WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.453
Volume 14, Issue 19, 22-38. Research Article ISSN 2277–7105

# INTEGRATING TRADITIONAL MEDICINE WITH MODERN FORMULATION: A POLYHERBAL APPROACH TO ANTICOAGULATION BY ALLUM SATIVUM, ZINGIBER OFFICINALE, SYZYGIUM AROMATICUM EXTRACT

***Mayur Premanand Chaudhari, Khushi Avinash Patil, Dipali Digambar Chaudhari, Dhiraj Ashok Mate, Vaishnavi Kishor Shinde and Mohammad Awais**

Dr. Uttamrao Mahajan College of Pharmacy, Chalisgaon.

Article Received on
08 August 2025,

Revised on 29 August 2025,
Accepted on 18 Sept. 2025

https://doi.org/10.5281/zenodo.17213131

***Corresponding Author**
**Mayur Premanand Chaudhari**
Dr. Uttamrao Mahajan College of Pharmacy, Chalisgaon.

## ABSTRACT

Blood clot formation and abnormal platelet activity are major factors contributing to cardiovascular diseases, which continue to rank among the top global health concerns. Plant-based therapies have gained increasing attention as safer and more versatile options compared to conventional anticoagulant drugs. In this research, a polyherbal anticoagulant syrup was developed using a carefully balanced combination of Garlic (Allium sativum), Ginger (Zingiber officinale), and Clove (Syzygium aromaticum), supported by stabilizing agents including EDTA, ascorbic acid, xanthan gum, and HPMC. The selected botanicals were chosen for their well-documented ability to reduce platelet aggregation, support healthy blood circulation, and counteract oxidative stress–related clot formation. The prepared formulation was tested for physicochemical attributes such as pH, viscosity, sensory characteristics, and microbial safety. Results showed that the syrup remained stable in appearance and texture, was free from microbial contamination, and demonstrated strong potential as a natural alternative for anticoagulant therapy.

**KEYWORDS:** The prepared formulation was tested for physicochemical attributes such as pH, viscosity, sensory characteristics, and microbial safety.

## INTRODUCTION

Herbal medicine, deeply rooted in traditional healing systems such as Ayurveda, places strong emphasis on the therapeutic value of plants for disease prevention, treatment, and overall wellness. In Ayurvedic practice, many botanicals are renowned for their ability to enhance cardiovascular health and purify the blood. With the rising global interest in natural remedies, plant-based alternatives to synthetic drugs are increasingly being investigated for their diverse pharmacological effects and relatively lower risk of side effects.

Cardiovascular disorders, especially those linked to abnormal clot formation and thrombosis, continue to be among the top causes of death worldwide. Although conventional anticoagulants like warfarin and heparin are effective, their use is often limited by serious side effects, a narrow therapeutic margin, and the requirement for frequent monitoring. Consequently, researchers have been exploring herbal anticoagulants as safer and more holistic options for managing clot-related conditions.

Among the most well-researched medicinal plants in this category are garlic (*Allium sativum*), ginger (*Zingiber officinale*), and clove (*Syzygium aromaticum*), each known for their anticoagulant, antiplatelet, and antioxidant actions. These herbs exert their effects through mechanisms such as blocking thromboxane production, inhibiting platelet aggregation, and improving blood rheology. Key bioactive compounds—allicin **from** garlic, gingerol from ginger, and eugenol from clove—demonstrate significant activity in preventing clot formation.

### Plant Profile

**1. Garlic (*Allium sativum*):** is a medicinally significant plant valued for its distinct aroma, culinary uses, and wide range of therapeutic properties. It is rich in bioactive constituents such as sulfur-containing compounds, flavonoids, and antioxidants, which contribute to its cardiovascular and general health benefits. Believed to have originated in Central Asia, garlic cultivation has expanded worldwide, particularly in regions with temperate to subtropical climates. Leading garlic-producing countries include China, India, South Korea, Egypt, and the United States, making it readily available for culinary, medicinal, and pharmaceutical applications. Known by various names across cultures, garlic's global recognition and accessibility enhance its potential as a key ingredient in herbal formulations, some of the common names are given in the table 1.

