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Review on Anti-coagulant property of medicinal plants belongs to Asteraceae and Pinaceae Families

Sanika Ramesh Kadam *, N. H. Kodag, Sanjay K. Bais

Fabtech College of Pharmacy, Sangola, Solapur, Maharashtra, India

*Corresponding Author: kadamsanika9889@gmail.com

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Abstract

One of the largest families of blooming plants is thought to be the Asteraceae. The Asteraceae family includes shrubs, vines, ground covers, annuals, and perennials. These plants' many biological benefits, such as their anti-inflammatory, antioxidant, and anticoagulant qualities, have led to their widespread usage as conventional medicine worldwide. It is thought that plants of the Asteraceae family are abundant in coumarins, flavonoids, and other substances that aid in coagulation. A combination of water, methanol, ethanol, and hexane was used to extract the various plants belonging to the Asteraceae family. Apiaceae also called as Umbelliferae. This family, which has 434 genera and over 3,700 species, is the 16th largest of flowering plants. Widely utilized in the pharmaceutical, cosmetic, cosmeceutical, flavor, and perfumery industries, the Apiaceae (formerly Umbelliferae) family is a strong source of antioxidants and anticoagulants, with a focus on phenolic compounds. In India, they are frequently cultivated and harvested in the winter and are found in both tropical and north temperate zones. This review article gives an overview of the medicinal plants in the Asteraceae and Apiaceae families that are utilized for their anticoagulant properties and explains their modes of action.

Keywords – Anticoagulant activity, Phytochemical, mechanism of action, classification of coagulant and anticoagulant.

INTRODUCTION

The world is currently exposed to a variety of diseases. Blood and heart disorders, often known as disorders of the blood circulation system, are the most prevalent diseases that afflict a large number of individuals. These illnesses, which are prevalent worldwide in middle-class to low-income nations, have substantial death rates. Furthermore, because it is so easily acquired by anyone, especially adults, coronary disease is the most prevalent and common disease in the world. Absence of therapy may result in a heart attack. Because a clot in the heart or blood vessels can result in a heart attack, it has been suggested that anticoagulant medications be taken to lessen the risk of a blood clot forming. Eighty-five thousand Americans suffered a heart attack annually, sixty-five thousands of them were first-time victims. Out of all heart attack victims, about 12% die as a result of their attack. In 2018, the World Health Organization reported that coronary heart disease accounts for 19.83% of deaths in the Philippines, with an adjusted rate of 197.08 per 100,000.[1] The chemical compounds that stop blood from clotting are called anticoagulants, or blood thinners. The act of turning liquid blood into a gel is called coagulation, sometimes referred to as clotting. People who run the risk of getting blood clots in their bodies use anticoagulants. The body can develop blood clots that cause serious illnesses such as ischemic heart disease, heart attacks, strokes, deep vein thrombosis, and pulmonary embolism. The world's leading causes of sickness and mortality are these.[2] During times of injury, the interplay between coagulation and anticoagulants, known as haemostasis, keeps blood within the damaged vascular system.[3]

