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Review Article

Anti- Hypertensive Activity Of Ginger, Cardamom, Garlic

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ABSTRACT

Blood pressure is caused by another medical condition or use of certain medicine. It usually gets better after you treat that condition or stop taking medicines that are causing it Antihypertensive drug therapy has been remarkable improved in the last 60 years received different classes of drugs have received prominence with passage of time in this period. Before 1950 hardly any effective and toleratad antihypertensive was available .There is majer risk factors of hypertension are High sodium (salt)" overweight & obesity physical inactivity According to world health organisation Imperical college London joint press release,the number of adults aged 30-79 years with hypertension has increased from 650 million to 1.28 billions in the last thirty years According to WHO & PAHO hypertension affect 1 in 6 adults in the Americas & is the main risk factor for cardiovascular diseases,which are the leading cause of death in the region responsible for around 2 million lives last each year Garlic has been shows to have cardiovascular protective & immunomodulatory properties Objectives - We updated previous meta-analysis on the effect of garlic on blood pressure & reviewed the effect of garlic on hypertension Garlic , Cardamom, Ginger are popular food spice & well established medicinal properties Evidence support that fact regular consumption of garlic can reduce factors associated with cardiovascular diseases Garlic, Cardamom, Ginger is also associated with a reduction in hypertension The mechanism of action by which garlic prevents CVD are being addressed & it's consumption for maintaining a healthy heart should be encouraged

INTRODUCTION

HYPERTENSION:

Hypertension or High Blood Pressure ,is a condition which generally has a no symptoms and if left untreated can lead to heart attack, heart failure, stroke, kidney failure and blindness.[1]

- Almost all HT management guidelines including NICE[2011], JNC8[2014], WHOICH[2003], EUROPEAN society of hypertension [2007,2013]define the cut-off level to be 140mm Hg systolic and 90mm Hg diastolic.

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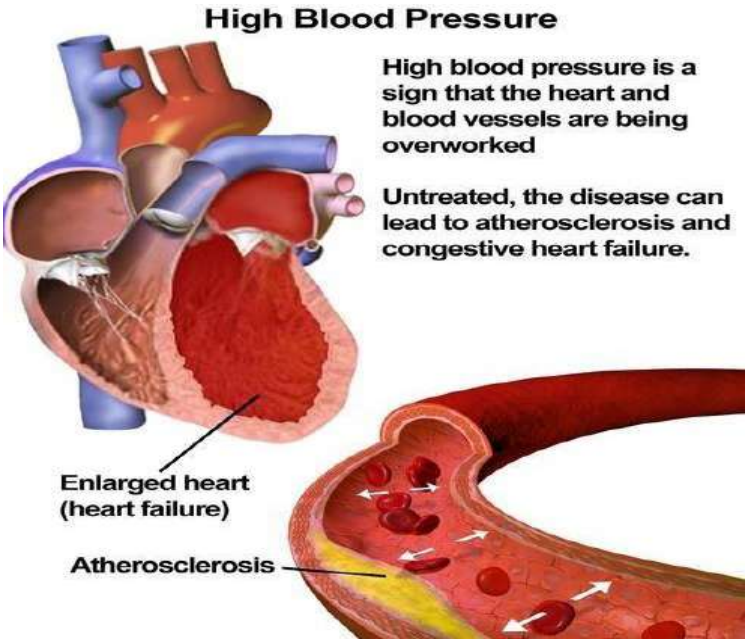
- However, the JNC8 have raised the defining level to 150/90 mm Hg for individuals above 60 years of age .
- Epidemiological studies have confirmed that higher the pressure [systolic or diastolic or both] greater is the risk of cardiovascular disease.[2]
- Several factors play a role in the development of hypertension ,including genetic variability ,lifestyle and dietary influences .While genetic variability is estimated to contribute about 30% to individuals BP profile ,lifestyle and diet.
- According to World Health Organisation and Imperial College London Joint press release, the number of adults aged 30-79 years with hypertension has increased from 650 millions to 1.28 billions in the last thirty years .