❖ **Common names and botanical classification of Allum sativum**

**Table 1.**

| Sr. No. | Common Name | Language / Region |
|---|---|---|
| 1 | Garlic | English |
| 2 | Lahsun | Hindi |
| 3 | Lashuna | Sanskrit |
| 4 | Lasun | Marathi |
| 5 | lasan | Gujrati |
| 6 | poondu | Tamil |

**Table 2.**

| Rank | Classification |
|---|---|
| **Kingdom** | Plantae |
| **Subkingdom** | Tracheobionta |
| **Division** | Magnoliophyta |
| **Class** | Liliopsida |
| **Subclass** | Lillidae |
| **Order** | Asparagalus |
| **Family** | Amaryllidaceae |
| **Genus** | Allium |
| **Species** | A. Sativum |
| **Binomial name** | *Allum sativum* |

**Botanical Description**

Garlic (*Allium sativum* L.), belonging to the family **Amaryllidaceae**, is a perennial, bulbous plant widely cultivated for its culinary and medicinal value. The plant produces a compound bulb consisting of several cloves, each enclosed in a thin, papery sheath. Leaves are long, narrow, and flat with a grass-like appearance, emerging from the base in a linear arrangement. The flowering stalk, known as a scape, is smooth, leafless, and terminates in an umbel bearing small, whitish to pinkish flowers, sometimes accompanied by bulbils. Garlic thrives in well-drained, fertile soils and is predominantly cultivated in temperate to subtropical regions worldwide. Its distinctive aroma and flavor are attributed to sulfur-containing compounds, which also contribute to its medicinal properties, particularly its anticoagulant and cardiovascular benefits.

**Fig 1: garlic bulb and it's paste.**

**Geographical Source**

Garlic (*Allium sativum* L.) is cultivated globally, with major production concentrated in temperate and subtropical regions. China is the largest producer, contributing the majority of the world's supply, followed by countries such as India, South Korea, Egypt, the United States, and Spain. In India, prominent garlic-growing states include Madhya Pradesh, Gujarat, Rajasthan, Uttar Pradesh, and Maharashtra. The crop thrives in well-drained, fertile loamy soils and requires a cool to mild climate for bulb development, making these regions highly suitable for large-scale cultivation.

**Fig 2: Whole Plant of Allum sativum Linn.**

**Morphology**

Garlic (*Allium sativum* L.) is a bulbous perennial herb reaching 30–60 cm in height. It develops from a compound bulb made of multiple cloves enclosed in thin, papery tunics that may be white or purple. Leaves are long, flat, linear, and arise alternately from the base, sheathing the pseudostem. A smooth, leafless stalk (scape) bears an umbel of small white to pinkish flowers, though in most cultivated varieties, bulbils replace flowers. The shallow, fibrous root system spreads widely, and the plant's strong aroma is due to sulfur-rich compounds concentrated in the cloves.

**Pharmacological Activities**

**1. Anticoagulant activity**

Ginger inhibits platelet aggregation by blocking thromboxane synthesis and altering eicosanoid metabolism. This effect helps reduce the risk of thrombosis and supports cardiovascular health.

**2. Anti-inflammatory Activity**

Ginger contains bioactive compounds such as gingerols, shogaols, and paradols that inhibit

pro-inflammatory cytokines (TNF-α, IL-and suppress the NF-κB signaling pathway. This helps reduce inflammation in conditions such as arthritis, muscle soreness, and inflammatory bowel diseases.

**3. Antioxidant activity**

Ginger's phenolic compounds (especially 6-gingerol and 6-shogaol) neutralize free radicals, enhance antioxidant enzyme activity (superoxide dismutase, catalase, glutathione peroxidase), and protect cells from oxidative stress, slowing aging and reducing chronic disease risk.

**4. Antiematic activity**

Ginger alleviates nausea and vomiting by modulating serotonin receptors (5-$HT_3$) in the gastrointestinal tract and central nervous system. It is effective in motion sickness, pregnancy-induced nausea, and chemotherapy-related nausea.

**5. Antimicrobial activity**

Ginger extracts exhibit antibacterial, antifungal, and antiviral properties by disrupting microbial membranes and inhibiting biofilm formation. It is particularly effective against *E. coli*, *Staphylococcus aureus*, *Candida albicans*, and respiratory viruses.

**2. Ginger (Zingiber officinale)**

Ginger (Zingiber officinale) is a medicinally important rhizomatous plant widely valued for its characteristic pungent aroma, spicy flavor, and diverse therapeutic applications. It contains bioactive constituents such as gingerols, shogaols, zingerone, and essential oils, which contribute to its anti-inflammatory, antioxidant, antiemetic, and cardiovascular health-promoting properties. Believed to have originated in Southeast Asia, particularly India and China, ginger cultivation has spread globally, thriving in tropical and subtropical climates with well-drained soils. Major producers include India, China, Nigeria, Nepal, and Thailand, ensuring its consistent availability for culinary, medicinal, and pharmaceutical uses. Known by numerous vernacular names across different regions, ginger enjoys global recognition, making it a vital component in herbal formulations.