In the complex process of haemostasis there are three primary steps: Vasoconstriction, platelet plug-induced temporary blockage of a break, and blood coagulation, or the production of fibrin clots, are the first three. In order to treat arterial and venous thrombotic disorders, anticoagulant drugs are necessary for both short-term treatment and long-term recurrence prevention. By creating a haemostatic block, the physiological process known as haemostasis stops bleeding at the site of an injury and stops blood loss. In injured blood vessels with exposed sub-endothelial matrix, the blood vascular endothelium's anticoagulant surface aids in maintaining blood flow and forming a blood clot. Several of these substances cause the blood, which is mostly made up of platelets and fibrin, to activate its two primary haemostasis processes. There are two primary parts to haemostasis, and this process starts as soon as an injury occurs. Platelet aggregation and platelet clog are referred to as primary haemostasis. Secondary haemostatic conditions and formation to the deposition the processes of primary and secondary haemostasis are mechanically intertwined and happen simultaneously. The proteolytic coagulation cascade generates the insoluble fibrin, which forms a mesh that aids in the blood clot's solidification and strength.[4] The body's system of coagulants and anticoagulants was in a state of dynamic equilibrium. Finding the equilibrium in the body can lead to thrombosis, myocardial infarction, and other blood coagulations; thrombus is a prevalent illness among the elderly. An essential antithrombosis mechanism, the anticoagulant system is activated by a series of enzyme reactions. Reactions, thrombin activation to prothrombin, thrombin activation to generate a thrombin activator, and thrombinogen conversion to fibrin are the three phases of the blood coagulation process. Anticoagulant medications are required both temporarily to treat arterial and venous thrombotic illnesses and permanently to avoid recurrences since the coagulation process, when integrated by various techniques, can be classified into exogenous and endogenous clotting.[5] Anticoagulants are widely available these days. Firstly, the ubiquitous aspirin. Prozac and Paxil are examples of serotonin uptake inhibitors that come next. Heparin is the most widely used anticoagulant and is also regarded as an anticoagulant.[6] Historically, anticoagulant and antithrombotic compounds have been originally obtained from medicinal plants. Investigating other anticoagulants is both necessary and urgent. We conducted an anticoagulant study of medicinal plants in the *Asteraceae* and *Apiaceae* families because they are a safer source of medication.[7]

Haemoglobin

Red bone marrow produces Haemoglobin.

It is a coagulated protein known as globin that is made up of histone and colours that contain ions.

Porphyrin, a protein with four pyrrole rings, is the Ion-containing protein.

We refer to this porphyrin as haem.

Vitamin B12 and folic acid can speed up the red cell's production of Haemoglobin.

Hematinics

Iron, folic acid, vitaminB12.

Iron

Approximately two thirds of the 3.5 grams of iron that make up the human body are found in the blo od. 510% of iron that is consumed gets absorbed. The spleen, bone marrow, hepatocytes, myocytes, a nd reticule endothelial.

Therapeutic use of iron

Pregnancy

Blood loss

Iron deficient anaemia.

Premature babies.

Folic acid

The small intestine is where folic acid is absorbed. Dihydrofolate reductase is responsible for converting folic acid to tetrahydrofolate. Another name for folic acid insufficiency is Will's illness. megaloblastic anaemia may be the result of deficiency. Fetal neural tube defect.

Therapeutic use of folic acid

Malabsorption

Rheumatoid arthritis

To alleviate anaemia that is associated with dihydrofolate reductase inhibitors.

Mass action: passive diffusion absorption of 100 mg/day.

Vitamin B12

Source

Food, kidney, and liver.

B12 absorption

The stomach's parietal cells create a protein called intrinsic factor.

Which binds to vitamin B12 and moves it from the ilium via a mechanism that is mediated by calcium.

Storage B12

The liver is where extra B12 is kept.

Therapeutic use of vitamin B12

Pernicious anaemia.

Gastrectomy.

Corrosive injury of GI mucosa.

Malabsorption syndrome.

Various Factors involved in process of coagulation

Fibrinogen (Factor I): It forms a fibrin clot.

Factor II, also known as prothrombin, activates I, V, X, VII, VIII, and XI.

Tissue thromboplastin (factor III): This cofactor is a component of VIIa.

Calcium ion, or Factor IV, is a binding factor for phospholipid.

Factor V

Cofactor of X.

Factor VII, also known as proconvertin, activates IX and X.

Factor VIII, also known as antihemophilic factor A, is an IX cofactor.

Antihemophilic factor B, or factor IX, is what activates X.

Stuart power factor (Factor X): It triggers II. IX is activated by

Factor XI (plasma thromboplastin antecedent).

The Hageman factor, also known as factor XII, activates prekallikrein, XI, and VII.

Fibrin stabilizing factor (factor XIII): Fibers form crosslinks.

Prekallikrein (pre-K): -It makes XII active.

HMWK, aids in the activation of XI and XII.

Kallikrein(ka).

Platelet phospholipid.[8]

Classification of anticoagulant

Parenteral Anti-coagulants

Indirect thrombin inhibitors

Heparin

Enoxaparin, Reviparin, Parnaparin, Dalteparin, Ardeparin

Fondaparinux

Danaparoid.

