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MEDICINAL VIRTUES AND PHYTOCHEMICAL CONSTITUENTS OF SOME OF THE IMPORTANT INDIAN SPICES

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ABSTRACT

Spices and herbs have been an integral part of Indian recipes since ages. They not only enhance the taste and flavor of Indian food, but have been also known remarkably for home remedies. Cure of many diseases and infections have been practiced in the most natural way by the instant herbal medicines made out of the spices and herbs available in domestic kitchens of our Indian homes. Their therapeutic roles are attributed to the rich nutritive and antioxidant values of many of the spices and herbs. This owes to the presence of specific plant chemicals, often called 'Phytochemicals'. The present work is focused on the brief review about the medicinal virtues and their phytochemical contents of the important Indian spices, *viz.*, Clove, Cinnamon, Black Pepper, Turmeric and Seeds of Bishops weeds.

KEYWORDS: Spices, Phytochemicals, Medicinal Virtues, Nutritive Values.

INTRODUCTION

Nature, plants, and their natural products have always been the source of rich potentials providing food, shelters, basic needs, and medicines to human beings (Refaz *et al.*, 2017). Plants have been utilized as medicines for thousands of years. Initially, these took the form of crude drugs such as tinctures, teas, poultices and other herbal formulation. This encouraged the idea of using the medicinal plants in food or in raw state, and even as traditional medicines, as Spices and Herbs. Their specific use for particular ailments and methods alongwith their appropriate proportion for usage, were passed down through oral tradition from the elderly people at home or through practitioners (Cohen and Ernst, 2010).

What are Spices?

Spices can be defined as any dried fragrant, aromatic or pungent vegetables or plant substances in whole, broken or ground forms that are used to flavor food. Spices originate in tropical or sub-tropical climates. They are the easily and commonly used agents in Indian cuisine, due to their significance in medicinal form, for food preservation, and as domestic 'first aid' treatments for the common ailments (Sugasini *et al.*, 2018; Hussain and Trak, 2018).

Spices are the aromatic parts of plants, such as seeds, stems or flowers. They are rarely used in their fresh forms, and in their dried forms are used primarily in food for seasoning rather than nutrition. Their medicinal values in traditional medicines is quite remarkable due to which they are considered safe and effective against many infections and diseases. Various spices show varied levels of antimicrobial and antioxidant activity making them as strong fighting agents against micro-organisms, as free-radical scavengers, depending upon their composition, and hence are considered as the **'Powerful therapeutic agents'.** (Husain and Pandey, 2015; Radha *et al.*, 2014).

Five Important Indian Spices and Their Medicinal Virtues

There are many spices that are commonly used in Indian food, and are known widespread for their Medicinal virtues. Some of them i.e., five of the most important ones are as follow.

1. Cloves (*Syzgium aromaticum*)

The cloves, popularly called **'Laung'** in India, are dried aromatic unopened floral buds of the middle-sized evergreen tree. It belongs to the family Myrataceae, and is indigenous to India, Indonesia, Zanzibar, Mauritius and Ceylon (Parle *et al.*, 2011). The name is derived from the French word ***'Clov'*** and the English word ***'Clout'***, both of which means '**Nail**'. Cloves resemble the broad headed nail. The Cloves are not only used as the esteemed flavoring agents, but also for scenting, chewing tobacco, and an ingredient of betel chew. (Photoplate **1A**).

Medicinal virtues

Cloves, as medicines, are the best to check tooth decay and bad breath. Its antibacterial characteristic helps it to flight infections such as cholera and diarrhea. Chewing of cloves reduces nausea and vomiting. Decoction with water is helpful to relive flatulence and gastro-intestinal spasm. Clove oil is a powerful stimulant and expectorant effective in controlling

cough. As a **'Pain-killer spice'**, clove is useful for tooth-ache and ear-ache. Its anti-inflammatory property is effective in treatment of arthritis and rheumatism. Cloves are useful to reduce respiratory disorders, ulcers, neural disorders and hyper-tension (Diego *et al.*, 2014).