**Fig 3: ginger and it's powder.**

**Botanical classification of Zingiber officinale**

**Table 3.**

| **Rank** | **Classification** |
|---|---|
| **Kingdom** | Plantae |
| **Subkingdom** | Tracheobionta |
| **Division** | Magnoliophyta |
| **Class** | Liliopsida |
| **Subclass** | zingiberidae |
| **Order** | zingiberales |
| **Family** | zingiberaceae |
| **Genus** | zingiber |
| **Species** | Z. officinake |
| **Binomial name** | *Zingiber officinale* |

**Pharmacological Activities**

**1. Cardioprotective activity**

Ginger's cardioprotective effects include inhibition of platelet aggregation, improvement in lipid profiles (reducing LDL, triglycerides, and total cholesterol while increasing HDL), and enhancement of blood circulation. By improving endothelial function and reducing oxidative damage to blood vessels, ginger lowers the risk of atherosclerosis and hypertension.

**3. Gastroprotective and digestive health**

Ginger stimulates the secretion of digestive enzymes, increases gastric motility, and prevents the formation of gastric ulcers by enhancing mucus production and reducing gastric acid secretion. It also relieves dyspepsia, flatulence, and constipation, supporting overall gastrointestinal health.

**4. Neuroprotective activity**

By reducing neuroinflammation, inhibiting acetylcholinesterase, and combating oxidative stress in the brain, ginger offers protection against Alzheimer's disease, Parkinson's disease,

and other neurodegenerative disorders.

**5. Antidiabetic and metabolic effects**

Ginger improves insulin sensitivity by upregulating GLUT4 expression and modulating carbohydrate-metabolizing enzymes. It also reduces fasting blood glucose, HbA1c, and improves lipid metabolism, making it beneficial for managing type 2 diabetes mellitus and metabolic syndrome.

**2. Clove (*Syzygium aromaticum*)**

Clove (*Syzygium aromaticum*) is a highly valued aromatic flower bud renowned for its distinctive pungent aroma, warm flavor, and broad spectrum of medicinal applications. It contains potent bioactive compounds such as eugenol, eugenyl acetate, and β-caryophyllene, which contribute to its antimicrobial, antioxidant, anti-inflammatory, analgesic, and digestive health-promoting properties. Native to the Maluku Islands (Indonesia), clove has a long history in traditional medicine, perfumery, and culinary practices. Today, it is cultivated extensively in tropical and subtropical regions, with major producers including Indonesia, Madagascar, Tanzania, Sri Lanka, and India. Its versatility and therapeutic potential have ensured its significant role in herbal formulations, dental care products, and flavoring industries worldwide. Recognized in various traditional healing systems, clove remains an indispensable spice and medicinal plant in both domestic and commercial use.[11-12]

**Table 4.**

| **Rank** | **Classification** |
|---|---|
| **Kingdom** | Plantae |
| **Subkingdom** | Tracheobionta |
| **Division** | Magnoliophyta |
| **Class** | Liliopsida |
| **Subclass** | zingiberidae |
| **Order** | zingiberales |
| **Family** | zingiberaceae |
| **Genus** | zingiber |
| **Species** | Z. officinake |
| **Binomial name** | *Zingiber officinale* |

**Pharmacological Activities**

**1. Gastroprotective Activity**

Clove stimulates gastric mucus secretion and inhibits gastric acid production, protecting the gastric lining from damage caused by NSAIDs, alcohol, and stress. This is partly due to its

antioxidant and anti-inflammatory effects on gastric tissues.

**2. Anticoagulant & Antiplatelet Activity**

Eugenol has been shown to inhibit platelet aggregation by modulating thromboxane $A_2$ synthesis and suppressing fibrinogen binding to platelet receptors. It also prolongs clotting time, making it beneficial as a natural adjunct in the prevention of thrombosis. This activity is particularly relevant for herbal formulations aimed at improving blood circulation and preventing clot-related disorders.

**3. Analgesic & Local Anesthetic Activity**

Eugenol acts on voltage-gated sodium channels in nerve membranes, producing a numbing effect. This explains its long-standing use in dentistry for toothache relief. Its analgesic effect complements its anti-inflammatory role in pain management.