Thrombin-direct inhibitors:
Lepirudin
Bivalirudin
Argatroban
Oral Anti-coagulants
Coumarin derivative
Bishydroxycoumarin(dicumarol)
Warfarin sod. Acenocoumarol (nicoumalone)
Ethyl-biscoum-acetate
Direct factor Xa inhibitor: a) Rivaroxaban
Oral direct thrombin inhibitor: a) Dabigatran-etexilate
In-vitro Anti-coagulants
Heparin
Sod. edetate
Sod. Citrate
Sod. oxalate
Classification of coagulant
Vitamin K
K1
Phytonadione (Phylloquinone)
K3
Menadione
Acetomenaphthone
Menadione sod. bisulfate
Menadione sod. diphosphate
Mechanisms of Anticoagulant Activity
Inhibition of Platelet Aggregation
Phenolic chemicals, terpenoids and flavonoids prevent platelets from activating and aggregating.
Repression of Coagulation Factors
Triterpenoid saponins, sesquiterpenes, and coumarins all suppress coagulation factors.
Antithrombin Activity
Phenolic chemicals and flavonoids increase the action of antithrombin III.
Fibrinolysis Enhancement
Certain substances increase fibrinolysis by activating plasminogen activators.[9]
Phytochemicals contributing to anticoagulant effects, along with their mechanisms
Flavonoids
Quercetin
Decreases the formation of thromboxane B2 and inh ibits platelet aggregation.
Kaempferol
Decreases factor Xa activity and inhibits platelet activation.
Apigenin
Reduces thrombin synthesis and prevents platelet aggregation.
Luteolin
Lowers the synthesis of thromboxane B2 and inhibits platelet activation.
Coumarins
The compound artemisinin inhibits factor II a (the anticoagulant), factor Xa, and both.

Ursolic acid
Decreases thrombin production and inhibits platelet activation.
Oleanolic acid: Decreases factor Xa activity and inhibits platelet aggregation.

Saponins

Ginsenosides: Decrease the formation of thromboxane B2 and inhibit platelet aggregation.
Triterpenoid saponins: Diminish the production of thrombin and inhibit platelet activation. [10]

***Asteraceae* Family**

Thisfamily comprises around 32,000 plants in the botanical domain. Because each member of this flo wer family consists of a composite cluster of tiny blossoms, it is also known as the Composite family In traditional medicine, many species of the *Asteraceae* family have traditionally been employed as therapeutics. Over 3,000 years have passed since some moon family members were first cultivated for its culinary and medicinal properties.[11] Shrubs, vines, ground covers, annuals, and perennials are all members of the *Asteraceae* family. Numerous biological benefits, such as anti-inflammatory, antioxidant, and anticoagulant properties, have been discovered for this plant family. All around the world, they are utilized as conventional medicine. According to Native Plants (2018), *Asteraceae* is primarily made up of characteristics that significantly aid in anticoagulation, which will benefit people with heart conditions or disorders involving blood clotting.[12]

***Apiaceae* Family**

The *Apiaceae* also known as *Umbelliferae*, is a family of flowering plants that are primarily aromatic It is named after the parent species Apium is also referred to as the parsley, celery, or carrot family. This is the sixteenth biggest family of flowering plants, with about 3,800 species distributed among about 446 genera. The majority of *Apiaceae* are annual, biennial, or perennial herbs, with the leaves typically clustered at the base. A few number, such as *Bupleurum fruticosum*, are woody shrubs or small trees. The size of their leaves varies, and they can be arranged in an alternating pattern or with the taller leaves nearly opposite each other. Both petiolate and sessile leaves are conceivable.[13]

Medicinal Plant Used in Anti-coagulant activity

Sulfur-based flavonoid

The polyphenols that have garnered the most interest are flavonoids. flavonoid forms, including aurones, flavanones, flavonols, isoflavones, flavones, and anthocyanins, vary greatly in their structural makeup. All of these compounds have 2-phenyl benzyl-pyrone as their nucleus. Sulphated flavonoids have been shown in numerous studies to possess pharmacological properties, including anticoagulant, anti-inflammatory, and anticancer properties. Numerous biological functions are known to be associated with flavonoids. Sulphated flavonoids are highly soluble in aqueous solutions and harmless. Ammi, Daucus, and Oenanthe are among the genera in the Umbelliferae that contain them.[14]

Mechanism of action Sulphated flavonoid

Flavonoids can stop platelets from sticking to collagen, activating, secreting, and clumping together. Thrombin and thrombin receptor-activating peptide-6 can both be inhibited by flavonoids. Increasing thrombus lysis by activating urokinase plasminogen activator and t-Pa: Flavonoids can activate t-Pa and u-PA.

