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Chapter

An Insight on Nutraceutical Influences of Spice and Condiments: Serve as a Flavor and Immunity Enhancer from Ages

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Abstract

Spice is a dried aromatic or pungent plant substance such as root, stem, bark, leaves, bud, flower, fruit, seeds, etc., used as a flavor modifier in many culinary practices. A historical wisdom supports their use as an ingredient for flavoring the food and medicinal uses in various kind of healing systems. Spice and condiments not only enhance the sensory quality of food whereas they boost the immune system and give healthy nutrition which prevents the risk of chronic diseases. The ancient study also reveals that an adequate amount of daily intake of spices balances the three doshas (tridoshas) of the human body such as Vata, Pitta and Kapha. The imbalance of these doshas effect directly immune health and makes the body susceptible to disease. These plants have special chemical compounds which are responsible for their aromatic or pungent flavor and therapeutic actions. Due to the richness of phytochemicals, spice & condiments supports pharmaceutical, cosmetics, perfumery and several other industries world-widely.

Keywords: medicinal plants, nutraceutical, phyto-chemistry, traditional uses

1. Introduction

Since the ancient era humans and plants had a complex relationship in which humans always depended on forests for many reasons like clean air, food, water, nutrition, energy, fuel, clothing, and shelter. They have the biggest role in the survival and growth of all living organisms that exist on the planet. Our forests have been playing an important role in the economic development and medicinal health of humans. The world's vegetation is rich in many special plants with those dried parts such as roots, stems, bark, leaves, bud, flowers, fruit, seeds, etc., known for their special aroma and pungent flavors, which are called spices. Over the centuries, these dried parts come to use in many culinary practices for enhancing taste and flavor as well as preservative and coloring agents. Special chemical constituents are responsible for the aromatic and pungent properties of plants which not only enhance the taste of

our food but also keep us away from many diseases. So, these parts have been used in many traditional healing systems for ages.

The history of spices is very long with their use in various ways during ancient times. Indian food is famous for its special taste, color, and aroma in the world which explains the diversity of spices and condiments in their land. Since the beginning of human history, all of India's spices have been strongly associated with its culture, traditions, preservation, and healing system. The maritime route called as spice route was developed in 3000 BCE before the silk route (land route), it was the biggest network that linked the east with the west. This route stretches from Japan's west coast through Indonesia's island, India to Middle Eastern lands to Europe through the Mediterranean. This spice route served as a bridge for religious and cultural contacts among many parts of the world. During ancient times spices were largely used for medicinal purposes than use in food preparation. At that time, India had become the center of the world's spice trade due to its top position in spice production. At present, India contributes 70% to the global production of spices and ranks first in the world among major spice-producing countries [1–3].

2. Ancient uses of spices & condiments

Since ancient spices were closely related to culture, and traditional activities for good health worldwide. The prestigious Hindu holy book 'Ramayana' and literature from the 1st century AD of the Roman Empire both make reference to the clove. In Ayurveda, small cardamom was known for its medicinal values which also mentions as 'ela' in various Ayurvedic Sanskrit texts on medicine 'Charaka Samhita', 'Sushruta Samhita' and 'Ashtanga Hridaya'. In 1555 BCE Ancient Egyptians recorded the use of coriander, fennel, juniper, cumin, garlic, and thyme. Garlic was also used for worship by ancient Egyptian and also have been found in the tomb of king Tutankhamen who ruled Egypt until 1338 BC. As early as 3000 BCE, the farmers of Mesopotamia cultivated garlic and it is also found that garlic was used in the treatment of intestinal disorders and for lowering blood cholesterol levels due to having fibrinolytic activity. Cardamom and cinnamon were used as spices in ancient Egypt. In the first century Greek physician, Pedanius Dioscorides published a plant monograph of 600 herbs which has a description of all the use of herbs for health benefits [1, 2, 4–7].