**4. Anti-inflammatory Activity**

Clove modulates inflammatory pathways by inhibiting cyclooxygenase-2 (COX-2) and lipoxygenase enzymes, reducing the production of pro-inflammatory mediators such as prostaglandins, leukotrienes, and nitric oxide. This makes it valuable in managing chronic inflammatory disorders, including those associated with vascular injury.

**5. Antidiabetic Activity**

Clove polyphenols improve insulin sensitivity and enhance glucose uptake in peripheral tissues. They also modulate carbohydrate-digesting enzymes such as α-amylase and α-glucosidase, resulting in improved glycemic control.


**Fig.4: powdered Syzygium aromaticum.**

## MATERIALS AND METHODS

### Collection and processing of sample

**1. Garlic (Allum sativum)**

- Collection: Obtain fresh, mature garlic bulbs from a local farm or market.
- Cleaning: Peel and separate individual cloves. Wash thoroughly with clean water to remove soil and surface contaminants.
- Drying: Allow the cleaned cloves to air dry in shade or under controlled drying conditions (not direct sunlight) to preserve active sulfur compounds.

**2. Ginger (Zingiber officinale)**

- Collection: Harvest mature ginger rhizomes from cultivated fields or purchase from a verified source.
- Cleaning: Rinse thoroughly under running water to remove soil and debris.
- Drying: Slice the cleaned rhizomes and dry in shade or using a tray dryer at low temperature to prevent degradation of active compounds (gingerols and shogaols).

**3. Clove (Syzygium aromaticum)**

- Collection: Procure unopened clove flower buds (dried form) from a reputed herbal supplier or harvest directly from clove trees when buds are mature but not yet open.
- Cleaning: Remove impurities or dust by gentle washing or sieving if needed.
- Drying: If fresh, sun-dry the buds until they turn dark brown and brittle.

### Chemicals and Reagents

Orange Garlic extract, Ginger extract, Clove extract, Citric acid, EDTA, Glycerine, Ascorbic acid, Xanthan gum, HPMC, Sorbitol syrup, Sodium citrate, Purified water, etc.

### Instruments and equipments

Sieve no:60 mesh, round conical flask(250ml), whatman filter paper no:41, aluminium foil, test tubes, nutrient agar plates, porcelain dish, thermometer, Buchner funnel, Ph meter, two glass slides of 20 cm × 20 cm, microscopic slide, Brookfield Viscometer.

### Preparation of sample extract[20]

**1. Aqueous extract of Allium sativum (Garlic)**

Garlic (Allium sativum) species were purchased from local market. 10g of peeled garlic was weighed and washed with sterile distilled water by soaking for 5 minutes and then it was

soaked in 95% ethanol for 3 minutes to make the species sterile. Then the garlic was dried for 10 minutes to evaporate the ethanol. Then the dried garlic was crushed in sterile mortar and pestle by adding 0.5ml of distilled water. After mashing the garlic will be in a paste form, it is filtered using Whatman no. 1 filter paper and the extract collected was 15 ml. This extract was considered to be 100% was used.

**2. Aqueous extract of Zingiber officinale (Ginger)**

Dried Ginger (Zingiber officinale) rhizomes were purchased from the local vegetable market. The dry rhizomes ground into a fine powder and ten grams of the powder were weighed using sensitive balance and then suspended in 100 ml of distilled water in a conical flask with continues shaking for twenty four hours. The supernatant of Zingiber officinale extract filtrated using filter paper size 42 mm. The final aqueous extract (10%) of Zingiber officinale was used for an in vitro testing of its possible anticoagulant activity in blood samples.

**3. Aqueous extract of Syzygium aromaticum (Clove)**

Clove flower bud aqueous Extract preparation Dried flower buds of clove were collected from local market and powdered (2 mm mesh size). 10 g crude powder was mixed in 100 ml of double distilled water, and the mixture was left over night. The mixture was then filtered; centrifuged and supernatant extract was stored at 4°C till further us.