2. Cinnamon (*Cinnamomum zylanicum*)

Cinnamon, as a spice is actually the inner brown bark, obtained from carefully selected shoots, which is then cured and dried. Drying shrinks the bark into curled cylinder or **'quills'**. They have a pleasing fragrant odour, and a warm, sweet and aromatic taste. (Debjit *et al.*, 2012). Belonging to the Lauraceae family, it is the native of Sri- Lanka, India, and other parts of tropical Asia. Apart from their pharmaceutical uses, cinnamon dried leaves and inner bark are used for flavouring cakes and sweets, and also in incense, dentifrices and perfumes. (Photoplate **2A**).

Medicinal virtues

Cinnamon is quite effective for fever, diarrhea and menstrual problems. It has soothing effect on stomach in case of indigestion, stomach ulcers and bowel disorders. Decoction is useful in relieving flatulence and in increasing discharge of urine. Blood sugar in diabetes is controlled by cinnamon, and also urinary tract and vaginal infections are warded off. Cinnamon is effective in killing dental bacteria, and also against tooth-ache and gum diseases. Acne and skin infections are also cured. The spice can be used as a natural birth control (Zafar, 2009).

3. Black Pepper (*Piper nigrum*)

Popular of all spices, Black pepper is known as **'King of spices',** and the common name used by Indians is **'Kali Mirch'**. The pepper plant is a stout, evergreen creeper. (Zoheir and Aftab, 2014). The fruits are berries, spherical, dark brown or black in color. Pepper belongs to the family Piperaceae. It is a native of Western Ghats of India, occurring commonly in Assam and Burma. Peppers have culinary uses, and are used in pickles, sauces and savoury dishes. (Photoplate **3A**).

Medicinal virtues

Black pepper has stimulating action on the digestive organs. It produces an increased flow of saliva and gastric juices. Pepper is a good home remedy for digestive problems, cough and throat irritation. It is an efficient appetizer, and is also effective in curing prolapse of rectum. Muscle and rheumatic pain is relieved on its external application as the paste or decoction

that acts as a counter-irritant. Amnesia or dullness of intellect is cured with ground pepper mixed with honey. They are well used as an antidote. As an aphrodisiac, black pepper is useful to treat impotency (Murlidhar and Goswami 2012).

4. Turmeric (*Curcuma longa*)

Turmeric, commonly called **'Haldi'** in India, is a versatile natural plant. It is a perennial plant, and a native of South-Eastern Asia, belonging to the family Zingiberaceae. The short, thick rhizome, constitute the useful 'turmeric'. (Roshan and Gaur, 2017). It is largely consumed as a spice of daily use. Turmeric exhibits the perfect combination of unique properties of a flavoring spice, a brilliant yellow dye, a natural beauty-aid, and an effective household remedy for several diseases. (Photoplate 4A).

Medicinal virtues

Turmeric is a very useful intestinal antiseptic, beneficial for intestinal disorders and intestinal worms. Fresh rhizome juice or decoction is good in the treatment of vomiting during pregnancy. It is a good tonic and a blood purifier. Turmeric is an effective household remedy for bronchial asthma, bronchitis and tropical eosinophilia. Being a good source of iron, turmeric is valuable in anemia. The spice is beneficial for arthritis and rheumatism due to its anti-inflammatory property. Turmeric is an effective expectorant, and a good remedy for chronic cough and throat irritation. It's anti-parasitic and anti-microbial properties make turmeric beneficial for skin infections, mouth disorders, and helps improve complexion. (Deepika *et al.,* 2013).

5. Seeds of Bishop's weed (*Trachyspermum ammi*)

The seeds of Bishop's weeds, commonly called **'Ajwain'** belongs to Apiaceae family. The shrub is small and erect, which grows upto about 1 meter. The dry seeds are used as the spice, and are aromatic, sharp, tingling and slightly bitter. (Rashmi *et al.,* 2011). The weed is cultivated in India from ancient times, and also is grown in Iran, Egypt and Afghanistan. Seeds are used as flavoring agents, antioxidants, preservatives, and in medicines. (Photoplate **5A**).