2.1 An insight on ayurvedic uses

Ayurveda is the ancient natural medical system that evolved more than 5000 years ago in the Himalayas. The ayurvedic healing system directly depends on three forces of energies known as *Doshas* such as *Vata* (air) -*Pitta* (fire) -*Kapha* (water). These three doshas are primary functional energies of the human body which are strongly related to five elements of nature such as Earth (Prithvi), Air (Vayu), Water (Jala), Fire (Teja), and Space (Aakash). The relationship between elements of nature with three doshas is *Vata Dosh*a- a catabolic dosha formed by a combination of air and space (air is an active element in vatta and space acts as a regulatory element), *Pitta Dosh*a- a metabolic dosha formed by a combination of fire and water (fire is an active element, and water helps to regulate or control fire), and *Kapha*- an anabolic dosha formed by a combination of earth and water (earth is an active element, and water acts as the regulatory element). Elements of nature energized the human body in the form of three doshas which balance the energy for good health. The balance of

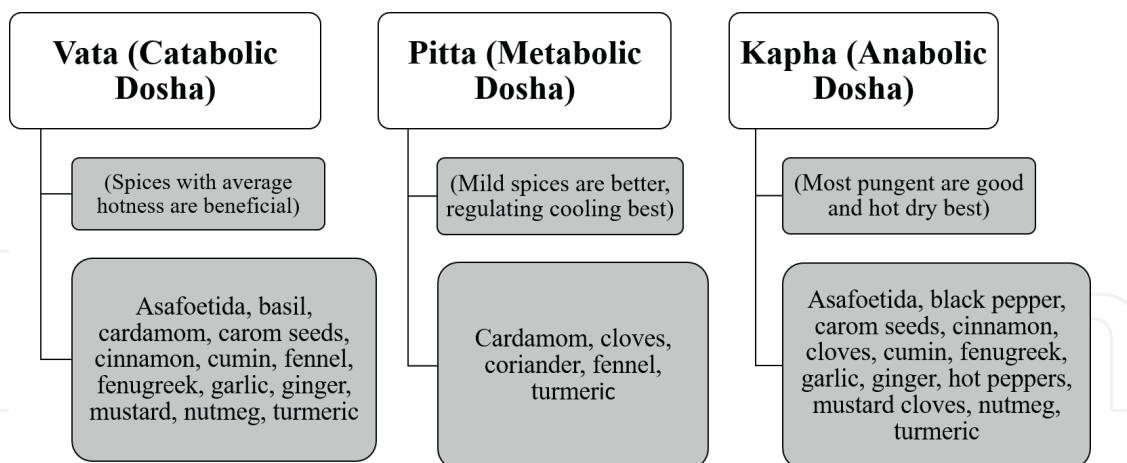


Figure 1.
 Spice & condiments use to pacify three doshas. Source: [14].

tridoshas is unique to each person and different from one individual to another, which represents the body’s natural state of equilibrium. The balance of these doshas produces good or bad consequences in the entire body [8–11].

“Vaata pitta sleshmaana eva deha sambhava hetavah Taireva avyaapannah adho madhyordhwa sannivishtaih Sariramidan dharyute aagaaramiya stoonaabhistisnubhih”.

Ayurvedic texts have a great description of the uses of spices and condiments in the prevention of diseases caused by these three doshas. For instance, the use of clove as a painkiller in dental emergencies, turmeric for microbial infection, skin disease and jaundice, basil for heart diseases, cinnamon to stimulate circulation, cardamom for headache, and mouth infections [2, 12]. An adequate amount of spice intake plays a vital role to pacify tridoshas [9, 13]. Some spices & condiments used to pacify three doshas are as follows (**Figure 1**).