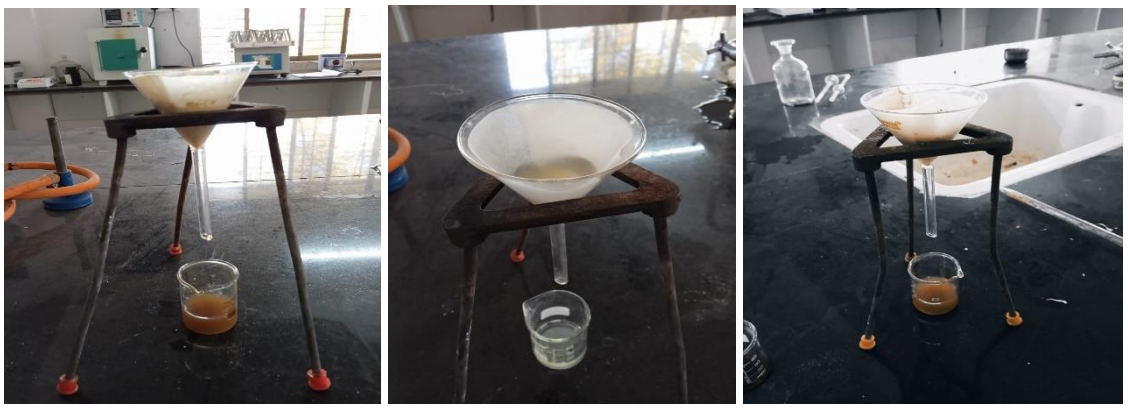


**Fig. 5 extraction of sample.**

**Formulation of anti-coagulant syrup**

**Ingredients and it's roles**

**Table 5.**

| Ingredients | Role |
|---|---|
| Garlic extract | Anticoagulant as Inhibits thromboxane synthesis |
| Ginger extract | Anti coagulant as inhibit cox- Lox pathway |

| | |
|---|---|
| Clove extract | Anticoagulant as inhibit thrombin activity |
| Citric acid | pH adjuster and mild preservative |
| EDTA | Chelating agent to improve stability and preservative efficacy |
| Glycerin | Humectant and smoothening agent |
| Ascorbic acid | antioxidant to enhance stability and shelf life |
| Xanthun gum | Primary thickening agent |
| HPMC | Additional thickener and stabilizer |
| Sorbitol syrup | Sweetening agent and base |
| Sodium citrate | pH buffer and stabilizer |
| Purified water | Solvent and base vehicle |

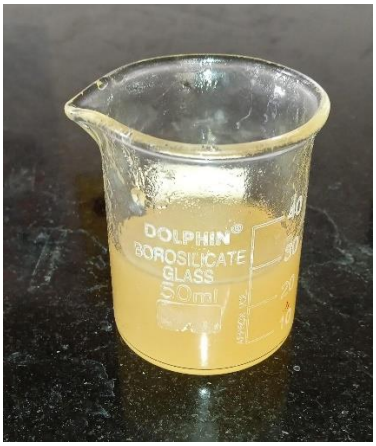
**Formulation table**

**Table 6**

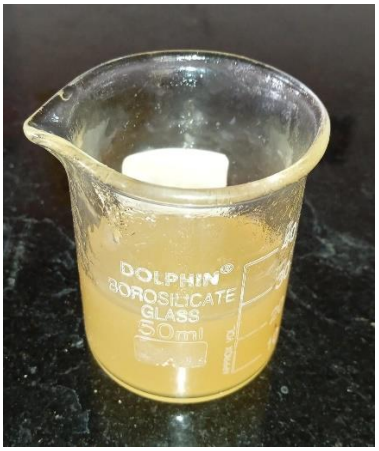
| Sr. no. | Ingredients | F1 | F2 | F3 | F4 |
|---|---|---|---|---|---|
| 1 | Garlic Extract | 2.64 ml | 3.08 ml | 2.53 ml | 2.82 ml |
| 2 | Ginger Extract | 2.64 ml | 2.56 ml | 3.04 ml | 2.82 ml |
| 3 | Clove Extract | 1.05 ml | 1.03 ml | 1.27 ml | 1.03 ml |
| 4 | EDTA | 0.05 g | 0.05 g | 0.05 g | 0.05 g |
| 5 | Ascorbic Acid | 0.03 g | 0.03 g | 0.03 g | 0.03 g |
| 6 | Xanthan Gum | 0.26 g | 0.26 g | 0.30 g | 0.26 g |
| 7 | HPMC | o.16 g | 0.15g | 0.15g | 0.15g |
| 8 | Sorbitol Syrup | 2.64 ml | 2.56 ml | 2.53 ml | 2.56 ml |
| 9 | Purified water | 10 | 10 | 10 | 10 |