Medicinal virtues

'Ajwain' has been used as a carminative medicine from ancient times. The seeds are stimulant are useful for spasmodic disorders. The leaves are used as a vermicide. Ajwain is good in treatment of various digestive disorders, indigestion and flatulence. Local application

of the seed paste relieves colic pain. Gastro-intestinal infections after child-birth are cured with ajwain seeds. Seeds are highly beneficial for respiratory disorders and cold. It is an antiviral food, hence its inhalation is effective to relieve nasal congestion. Ajwain oil is good in treatment of rheumatic and neuralgic pains, as well as for skin disorders including ringworm, scabies, urticaria and psoriasis. Its aphrodisiac properties enable it to treat sexual debility and prolapse of uterus. (Mohammad *et al.*, 2014).

Significant phytochemical constituents of the 5 important Indian spices (Under study)

Besides providing food and forming a major part of medicinal systems, the plants are used for many other purposes too, such as in agrochemicals, food additives, cosmetics, textiles and pharmaceuticals. All of these remarkable contributions are due to the presence of certain types of chemical compounds in plants, wherein they are synthesized too. (Efterpi *et al.*, 2012; Hartmann 2007; Jenke *et al.*, 2008).

For the **phytochemical analysis,** the extracts of the spices taken into consideration in the present work, were separately prepared. Extracts were prepared using Soxhlet Extraction Apparatus, and particularly of that plant-part, which is considered as the 'Spice'. Different solvents were used for the investigation of phytochemicals, such as acetone, methanol, chloroform and aqueous. The methods applied for screening were the specific tests for detection, *viz.*, Mayer's test, Ammonia test, Lead Acetate test, Ferric chloride and Salkowski test. (Table **PH-1**).

Table PH-1: Tests Used For Phytochemical Screening.

Phytochemical	Test Applied For Phytochemical Screening
Alkaloids	**Mayer's Test:** 0.5 ml of extract was dissolved in 5ml of 1% HCL, and placed in boiling water-bath followed by filtration. Few drops of Mayer's reagent was added to the filtrate. Appearance of precipitation/turbidity confirmed the presence of alkaloids.
Flavonoids	**Ammonia Test:** 5ml of dilute NH_3 solution was added to a portion of aqueous filtrate of the extract. To this concentration H_2SO_4 was added. Appearance of yellow color indicated the presence of flavonoids. Yellow color usually disappeared on standing.
Phenols	**Lead-Acetate Test:** Take some amount of extract and treat it with 3ml of 10% lead acetate solution. A bulky white precipitate indicated the presence of phenolic compounds.
Tannins	**Ferric Chloride Test:** 0.5ml of extract was boiled in 10ml of distilled water and then to the filtrate was added a few drops of 1% $FeCl_3$ (Ferric Chloride). Brownish green or blue black coloration confirmed the presence of tannins.
Terpenoids	**Salkowski Test:** 0.5 gms of extract was mixed with 2ml of $CHCl_3$ (Chloroform), followed by addition of 3 ml of concentrated H_2SO_4. A reddish brown color at the interface confirms the presence of terpenoids**.**

The very **significant classes of phytochemicals** usually present in the **'Spices'** under consideration are as follows.

1. Alkaloids

One of the major groups of secondary metabolites are the 'Alkaloids'. They are the naturally occurring basic complex, nitrogenous organic compounds with specific physiological and pharmacological properties. They are accumulated mainly in young growing tissues of root, stem, bark, flowers, seedlings etc. Alkaloids behave as growth regulators like hormones. Alkaloids help in protein synthesis. Medically, the alkaloids are used as anti-malarial drug and for eye aliments. Alkaloids are used as cough expectorants. (Belewu *et al.,* 2009).

2. Flavonoids

Flavonoids and flavones are richly present in many medicinal and photosynthesizing plants. They are present virtually in plants. Their phenolic structure attributes them the variety of pharmacological activities. Fruits and vegetables are the main dietary sources of flavonoids. Flavonoids are effective against antherosclerosis, blood pressure and Parkinson's disease. They help in prevention of cancer, skin infections and brain disorders. (Alexander *et al.,* 2017).