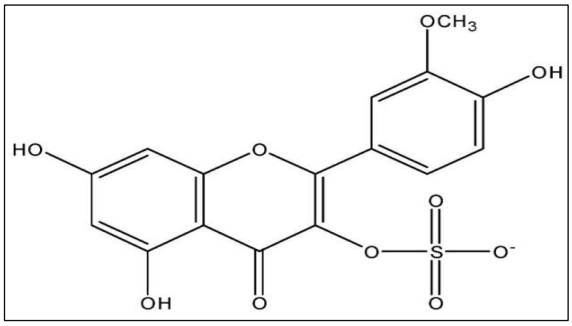

Figure1: *Sulphated flavonoid*

Use of Sulphated flavonoid

It acts as a coagulant inhibitor and anti-tumour.

It has anti-inflammatory properties.

It's employed as an antioxidant.

Antiplatelet aggregation is one usage for it.

Triterpenoid saponin

Both water & alcohol can dissolve Triterpenoid saponin, which when shaken with water produces a continuous foam by Haemolysing red blood cells. One bioorganic chemical that occurs naturally & is especially common in the kingdom of plants is saponin. The structural makeup of these compounds consists of one or more hydrophilic glycoside sugar moieties joined to lipophilic triterpene molecules. These chemicals are the foundation for the development of contemporary medicine & pharmacology. Triterpenoid saponin is one particular type of saponin, a class of bioactive compounds found in a large number of plants.[15]

Mechanism of action Triterpenoid saponin

Through the downregulation of endothelial tissue factorexpressionterpenoid saponins can modify the blood coagulation system. High levels of the blood coagulation

inducing protein TF are seen in the brain, heart, lung, uterus, and placenta.[16]

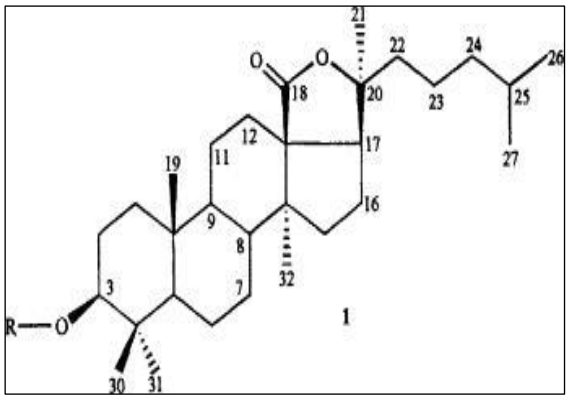

Figure 2: ***Triterpenoid Saponin***

Uses of Triterpenoid saponin

It has anti-inflammatory properties.

It functions as an antioxidant.

It serves as a hypoglycaemic agent.

It has Immunomodulatory properties.

Hepatoprotective use is made of it.

It has Neuroprotective properties.

It is used as Anti-coagulant.

Tridax procumbens

Commonly found in America, Australia, and Asia, this plant is used extensively in Indian Ayurveda medicine. It is an ancient medicinal plant used as a procoagulant to stop bleeding and improve woun d healing properties. Antioxidant, anticoagulant, anti-inflammatory, anticancer, antibacterial, and antihypertensive active products are produced by varying extraction techniques. Plant harvesting the procedure entails gathering leaves and stems and drying them in the shade. Following weighing, mixing, and homogenizing, the crushed plant was stirred with distilled water for 24 hours at room temperature using a magnetic stirrer set to 500 rpm in order to perform the extraction process. The filtrate was centrifuged at 8000 rpm for 24 minutes at 40 degrees Celsius after this extract was flottered using muslin cloth. The lyophilized powder was then weighed and stored for later use at -200 degrees Celsius after the supernatant was recovered.[17]

