

## An Overview of Medicinal Plants as Potential Anti-Platelet Agents

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**Abstract:** Anti-platelet agents are those that decrease platelet aggregation and inhibit thrombus formation. Anti-platelet drugs are used to prevent and help in the reversal of platelet aggregation in arterial thrombosis which is the principal reason in the pathology of myocardial infarction (MI) and ischemic stroke. Currently many synthetic and semi-synthetic formulations are available in the markets which are potent anti-platelet agents but they have significant adverse effects. Herbs have been always an ideal source of drugs and numerous of the presently available drugs have been obtained directly or indirectly from them. In this article, authors made an extensive literature study about the work carried out on herbs with anti-platelet activity and their bioactive constituent. Here, an attempt was made to elaborate the isolated constituents from plant origin, which showed promising activity as anti-platelet agent.

**Keywords:** Anti-platelet, Constituents, Extracts, Herbs, Medicinal Plants

### I. Introduction

Platelets play an essential role in the initial response to vascular injury [1]. Its activation leads to formation of a haemostatic plug at the site of injury. Activation of platelets is therefore crucial for normal haemostasis but, uncontrolled platelet activation may also lead to the formation of occlusive thrombi that can cause ischemic events [2] and thus, anti-platelet therapy is very much needed for treatment. Numerous studies have recorded the anti-platelet activities of natural products over last four lustrum [3].

For the past 2500 years, the traditional system of medicines such as Chinese, Ayurveda and Unani have been very strong. These traditions are still prospering. Roughly 80% of the people in the developing countries depend on these systems of medicine for their primary health care needs [4, 5]. The World Health Organisation (WHO) accounts that from 119 plant-derived pharmaceutical medicines; about 74% are used in modern medicine in ways that corresponds directly with their traditional uses as plant medicines by native cultures. Major pharmaceutical companies are currently conducting extensive research on plant materials gathered from the rain forests and other places for their potential medicinal value. About 25 percent of today's prescription drugs are at least partially derived from plants [6, 7].

This paper present a review focused on experimental studies performed on herbs with anti-platelet activity and their bioactive constituent. Comprehensive literature review was carried out using Google Scholar, PubMed, Chemical abstracts, as well as the journals. We believe the list of medicinal plants represented in this article will be beneficial to researchers and practioners.

**TABLE 1:** Anti-Platelet Constituents from Medicinal Plants.

<i>Plant Name</i>	<i>Plant Part/Extraction</i>	<i>Bioactive Compound</i>	<i>Ref.</i>
<i>Allium sativum</i>	Garlic oil	Diallyl disulphide and Diallyl trisulphide	[8]
<i>Allium cepa</i>	Bulb	Adenosine; Allicin; Paraffinic Polysulfides	[9]
<i>Areca catechu</i>	Aqueous-Methanolic extract of seeds	Catechin	[10]
<i>Artocarpus communis</i>	Roots	Dihydroartomunoxanthone; Artochamins B; Artocommunol CC	[11]
<i>Annona purpurea</i>	Methanolic extract of leaves	Oxopurpureine; Oxonuciferine; Oxoglauanine; (+)-Predicentrine; Thalbaicalidine; Thalicipureine; Dehydrolirinidine; 7-hydroxy-dehydroglauanine	[12]
<i>Andrographis paniculata</i>	Leaves	Andrographolide	[13]
<i>Achillea santolina</i>	Diethylether fraction of the Crude extract of leaves	Flavonoids and Sesquiterpene lactone	[14]
<i>Artemisia dracunculus</i>	Essential oil	Phenylpropanoids	[15]
<i>Cassiytha filiformis</i>	Methanolic extract of the fresh herbs	Cathafiline; Cathaformine; Actinodaphnine; N-methylactinodaphnine; Predicentrine; Ocoteine	[16]

