drops of concentrated nitric acid. | Yellow color |  **Fig. 15 - Proteins test** (Positive) |
| 7 | **Reducing sugar:** The plant extracts was added with the Fehling's solution (A and B) in a test tube. | Colour reaction indicates the presence of reducing sugar. | (Positive)  **Fig. 16 – Reducing sugar test** |

***b] Onion***

**Table 3 - Phytochemical Analysis of Onion[20].**

| SR.NO. | TEST | OBSERVATION | INFERENCE |
|---|---|---|---|
| Tests for Alkaloids | | | |
| 1 | (i) 1 ml of extract + few drops of Drangendoff's reagent | Yellowish brown colour | **Fig. 17 - Alkaloid test** (Positive) |

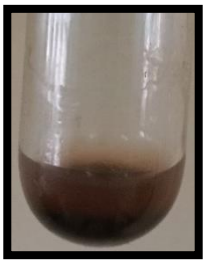
| | | | |
|---|---|---|---|
| | | |  |
| 2 | (ii) 1 ml of extract + few drops of Mayers reagent | Yellowish colour seen |  **Fig. 18 - Alkaloid test** Positive |
| 3 | (iii)1 ml of extract + Wagner's reagent | Dark turbid brown |  (Positive) **Fig. 19 - Alkaloid test** |
| Tests for Tannins | | | |
| 4 | (i)1 ml of extract + bromine water | Brownish red turbid |  **Fig. 20 - Tannins test** (Positive) |
| Tests for Flavonoid | | | |
| 5 | (i) **Ferric chloride test:** 0.2 ml of 10% ferric chloride was added to the extract. The mixture was shaken together to observe colour. | Wooly brownish colour | **Fig. 21 - Flavonoid test** (Positive) |

| | | | |
|---|---|---|---|
| | | |  |
| 6 | (ii) **Sodium hydroxide test:**<br>0.2 ml of dilute NaOH was added to 0.2 ml of the extract shaken gently. | Golden yellow precipitate obtained | (Positive)<br>  <br>**Fig. 22 – NaOH test** |
| Tests for Cardiac glycoside | | | |
| 7 | (i) **Salowiski's Test:**<br>0.5 g of the red onion skin extract was dissolved in 2ml of chloroform, concentrated sulphuric acid was carefully added to form lower layer. | Reddish brown colour at interface |  <br>**Fig. 23 - Salowiski test** (Positive) |
| 8 | (ii) **Keller Killiani's Test:**<br>The extract of the red onion skin (0.5 g) was dissolved in 2 ml of glacial acetic acid containing one drop (1 drop) of ferric chloride solution. This was under-layered with concentrated sulphuric acid. | Presence of brown ring on the interface |  <br>**Fig. 24 - Keller Killiani test(**Positive) |
| Tests for Saponins | | | |
| 9 | (i) **Frothing Test:** A little portion of the extract was shaken with water in a test tube | Frothing | **Fig. 25 – Saponins test** (Positive) |

| | | | |
|---|---|---|---|
| | | |  |

***c] Garlic***

**Table 4 - Phytochemical Analysis of Garlic[21, 22].**

| SR.NO. | TEST | OBSERVATION | INFERENCE |
|---|---|---|---|
| Tests for Alkaloids | | | |
| | **Mayer's reagent test:**<br>To 1 ml of filtrate, few drops of Mayer's reagent was added along sides of the tube. | Formation of creamy precipitate indicates the presence of Alkaloids. |  <br>(Positive)<br>**Fig. 26 – Alkaloid test** |
| | **Wagner's test:**<br>To 1 ml of filtrate, few drops of Wagner's reagent was added in a test tube. | Formation of reddish brown precipitate indicates the presence of Alkaloids. |  <br>**Fig. 27 – Alkaloid test** (Positive) |
| Tests for Carbohydrates | | | |
| | **Molisch test:**<br>One ml of aqueous extract was treated with drops of alcoholic α-naphthol solution in a test tube and then 500 µl of concentrated sulphuric acid was added carefully along the sides of the test tube. | Formation of the violet ring at the junction indicates the presence of carbohydrates. |  <br>**Fig. 28 – Carbohydrate test(**Negative) |