Shattering the collected *tridax* leaves the extracted material was placed in petri dishes and the crude extract was allowed to air dry. In different concentrations for analysis.[18] They soaked crushed 25 grams of the entire plant in 25, 50, and 100 milliliters of purified water for 24 hours each. Continue filtering the extract using a cotton towel. The final volumes were 25 ml, 50 ml, and 100 ml after correction. By washing debris away with distilled water.[19]

Mechanism of action *tridax procumbens*

Tridax procumbens has the ability to induce coagulation by raising plasma fibrinogen levels and factor XII activity. *Tridax procumbens* has the ability to prevent fibrinolysis. *Tridax procumbens* has the potential to induce platelet aggregation. Constriction of smooth or vascular muscles*: Tridax procumbens* may result in constriction of smooth or vascular muscles.

Figure 3: *Tridax procumbens*

Uses of *tridax procumbens*

It functions well as an anticoagulant.
It functions as an antifungal.
It has an antibacterial purpose.
It serves as an insect deterrent.

Artemisia dracunculus

The leaf extract of *Artemisia dracunculus* has been shown in good rat experiments to have the capacity to reduce the resemblance of coronary illnesses to human diseases. *Asteraceae* is the family that includes *Artemisia dracunculus*. A Soxhlet device was used to mix 100 grams of powdered artemisia leaves with 100ml of n-hexane, 600ml of chloroform, and 600ml of methanol. Performed this extraction Three distinct dry extracts (hexane, chloroform, and methanol extract) were obtained after eight hours of work, and the herbal residue was separated. Steam distillation created a vegetable matrix by separating this herbal residue into four parts from the water: diethyl ether extract, chloroform extract, and aqueous extract basified to pH9, pH11, and pH12. When this plant's essential oil was distilled, coumarins were found in the diethyl ether fraction and the organic fraction with water. To detect coumarin components in different fractions and extracts, the TLC method was used. The qualitative and quantitative Coumarin compounds in the methanol extract were analyzed using high pressure liquid chromatography.[20]

Mechanism of action *Artemisia dracunculus*

Various sites in the coagulation cascade are disrupted by anticoagulants. Some of the factors work directly by blocking certain enzymes, while others work indirectly by attaching to antithrombin or preventing the liver from synthesizing them.

Figure 4: *Artemisia dracunculus*

Uses of *Artemisia dracunculus*

It serves as an anticoagulant.
It has anticonvulsant properties.
It has antimicrobial properties.
It has antifungal properties.
It has an antioxidant function.

Coumarouna odorata

The compounds are a kind of lactone made up of a benzene ring fused to an alpha-pyrone ring. They have a conjugated structure with a large number of electrons and strong charge transport capabilities. One of the earliest naturally occurring compounds discovered in 1820, coumarin, comes from the French word coumarou, which refers to the Tonka bean seeds of Dipteryx odorata. Many plants contain coumarin, an anticoagulant.

Coumarin functions by preventing calcium from being produced in the blood coagulation cascade. Due to the thrombolytic and antithrombotic properties of phenolic coumarins, the test plant extract might have antithrombotic properties. Phenolic chemicals may also interfere with calcium's procoagulant action, which could explain the marked increase in prothrombin time and active partial thromboplastin time.[21]

Mechanism of action *Coumarouna odorata*

Coumarin anticoagulants stop the formation of clotting proteins by stopping vitamin K1 from regenerating from its 2,3-epoxide metabolic form.

Figure 5: *Coumarouna odorata*

Uses of *Coumarouna odorata*

Stomach ache is treated with it

It's applied to the treatment of oral ulcers.

It's applied as a cramp remedy.

It functions as a disintegrant.

