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A review on medicinal properties some commonly used culinary agents of Bangladesh

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Abstract

Medicinal plants are being used by human beings from the beginning of civilization to treat different ailments. As an origin of medicine, these plants played essential roles in almost every civilization. Bangladesh is a country of a tropical region having large amounts of medicinal plants which native people are using. A large portion of therapeutically active molecules is present in these plants, which can be used to synthesize modern medicines. However, a lot of plant-based substances are used to make the cooking more tasteful. In this review, we gathered the chemical compositions and pharmacological activities of several culinary agents which are very commonly used in this country. These substances contain several secondary metabolites, including alkaloids, tannins, glycosides, flavonoids, and important medicinal properties, including anti-inflammatory, analgesic, anti-pyretic antidiabetic, and anticancer. A detailed study may be performed on the structure of these medicinal compounds and designing novel drugs. This work will help those who want to explore the activities and use them to treat diseases better.

Keywords: culinary agents, spices, medicinal activity, Bangladesh

Introduction

Plants are essential for life on Earth as they are the primary producers that sustain all other life forms. People depend upon plants to satisfy such basic human needs as food, clothing, shelter, and health care. These needs are growing rapidly due to the growing world population, increasing incomes, and urbanization [1]. Plants also provide us with fibers for making cloth, rope, paper etc [2]. People started using plants to treat illnesses since the dawn of civilization. Plants that possess therapeutic properties or beneficial pharmacological effects on the animal body are generally classified as Medicinal plants [3]. The medicinal use of plants in the Indian sub-continent is found in the Rig Veda (4500-1600 BC), which noted that the Indo-Aryans used the Soma plant (*Amanita muscaria*) as a medicinal agent. The Vedas made many references to medicinal plants while a comprehensive Indian Herbal, the Charaka Samhita, cites more than 500 medicinal plants [4]. Being naturally gifted by a suitable tropical climate and fertile soil, Bangladesh is a storehouse of plants, herbs and creepers. About 5000 species of phanerogams and pteridophytes grow in its forests, jungles, wastelands and road sides as indigenous, naturalised and cultivated plants [5].

Spices are a type of culinary agent used in various forms, namely fresh, dried, ripe, dried, crushed, powdered, etc. for adding extra taste, flavor, and color to the food [6]. The medicinal properties of a plant is mainly exerted by the presence of secondary metabolites, which are not essential for the normal growth and functioning of the plants. However, these chemicals to protect themselves, but recent research demonstrates that they can also protect humans against diseases [7]. Spices are a good source of polyphenolic compounds with marked antioxidant properties [8]. They contain many bioactive compounds that protect the human body [9].

Spices Used in Bangladesh

Bangladesh is renowned for making delicious foods using different types of spices. At present, 109 types of spices are being cultivated worldwide, however Bangladeshi people use only 27 types of spices [10]. However, the spices not only increase the food values but also provide a large extent of health benefits. The most commonly used spices in Bangladeshi foods are listed in Table 1 [11].

Table 1: Some commonly used spices of Bangladesh with their botanical name and picture

Common name	Bengali name	Scientific name	Picture
Black Pepper	Gol morich	<i>Piper nigrum</i>	
Cardamom	Elach	<i>Elettaria cardamomum</i>	
Cassia leaf	Tejpata	<i>Cinnamomum tamala</i>	
Chili	Morich	<i>Capsicum frutescens</i>	
Cinnamon	Daruchini	<i>Cinnamomum verum</i>	
Clove	Lobongo	<i>Syzygium aromaticum</i>	
Coriander	Dhonia	<i>Coriandrum sativum</i> L.	
Cumin	Zira	<i>Cuminum cyminum</i>	
Fenugreek	Methi	<i>Trigonella foenum-graecum</i>	
Garlic	Roshun	<i>Allium sativum</i> L.	

