



A REVIEW ON ANTICOAGULANT/ANTITHROMBOTIC ACTIVITY OF NATURAL PLANTS USED IN TRADITIONAL MEDICINE

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ABSTRACT

Thrombosis is one of the leading cause of thromboembolic disorders affecting million persons worldwide. Several plants used for the treatment of thromboembolic diseases in different systems of traditional medicine have shown anticoagulant/antithrombotic activity and such plants claimed in the traditional system still remain to be scientifically investigated. The review explored various herbal drugs mentioned in different traditional systems of medicine. This review is focused on following plants *Careya arborea*, *Melastoma malabathricum* Linn., *Gloriosa superba*, *Bauhinia forficata*, *Eichhornia crassipes*, *Jatropha curcas* L., *Synclisia scabrida*, *Porana volubilis*, *Viola yedoensis* Makino and *Erigeron canadensis*.

Keywords: Medicinal Plants, Anticoagulant activity, Antithrombotic activity.

INTRODUCTION

Thromboembolic disorders such as pulmonary emboli, deep vein thrombosis, strokes and heart attacks are the main causes of morbidity and mortality in developed countries¹. Hence, anticoagulants play a pivotal role as agents for the prevention and treatment of thromboembolic disorders^{2,3}. For more than five decades, anticoagulant drugs consisting of heparins, vitamin K-antagonists, and their derivatives have been the major players in the clinical setting. Although their efficacy remains undisputed, the deleterious life-threatening side effects of these drugs have also been well documented^{4,5}.

Plants may serve as the alternative sources for the development of new anticoagulant agents due to their biological activities. There is compelling scientific evidences demonstrating that the consumption of dietary anticoagulants or phytochemicals with anticoagulant properties can ultimately reduce or eliminate the risks of thromboembolic diseases^{6,7}. This review focused on following documented natural plants was used as antithrombotic or anticoagulant as mentioned in folklore medicine.

Careya arborea

Careya arborea Roxb. belongs to the family Lecythidaceae is found in many places of the world. It is known as "Kumbhi" in Ayurveda. It mainly contains terpenoids, flavonoids, alkaloids, saponins and tannins⁸. The bark is traditionally used in treatment of tumors, bronchitis, astringents, antidote to snake- venom and skin diseases. It mainly possess pharmacological activities like antidiarrhoeal, analgesic, hepato-protective, CNS activities of the methanolic extract, antitumor, antileishmanial, antimicrobial and antioxidant activities of stem bark⁹. The methanolic bark extract of *Careya arborea* exhibited anticoagulant activities when compared with the standard warfarin. Methanolic bark extract of *Careya arborea*

prolonged the time taken for blood clotting and there was a significant (*p<0.05) increase in the activated Partial Thromboplastin Time, Prothrombin Time and Thrombin Time¹⁰.



Figure 1: *Careya arborea*

Melastoma malabathricum

Melastoma malabathricum Linn. belonging to family: Melastomataceae. It contains amides, triterpenoids, flavonoids, alkaloids and tannins¹¹.



Figure 2: *Melastoma malabathricum*

This plant reported for anti-diarrhoeal¹², antibacterial, wound healing activities¹³, the aqueous extract of leaves used as antinociceptive, anti-inflammatory, antipyretic¹⁴, gastroprotective effects¹⁵, antioxidant activity¹⁶. The aqueous leaf extract of *Melastoma malabathricum* Linn. possesses potent anticoagulant property. *In vitro* the results showed that activated Partial Thromboplastin Time (aPTT) of plasma samples spiked with different concentrations of the leaf extract (100-1000 µg/ml) was markedly prolonged in a concentration-dependent manner ($p < 0.001$), but was otherwise for Prothrombin Time (PT) and Thrombin Time (TT). The anticoagulant activity of *M. malabathricum* aqueous leaf extract affects the intrinsic pathway of the coagulation cascade by causing clotting factor(s) deficiency¹⁷.

Gloriosa superba

Gloriosa superba Linn. is commonly known as "Glory lily" belonging to family- Liliaceae. Gloriosine and colchicines are two commonly used phytochemicals for treatment of gout and rheumatism.



Figure 3: *Gloriosa superba*

It possesses the analgesic, anti-inflammatory, antitumour, in treatment of snake bite and also used in skin diseases, respiratory disorders and in Familial Mediterranean Fever (FMF)¹⁸. *Gloriosa superba* Linn. extracts are used as antimicrobial¹⁹ and anthelmintic activity²⁰. The leaves extracts displayed anticoagulant properties by inhibiting thrombin induced clotting, with IC₅₀ value of 2.97 mg/ml²¹.

Bauhinia forficata

Bauhinia forficata is a medicinal plant, belongs to family: Leguminosae, commonly called as "Pata de vaca" in Brazil. It mainly contains flavonols, flavonoids, glycosides, kaempferitrin, astragaloside, β-sitosterol, organic acids, quercitrosides, rhamnose, saponins and etc. *Bauhinia forficata* leaves employed in Brazilian folk medicine for treatment of diabetes, as a diuretic for kidney and urinary disorders (including polyuria, cystitis and kidney stones), as a blood cleanser and to build blood cells, for high cholesterol.