| | | | |
|---|---|---|---|
| Tests for Reducing Sugars | | | |
| | **Fehling's test:**<br>To 500µl of extract 500µl of Fehling's A and 500µl of Fehling's B solutions were added in a test tube and heated on a water bath for 10 minutes. | Formation of red precipitate indicates the presence of reducing sugar. | Negative<br>  <br>**Fig. 29 – Reducing sugar test** |
| Tests for Flavonoids | | | |
| | **Lead Acetate Test:**<br>One ml of the extract was treated with few drops of lead acetate solution. | Formation of yellow precipitate indicates the presence of flavonoids. |  <br>**Fig. 30 – Flavonoid's test** (Negative) |
| Tests for Glycosides | | | |
| | **Legal's test:**<br>500µl of test solution was dissolved in pyridine. 500µl of sodium nitroprusside solution was added and made alkaline using 500µl of 10% sodium hydroxide solution. | Formation of pink to blood red color indicates the presence of cardiac glycosides. |  <br>**Fig. 31 – Glycoside's test** (Positive) |
| Test for cardiac glycosides | | | |
| | **Keller-Killani test:**<br>To 1 ml of a test solution, 1.5 ml of glacial acetic acid and 1 drop of 5% ferric chloride were added in a test tube. Carefully few drops of concentrated sulphuric acid were added to the sides of the test tube. | Formation of blue color in the acetic acid layer indicates the presence of cardiac glycosides. | **Fig. 32 – Cardiac glycoside test** (Negative) |

| | | | |
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| | | |  |
| Test for Phenolic compounds | | | |
| | **Lead Acetate Test:**<br>One ml of the extract was dissolved in distilled water. To this solution, few drops of lead acetate solution were added. | Formation of white precipitate indicates the presence of phenolic compounds. | (Negative)<br>  <br>**Fig. 33 – Phenolic compound test** |
| Test for Saponins | | | |
| | **Froth test:**<br>One ml of the extract was diluted with 2ml of distilled water and shaken in a graduated cylinder for 15 minutes. | The formation of layer of foam indicates the presence of saponins. |  <br>**Fig. 34 – Saponins test**<br>(Positive) |
| Test for Protein | | | |
| | **Biuret test:**<br>The extract was treated with 1 ml of 10% sodium hydroxide solution in a test tube and heated. A drop of 0.7% copper sulphate solution was added to the above mixture. | The formation of the violet or pink color indicates the presence of proteins. | **Fig. 35 – Proteins test**<br>(Negative) |

| | | | |
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| | | |  |
| Test for Triterpenoids | | | |
| | **Salkowski's test:**<br>One ml of the extract was treated with 1ml of chloroform and filtered. The filtrate was added with few drops of concentrated sulphuric acid, shaken and allowed to stand. If the lower layer turns red, a steroid is present. | Presence of golden yellow layer at the bottom indicates the presence of triterpenoids. | Positive<br>  <br>**Fig. 36 – Triterpenoid's test** |
| Test for Sulphur | | | |
| | **Lead Acetate Test:**<br>2 mL extract was taken in a test tube and mixed with 3 - 4 drops of lead acetate and 2 - 3 drops of 40 % Sodium hydroxide was added and mixed till the precipitate dissolved. The test tube was boiled for 2 mins. and cooled. | There was appearance of brownish black precipitate which confirms the presence of sulphur. |  <br>**Fig. 37 – Sulphur test** (Positive) |
| | **Sodium Nitroprusside Test:**<br>Allicin liquid forms thiosulfinate compounds. 2 mL extract was taken in the test tube and 3 - 4 drops of sodium nitroprusside was added to it. The medium was made alkaline by adding 2 - 3 | There was appearance of deep violet colour indicating the presence of sulphur. | **Fig. 38 – Sulphur test** (Positive) |

| | | | |
|---|---|---|---|
| | drops of 40 % sodium hydroxide. | |  |

***3.5.2 Determination of organoleptic properties:***

The cream's colour, roughness, and pearlescence were evaluated and rated based on appearance.