3. Phenols

Phenols or a phenolic compounds occur universally in plant kingdom. They are found in cyano-bacterial species, and in abundance in lichens, fungi and mushrooms. They are used in the dietary supplements, and also as antioxidants, food additive and industrial chemicals. Phenolic compounds act as protective agents and inhibitors, thereby protecting the plants from predators and pathogens. They are the natural animal toxicants. Some of them are very helpful in curing a number of diseases. (Fulgentius *et al.,* 2013).

4. Tannins

Tannins are found in vascular plants, particularly in angiosperms and woody tissues. Also they occur in leaves, stems, bark and unripe seeds. Plant galls are rich in tannins, but absent in animal body. Tannins serve as safe accumulation in the form of metabolic products. Certain tannins are the special protection agents against the damage by animals. (Harsha *et al.,* 2013).

5. Terpenoids

Terpenoids include essential oil components, the volatile and involatile terpenes. These function significantly in plant growth and metabolism. Terpenoids have growth-regulating properties. In insects and other organisms, they act as agents of communication and defence. (Lai and Roy. 2004).

DISCUSSION AND CONCLUSION

Apart from the rich presence of alkaloids flavonoids, phenols, tannins and terpenoids in the 'Spices' in general, other phytochemicals such as saponins, cardiac glycosides are also present. Many other nutrients, such as carbohydrates, proteins, minerals and vitamins also occur in sufficient amounts. The general phytochemical analysis of the five important and most commonly used Spices, especially, in India *viz.*, Clove, Cinnamon, Black pepper, Turmeric and Seeds of Bishop's weeds or Ajwain, is quite remarkable. (Khare, 2007; Anupam *et al*., 2018) (Table PH-2).

Table PH 2: Qualitative Phytochemical Analysis of the Five Important Indian Spices.

PHYTOCHEMICALS	SPICES				
	Clove	Ajwain	Turmeric	Pepper	Cinnamon
Alkaloid	+	+	+	+	+
Flavonoid	+	#	+	#	+
Phenol	+	—	—	+	+
Tannins	+ +	+ +	—	—	+
Terpenoids	+ +	—	—	+ +	+ +

+ (Present); + + (Present on bulk); # (Less amount); — (Absent).

The alkaloids, during the investigation, were found to be present in rich amounts in five of the spices, i.e., Clove, Ajwain, Turmeric, Black pepper and Cinnamon. The flavonoids are present in sufficient amounts in Clove, Turmeric and Cinnamon, in comparison to Ajwain and Pepper where the flavonoids are detected in very less amounts. The presence of phenols is in more than obvious amounts in Clove, Pepper and Cinnamon. Ajwain and Turmeric do not show the presence of phenols distinctly. The tannins are abundantly present in Clove and Ajwain. Cinnamon also have good amounts of tannins, which are almost near to nil in Turmeric and Pepper. Clove, Pepper and Cinnamon show the presence of terpenoids in excellent amounts. Ajwain and Turmeric, either have almost no amounts of terpenoids or very less amounts. (Friday *et al.*, 2011).

Flavonoids and phenols are known to act as primary antioxidants that can scavenge free radicals. Immune system is strengthened, thereby minimizing the incidences of pathogenesis. Alkaloids present richly in the five of the spices are beneficial as they impart them anti-rheumatic, anti-cancerous and anti-spasmodic activity. Due to the presence of tannins, the spices, especially Clove and Ajwain exert anti-hemorrhoid and anti-diarrheal activity. The presence of terpenoids in large quantities enhance the therapeutic properties, particularly Clove, Pepper and Cinnamon. Hence they exert antiseptic, diuretic, analgesic, anti-rheumatic and anti-microbial activities. (Diksa *et al.*, 2013).

Thus, the plant-derived phytochemicals play an important role in human health and prevention of diseases. Spices and herbs, as the important class of medicinal plants, owe their medicinal values due to the presence of such phytochemicals. (Apak *et al.*, 2007; Ahmad & Beg, 2001).

1A. Syzgium aromaticum

2A. Cinnamomum zylanicum

3A. Piper nigrum

4A. Curcuma longa

Photoplate A: Important Indian Spices.

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