Pharmacologically it has hypoglycemic activity²² and antioxidant activity²³. It also has anticoagulant, antifibrinolytic properties of aqueous extract from aerial parts of *Bauhinia forficata* is a source of natural

inhibitors of serine-protease involved in blood clotting disturbances induced by snake venoms²⁴.



Figure 4: *Bauhinia forficata*

Eichhornia crassipes

Eichhornia crassipes (Pontederiaceae), commonly known as "Common Water Hyacinth" is a floating waterweed. It contains tannins, flavonoids, alkaloids, terpenoids, steroids, phenolic contents, anthraquinones, quinone & cardiac glycosides²⁵.

The plant possesses antioxidant activity²⁶, and anticoagulant activity due to presence of polysaccharides from the methanol extract of leaf of *Eichhornia crassipes*. Anticoagulant activity by acting on the intrinsic pathway of the coagulation cascade²⁷.



Figure 5: *Eichhornia crassipes*

Jatropha curcas

Jatropha curcas L. (Euphorbiaceae) is a soft-wooded shrub, commonly grown in rural areas in India. The oil of this is used for manufacturing of various household commodities and industrially useful products.



Figure 6: *Jatropha curcas*

It is also used traditionally for the treatment of sciatica, dropsy, paralysis, rheumatism, dysentery, diarrhoea, and certain skin diseases²⁸. It mainly possess pharmacological activities like analgesic, anti-inflammatory²⁹, antidiarrhoeal³⁰, hepatoprotective³¹, and anti-diabetic activity³². Coagulant activity of the latex of *Jatropha curcas* showed that whole latex significantly ($P < 0.01$) reduced the clotting time of human blood. Diluted latex, however, prolonged the clotting time: at high dilutions, the blood did not clot at all. This indicates that *Jatropha curcas* latex possesses both procoagulant and anticoagulant activities. The butanol fraction had the highest anticoagulant activity³³.

Synclisia scabrida

Synclisia scabrida (Meris) of the family- Menispermaceae is a common shrub of tropical Africa present in South Nigeria, Camroon, Gabon, Democratic Republic of Congo and Angola³⁴. It is commonly used as fodder for domestic animals but also has a folklore reputation as herbal remedy for lower abdominal pains, listlessness, mental strain and certain sexually transmitted diseases. Aqueous decoctions of the leaves, stem bark and root have been prescribed in ethano-medicine in case of gastroenteritis. The alkaloid and flavonoid fractions of *Synclisia scabrida* had significant antiulcer property³⁵. Root extracts have antibacterial activity³⁶. The aqueous and ethanol extract of *Synclisia scabrida* significantly ($P < 0.05$) prolonged the Prothrombin Time (PT) of normal plasma, which suggests that both extracts of *Synclisia scabrida* have anticoagulant properties³⁷.

Porana volubilis

Porana volubilis is commonly known as "Horse-tail creeper" belonging to family- Convolvulaceae. The polysaccharide from the species *Porana volubilis*, which showed the highest anticoagulant activity. The polysaccharide from this species contains mainly galactose, galacturonic acid, and mannose. Its anticoagulant activity mediated by the enhancement of thrombin inhibition that in turn is mediated by heparin cofactor II but not by antithrombin³⁸.



Figure 7: *Porana volubilis*

Viola yedoensis

Viola yedoensis Makino, a species Violaceae, is commonly used in Chinese medicine. It is used to remove toxic heat, reduced swelling, and to treat carbuncle and boil,

superficial infections, hieropyra, and venomous snake bites³⁹. Traditionally in Chinese herbal medicine used as an anti-*Helicobacter pylori* activity⁴⁰, and anti- HIV activity⁴¹. A new dicoumarin, named as dimeresculetin isolated from *Viola yedoensis* Makino which exhibited anticoagulant activity with respect to activated Partial Thromboplastin Time (aPTT), Prothrombin Time (PT) and Thrombin Time⁴².

Erigeron canadensis

Erigeron canadensis is commonly known as "Horseweed" belongs to family: Asteraceae. Horseweed contains volatile oil (including limonene, terpineol, and linalool), flavonoids, terpenes, plant acids, and tannins. In folklore claim, it is used in diarrhoea, dysentery, astringent to stop bleeding, diuretic and etc. The polyphenolic polysaccharide preparation from *Erigeron canadensis* may become a new source of anticoagulant compounds potentially useful in anticoagulant therapy. Anticoagulant activity is based on interactions with heparin cofactor II, to inactivate thrombin⁴³.



Figure 8: *Erigeron Canadensis*

CONCLUSION

The present review is mainly focus on many natural and traditional anticoagulant agents. With the advent of allopathic system of medicine which is based on the fast therapeutic actions of gradually loses its popularity among people. But traditional medicines have been used to alleviate the suffering of human beings since the down of human civilization, with centuries of use of these medicines, there is a nation that 'natural' is 'safe' has taken a strong hold in the society. Despite their wide spread usage traditional medicines have not been evaluated scientifically with regard to their safety and efficacy and has many limitations⁴⁴. The review explored various herbal drugs mentioned in different traditional systems of medicine across the world that require more exploitation up to desired level, and these report could be a better target for the development of alternatives to synthetic anticoagulant drugs.

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