Rhaponticum acaule

A perennial member of the *Asteraceae* family, *Rhaponticum acaule* boasts massive leaves that are 10 to 15 cm long and arranged in a rosette on the ground. The leaves are green above and white The leaves are white tomentose underneath and green above. The rosette's centre is adorned with large capitula that measure 5 to 6 cm in diameter. Each inflorescence is tubular and yellowish. The fast time, sometimes referred to as the prothrombin time, is the coagulation time of recalcified citrated plasma when tissue factor and phospholipids introduced in significant excess by the thromboplastin reagent are present. This time is in seconds and relates to the time it took to obtain the control plasma. The prothrombin level, reported as a percentage, is used traditionally. For tracking oral anticoagulant treatments with anti-vitamin K, International Normalized Ratio expression is preferred over seconds or percent expression. The INR expression explains the sensitivity of the reagent and limits the differences between two labs. There are no units associated with the number INR.

Mechanism of action of *Rhaponticum acaule*

Inhibition of Platelet Aggregation: Flavonoids have been shown to prevent platelets from clumping together, which lowers the risk of blood clot formation. If *Rhaponticum Acaule flavonoid* content contributes to similar bioactivity, this could be a significant impact. Decrease in Oxidative Stress: Antioxidants help to stop low-density lipoproteins (LDL) from oxidizing, which leads to the formation of clots. The plant's antioxidant qualities may help to lessen oxidative stress in vascular tissues, which would reduce the chance of thrombosis. Inhibition of Coagulation Factors: It has been observed that certain phenolic compounds and flavonoids inhibit particular coagulation factors, including Factor VII and Factor X, which are essential for the process of blood clotting. This process might enhance the anticoagulant qualities.[22]

Figure 6: *Rhaponticum acaule*

Uses of *Rhaponticum acaule*

It has an antioxidant function.

It acts as a coagulant inhibitor.

Enzyme inhibition is one usage for it.

Erigeron canadensis

Common names for it include coltstail, marestail, butterweed, horseweed, and Canadian horseweed. It is also known as *Canadian fleabane*. 75% of people on the planet used plants as preventative and therapeutic measures.

A wide range of pharmacological activities were exhibited by the plant, including antimicrobial, antioxidant, anticancer, hypolipidemic, cardiovascular, central nervous, respiratory, immunological, anti-inflammatory, analgesic, antipyretic, and many more. It has been discovered that Conyza canadensis, also called *Erigeron canadensis*, contains flavonoids, tannin, anthraquinone, steroids, terpenoides, glycosides, and saponin. Pharmacological studies showed that *Erigeron canadensis* had antibacterial, antioxidant, anticoagulant, anti-inflammatory, anticancer, mutagenic gastric protective influence, and skin depigmentation activity. An anticoagulant effect was observed in vivo by *Erigeron Canadensis*.[23]

Mechanism Of Action of Erigeron *canadensis*

The impact of antithrombin on thrombin and factor X inactivation and heparin cofactor II on thrombin inhibition were contrasted. When antithrombin was present, both thrombin and factor X amidolytic activity were decreased; however, significantly larger levels of unfractionated heparin were needed to provide the same effects. The pathways underlying the anticoagulant activity seemed to involve thrombin inactivation and interactions with heparin cofactor II.[24]

Figure 7: *Erigeron canadensis*

Uses of *Erigeron canadensis*

It has antitussive properties.
It has anti-cancer properties.
It has an antimicrobial purpose.
It has an antioxidant function.
It acts as a disintegrant.

Petroselinum crispum

In Morocco, it's usually referred to as parsley. A member of the *Apiaceae* family is *Petroselinum crispum*. It is used medicinally in Morocco to treat renal, cardiovascular, and diabetic disorders. The anticoagulant properties of the plant were demonstrated by the parsley's aqueous leaf extract, which inhibited platelet aggregation in vivo. Consuming parsley in the diet may help to normalize platelet hyper activation. A rosette of tripinnate leaves with several 1 to 3 cm leaflets is produced in the first year of this biennial plant, along with a taproot that serves as a winter food storage. It grows a flowering stem up to 75 cm tall in the second year, with sparser leaves, flat-topped umbels that are 3 to 10 cm in diameter, and numerous yellow to yellowish-green flowers that are 2 mm in diameter.[25]

Mechanism of action of *Petroselinum crispum*

Inhibition of Platelet Aggregation

Studies have demonstrated the inhibitory effects of parsley flavonoids, including apigenin. Crucial to the formation of a thrombosis platelet aggregation. Parsley lessens the chance of blood clot development by blocking this process.