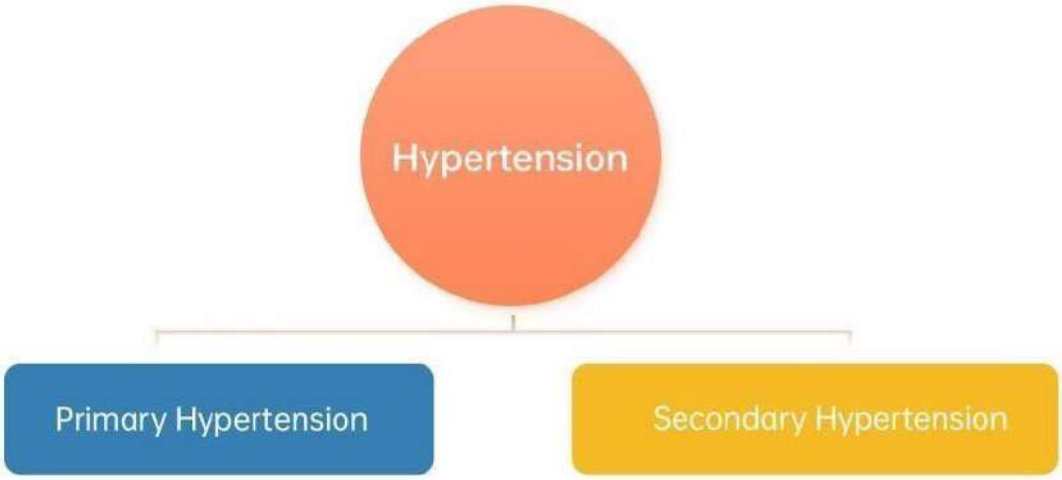
- The study conducted by global network of physicians and researchers, covered the period 1990-2019 .It used blood pressure measurement and treatment data from over 184 countries, together covering 99% of the global population which makes it the most comprehensive review of global trends in hypertension to data.[3]

Blood Pressure Levels

The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (2003 Guideline)2		The American College of Cardiology/American Heart Association Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults (2017 Guideline)1	
Normal	systolic: less than120 mm Hg diastolic: less than 80 mm Hg	Normal	systolic: less than 120 mm Hg diastolic: less than 80 mm Hg
At Risk (prehypertension)	systolic: 120–139 mmHg diastolic: 80– 89 mm Hg	Elevated	systolic: 120–129 mmHg diastolic: less than 80 mm Hg

High Blood Pressure (hypertension)	systolic: 140 mm Hg or higher diastolic: 90 mm Hg or higher	High blood pressure (hypertension)	systolic: 130 mm Hg or higher diastolic: 80 mm Hg or higher

TYPES OF HYPERTENSIONS



1. Primary or essential Hypertension

Primary hypertension is also known as essential hypertension. Most adults with hypertension are in this category. Despite years of research on hypertension, a specific cause isn't known. It's thought to be a combination of genetics, diet, lifestyle, and age. Lifestyle factors include smoking, drinking too much alcohol, stress, being overweight, eating too much salt, and not getting enough exercise.Changes in your diet and lifestyle can lower your blood pressure and risk of complications from hypertension.

2. Secondary Hypertension

Secondary hypertension is when there's an identifiable— and potentially reversible— cause of your hypertension. Only about 5 to 10 percent of hypertension is the secondary type. It's more prevalent in younger people. An estimated 30 percent of those ages 18 to 40 with hypertension have secondary hypertension. The underlying causes of secondary hypertension include: narrowing of the arteries that supply blood to your kidneys adrenal gland disease side effects of some identified, prompting a search by their doctor for secondary causes. Most people with resistant hypertension can be successfully treated with medications, including birth control pills, diet aids, stimulants, antidepressants, and some over-the-counter medications obstructive sleep apnea hormone abnormalities thyroid abnormalities constriction of the aorta

Other types of hypertension

Subtypes that fit within the categories of primary or secondary hypertension include:

1. Resistant Hypertension
2. Malignant Hypertension
3. Isolated Hypertension

1. Resistant Hypertension

Resistant hypertension is the name given to high blood pressure that's difficult to control and requires multiple medications. Hypertension is considered resistant when your blood pressure stays above your treatment target, even though you're taking three different types of blood pressure lowering medications, including a diuretic. An estimated 10 percent people with high blood pressure have resistant hypertension. People with resistant hypertension may have secondary hypertension where the cause hasn't yet been multiple drugs or with the identification of a secondary cause. is the term used to describe high blood pressure that causes damage to your organs.

This is an emergency condition. Malignant hypertension is the most severe type, characterized by elevated blood pressure usually at >180 mm Hg systolic or >120-130 mm Hg diastolic, plus damage to multiple organs. The prevalence of malignant hypertension is low — about 1 to 2 cases in 100,000. Rates may be higher in populations of black people.

2. Malignant hypertension

Malignant hypertension is the term used to describe high blood pressure that causes damage to your organs. This is an emergency condition.

Malignant hypertension is the most severe type, characterized by elevated blood pressure usually at >180 mm Hg systolic or >120-130 mm Hg diastolic, plus damage to multiple organs. The prevalence of malignant hypertension is low — about 1 to 2 cases in 100,000. Rates may be higher in populations of black people. Malignant hypertension is an emergency medical condition and requires quick treatment. Seek immediate emergency medical attention if you think you may be having a hypertensive emergency.