Ginger	Ada	<i>Zingiber officinale</i>	
Nutmeg	Zaifol	<i>Myristica fragrans</i>	
Onion	Piyaj	<i>Allium cepa</i>	
Turmeric	Holud	<i>Curcuma longa</i>	

Black pepper

Black pepper (*Piper nigrum* L., family: *Piperaceae*) is extensively applied predominantly as spice and seasoning due to its beneficial health and flavoring effects [12]. Moreover, it is an effective biocontrol and preservative agent having applications medicines particularly in herbal medicines [13].

Chemically Black pepper is enriched in fibers, proteins, carbohydrates, fat, and minerals notably Mg, Ca, P, and K [14]. The markable biological activities possessed by this plant are chemopreventive and thermogenic action, anti-thyroid & inflammatory as well as growth stimulatory activities [15]. Due to rich medical values, the plant has been used for the treatment of disorders related to digestion such as gastric acidity, large intestinal toxins indigestion, and diarrhea; moreover, it has effectiveness against disorders pertaining to the respiratory tract including asthma, fever, and cold [16]. The seeds have the power of killing the insecticides and act as counter-irritant while a study has found the cognitive effect of the plant [17].

Cardamom

Cardamom (*Amomum subulatum*) has been used for the treatment of various diseases due to its potential medicinal properties. Methanol extract of Cardamom has remarkable antimicrobial activity against some pathogenic bacteria and it showed equivalent in potency when compared with ciprofloxacin [18]. At a dose of 6 µl essential oil obtained from Cardamom acts as a powerful antifungal agent against *Aspergillus flavus* besides, it is a better antioxidant than Butylated Hydroxytoluene (BHT) [19]. Cardamom is an effective crude drug for the asthmatic patient because of its flavonoids which likely to contribute in its airways relaxing action [20]. Current researches recommend that Cardamom has anticancer property as it decreased activity of the cancer cell lines MCF and HEP-G2 [21].

Cassia leaf

Cassia leaf (*Cinnamomum tamala*), also known as Bay leaf is an essential ingredient in cooking and has been used as herbal

medicine against several diseases such as rheumatism, sprains, indigestion, earaches, and to enhance perspiration [22]. Ethanol extracts of Bay leaf has powerful antioxidant, [23] analgesic and anti-inflammatory activities [24] furthermore its methanolic extract of seed oil and essential oils has more effective antibacterial action against gram-positive pathogenic bacteria [25]. A randomized controlled trial revealed that Bay leaf can reduce blood glucose and LDL cholesterol levels in people with type 2 diabetes [26].

Chili

Chili pepper (*Capsicum frutescens* L.), also known as red pepper pertaining to the Solanaceae family, is used in the cosmetics, pharmaceutical, beverage industries, and meat processing as a flavoring and coloring agent [27]. In traditional medicine, capsicum fruits are used in the healing of wounds and the treatment of rheumatoid arthritis, toothache, cough, parasitic infections, sore throat beyond being used as additives in the food. It contains other vital properties, likewise anticancer, antibacterial effects, and also employed as an appetite stimulator, counterirritant, and antiseptic. GIT disorders such as gastric ulcer, loss of appetite, gastroesophageal reflux disease, dyspepsia, and flatulence are protected by the chilis [28, 29].

Cinnamon

Cinnamon (family: *Lauraceae*) has a wide range of applications as a flavoring additive and aromatic condiments exclusively in traditional foods, tea, breakfast cereals, snack foods, savory dishes, sweets, and a wide variety of cuisines. There are a large number of essential oils and resinous chemical constituents present in the cinnamon, principally cinnamate, cinnamaldehyde, and cinnamic acid, moreover eugenol (in the leaf oil); the root-bark oil contain camphor, leaf oil eugenol whereas trans-cinnamyl acetate is found in the flowers and fruits [30]. The chemical constituents of the plant possess anticancer, antidiabetic, anti-inflammatory, antimicrobial, and antioxidant properties. It also lowers lipid, fights against cardiovascular diseases and neurological

disorders [31].