**Preparation of anti-coagulant syrup**

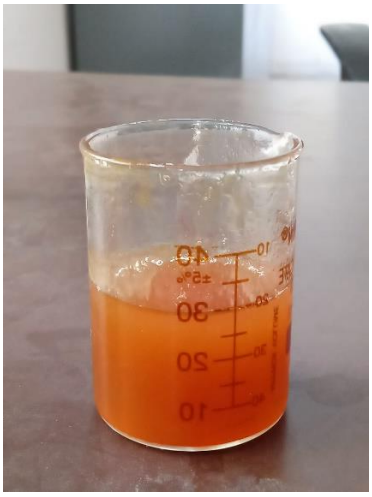
First, the herbal extracts of Garlic, Ginger, and Clove are individually passed through a fine mesh sieve to ensure a smooth and uniform texture. A measured portion of purified water (approximately 60–70% of the total volume) is taken in a clean stainless-steel vessel, and the sieved extracts are slowly added with continuous stirring to form a homogenous solution. To this, Sorbitol syrup and Glycerin are added as sweetening and humectant agents, and the mixture is stirred until fully blended. Next, Citric acid, Sodium citrate, EDTA, and Ascorbic acid are added to stabilize the pH, prevent oxidation, and enhance preservative efficacy. In a separate step, Xanthan gum and HPMC are gradually sprinkled into the mixture with constant stirring to avoid clumping and to develop the desired syrupy consistency. Once the mixture is uniform and lump-free, the volume is adjusted to 30 mL with the remaining purified water, and the pH is checked and adjusted within the range of 4.5 to 6.0 using Citric acid or Sodium citrate as needed. The final syrup is filtered through a muslin cloth to remove any undissolved particles, then transferred into clean, sterilized amber bottles. The bottles are labelled and stored in a cool, dry place away from sunlight.




**F 1**




**F 2**



**F 3**

**F 4**

**Evaluation Of Anti Coagulant Syrup**

**1. Organoleptic Properties**

Organoleptic properties of the formulated syrup containing garlic extract , ginger , extract , clove extract were assessed visually and manually to evaluate its physical characteristics.

**Table 7.**

| Parameter | observation | inference |
|---|---|---|
| **Color** | Light brown to pale amber | Uniform and appealing natural appearance |
| **Odor** | Mild aromatic, characteristic of herbs | Pleasant and acceptable for oral use |
| **Taste** | Slightly sweet, with mild pungent notes | Balanced palatability, no bitterness |
| **Consistency** | Viscous, free-flowing syrup | Ideal for syrup dosage form |
| **Appearance** | Homogeneous, no sediment or particulate | Stable and well-formulated |
| **Clarity** | Slightly opaque (due to herbal extracts) | Acceptable for herbal syrup |

**2. Ph of syrup**

Ph was determined by Ph meter, The pH meter was calibrated with a standard buffer solution.

**Table 8.**

| Formulation | PH |
|---|---|
| F1 | 4.9 |
| F2 | 4.05 |
| F3 | 4.02 |
| F4 | 4 |

**3. Determination of Density**

1) Weight of empty bottle – 18.10 gm (W1)

2) Weight of bottle + water – 53.50 gm (W2)

3) Weight of bottle + sample – 56.20 gm (W3)

Mass of liquid sample (syrup) = w2 – w1

53.30 – 18.10

35.2

$$\text{Density of syrup} = \frac{(W3-W1) * \text{Density of water}}{(W2-W1)}$$

$$= \frac{38.10 - 18.10}{53.30 - 18.10} * 0.997$$

$$= \frac{20 * 0.997}{35.2}$$

F3 = 0.566 gm/ml

**4. Determination of viscosity**

**Table no. 9.**

| Sr. No. | Liquid Sample | Time to Flow | | | Mean | Density | Viscosity |
|---|---|---|---|---|---|---|---|
| 1 | Distilled Water | 15.53 | 16.17 | 15.96 | 15.88 = t1 | 0.997 | 0.8937 |
| 2 | Syrup | 17.20 | 18.11 | 17.36 | 17.55 = t2 | 0.566 | 0.5606 |