3. Isolated systolic hypertension

Isolated systolic hypertension is defined as systolic blood pressure above 140 mm Hg and diastolic blood pressure under 90 mm Hg. It's the most frequent type of hypertension in older adults. An estimated 15 percent Source of people 60 years or older have isolated systolic hypertension. The cause is thought to be the stiffening of arteries with age. Younger people can also develop isolated systolic hypertension. A 2016 study Source noted that isolated systolic hypertension appears in 2 percent to 8 percent Source of younger people. It's the most common form of hypertension in youth ages 17 to 27, according to a United Kingdom survey. A large study published in 2015 with an average of 31 years follow-up found that younger and middle-aged people with isolated systolic hypertension were at a higher risk of stroke and heart attack compared with those with normal blood pressures.[5]

Symptoms

- Most people with high blood pressure have no symptoms ,even if blood pressure reading reach dangerously high level. You can have high blood pressure for years without any symptoms
- A few people with high blood pressure may have:

a. Headache
b. Shortness of breath
c. Nosebleeding
d. Vomiting
e. Irregular heart beat Dizziness
f. Fatigue Nausea[7

Antihypertensive Drug Therapies

- Antihypertensive drug therapy has been remarkable improved in the last 60 years received different classes of drugs have received prominence with passage of time in this period .
- Before 1950 hardly any effective and toleratad antihypertensive was available .
- Veratrum and sod this cyanate could lower BP, but were toxic and difficult to use
- The ganglion blockers developed in the 1950s were toxic and difficult to use
- Reserpine was a breakthrough, but produced mental depression .
- The therapeutic potential of hydralazine could not be tapped fully because of marked side effects when it was used alone . [2]

Risk factors of hypertension

Modifiable risk factors for hypertension include

1. **High Sodium (salt) intake –**

In the Americas ,adults consume around 8.5g of salt per day, 1.7 time more than the World Health Organization (WHO) Recommended levels (<5g per day).

2. **Overweight and obesity –**

Around 62.5 % OF People in the Americas are overweight or obese, the highest of all WHO regions.

3. **Physical inactivity –**

The Americas ranks as the least actve of the 6 WHO regions .

4. **Age.**

The risk of high blood pressure increases with age. Until about age 64, high blood pressure is more common in men. Women are more likely to develop high blood pressure after age 65.

5. **Family history.**

You're more likely to develop high blood pressure if you have a parent or sibling with the condition.

6. **Lack of exercise.**

Not exercising can cause weight gain. Increased weight raises the risk of high blood pressure. People who are inactive also tend to have higher heart rates.

7. **Tobacco use or vaping.**

Smoking, chewing tobacco or vaping immediately raises blood pressure for a short while. Tobacco smoking injures blood vessel walls and speeds up the process of hardening of the arteries. If you smoke, ask your care provider for strategies to help you quit.

8. **Low potassium levels.**

Potassium helps balance the amount of salt in the body's cells. A proper balance of potassium is important for good heart health. Low potassium levels may be due to a lack of potassium in the diet or certain health conditions, including dehydration.

9. **Drinking too much alcohol.**

Alcohol use has been linked with increased blood pressure, particularly in men.[1][7]

Challenges

1. Hypertension often more present with no sign and symptoms and thereforwe is more frequently undiagnosed and untreated.
2. In the Americas ,among the adults aged 30to90 years , a third of men[33%] and a quarter of women[25%]with hypertension,are unware of their condition.
3. Only 60% of adults with hypertension are treated , a figure that is higher among women [67%] than Men [54%].
4. Of those who receive treatment ,only around a third of adults [30-79 years of age]have their hypertension under control [36%].[1]

History of Developments of Hypertension Treatment:

1. Cardiovascular risk and achieved high blood pressure reduction organ perfusion ,as early recognized by William Harvey, has been suggested to be dependent on blood pressure.
2. The development of blood pressure measurement which was first performed in horse in 1733and later further developed by

Riva-Rocci and Korotkoff, paved the way to recognize that blood pressure level beyond the requirement of organ perfusion are associated with cardiovascular outcomes and death.

3. However ,there was a longstanding uncertainty of whether it might be useful to reduce blood pressure.
4. John Hay wrote ,in 1931,that "High Blood Pressure is often the penalty of success……''He stated in his conclusion section; "The greatest danger to a man with high blood pressure lies in its discovery , because some fool is certain to try and reduce it''.
5. The connotation that hypertension is essential to success and certain life styles and founded or at least influenced the term "essential hypertension'' still used today.
6. However ,the strong association of elevated blood pressure with outcomes ,in particular of malignant blood pressure above 110mmHg .
7. One famous case of untreated hypertension was that of franklin D.
8. Roosevelt,who was diagnosed with elevated blood pressure in 1937.
9. The first controlled studies , which marked the paradigm changes into the future , were performed by the Veterans Administration Cooperative Study Group on Antihypertensive agents funded by National Institute of Health.[6]

Herbal drug used in the treatment of hypertension

1. Garlic
2. Cardamom
3. Ginger

1. Garlic

Synonym-

Garlic allium

Biological source-

This consist of bulbs of the plant known as Allium sativum Linn.

