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"Formulation And Evaluation Of Polyherbal Antihypertensive Tablets Containing Cinnamon, Cardamom, And Cissus Quadrangularis"

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ABSTRACT

Hypertension is the leading remediable risk factor for cardiovascular morbidity and mortality in the United States. Excess dietary salt consumption, which is a catalyst of hypertension, initiates an inflammatory cascade via activation of antigen-presenting cells (APCs).[1] Flavonoids, a natural phenolic compound, have these therapeutic benefits and can potentially serve as antihypertensive. Flavones are a type of flavonoid that have increased anti-inflammatory effects that may allow them to act as therapeutic agents for hypertension, including diosmosing, which is able to induce significant arterial vasodilation in several different animal models. This review will focus on the activity of flavones to illuminate potential preventative and potential therapeutic mechanisms against hypertension. Cinnamon (*Cinnamomum burmannii*)[5] is a potential source used in cosmetics to prevent skin aging due to its flavonoids and antioxidant properties Calcium intake may regulate blood pressure by modifying intracellular calcium in vascular smooth muscle cells and by varying vascular volume through the renin-angiotensin-aldosterone system. The present study assessed the role of cardamom fruit in lowering blood pressure in patients with grade1 hypertension.[2,3] The stem of *Cissus quadrangularis* L. is also reputed in Ayurveda as alterative, anthelmintic, dyspeptic, digestive, tonic, analgesic in eye and ear diseases, in the treatment of irregular menstruation and asthma, and in complaints of the back and spine. The plant extracts also exhibit cardio tonic property in present study there are various test reveals the presence of Alkaloids Carbohydrates, Glycosides Tannins phenolic compounds Protein and amino acids Gum and mucilage Flavones and flavonoids Saponins Steroids and sterols.[4,5]

Keywords: Ayurveda, Hypertension, Steroids, Cardamom, Cinnamon *Cissus Quadrangularis* Polyherbal tablet formulation [29,30]

Introduction

Hypertension, or high blood pressure, is a silent killer contributing significantly to cardiovascular and renal diseases. Oxidative stress, inflammation, and calcium dysregulation are key mechanisms underlying this condition.[1,2] Medicinal plants with antioxidant and anti-inflammatory properties have shown promise in mitigating these effects.[4,5] Cinnamon, cardamom, and Cissus are traditional remedies noted for their cardio-protective and hypotensive effects. It Also the incidence of diabetes mellitus (DM) is increasing alarmingly droughout the world and is ranked as the fourth leading cause of death by disease globally[6] Oxidative stress, through the production of reactive oxygen species (ROS), has been reported as the root cause for the development of β -cell dysfunction and impaired glucose tolerance in DM[7] The depletion of antioxidants occurs in diabetic patients and leads to diabetes-related complications and onset of other disease conditions like atherosclerosis and coronary heart disease[8] Many antihypertensive mediators are used for the treatment of HTN, such as diuretics, sympatholytic agents, renin inhibitors, angiotensin converting enzyme (ACE) inhibitors, calcium channel blockers, β adrenergic and α 1/P-adrenergic antagonists, and vasodilators. These drugs have various side effects, including muscle cramps, abnormal heart rate, blurred vision, skin rash, vomiting, kidney failure, extreme tiredness, headache, and edema[5]

There are some medicinal plant which used treat both hypertension and diabetes mellitus which produce due to the oxidative stress.[9] Most herbal medicines control and reduce HTN by exerting antioxidant, anti-inflammatory, and anti-apoptosis properties, stimulating the NOS-NO signaling pathway, suppressing endothelial permeability, and activating angiogenesis,[10] The mechanisms of some medicinal plants of their extracts in the management of HTN

Hypertension:

Hypertension, or high blood pressure, is a condition where the force of blood against the artery walls is consistently too high. It's a common condition that can increase the risk of heart, brain, kidney, and other diseases. [26,27]

Hypertension means the rise of blood pressure along with arteries and vessels.