**Viscosity =** $\frac{P2t2}{P1t1} X\ n1$

Where,

p1 – Density of water

p2 – Density of test sample n1 – viscosity of water

n2 – viscosity of test sample

t1– mean time of flow of distilled water t2 – mean time of flow of syrup

$$= \frac{0.566 \text{ X } 17.55}{0.997 \text{ X } 15.88} \text{ X } 0.8937$$

$$= \frac{9.93 \text{ X } 0.8937}{15.83}$$

F3 = 0.5606

**5. Determination of Weight per ml**

1) Empty bottle weight ($W_1$): 35 gm

2) Bottle + 100 mL syrup ($W_2$):148 gm

Step 1: Calculate Weight of 100 ML syrup = W2 – W1

148 – 35

113 gm

Step 2: Calculate weight per mL

$$\text{Weight per ml} = \frac{\text{Weight of syrup}}{\text{Volume}}$$

$$\frac{113}{100}$$

= 1.13 g/ml

**6. Microbial Testing**

The syrup underwent microbial testing to ensure its microbiological safety. The total aerobic microbial count (TAMC) and total yeast and mold count (TYMC) were found to be within pharmacopeial limits.

**These results indicate that the syrup meets microbiological quality standards and is free from contamination**

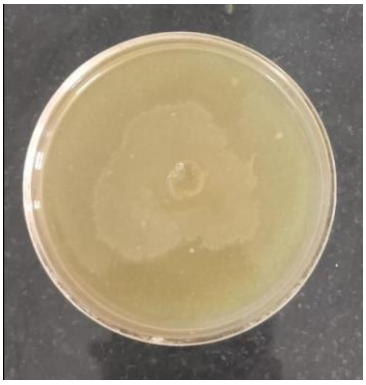


**Fig 7: microbial testing.**

**7. Stability testing**

The syrup, packed in 100 mL PET bottles, was subjected to stability testing under two storage conditions: 25°C for a duration of 3 months. Throughout the study period, no significant changes were observed in the physical parameters, including appearance, pH, and viscosity. Furthermore, the API content remained within acceptable limits, indicating no notable chemical degradation.

## CONCLUSION

The formulated polyherbal anticoagulant syrup presents a promising natural alternative to synthetic anticoagulants, with potential applications in preventing thrombosis, improving blood circulation, and supporting vascular health. Each herbal component offers complementary mechanisms that inhibit platelet aggregation, protect endothelial function, and minimize oxidative stress—without the bleeding risks associated with conventional therapies. The integration of traditional medicinal knowledge with modern formulation science has led to a stable, effective, and patient-friendly dosage form. However, further in vivo evaluations and clinical trials are essential to confirm its long-term safety, efficacy, and suitability for commercial production. In formulation of F1, F2, F3, F4 all syrup showed good stability but the F3 was found to be most stable and expected to show long shelf life.

## REFERENCES

1. Chaieb, K., Hajlaoui, H., Zmantar, T., Kahla-Nakbi, A.B., Rouabhia, M., Mahdouani, K., & Bakhrouf, A. (2007). The chemical composition and biological activity of clove essential oil, *Syzygium aromaticum* L. Myrtaceae: A short review. *Phytotherapy*

*Research*, 21(6): 501–506. https://doi.org/10.1002/ptr.2124

2. Cortés-Rojas, D.F., de Souza, C.R.F., & Oliveira, W.P. (2014). Clove (*Syzygium aromaticum*): A precious spice. *Asian Pacific Journal of Tropical Biomedicine*, 4(2): 90–96. https://doi.org/10.1016/S2221-1691(14)60215-X
3. Prashar, A., Locke, I. C., & Evans, C. S. (2006). Cytotoxicity of clove (*Syzygium aromaticum*) oil and its major components to human skin cells. *Cell Proliferation*, 39(4): 241–248. https://doi.org/10.1111/j.1365-2184.2006.00381.x
4. Sharma, D., Mehta, K., & Patel, S. (2021). Evaluation of Phenolic Content and Antimicrobial Activity of Citrus Peel Extracts. *International Journal of Pharmaceutical Sciences and Research*, 14(1): 10–20.
5. Patel, V., Gupta, N., & Desai, A. (2020). Tannin.
6. Raj, P., Kumar, A., & Jain, V. (2019). Glycosides in Citrus Fruits: Extraction and Applications in Health. *Natural Products Research*, 33(4): 522–530.
7. Khan, H., Ahmad, S., & Ali, M. (2018). Saponins in Citrus Peels: Chemistry and Functionality. *Journal of Agricultural and Food Chemistry*, 66(2): 305– 312.
8. Mishra, A., Gupta, K., & Rani, S. (2017). Terpenoids from Citrus Peel: Chemical Composition and Pharmacological Properties. *Phytotherapy Research*, 31(3): 501–508.
9. Verma, S., & Singh, P. (2016). Protein Content in Citrus Peels and Their Potential Use in Nutraceuticals. *Journal of Nutritional Science and Food Safety*, 5(2): 89–95.
10. Pandey, R., & Gupta, D. (2015). Carbohydrates in Citrus Peels: Analyzing Their Role in Antioxidant Defense. *Current Trends in Biotechnology and Pharmacy*, 9(1): 40–48.
11. W, et al. *Effect of Daily Ginger Consumption on Platelet Aggregation in Adults: A Systematic Review and Meta-Analysis* DOI: https://doi.org/10.1016/j.ctim.2019.02.006
12. Nerkar P, Ghadge A. *Formulation and Evaluation of Herbal Syrup of Ginger Extract* DOI: https://doi.org/10.22270/jddt.v10i3-s.4151
13. Pandey, I., & Nama, K.S.*Withania coagulans (Stocks) Dunal: A Rare Ethnomedicinal Plant of the Western Rajasthan Desert.*
14. Study Of Some Biological Activities Of Aqueous Extract Of Ginger (Zingiber Officinale) Helal Mohamed MI, Osman Mona Y, Ghobashy Madeha OI, Helmy Wafaa A Year, 2014; 13(2): 144-150.
15. Saeed SA, Gilani AH. Antithrombotic Activity of Clove Oil. J Pak Med Assoc, 1994; 44(5): 112-5.
16. Rasheed A, Laekeman G, Totte J, Vlietinck A J, Herman A G. Eugenol And Prostaglandin Biosynthesis. N Engl J Med., 1984; 310: 50-1.