Family-

Liliaceae

It contains not less than 0.2% of allin on dried basis.

Botanical classification of Garlic:

1	Kingdom	Plantae
2	Order	Asparagales
3	Family	Amaryllidaceae
4	Subfamily	Allioideae
5	Genius	Allium
6	Species	A.Sativum

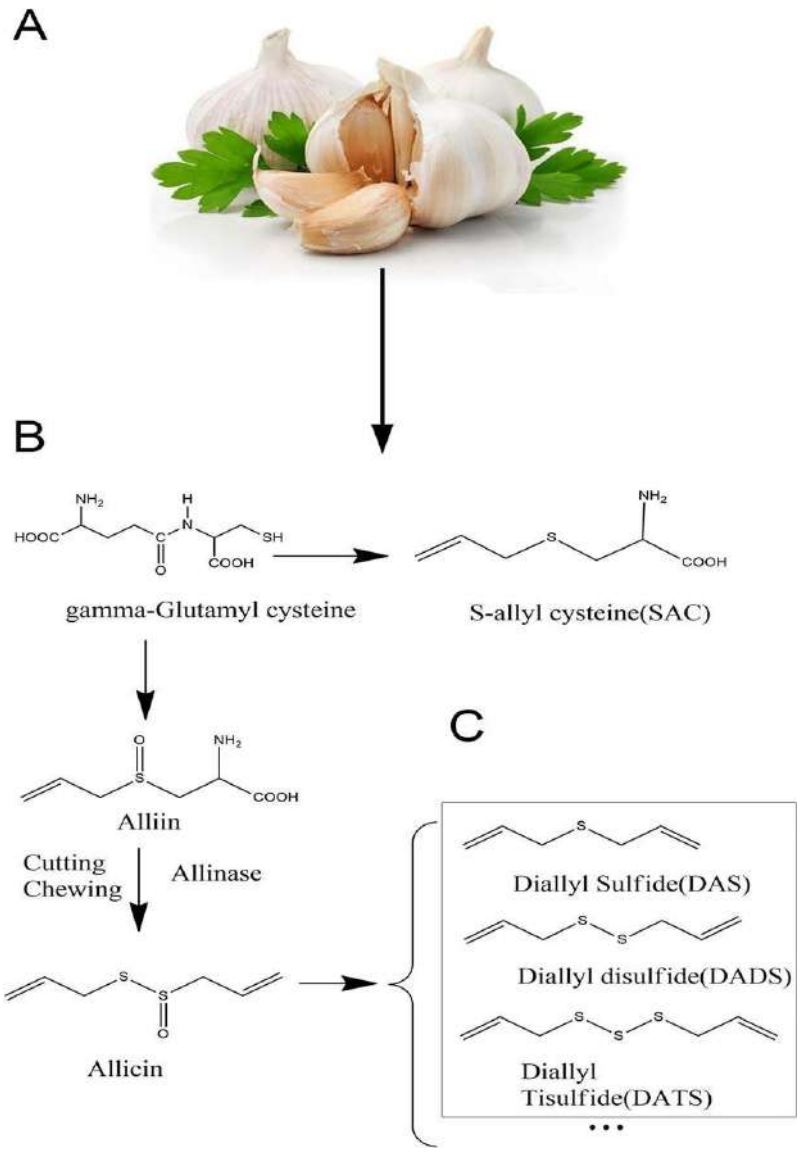
Molecular Formula –

C18H32OS7 Molecular weight -488.9

Solubility-

It is formed by the fast lysis of Alliin by Allinase in crushed garlic cloves or wetted garlic powder . Allicin 2% soluble in water ,moderately soluble in hexane and extremely soluble in organic solvent that are more polar than hexane . Garlic quality is generally measure by Allicin production

Structure Of Garlic



Geographical source-

Lahsun is cultivated in central Asia,southern Europe,USA and India. In India,it is found in almost all the state and cultivated as a spice or a condiment crop.

Cultivation and collection-

- Garlic is cultivated in well-drained moderately clay loamy soil.It need cool moist climatic condition during the growth and dry period during maturity.
- Garlic is hardy perennial with narrow flat leaves and bears white small flowers and bul-bils.The cultivation of drug is done by planting bulbs generally in the month of September to late in October.It takes about four months for harvesting
- -It is also taken as alternative crop with many other vegetables.
- For cultivation,about 300KG of bulbs per hector are required and yield per hector is about 8000KG.

Macroscopic character

Colour-

Bulbs are white to pink in colour

Odour - characteristic and aromatic

Taste - Aromatic and pungent

Size -1.5 70 2.5 cm. [8]

Chemical Constituent

29% Carbohydrate, 56%Protiens,[Albumin] 0.1%fat, Mucilage,0.06to0.1% Volatile oil.