***3.5.3 Determination of pH:***

Using a pH paper, the pH was determined to be between 6 and 7.

***3.5.4 Determination of homogeneity:***

The formulations were examined for homogeneity using both touch and visual appearance.

***3.5.5 Determination of spread ability:***

The amount of surface area that the topical application covers when applied to the skin's afflicted areas can be used to quantify spread ability. The formulation's spreading value also affects how effective it is as a treatment. Determining the formulation's spread ability was therefore deemed crucial. One gram of cream was sandwiched between two slides in this way. For two minutes, a 255-gram weight was set on the upper slide. Extra formulation was scraped off and the weight was eliminated. The amount of time it took for the upper slide to come off was recorded. The following formula was used to determine the spread ability (S):

$S = \frac{m \times L}{T}$

$S = \frac{(255 \times 5.5)}{120}$

S = 0.000117 N.m/s

Were,

S = Spread ability

m= Weight tied to upper glass slide.

L = Length moved on a glass slide

T = Time taken.

**Fig. 39 – Cream is spreaded between 2 slides for the determination of spread ability**

***3.5.6 Determination of Dye test:***

To conduct the test, a drop of cream was placed on a slide, covered with a cover slip, and examined under a microscope after being mixed with red dye. The cream was of the o/w type if the dispersion phase showed up as crimson globules. The cream was w/o type if the continuous phase shows red.

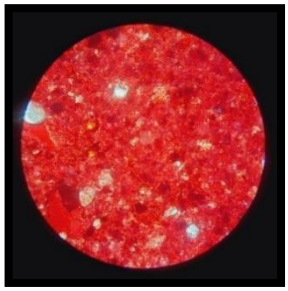

**Fig. 40 – View from the eyepiece of the microscope**

***3.5.7 Determination of Wetness:***

A human volunteer's skin surface was treated with cream to measure the level of moisture.

***3.5.8 Assessing homogeneity:***

The formulations were examined for homogeneity using both touch and visual appearance.

***3.5.9 Determination of Appearance:***

The cream's colour, opacity, and other characteristics were examined to determine its appearance.

***3.5.10 Determination of Smear type:***

The test was performed after the skin had been treated with cream, and the resulting smear was either aqueous or oily in composition.

***3.5.11 Determination of emolliency:***

Following the application of predetermined amounts of cream, the amount of residue, emolliency, and slipperiness were assessed.

### *3.5.12 Determination of viscosity:*

Using a Brookfield viscometer (DV2T model) with spindle number S-64 at 10 rpm and 28.2°C, the viscosity levels were determined to be 32,460cP.

**Fig. 41 –Brookfield Viscometer**


**Fig. 42 – Result Table**

### *3.5.13 Determination of Wash ability:*

The cream was removed from the skin by washing it under tap water with very little force[23].

### *3.5.14 Determination of Permeation study:*

An egg shell membrane can be cleaned and prepared by soaking it in 1% acetic acid, rinsing it with PBS, and then mounting it between a Franz diffusion cell's donor and receptor chambers. Apply a limited amount of vanishing cream (5–10 mg/cm²) uniformly over the donor side of the membrane, fill the receptor chamber with degassed PBS (pH 7.4), and keep it at 32±1°C. At predetermined intervals (10mins), remove 4 ml of receptor media samples, replace them with new PBS, and use UV-Vis to examine the penetrated actives (capsaicin, quercetin, and allicin). To evaluate the effectiveness of transdermal administration, compute the cumulative permeation, flux, and permeability coefficient[24].