It improves tissue regeneration and augments the circulation of blood in the uterus; it also prevents bleeding by acting as a coagulant [32]. Traditionally cinnamon has also been applied to cure dental problems such as bad breath, toothaches, and oral microbiota in the form of tooth powder [33].

Clove

Clove is an aromatic dried flowering bud obtained from an evergreen tree (*Syzygium aromaticum*); pertaining to the family *Myrtaceae* is extensively used in the food, agricultural, perfumery, cosmetic, and pharmaceutical industries [34]. Clove is rich in phenolic compounds, namely gallic acid, eugenol acetate eugenol. As a traditional medication in Asian countries, it is very often used in the treatment of headaches, asthma, sore throats as well as respiratory, dental, and digestive system disorders [35]; moreover it has a large-scale application in the remedy of diarrhea, dyspepsia, and gastritis [34]. It has been found to have antioxidant, antimicrobial, anti-cancer, anesthetic, anti-inflammatory, antiviral, antifungal, and insecticidal properties [36].

Coriander

Coriander (*Coriandrum sativum* L.) is an annual herbaceous aromatic glabrous plant that pertains to the *Umbelliferae/Apiaceae* family. The primary ingredients found in the essential oils from Coriander are geraniol, α -pinene, geranyl acetate, linalool, camphor, and γ -terpinene [37]. Deemed to possess the dual characteristics of spice and herb this plant has long been used in traditional medicine to treat anxiety, convulsion, loss of appetite, insomnia, and dyspeptic complaints. With the potential medicinal properties, this plant is also used as an anti-hyperglycemic agent and to control blood glucose [38]. Moreover, this plant has been found to possess antioxidant [39], antimicrobial [40], anticonvulsant [41], hypolipidemic, and hypocholesterolemic [42] properties.

Cumin

The Cumin seed obtained from the small annual herb *Cuminum cyminum* (Family: *Apiaceae*) is utilized in popular spice as food additives and various cuisines as a flavoring agent. In traditional therapy, the seeds are applied in the treatment of bloating, dyspepsia, dyspeptic headache, diarrhea, morning sickness, flatulence, besides it is contemplated to possess astringent, eupeptic, antispasmodic, and carminative properties [43]. In the various traditional system of medicine, cumin has multiple disciplinary applications such as the therapy of hypertension, diabetes [44] epilepsy, toothache, diarrhea, and also for respiratory, gastrointestinal & gynecological disorders [45].

Fenugreek

Fenugreek (*Trigonella foenum-graceum*) has been extensively used as a traditional medicine of diabetes since ancient times in different countries. A randomized, controlled, and crossover human trial revealed that it improves glycemic control and decreases insulin resistance in type-2 diabetic patients [46]. Investigation of fenugreek extract revealed its antimicrobial, antiparasitic, lactation stimulant and hypocholesterolemic effects on human. Furthermore, its alcoholic whole plant extracts showed in vitro cytotoxicity against different human cancer cell lines [47].

Garlic

Garlic (*Allium sativum*) is considered as one of the oldest

cultivated plants and has been a widely used spice and flavoring agent in cuisines with a long history of human consumption. Traditionally, it has been the most extensively studied medicinal plant for its use in disease prevention and treatment [48]. In ancient civilizations and cultures, garlic was used to treat several conditions such as arthritis, pulmonary complaints, abdominal growths, respiratory infections, cardiovascular diseases, skin disease, symptoms of aging, diarrhea, headache, bites, worms, wounds, ulcers, and tumors [49]. Allicin and other compounds of garlic are responsible for the antibiotic, antibacterial, and antimycotic properties of garlic [50]. Allium has a strong potential for anticarcinogenic activity & has been shown to inhibit the development of chemically induced tumors in the liver, kidney, mammary gland, esophagus, lung, skin, and stomach in rodents [51]. The herbs hypocholesterolemic, antithrombotic, antihypertensive, and antioxidative properties help to prevent cardiovascular and cerebrovascular disease and also reduce the possibility of development of dementia and Alzheimer's disease [52].