It also contain allyl propyl disulphide,Diallyl disulphide, Allin and Allicin. Allin by action of enzyme allinlyaseis converted into allicin. Garlic oil is yellow in colour and have a specific gravity of 1.046. It is optically inactive. The primary odoriferous compounds in freshly milled garlic homogenates are S propylcysteine- sulfoxide (PCSO), allicin, and S-methyl cysteine sulfoxide (MCSO). Garlic is high in sulphur compounds enzymes and minerals such as germanium, calcium, copper, iron, potassium, magnesium, selenium, zinc,as well as vitamin A vitamin B1,and Vitamin C, Fibre , and water. Lysine, histidine, arginine, aspartic acid, threonine, swine, glutamine , proline, glycine, alanine, cysteine, valine, methionine, isoleucine, leucine, tryptophan, and phenylalanine are among the 17 amino acid present in garlic (Josling, 2005). It has more sulphar compounds than any other Allium species, which are responsible for garlics pungent odour as well as many of its medical properties . Effect of 402 Int. J. Med. **Med.Sci.Modes:**

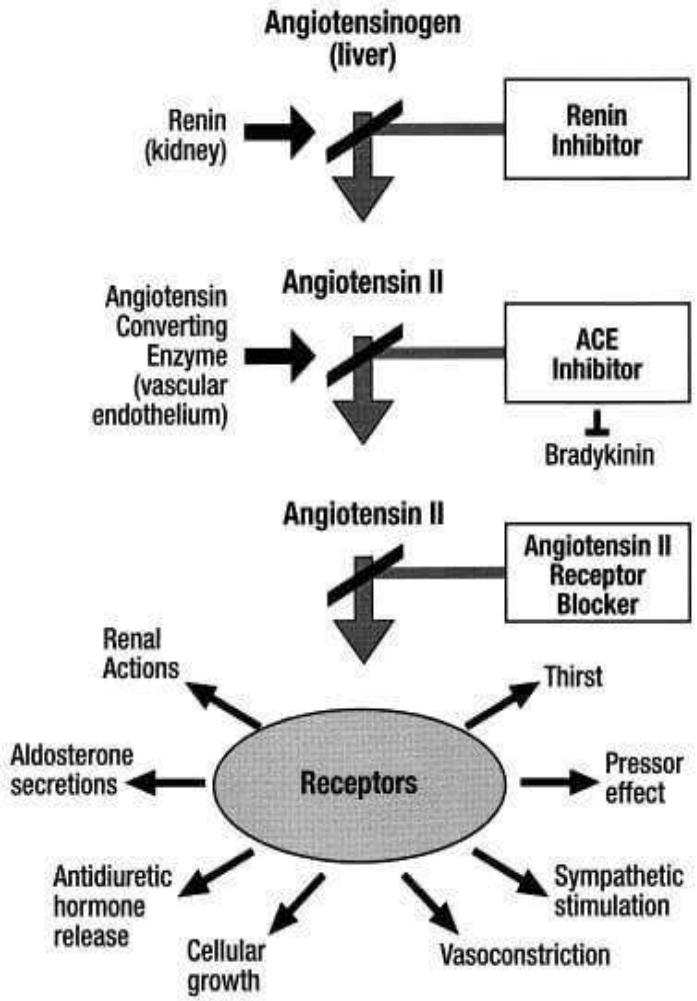
One of the most biologically active compound in garlic is allicin (diallyl thiosulfinate or diallyldisulfide). The most abundant sulfur compound in garlic is alliin (S- allylcysteine sulfoxide), which is present at 10 and 30 mg/g in fresh and dry garlic, respectively (Lawson 1998). Typical garlic food preparation such as chopping, mincing, and crushing disturbs Sallyl cysteine sulfoxide and exposed it to the allinase enzymes, then quickly converted it to diallyl thiosulfinate, which give off garlic`s characteristic aroma. The allinase enzyme responsible for diallyl thiosulfanate conversion becomes inactivated below a Ph of 3.5 or with heating (pedrazza-chaverri et al.,2006). Although allicine is considered the major antioxidant and scavenging compound, recent studies showing that other compound may play stronger roles; such as polar compounds of phenolic and steroidal origin, which offer various pharmacological properties without odor and are also heat stable (Lanzotti, 2006). Allicine is one of gaelic most biological active compounds (diallyl thiosulfinate or diallyldisulfide). Alliin (S-allylcysteine sulfoxide) is the most prevalent sulphur compound in garlic, with concentration of 10 and 30 mg/g in fresh and dry garlic, respectively (Lawson, 1998). Typical garlic food preparation methods such as chopping, mincing, and crushing disrupt S-allyl cysteine sulfoxide, exposing it to allinase enzymes , which swiftly convert it to diallyl thiosulfinate, which gives garlic its distinctive scent. Below a PH of 3.5 or when heated, the allinase enzyme responsible for diallyl thiosulfanate conversion becomes inactive (pedrazza-chaverri et al., 2006). Despite the fact that allicin is most important antioxidant and scavenging component, recent research suggests that other chemical, such as phenolic and plar phenolic compounds, may be more important.[9][10][11][12][13]