**Fig. 43 – Franz diffusion cell apparatus**

**Fig. 44 – Checking absorbance of the samples**

**Fig. 45 – Placing covet in UV-vis spectrophotometer**

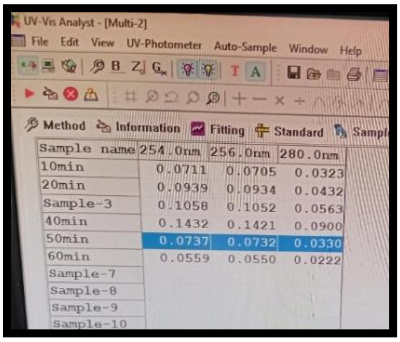


**Fig. 46 – Absorbance readings**

## Discussion

Lipomas, benign fatty tumors that develop beneath the skin, affect approximately 1 in 1,000 people, with higher prevalence among those aged 40-60 and slightly more common in women. While conventional medicine often adopts a watch-and-wait approach or recommends surgical removal, growing interest in integrative therapies has led to exploration of herbal remedies and non-invasive techniques. This discussion examines the potential of three bioactive compounds—capsaicin from chili peppers, quercetin from onions, and allicin from garlic—as part of a comprehensive approach to lipoma management, supported by current evidence from traditional medicine systems and contemporary research[25].

### *Understanding Lipomas: Pathophysiology and Current Treatment Paradigms*

Lipomas are soft, movable, typically painless growths composed of adipose tissue, most commonly appearing on the trunk, back, arms, shoulders, and neck. While their exact etiology remains unclear, several contributing factors have been identified:

- **Genetic predisposition**: Familial patterns and conditions like hereditary multiple lipomatosis suggest strong genetic components
- **Metabolic imbalances**: Associations with obesity, insulin resistance, and non-alcoholic fatty liver disease (NAFLD) indicate metabolic involvement
- **Lifestyle factors**: Sedentary behaviour, poor dietary habits, and chronic stress may contribute to development
- **Toxin accumulation**: Impaired detoxification pathways may lead to abnormal fat deposition

Conventional treatment typically involves surgical excision or liposuction for symptomatic or cosmetically concerning lipomas. However, emerging integrative approaches focus on addressing underlying metabolic imbalances while utilizing herbal therapies to potentially reduce lipoma size and prevent recurrence[26].

### *1.6. Bioactive Compounds in Lipoma Management*

#### *4.3.1. Capsaicin: The Active Component of Chili Peppers*

Capsaicin, the compound responsible for chili peppers' heat, has demonstrated several properties relevant to lipoma management:

- **Adipocyte modulation**: Research suggests capsaicin may influence fat metabolism through activation of transient receptor potential vanilloid 1 (TRPV1) channel, potentially affecting adipogenesis and lipolysis.

- **Anti-inflammatory effects**: Chronic low-grade inflammation is associated with metabolic disorders that may contribute to lipoma formation. Capsaicin's ability to reduce inflammatory markers could address this component.

- **Pain management**: For lipomas causing discomfort, topical capsaicin applications may provide localized pain relief through its effects on substance P.

Integrative protocols might incorporate capsaicin through dietary inclusion of chili peppers or standardized topical formulations, though optimal dosing for lipoma-specific applications requires further research.

#### *4.3.2. Quercetin: The Flavonoid Powerhouse from Onions*

Quercetin, a flavonoid abundant in onions and other plant foods, offers multiple mechanisms relevant to lipoma management:

- **Antioxidant capacity**: As a potent antioxidant, quercetin helps combat oxidative stress associated with metabolic dysfunction and toxin accumulation implicated in lipoma pathogenesis.

- **Lipid metabolism regulation**: Emerging evidence suggests quercetin may influence adipocyte differentiation and lipid storage patterns.

- **Detoxification support**: By enhancing phase II detoxification enzymes, quercetin may assist in eliminating toxins that could contribute to abnormal fat deposition.

- **Anti-fibrotic properties**: For fibrolipomas containing fibrous tissue, quercetin's potential to reduce fibrosis may be particularly relevant.