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<i>Curcuma wenyujin</i>	Essential oil	Curdione	[17]
<i>Cudrania tricuspidata</i>	Roots	Cudraticusxanthone A	[18]
<i>Curcuma longa</i>	Rhizome	Ar-tumerone	[19]
<i>Coleus forskohlii</i>	Roots	Forskolin	[20]
<i>Corydalis tashiroi</i>	Entire Plant	Tetrahydroprotoberberine N-oxide alkaloid; (-)-cis-isocorypalmine N-oxide; 6-methoxydihydrosanguinarine; Norjuziphine; (-)-cis-corydalmine N-oxide; (-)-trans-corydalmine N-oxide; (-)-trans-isocorypalmine N-oxide; Scoulerine; Protopine; Oxysanguinarine; Corydalmine	[21]
<i>Elephantopus scaber</i>	Leaves	Lupeol	[22]
<i>Foeniculum vulgare</i>	Essential oil	Anethole	[23, 24]
<i>Filipendula ulmaria</i>	Flowers	Heparin	[25, 26]
<i>Ginkgo biloba</i>	Petroleum ether extract	Isoginkgetin	[27]
<i>Gynura japonica</i>	Rhizome	Caryophyllene oxide; 6-acetyl-2, 2-dimethylchroman-4-one; Vanillin; 2, 6- dimethoxy- 1, 4- benzoquinone; benzoic acid	[28]
<i>Glycyrrhiza glabra</i>	Aqueous extracts of roots	3-(3,4-dihydroxyphenyl)-8-hydroxymethyl-8-methyl-5-methoxy-6,7-dihydro-2H,8H-benzo(1,2-b:5,4-b')dipyran-2-one	[29]
<i>Hernandia Sonora</i>	Stem bark	Ovigerine; Hernangerine; N-methylhernangerine, (+)-malekulatine; Isovanillin	[30]
<i>Hypericum geminiflorum</i>	Heartwood, Leaves, Roots	Gemichalcone A	[31]
<i>Justicia procumbens</i>	Ethanol extract	Neojustin A; Justicidin B; Taiwanin E methyl ether; Taiwanin E	[32]
<i>Leuzea carthamoides</i>	Ethanol extract	Eriodictyol; Patuletin; Eriodictyol-7-β-glucopyranoside; 6-hydroxykaempferol-7-O-(6"-O-acetyl-β-D[small cap]-glucopyranoside)	[33]
<i>Leonurus japonicus</i>	Aerial parts	(13 <i>R</i> )-bis-spirolabdane diterpenoids	[34]
<i>Lindera obtusiloba</i>	Ethanol extract	Polyphenols	[35]
<i>Lonicera japonica</i>	Flowers	Protocatechuic acid	[36]
<i>Magnolia obovata</i>	Methanolic extract of barks and fruits	Magnolol; Honokiol; Obovatol; Syringin; Methyl caffate	[37]
<i>Melicope semecarpifolia</i>	Root bark	Quinoline Alkaloids	[38]
<i>Ocotea quixos</i>	Essential oil	Phenylpropanoids	[39]
<i>Operculina macrocarpa</i>	Roots	Chlorogenic; Caffeic acids; Gallic acids	[40]
<i>Piper longum</i>	Fruits	Piperlonguminine	[41]
<i>Petroselinum crispum</i>	Leaves	Genins	[42]
<i>Peucedanum japonicum</i>	Roots	Eugenin; (-)-selinidin; (+)-pteryxin, Imperatorin; Bergapten; Cnidilin; (+)-visamminol	[43]
<i>Persea Americana</i>	Fruit pulp	Persenone-C and Persenone A	[44]
<i>Perganum harmala</i>	Decoction of seeds	β-carboline alkaloids	[45, 46]
<i>Pogostemon cablin</i>	Water extract	α-Bulnesene	[47]
<i>Rhus verniciflua</i>	Heart wood extract	Fisetin; Butein; Sulfuretin	[48]
<i>Rhamnus nakaharai</i>	Stem bark	Isotorachrysone; Isotorachrysone peracetate; Quercetin 3-O-methyl ether; Quercetin 3-O-methyl ether peracetate	[49]
<i>Salvia milthoriza</i>	Roots	Tanshinone II	[50]
<i>Varthemia iphionoides</i>	Decoction of shoots, leaves	Boiss and Blanche	[51, 52, 53]
<i>Yucca schidigera</i>	Bark	Resveratrol; trans-3,3',5,5'-tetrahydroxy-4'-methoxystilbene; Yuccaols	[54]
<i>Zanthoxylum schinifolium</i>	Chloroform-soluble portion of the root bark	Terpenyl-coumarins and Furoquinolines	[55]
<i>Zanthoxylum simulans</i>	Root bark	Huajiaosimuline	[56]
<i>Zingiber officinale</i>	Rhizomes	(6)-gingerol & (6)-Shogaol	[57]
<i>Zizyphus jujuba</i>	Ethanol extract of Seeds	Jujuboside A and Jujuboside B	[58]

## II. Conclusion

Comprehensive details of medicinal plants with anti-platelet activity have been presented in this review. The herbs mentioned in this extensive study are those which possess anti-platelet activity. There are many synthetic formulations available in market, though they are showing magnificent clinical and pharmacological activity as an anti-platelet agent but they have significantly notable adverse effect. Hence, herbal drugs are favoured over synthetic formulations in order to avoid serious adverse and side effects; however one has to be very careful about the use of medicinal plants due to the fact that quality control regulations are too pliable in India. Department of AYUSH and other Government governing bodies have to encourage the herbal drug manufacturers to set up the quality control parameters.

So far, very few studies have been carried out on medicinal plants which present anti-platelet potency, further investigations are need to be carried out to evaluate the mechanism of actions of medicinal plants with anti-platelet effect and increase the isolation of the newer molecules having anti-platelet potential.

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