Uses Of Garlic

1. Antibacterial [bactericide] is a substance that kill bacteria.
2. Antibiotic [a substance that kills or inhibits the growth of microorganism] [a highly effective natural antibiotic that does not harm the body natural flora]
3. Anthelmintic [is a substance that kill or expels worm and parasites in the instestine ; vermicide; vermifuge]
4. Antoxidant [aids in the oxidation of free radicals ,which are thought to play a role in premature ageing and demential] [a really strong one]
5. Antispasmodic [a substance that relieves muscle spasms ,cramps,and convulsions] 6.It thins the blood.
6. Carminative [an agent that relieves griping pains ,colic,and helps the intestines the expel gas]

7. Anticoagulant [a substance that prevents clots from forming in a liquid ,such as blood]
8. Antiseptic [a substance that prevents in microorganisms from growing on living things]
9. Antiviral [a substance that kills viruses]
10. Increases the flow of bile into the intestine by acting as a cholagogue fan agent.
11. .Perspiration –Inducing diphoretic fan agent]
12. Digestive [addresses the gastrointestinal system]
13. Diuretic [a substance that cleanses the urinary system by increasing the volume and flow of urine]
14. Expectorant lan agent that promotes mucous and secretion discharge from the respiratory passages]
15. Febrifuge [a substance that reduces or eliminate the effects of favours]
16. Stimulant [a substances that stimulates or accelerates the functional activity of tissues ,resulting in increased energy][14,15,16,17,18,19,20,21]

Mechanism: [22]



Cardamom:

Synonyms:

Cardamom fruits, Cardamom seeds, Cardamon, Small cardamom.

Biological Source:

Cardamom consists of the dried ripe fruits of Elettaria cardamomum Maton var, minuy Burkill, family Zingiberaceae, the seeds of which are removed as and when required for use

Geographical source of cardamom

occurs wild in Sri Lanka (partly in Ratnapura and Lunugala districts) and also in Myanmar and Malaysia. In India it is cultivated scientifically in Karnataka, Tamil Nadu and Kerala. In Karnataka, is chiefly cultivated in Mysore and Kurg districts. It also grows wild on Malabar hills. Guatemalas is the largest producer of cardamom in the world.

Cultivation And Collection

For cultivation, cardamom needs about 150 to 600 cm of rainfall. The altitude, which suits the drug favourably is about 600 - 1600 m and the temperature range required is between 50° - 100°F. It grows on variety of soils, which are full of moisture and also well-drained. Mulching is necessary in case of cardamom cultivation. The cultivation of the drug varies to a very great extent in differet regions and is done by sowing the seeds. The seeds of cardamom are very hard and take four Months to germinate. They are either sown by broadcasting method or selected seeds prepared seed-beds. Cardamom-71 and cardamom-81 are the varieties giving highest yield per hectare. The seedlings are transplanted into nursery beds, and finally in the fields. The germination of the seeds is poor (30-40 per cent). Fresh seeds should always be used for cultivation. The seed- beds of 1 x 10 m are prepared on the raised grounds. The seeds are sown and covered with soft earth. Sowing is done from August to October and it takes 7 - 8 weeks for germination. In Tamil Nadu, the cultivation is done in the months of February and March. About 3 - 4 months old seedlings are transplanted into nursery bed by keeping the distance of 15 - 40 cm in between. The seedlings, being delicate, are provided with sheds in the beginning. When they are about 130 cm in height or bear about 8 - 10 leaves and are 1 - 1.5 year old, they are transplanted in the forest fields just before the setting in of monsoon. The cardamom plants start bearing from third year of their planting. The flowering commences in May and continues upto August. The fruits are picked up just before their ripening, so as to prevent the capsules from splitting on the floors. The collected capsules are dried after harvesting either in sun or in artificial dryers. During drying, the fruits shrink and the shrinked appearance persists in the final product. The artificial drying takes about 48 hours, while the natural drying in sun requires more time. In sun-drying, the bleaching of the fruits takes place to some extent, while in the artificial drying the green colour of the capsule is maintained. The sun-dried fruits are preferred, because the seeds remain intact and also the characteristic sweetish aroma can be maintained. The fruits loose about 70-80 per cent of their weight during drying. The fruits are hand-rubbed and sieved to remove foreign matter. The average life of cardamom plant is tout 20-25 years and yield per hectare in the beginning is about 25-50 kg and may reach 50- 70 kg in successive years. Many a time, the fruits are subjected to the treatment of bleaching with suphur dioxide to improve the colour. Therefore, they are bagged, stored and transported as reeded. The Cardamom Act of 1965 was passed by the

Government to encourage the cultivation of drug in Karnataka.