Ginger

Ginger (*Zingiber officinale*), a plant of the Zingiberaceae family, has been widely used as spice and condiment in foods worldwide [53]. In many conventional and complementary systems of medicine such as Ayurveda, Siddha, Unani, Homeopathy and Chinese, etc. ginger has been used alone or in combination to treat infective and noncommunicable diseases as well as a number of unrelated ailments like arthritis, rheumatism, sprains, muscular aches, pains, sore throats, cramps, fever, and helminthiasis [54,55]. It is also used to treat GI problems such as nausea, morning vomiting, colic, sore stomach, gas, bloating, heartburn, flatulence, diarrhea, loss of appetite, and dyspepsia since it is believed to have a direct effect on the gastrointestinal system [56]. It possesses other properties like antioxidative, antitumorigenic, anticarcinogenic, antilipidemic, cardiotoxic, cytotoxic and apoptotic activities, as well as immunomodulatory effects [57].

Nutmeg

Nutmeg (*Myristica fragrans*) is a rich source of β -caryophyllene, eugenol and lignans hence it possesses antioxidant, immuno-modulatory and radio-protective activities [58]. It also shown strong antimicrobial activity against numerous bacteria and fungi due to presence of various compounds like carvacrol, γ -cymene, α -pinene, β -pinene, and β -caryophyllene in its essential oil [59]. The petroleum ether extract of nutmeg exert anti-inflammatory activity similar to conventional NSAIDs [60] and its hepato-protective activity also showed in rats with damaged liver [58].

Onion

Onion (*Allium cepa*) showed antibacterial activity against human pathogenic microorganisms as it contains high level of flavonoids in its ethyl acetate extract. Preclinical study of its ethylene extract (containing quercetin) revealed that it significantly controls the blood glucose levels by inhibiting the activity of α -glucosidase enzyme (involved in the absorption of glucose in intestine) [61]. Reported studies suggest that, aqueous and alcoholic extract of onion has powerful hepato-protective activity hence the regular dietary intake of onion can reduce the occurrence of liver diseases [62]. Fresh onion juice can effectively reduce both pain and inflammation along with its anti-depressant activity by suppression of lachrymatory factor synthase (LFS) [63]. The unutilized outer layers of the red variety of onion is an

important source of natural antioxidants which provides a protective effect on human health ^[62].

Turmeric

Turmeric (*Curcuma longa*) is a rhizomatous herbaceous perennial plant in the Zingiberaceae family and has been used as a medicine, cosmetics as well as coloring, and flavoring agents in many Asian foods ^[64]. In traditional systems such as Ayurvedic and Chinese medicine, it has been used for several medical effects such as treating menstrual cramps, jaundice, hematuria, hemorrhage, and colic as well as anti-inflammatory agents ^[65]. Curcuma is used as an antiseptic for cuts, burns, and bruises, and as an antibacterial agent in many Asian countries ^[64]. This herb is well known for its therapeutical properties such as antioxidant, anti-protozoal, anti-venom activities, anti-microbial, anti-malarial, anti-tumor, anti-proliferative, anti-angiogenic, and anti-aging properties ^[66].

Conclusion

Bangladesh has a long tradition of using different culinary agents for making the food delicious. The commonly used spices are mainly originated from plant sources. The spices not only exert extra taste to the food but also contain a large number of medicinal properties. From the above discussion, it's evident that these species possess various medicinal properties including antimicrobial, hypoglycemic, antidiarrheal, antioxidant, anti-inflammatory, hepatoprotective, cardio tonic, anti-carcinogenic and so on. However, these medicinal properties of the spices are being exerted by different secondary metabolites present in them. Extensive research may be performed to explain the exact role these metabolites in different medicinal activity.

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