Table No.1: Ranges of Blood Pressure[5]

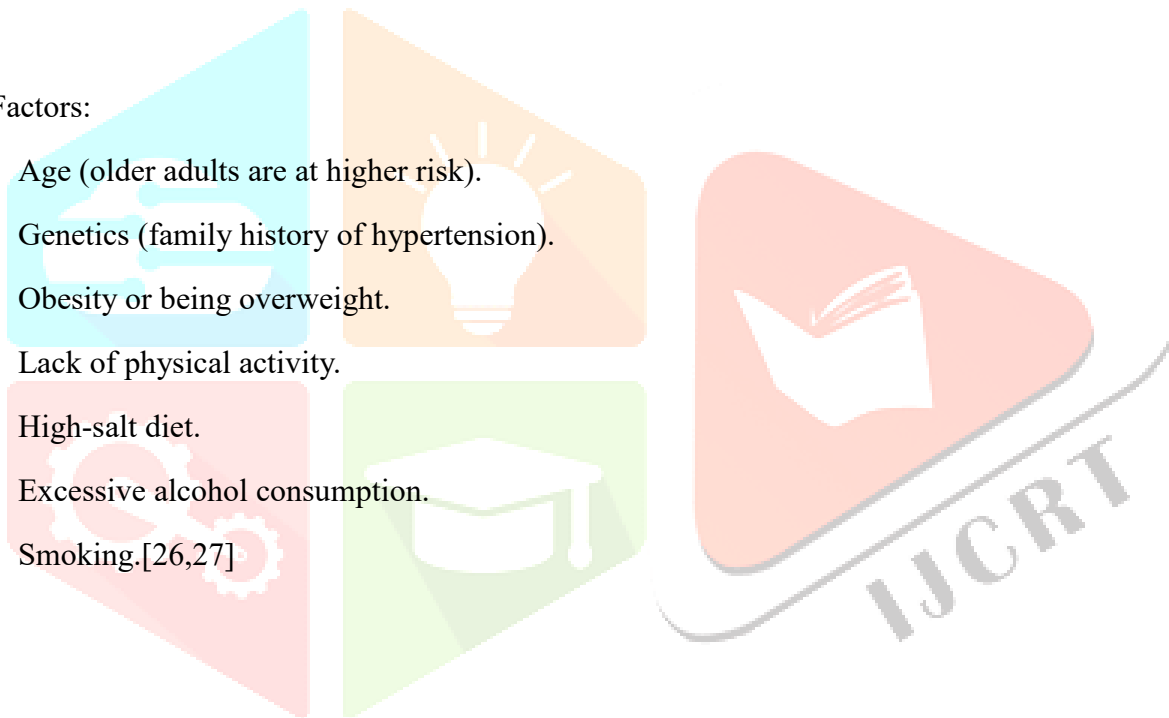
Meaning	Top number (systolic) mm/Hg	Bottom number (diastolic) mm/Hg
Optimal	Less than 120	Less than 80
Normal	120 to 129	80 to 84
High-normal	130 to 139	85 to 89
High	Greater than 140	Greater than 90

Symptoms of hypertension

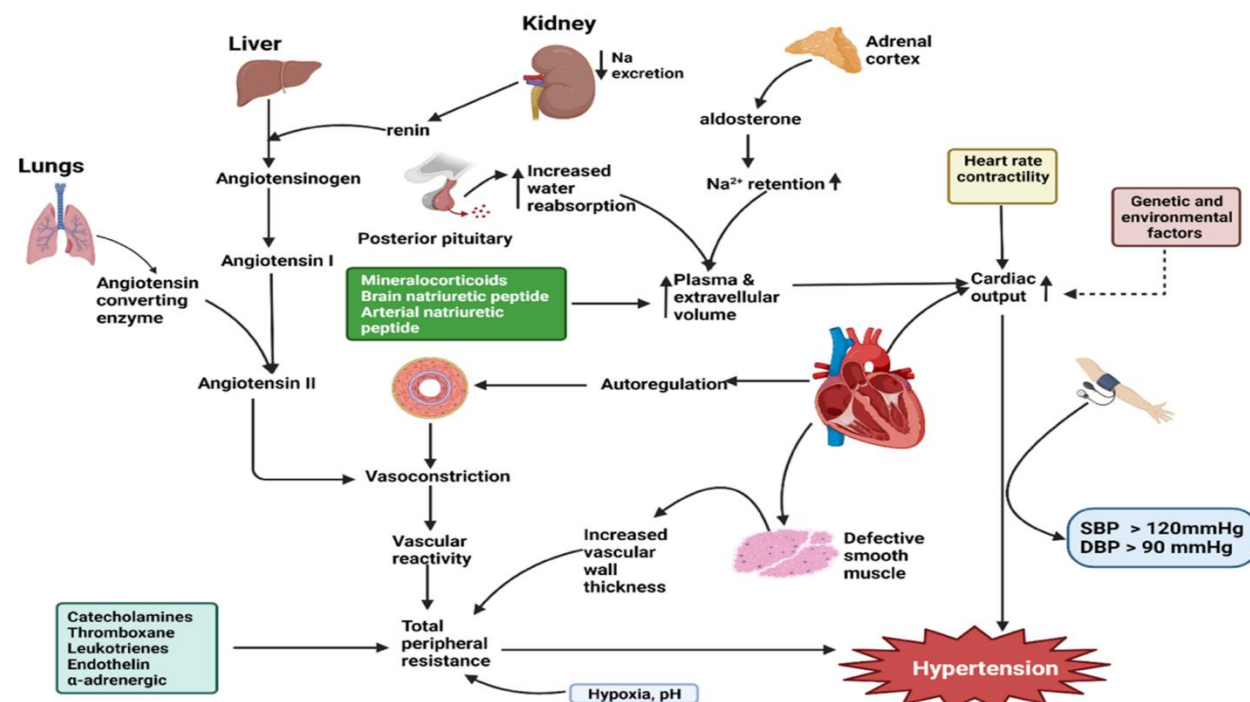
- severe headaches.
- chest pain.
- dizziness.
- difficulty breathing.
- nausea.
- vomiting.
- blurred vision or other vision changes.
- anxiety.
- irregular heartbeats[28]