Macroscopic Characters:

Colour :

The natural colour of cardamom without processing is green or pale buff. If treated with sulphur dioxide, it changes to white.

Odour:

Aromatic, agreeable and pleasant. Taste:Strongly aromatic

Size:

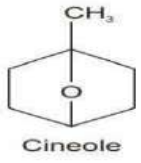
The cardamom fruits, i.e. capsules are about 2 cm in length.

Shape:35WRDZCThey are ovoid or oblong, plump, 3-sided, sharply beaked at the top, with smooth

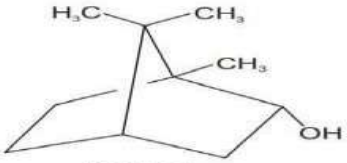
Chemical Constituents:

Cardamom seeds contain volatile oil to the extent of 2 per cent to 8 per cent. The active constituent of the volatile oil is cineole. Other aromatic compounds present are terpinyl acetate, terpineol, borneol, terpinene, etc. The other constituents of the cardamom seeds are fixed oil, starch and proteins.

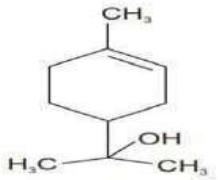
Structure Of Cardamom



Cineole



Borneol

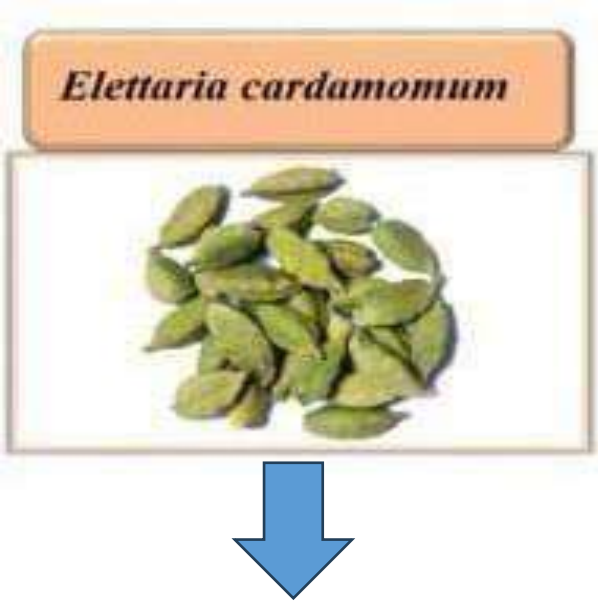


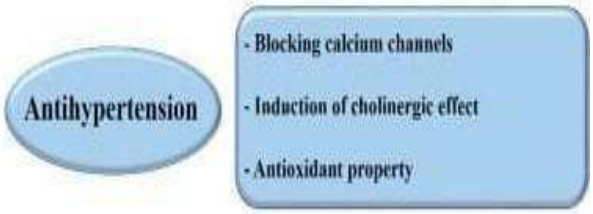
α-Terpineol

Uses

Cardamom is used as an aromatic, a carminative and stimulant. It is also a god flamey agent. It is used in the form of compound tincture, anti-hypertensive [23]

Mechanism Of Action [24]





Ginger

Synonyms

Zingiber, Zingiberis, Sunthi,

Biological Source

Ginger consists of whole or cut, dried scrapped or unscrapped rhizomes of Zingiber officina Roscoe, family Zingiberaceae. It contains not less than 0.8 per cent of total gingerols on dried basis

Geographical Source

It is said to be native of South East Asia, but is cultivated in Caribbean islands, Africa, Australia, Mauritius, Jamaica, Taiwan and India. More than 35 per cent of the world's production is from India.

Cultivation And Collection

Approximately, 25,000 hectares of land is under cultivation in India for the production of ant 25,000 tones of dry ginger annually. In almost all states of India, ginger is cultivated, especially in Kerala, Assim, Himachal Pradesh, Orissa, West Bengal and Karnataka, Ginger needs warm humid cinute and is cultivated in areas with heavy rainfall. It is cultivated even at sea leve, but still it thrives best at an altitude of 1000-1500m, if no sufficient rainfall is available, proper arrangements ririgation are necessary. Sandy or clay or red loamy soils are suitable for ginger. Ginger is cuthated by sowing rhizomes in the month of June. Carefully preserved seed- rhizomes are cut into small pieces and, at least one living bud is allowed in each piece. About 1200-1400 kg ginger end-hizomes are necessary per hectare. Ginger is a soil exhausting crop and being a rhizome, ads to be supplemented with good quantity of manures and fertilizers. Superphosphate, monium sulphate and potash are the common fertilizers used for ginger. Ginger is ready for lanesting in about six months, when its leaves become yellow. Harvesting of ginger is done by digging the rhizomes. They are washed properly and scrapped, dried and coated with inert material like calcium sulphate. The yield of 1500 kg per hectare of green ginger is possible by cultivation Ginger is produced in almost all the states of India and ranks first among ginger producing mantries of the world. There are one dozen large scale oleo resin producing industries in India at present with total installed capacity of 900 tones. In 1988-89, 404.8 tones of spice oleo resins were exported during 1995 - 1996. Most of the exports are to US, UK, France,