Clinical applications could include dietary increases in quercetin-rich foods or standardized supplements, with attention to bioavailability enhancement through formulations combining it with vitamin C or piperine[27].

#### *4.3.3. Allicin: Garlic's Bioactive Sulphur Compound*

Allicin, formed when garlic is crushed or chopped, presents several therapeutic properties for lipoma management:

- **Lipid-modulating effects**: Allicin has demonstrated ability to support healthy lipid profiles and may influence fat metabolism at the cellular level.

- **Detoxification enhancement**: Through sulphur-containing compounds, allicin supports liver detoxification pathways, potentially addressing toxin accumulation factors in lipoma development.

- **Anti-inflammatory action**: Allicin's modulation of inflammatory pathways may help create an internal environment less conducive to lipoma growth.

- **Antimicrobial properties**: By supporting healthy gut microbiota, allicin may indirectly influence metabolic health and fat distribution patterns.

Practical applications include consumption of fresh crushed garlic or enteric-coated supplements to preserve allicin's bioavailability, with consideration of individual tolerance[31].

### *4.4. Mechanisms of Action: Proposed Pathways*

The combined activity of capsaicin, quercetin, and allicin may influence lipoma development and progression through multiple interconnected pathways:

- **Adipocyte modulation**: Potential effects on fat cell differentiation, proliferation, and apoptosis.
- **Inflammatory regulation**: Downregulation of pro-inflammatory cytokines and oxidative stress reduction.
- **Detoxification enhancement**: Support of phase I and II liver detoxification enzymes.
- **Metabolic optimization**: Improvement of insulin sensitivity and glucose metabolism.
- **Microbiome influence**: Modulation of gut microbiota associated with metabolic health[28].

### *4.5. Clinical Considerations and Safety*

While these natural compounds generally have favorable safety profiles, several considerations apply:

- **Capsaicin sensitivity**: Some individuals may experience gastrointestinal irritation or skin reactions.
- **Quercetin interactions**: Potential interactions with certain medications metabolized by CYP3A4.
- **Allicin tolerance**: Gastrointestinal effects and possible anticoagulant properties warrant caution.
- **Individual variability**: Responses may differ based on genetic factors, metabolic status, and concurrent health conditions.

Monitoring should include regular assessment of lipoma size and characteristics, metabolic markers, and any adverse effects, with adjustment of the protocol as needed[29].

### *4.6. Research Gaps and Future Directions*

While traditional medicine systems like Ayurveda have long utilized these compounds for various conditions, specific research on their efficacy for lipomas remains limited. Key areas for future investigation include:

- **Direct effects on lipoma tissue**: In vitro and in vivo studies examining impact on lipoma-derived adipocytes
- **Optimal formulations and delivery methods**: Determining most effective routes of administration and combinations
- **Clinical trials**: Rigorous human studies evaluating efficacy as primary or adjunctive therapy
- **Long-term outcomes**: Assessment of recurrence rates and sustained benefits
- **Biomarker development**: Identification of molecular markers to predict and monitor response[30].

## Result

The formulated vanishing cream exhibited excellent physicochemical properties, including optimal pH (5.5-6.5), smooth texture, and good spreadability. Franz diffusion studies using egg membrane demonstrated effective permeation of active phytoconstituents (capsaicin, quercetin, and allicin)

The absorbance values of the vanishing cream's active extracts (garlic, onion, chili pepper) were measured over 60 minutes (Table 7). Garlic and onion extracts showed similar trends, peaking at 40 minutes (0.1432 and 0.1421, respectively), indicating rapid initial permeation. Chili pepper extract had lower absorbance (peak: 0.09 at 40 mins), likely due to capsaicin's lipophilicity requiring longer diffusion. A sudden drop in absorbance at 50–60 mins suggests compound degradation or saturation.