3. Spice & condiments

Spice is an aromatic and pungent dried part of the plants such as roots, stems, bark, leaves, bud, flowers, fruit, seeds, etc., which are used as food adjuncts for aroma and

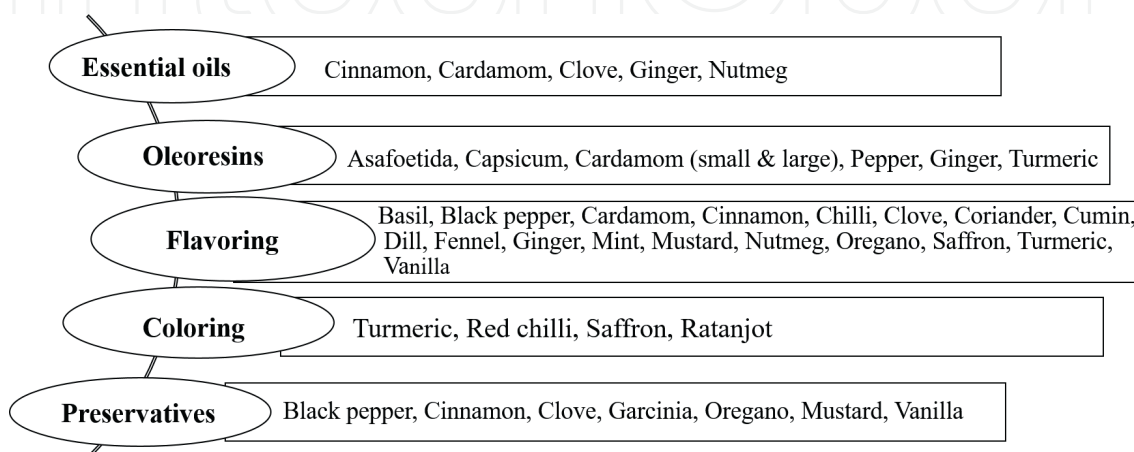


Figure 2.
 Spice & condiments for value-added products.

S.N.	Common name (Botanical name)	Native range	Production rank in the world	Parts use	Principle phytochemical compound	Pharmacological activity
1.	Asafoetida [20–22] (<i>Ferula assa-foetida</i> L.)	Iran	Afghanistan, Iran	Latex from rhizome	Asaresinotannols, ferulic acid, umbelliferone	Antioxidant, Antispasmodic, Hypotensive, Hepatoprotective, Antimicrobial, Anticancer, Anthelmintic
2.	Aniseed [20, 21, 23] (<i>Pimpinella anisum</i> L.)	SE. Turkey to Central Israel	Mexico, The Netherlands, Spain	Fruit	Anethole, anisaldehyde	Antibacterial, Antifungal, Anti-inflammatory, Antispasmodic, Anti-ulcer,
3.	Basil/sweet basil [20, 21, 24] (<i>Ocimum basilicum</i> L.)	India	India	Leaves, Seeds	Linalool, 1,8, cineol, eugenol, methyl eugenol, methyl chavicol	Antibacterial, Anticonvulsant, Anti- inflammatory, Antioxidant, Insecticidal, Larvicidal
4.	Basil/ holy basil [20, 21] (<i>Ocimum tenuiflorum</i> L.)	Indian subcontinent	India	Leaves, Seeds	Methylchavicol, linalool, methyl eugenol	Antiasthmatic, Anti-carcinogenic, Anti- inflammatory, Antimicrobial, Antioxidant, Antistress
5.	Indian bay leaf [20, 21] (<i>Cinnamomum tamala</i> (Buch.-Ham.) T.Nees & C.H.Eberm.)	Himalaya to China and Indo-China	India	Leaves	Eugenol, β -pinene, caryophyllene, spathulenol, acetyl eugenol	Antibacterial, Antidepressant, Anti-diabetic, Antifungal, Carminative, hypolipidemic, Sedative
6.	Black pepper [20, 21, 23] (<i>Piper nigrum</i> L.)	India	Vietnam, Indonesia, and India	Fruit	Piperine, β -caryophyllene, chavicine	Analgesic, Antiseptic, Antispasmodic, Antitoxic, Diaphoretic, Digestive, Diuretic, Febrifuge, Laxative, Phrodisiac, Rubefacient
7.	Cardamom (small) [20, 21, 23] (<i>Elettaria cardamomum</i> (L.) Maton)	India	India, Guatemala	Fruit	1,8-cineole, α -terpinyl acetate	Anti-inflammatory, Antimicrobial, Antiseptic, Antispasmodic, Carminative, Digestive, Diuretic, Stimulant, Stomachic, Tonic
8.	Cardamom (large) [20, 21, 23] (<i>Amomum subulatum</i> Roxb.)	Eastern Nepal, India, Bhutan	Nepal, India Bhutan	Fruit	1,8-cineol, terpinyl acetate, limonene	Anthelminthic, Antibacterial, Anti- inflammatory, Aphrodisiac, Antiseptic, Antispasmodic (neuromuscular), Anti-ulcerogenic