Reduction of Fibrinogen Level: Research indicates that parsley extracts may lower blood levels of fibrinogen. A crucial protein in the clotting cascade, fibrinogen is transformed into fibrin, which forms the structural foundation of a blood clot. Parsley aids in clot reduction by reducing fibrinogen levels. Calcium Modulation: The coagulation cascade is significantly influenced by calcium ions. Bioactive substances found in parsley have the ability to alter intracellular calcium levels, which may influence platelet function and clot formation and hence have anticoagulant effects

Figure 8: *Petroselinum crispum*

Uses of *Petroselinum crispum*

It has an antiplatelet function.

Antioxidants employ it.

It is applied to prevent hyperglycemia.

Ferulago carduchoram

A member of the *Apiaceae* family is *Ferulago carduchoram*. Chavil is the Persian term for it that is commonly used. The majority of its farming is done in western Iran. *Ferulago carduchoram* is used locally to preserve oil, ghee, and dairy products. In the past, this herb was used to treat haemorrhoids, intestinal worms, ulcers, and snake bites. There are other reports of calming, digestive, tonic, and aphrodisiac effects from it. The isolation of coumarins was made possible by the preparation of aerial parts of Ferulago *carduculam* for Methanolic extract extraction. It is largely the isolated coumarins that are responsible for the anticoagulant activity. Bornyl acetate and αpinene make up the majority of its essential oil. Studies carried out between 1967 and 2019 have led to the classification of the Ferulago species' chemical makeup. Coumarins are abundant in the genus Ferulago.[27]

Mechanism of action *Ferulago carduchoram*

Enzyme inhibition is a direct method of action for some anticoagulant.

Antithrombin binding

Certain anticoagulants bind to antithrombin or stop the liver from producing it.

Depletion of vitamin K

Warfarin is one anticoagulant that causes the body's stores of vitamin K to be depleted, which lowers the body's synthesis of active clotting components.

Figure 9: *Ferulago carduchoram*

Uses of *Ferulago carduchoram*

Antimicrobials use it.
Anticoagulant uses it.
Antioxidants employ it.
Anti-diabetic medication uses it.
It has a preservation purpose.

Angelica shikokiana

A traditional plant from Japan, shikokiana *Angelica makino*, often called Inutoki, is frequently marketed as a dietary supplement to alleviate conditions affecting the digestive and circulatory systems. The perennial herb *Angelica shikokiana* has a maximum height of 1.5 meters. It features distinctive umbel blooms and huge, pinnate leaves.

The root, leaves, and seeds of the plant are most typically utilized for medical purposes The plant is r ich in essential oils, flavonoids, coumarins, and other bioactive substances. Compounds with known t herapeutic benefits, such as xanthopterin and angelicin, have been found in certain investigations.[28]

Angelica Shikokiana is a food and drink additive that is used to suppress tumor growth. Additionally, the HCC cell line was shown to be strongly cytotoxically affected by the methanol extract of A. Shikokiana and its primary coumarin, isoepoxypteryxin, in our most recent investigation.

Mechanism of action *Angelica shikokiana*

The main way that *Angelica shikokiana* inhibits blood clotting is by means of its coumarin-related substances, which include isoepoxypteryxin and hyuganin C. By influencing blood coagulation pathways, such as the inhibition of adenosine diphosphate induced platelet aggregation, these substances delay the clotting time and prevent platelet aggregation. Because of this, the plant may be helpful for heart problems caused by excessive clotting. Furthermore, considerable suppression of Vitamin K-dependent mechanism.

Figure 10: *Angelica shikokiana*

Uses of *Angelica shikokiana*

It is applied to the treatment of cardiovascular disease.
It is applied in the therapy of OLP.
Hyperlipidaemia is treated using it. [29]

CONCLUSION

Anticoagulant phytochemicals are abundant in the *Asteraceae* and *Apiaceae* families of medicinal plants, offering promising therapeutic solutions for the prevention and treatment of thrombotic diseases. Numerous bioactive substances, including as flavonoids, terpenoides, coumarins, phenolic compounds, and Saponins, are thought to be responsible for these plants' anticoagulant qualities.

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