Risk Factors:

- Age (older adults are at higher risk).
- Genetics (family history of hypertension).
- Obesity or being overweight.
- Lack of physical activity.
- High-salt diet.
- Excessive alcohol consumption.
- Smoking.[26,27]



Mechanism of hypertension [26,27]



PLANT PROFILE :

1.CINNAMON

Cinnamon is generally used in the aroma and industries due to its smell, which can be combined into diverse varieties of foodstuffs, perfumes, and medicinal product Overall, around 250 species have been recognized among the cinnamon genus, with trees being scattered all over the world[16,17]1



Fig. No.2: Cinnamon bark.[26]

BOTANICAL DESCRIPTION

Synonyms: Dalchini, Ceylon Cinnamon, Cinnamon bark

Biological source: Cinnamon consist of dried bark freed from outer cork :
Cinnamomum Zeylanicum[13]

Family: Lauraceae

Geographical source: Srilanka, Malabar Coast of India, Jamaica and Brazil

Description –

Colour: Externally dull yellowish brown, internally dark yellowish brown

Taste: Warm and very refined (Sweetish and aromatic)

Size: Length is about 1 meter, diameter is nearly 1 cm[18]

Shape: Compound quill form

Chemical Constituents:

1) 0.5-1% volatile oils, 1.2% tannins (phlobatannins), mucilage, calcium oxalate, starch and mannitol

2) Cinnamon oil-Eugenol, benzaldehyde, cuminaldehyde and other terpenes[12]

Uses:

Mainly cinnamon is used as the spice in Indian tradition. It shows the antihypertensive effect on human body. The drug is used as aromatic stimulant, antibacterial, antifungal, antiseptic, carminative,[14] stomachic and astringent. Commercially, it is also used as spice, condiment, in candy preparation, dentrifices and perfumery. Cinnamon oil is used in urinary infection and food technology.

2.Cardamom



Fig.No.3:Cardamom[26]

Synonyms :	cardamom fruit , cardamom seed , elachi , Ailum[26]
Biological Source:	Cardamom consists of the dried ripe seeds of Elettaria Cardamomum maton
Family:	Zingiberaceae.
Geographical source:	Cardamom fruits may be collected from the wild plants,
Description:	
Colour:	Pale green to yellow
Odour:	Aromatic, spicy, somewhat camphoraceous
Flavour:	Pungent, cooling sensation
Shape:	Elongated oval-shape filled with small aromatic seeds
Size :	3 cm long

Chemical constituent:

- 1) 2-8% volatile oil, fixed oil, starch and proteins
- 2) Volatile oil contain-a-terpinol 455, myrcene 27%, limonene 8%, menthone 6%,
- 2) The oil is colourless when fresh, but becomes thicker, more yellow and less aromatic on storage. It is soluble in alcohol and readily in four volumes of 70% alcohol, producing a clear solution. Its specific gravity at 25°C is 0.924 to 0.927
[23-24]

Uses:

Cardamom is used as an aromatic, carminative, stimulant, stomachic, expectorant, diaphoretic, digestive, appetizer, and flavouring agent.[11] It is used in the treatment of respiratory disorders like bronchitis, cough, nausea, vomiting, indigestion, headache, diarrhoea, colds, for flatulence, also used as a spice in cooking. Marketed Products It is one of the ingredients of the preparations known as Koflet, Renalka syrup, Mentat [14,15,16]

3. Cissus quadrangularis**Fig.No.4: Cissus quadrangularis[26]****Synonym:**

Cisau succulent, hodjod, pirandai [18-19]

Biological Source

It is a perennial plant obtained from Cissus Quadrangularis

Family:

Vitaceae

Geographical source:

Plant is native to India, Sri Lanka, Malaysia, Java and West Africa

Description:**Colour:**

Fleshy green

Odour:

Bitter

Height:

1.5 m approximately, stem joint at nodes, internodes

Flowers:

Rare and small, greenish white and tetramerous

Fruits :

Globus or obovoid fleshy berries

Chemical Constituents:

The stem parts of plant contains A and B-amyrins, sitosterol, ketasetosterol, phenols, tannins, vitamin, carotene, Calcium oxalate, 31 methyl tritriacontanoic acid, taraxeryl acetat, taraxerliso-pentadecanoic acid, Calcium ions and phosphorus[18,-20]

Uses:

- 1] The herb is used for osteoarthritis, rheumatoid arthritis and osteoporosis.
- (2) The roots and stems are used to treat fractures of the bones.
- [3] The stem paste boiled in limewater is given for asthma
- [4] The herb powder is administered in treatment of haemorrhoids and certain bowl infections
- [5] Stem juice is used for scurvy, debilitating menstrual disorders, gonorrhoea and epistaxis
- [6] The herb is fed to cattle to stimulate milk flow.[24-25]

Material and method:

Formulation of herbal tablet Herbal medicines are those with active ingredients made from plant parts, such as leaves, roots or flowers.[25] But being "natural" doesn't necessarily mean they're safe for you to take. Just like conventional medicines, herbal medicines will have an effect on the body, and can be potentially harmful if not used correctly. Cinnamon, Cissus and Cardamom combinely show the both antihypertensive and anti-diabetic effect [15] Formulation of herbal tablet by using wet granulation mathed [21,22]

**Table No2 Formulation of 500 mg tablet**

Ingredients	Quantity (500 mg)	Category
Cinnamon Zeylanicum	110 mg	Active ingredient
Cissus Quadrangularis	60 mg	Active ingredient
Cardamom Maton	25 mg	Active ingredient
Vit. B6	1.5 mg	Supplement
Lactose	180 mg	Diluent

Starch	90 mg	Binder
CMC	10 mg	Disintegrant
Magnesium stearate	9 mg	Lubricant
Talc	9 mg	Glidant
Methyl paraben	1.5 mg	Preservative
Sodium Saccharine	4 mg	Sweetener

Result and Disscution:

Table No 3 Result and dissacution

Sr. no	Test	Acceptance criteria	Result
1	Bulk density	-	0.49
2	Tapped density	-	0.5
3	Angle of repose	Excellent Flow	29.74
4	Car's index	Excellent	2
5	Hausner's ratio	Excellent	1.02
6	Hardness	Up to 4 Kg	3.4 kg
7	Friability	Not more than 1%(IP) Not more than 0.5-1%(USP)	061%
8	Weight variation	= 7.5%	5%
9	Wetting time	Depend on hydrophilicity of inner ingredients	4.5 mins
10	Water absorption ratio	-----	46.8
11	Dissolution time	30-60 minutes	45 mins
12	Disintegration time	15 or less(IP) 30 or less(USP)	10 mins

Conclusion :

The study successfully demonstrated the formulation and evaluation of a polyherbal tablet comprising Cinnamon (*Cinnamomum zeylanicum*), Cardamom (*Elettaria cardamomum*), and Cissus quadrangularis for potential antihypertensive effects. The formulation was developed using the wet granulation method, with each herbal component selected based on its well-documented pharmacological properties, particularly antioxidant, anti-inflammatory, and vasodilatory activities. The results confirmed the polyherbal antihypertensive tablet developed in this study demonstrates promising potential as a natural, cost-effective alternative to synthetic

medications. Its favorable physicochemical properties, ease of formulation, and presence of active phytoconstituents make it a viable candidate for further clinical investigation and development as a complementary or standalone herbal treatment for hypertension.

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