West Germany, Vederlands and Yugoslavia. Exports of ginger oil during 1994 - 95 and 199596 were 81.0 lakhs and 142 lakhs respectively

Macroscopic characters

Colour:

Externally, it is coloured.

Odour :

Agreeable and aromatic

Taste

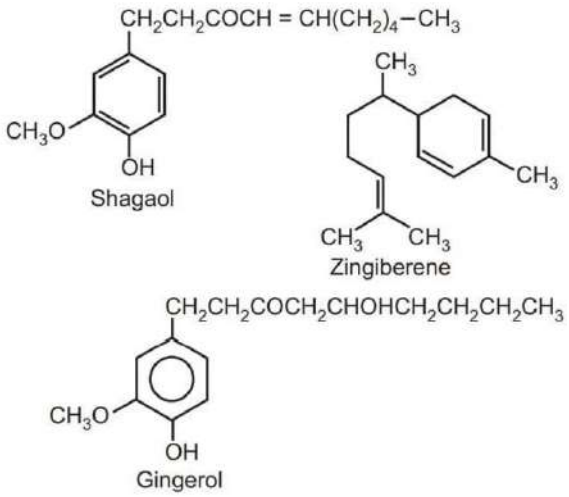
Agreeable and pungent.

Size :

Rhizomes of ginger are about 5-15 x 1.5-6.5 cm. **Fracture :** Short and fibrous.[25]

Chemical constituents

Chemical analysis of ginger shows that it contains over 400 different compounds. The major constituents in ginger rhizomes are carbohydrates (50-70%), lipids (3-8%), terpenes, and phenolic compounds [10]. Terpene components of ginger include zingiberene, B-bisabolene, a-farnesene, B-sesquiphellandrene, and a- curcumene, while phenolic compounds include gingerol, paradols, and shogaol (Figure 2). These gingerols (23-25%) and shogaol (18-25%) are found in higher quantity than others. Besides these, amino acids, raw fiber, ash, protein, phytosterols, vitamins (e.g., nicotinic acid and vitamin A), and minerals are also present [26] Structure Of Ginger



Uses

Ginger (Zingiberofficinale) is a medicinal plant that has been widely used all over the world, since antiquity, for a wide array of unrelated ailments including arthritis, cramps, rheumatism, sprains, sore throats, muscular aches, pains, constipatio vomiting, hypertension, indigestion, dementia, fever and infectious diseases. Ginger has direct antimicrobial activity and thus can be used in treatment of bacterial infections.Ginger belongs to Zingiberaceae family. The Zingiberaceous plants have strong aromatic and medicinal properties and are characterized by their tuberous or non tuberous rhizomes.Ginger is relatively inexpensive due to their easy availability, universally acceptable and well tolerated by the most people. In many countries including Bangledesh, ginger is used in boiled food preparation.[27]

Mechanism of action of ginger

Ginger could prevent atherosclerosis, since consumption of a ginger extract has been observed to improve lipoprotein results in hamsters thanks to an increased activity of the liver enzyme CYP7A1 and decreased mRNA levels of intestinal cholesterol absorption proteins such as MTP, ACAT2, and NPC1L1 6-Gingerol regulates lipogenesis, fatty acid oxidation, mitochondrial dysfunction, and oxidative stress of aging rats. Several authors observed that 8gingerol due to its antioxidant properties could inhibit melanogenesis in murine melanoma cells. In addition, it increases the activity of the antioxidant enzyme superoxide dismutase (SOD) and decreases the levels of malondialdehyde (MDA), a marker of lipid peroxidation, in a concentration-dependent manner .[28]

CONCLUSION:

In conclusion, garlic, ginger, and cardamom have each been found to possess potential antihypertensive properties. Garlic has been shown to lower blood pressure by reducing peripheral vascular resistance and increasing nitric

oxide levels. Ginger has been found to reduce blood pressure through its vasodilatory and antioxidant effects. Cardamom has also been associated with blood pressure reduction, potentially due to its diuretic and antioxidant properties. However, more research is needed to determine the optimal dosages and longterm effects of these herbs on hypertension. Therefore, while these herbs may have potential
as adjunct therapies for hypertension management, it is important to consult with a healthcare professional before incorporating them into a treatment plan.

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