**Table 5 Result of phytochemical screening of Chili pepper extract.**

| Sr. No. | Test | Inference |
|---|---|---|
| 1 | Alkaloids | + |
| 2 | Tannins | + |
| 3 | Saponins | + |
| 4 | Phytosterols | - |
| 5 | Carbohydrate | + |
| 6 | Proteins | + |

| | | |
|---|---|---|
| 7 | Reducing sugar | + |

**Table 6 Result of phytochemical screening of Garlic extract.**

| Sr. No. | Test | Inference |
|---|---|---|
| 1 | Mayer's reagent test | + |
| 2 | Wagner's test | + |
| 3 | Molisch test (Carbohydrates) | - |
| 4 | Fehling's test (Reducing sugar) | + |
| 5 | Lead Acetate Test (Flavonoids) | + |
| 6 | Legal's test (Glycosides) | + |
| 7 | Keller-Killani test (Cardiac glycosides) | - |
| 8 | Lead Acetate Test (Phenolic compounds) | - |
| 9 | Froth test (Saponins) | + |
| 10 | Biuret test (Proteins) | - |
| 11 | Salkowski's test (Triterpenoids) | + |
| 12 | Lead Acetate Test (Sulphur) | + |
| 13 | Sodium Nitroprusside Test (Sulphur) | + |

**Table 7 Result of phytochemical screening of Onion extract.**

| Sr. No. | Test | Inference |
|---|---|---|
| 1 | Dragendorff's reagent (Alkaloids) | + |
| 2 | Mayer's reagent (Alkaloids) | + |
| 3 | Wagner's reagent (Alkaloids) | + |
| 4 | Bromine water (Tannins) | + |
| 5 | Ferric chloride test (Flavonoid) | + |
| 6 | Sodium hydroxide test (Flavonoid) | + |
| 7 | Salowiski's test (Cardiac glycoside) | + |
| 8 | Keller Killiani's Test (Cardiac glycoside) | + |
| 9 | Frothing Test (Saponins) | + |

**Table 8 Absorbance of vanishing cream.**

| Sampling Time | Vanishing cream absorbance | | |
|---|---|---|---|
| | Garlic extract | Onion extract | Chili pepper extract |
| 10mins | 0.0711 | 0.0705 | 0.0323 |
| 20mins | 0.0939 | 0.0934 | 0.0432 |
| 30mins | 0.1058 | 0.1052 | 0.0563 |
| 40mins | 0.1432 | 0.1421 | 0.09 |
| 50mins | 0.0737 | 0.0732 | 0.033 |
| 60mins | 0.0559 | 0.055 | 0.0222 |

**Graph (Absorbance vs. Time):**

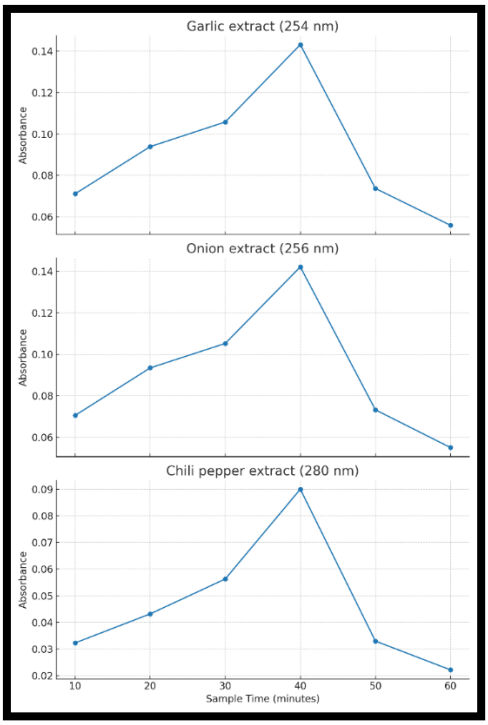


**Fig. 47 – Absorbance vs Sampling time**

## Conclusion

The vanishing cream demonstrated effective but differential permeation of active compounds, with garlic/onion extracts showing faster release than chili pepper. Future studies should:

- Optimize chili pepper extract stability
- Validate results with in vivo models
- Explore nanoencapsulation to enhance capsaicin delivery.

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