NJESR/November-2025/Volume-7/Issue-11 E-ISSN-2582-5836
DOI-10.53571/NJESR.2025.7.11.1-4

Use of Piper betle, Allium sativum, And Zingiber officinale Extracts In Coronary Thrombosis: An Integrative Review

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(Received-15October2025/Revised-25October2025/Accepted-10November2025/Published-30November2025)

Abstract

Coronary thrombosis is the principal pathological event precipitating Acute Coronary Syndrome (ACS) and results from platelet aggregation, endothelial dysfunction, oxidative stress, and inflammatory processes. Although modern therapeutic interventions such as percutaneous coronary intervention and antiplatelet therapy have substantially improved survival, recurrent thrombotic events and long-term adverse effects continue to pose clinical challenges.Ayurveda conceptualizes cardiovascular disorders under Hṛdroga, emphasizing preservation of vascular patency, purification of blood (raktaśodhana), and correction of metabolic imbalance. Medicinal plants including Piper betle (Tambūla), Allium sativum (Rasona), and Zingiber officinale (Śuṇṭhī) are traditionally employed for their hṛdya, sara, and śothahara properties. Experimental and clinical studies support their antiplatelet, antioxidant, anti-inflammatory, and vasoprotective activities.This integrative review examines classical Ayurvedic references, modern pharmacological evidence, mechanistic pathways, and dosage considerations to evaluate the potential adjunctive role of these medicinal plants in coronary thrombosis.

Keywords: Coronary thrombosis, Extracts

Introduction

Coronary thrombosis occurs following disruption of an atherosclerotic plaque, leading to platelet adhesion, aggregation, and activation of the coagulation cascade. Thromboxane A_2, reactive oxygen species, inflammatory cytokines, and endothelial dysfunction play critical roles in thrombus propagation. Despite optimal contemporary management, residual thrombotic risk persists, highlighting the need for complementary preventive strategies.

Ayurveda attributes cardiovascular pathology to vāta-kapha dushti, rakta dushti, āma, and srotorodha. Drugs possessing hṛdya, raktaśodhaka, dīpana, and sara properties are indicated to restore circulatory balance. Piper betle, Allium sativum, and Zingiber officinale are described in classical texts for circulatory enhancement and inflammation control, and modern research increasingly validates these actions.

1. Piper betle (Tambūla)

Ayurvedic Description

Bhavaprakasha Nighantu – Tambūla Varga

Tambūla is described as hṛdya (cardiotonic), sara (circulatory stimulant), and raktaśodhaka, supporting its use in disorders involving impaired blood flow and platelet dysfunction.

Pharmacological Evidence

Betel leaf extracts demonstrate inhibition of arachidonic acid- and collagen-induced platelet aggregation, suppression of thromboxane B_2 synthesis, and significant antioxidant activity. Animal studies report reduced myocardial injury, decreased infarct size, and improved antioxidant status.

Clinical Perspective

Human clinical trials are lacking. Importantly, medicinal leaf extracts must be differentiated from betel-quid consumption. Currently, Piper betle may be considered an experimental antiplatelet agent suitable for further investigation.

2. Allium sativum (Rasona)

Ayurvedic Description

Bhavaprakasha Nighantu

Rasona is traditionally indicated in hṛdroga, śotha, and metabolic disorders.

Pharmacological Evidence

Garlic inhibits platelet aggregation, reduces thromboxane synthesis, enhances fibrinolysis, improves endothelial function, and favorably modulates lipid and blood pressure parameters. Clinical studies demonstrate reduced platelet responsiveness, though its antiplatelet effect is milder than aspirin.

Safety

Garlic may potentiate bleeding when used alongside antiplatelet or anticoagulant drugs and should be used cautiously.

3. Zingiber officinale (Śuṇṭhī)

Ayurvedic Description

Bhavaprakasha Nighantu – Haritakyadi Varga

Śuṇṭhī is valued for its dīpana-pācana and śothahara actions.

Pharmacological Evidence

Ginger inhibits platelet aggregation, reduces thromboxane B_2 levels, induces vasorelaxation, and protects against ischemia–reperfusion injury in experimental models.

4. Integrative Mechanism Of Action

The combined use of these three plants may exert antithrombotic effects through:

Inhibition of platelet activation via multiple pathways

Suppression of thromboxane synthesis

Reduction of oxidative stress and inflammation

Improvement in endothelial function and vascular tone

5. Dosage, Anupāna, And Kāla (Integrated Ayurvedic Perspective)

Dosage And Anupāna Table

Plant

Part Used

Form

Suggested Dosage*

Anupāna

Therapeutic Rationale

Piper betle

Leaf

Dry / aqueous extract

250–500 mg once or twice daily

Honey or warm water

Enhances circulation and bioavailability

Allium sativum

Bulb

Chūrṇa / standardized extract

1–2 g chūrṇa or 300–600 mg extract daily

Warm water or lukewarm milk

Supports digestion and mitigates gastric irritation

Zingiber officinale

Rhizome

Chūrṇa / extract

500 mg–1 g chūrṇa or 250–500 mg extract

Honey or warm water

Reduces āma and inflammation

*Suggested for preventive and adjunctive use under medical supervision.

Kāla (Time of Administration)

Administration during morning hours (Prātaḥ Kāla) and after meals is preferred to enhance metabolism, circulation, and tolerability of uṣṇa drugs.

Safety Considerations

Avoid high doses in pitta-pradhāna prakṛti

Use cautiously with conventional antiplatelet therapy

Contraindicated in active bleeding and perioperative period

6. Limitations And Future Directions

Despite promising evidence, limitations include lack of standardized formulations, uncertain pharmacokinetics, and absence of randomized clinical trials. Future research should focus on standardized extracts, safety profiling, and controlled clinical evaluation.

Conclusion

Piper betle, Allium sativum, and Zingiber officinale exhibit significant antiplatelet, antioxidant, and cardioprotective properties validated by classical Ayurvedic literature and modern pharmacology. While not substitutes for standard therapy, these plants may serve as valuable adjuncts in supervised integrative and preventive management of coronary thrombosis.

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