17. Srivastava KC. Antiplatelet Principles From A Food Spice Clove (Syzygium Aromaticum L). J Prostaglandins Leukot Essent Fatty Acids, 1993; 48: 363-72.
18. Lawson LD, Ransom DK, Hughes BG. *Inhibition of Whole Blood Platelet-Aggregation by Compounds in Garlic Clove Extracts and Commercial Garlic Products* DOI: https://doi.org/10.1016/0952-3278(93)90116-E
19. Marx W, et al. *Effect of Daily Ginger Consumption on Platelet Aggregation in Adults: A Systematic Review and Meta-Analysis* DOI: https://doi.org/10.1016/j.ctim.2019.02.006
20. Gadkari JV, Joshi VD. *Effect of Ingestion of Raw Garlic on Serum Cholesterol Level, Clotting Time and Fibrinolytic Activity in Normal Subjects* DOI: https://doi.org/10.1016/S0952-3278(96)00099-X
21. Lapikova ES, Drozd NN, Tolstenkov AS, Makarov VA, Zvyagintseva TN, Shevchenko NM, Bakunina IU, Besednova NN, Kuznetsova TA. Inhibition Of Thrombin And Factor Xa By Fucus Evanescens Fucoidan And Its Modified Analogs. Bull Exp Biol Med., 2008; 146: 328-333.
22. Pharmacological Activity Of Zingiber Officinale Rajesh Kumar Mishra*, Anil Kumar And Ashok Kumar Pharmacy College, Itaura, Chandeshwar, Azamgarh, Uttar Pradesh, India, 1422-1428.
23. Scharbert G., Kalb Madeleine L., Duris M., Marschalek C., Kozek-Langenecker Sibylle A. Garlic At Dietary Doses Does Not Impair Platelet Function. Anesth. Analg, 2007; 105: 1214-1218.
24. Rahman K. Effects of Garlic on Platelet Biochemistry And Physiology. Mol. Nutr. Food Res., 2007; 51: 1335–1344.
25. Study Of Some Biological Activities Of Aqueous Extract Of Ginger (Zingiber Officinale) Helal Mohamed MI, Osman Mona Y, Ghobashy Madeha OI, Helmy Wafaa A Year, 2014; 13(2): 144-150
26. Thomson M, Ali M. Garlic Allium Sativum: A Review of Its Potential Use As An AntiCancer Agent. Curr Cancer Drug Targets, 2003; 3: 67-81.
27. Ahmad T, Shinkafi TS, Routray I, Mahmood A, Ali S. Aqueous Extract Of Dried Flower Buds Of Syzygium Aromaticum Inhibits Inflammation And Oxidative Stress. J Basic Clin Pharm, 2012; 3(3): 323-327.
28. Borrelli F., Capasso R., Izzo A.A. Garlic (Allium Sativum L.): Adverse Effects And Drug Interactions In Humans. Mol. Nutr. Food Res., 2007; 51: 1386–1397.