S.N.	Common name (Botanical name)	Native range	Production rank in the world	Parts use	Principle phytochemical compound	Pharmacological activity
9.	Carom seeds /Ajowan (<i>Trachyspermum ammi</i> (L.) Sprague) [2, 20, 21, 23]	Egypt	India	Seeds	Thymol, γ -terpenene	Antibacterial, Antihypertensive, Anti-inflammatory, Antimicrobial, Antinociceptive, Antioxidant, Antispasmodic, Broncho-dilating Cytotoxic, Diuretic Hypolipidemic,
10.	Chili [20, 21, 23] (<i>Capsicum frutescens</i> L.)	Bolivia to Brazil	India, China, Thailand	Fruit	Capsaicin	Aflatoxicogenic, Anthelmintic, Anticancerous, Anti-inflammation, Antioxidant, Insecticidal
11.	Cinnamon [20, 21, 23] (<i>Cinnamomum verum</i> J.Presl)	Sri Lanka	Sri Lanka, India	Stem, bark	Eugenol, benzyl benzoate, cinnamaldehyde	Antibacterial, Antidiabetic, Anti-inflammatory, Antioxidant, Antipyretic, Immunological effects, Insecticidal,
12.	Clove [2, 20, 21, 23] (<i>Syzygium aromaticum</i> (L.) Merr. & L.M.Perry)	Indonesia	Indonesia, Malaysia, Tanzania	Buds	Eugenol, eugenyl acetate	Anesthetic, Antibacterial, Anticancerous, Anti-inflammatory, Antioxidant, Antipyretic, Antithrombotic, Antiviral, Insecticidal,
13.	Coriander [2, 20, 21, 23] (<i>Coriandrum sativum</i> L.)	E. Medit. to Pakistan	India, Morocco, Russia	Fruit	Linalool	Aflatoxin, Antimicrobial, Antioxidant, Insecticidal,
14.	Cumin [20, 21, 23] (<i>Cuminum cyminum</i> L.)	The Mediterranean to India	India, Syria, Iran, Turkey	Fruit	Cuminaldehyde, b-pinene, cis- β -farnesene	Antimicrobial, antioxidant, antispasmodic, carminative, chemoprotective, stimulant
15.	Curry leaf [20, 21, 23] (<i>Murraya koenigii</i> (L.) Spreng.)	India	India, Burma	Leaf	Murrayacine, koenigine, α -pinene, β -phellandrene	Antidiabetic, Antioxidant, Anti-inflammatory, Antimicrobial
16.	Dill [20, 21, 23] (<i>Anethum graveolens</i> L.)	Europe	India	Fruit	Dillapiole	Antimicrobial
17.	Fennel [20, 21, 23] (<i>Foeniculum vulgare</i> Mill.)	Europe and Asia Minor	India, Syria, Egypt, Turkey	Fruit	Anethole, estragol	Acaricidal, Anticancer, Antimicrobial, Antioxidant, Hepatoprotective
18.	Fenugreek [2, 20, 21, 23] (<i>Trigonella foenum- graecum</i> L.)	South Eastern Europe and West Asia	India	Leaves, Fruit, Seeds	Diosgenin	Anticarcinogenic, Antifertility, Antioxidant, Hypocholesterolemia, Hypoglycaemic, Immunomodulatory

S.N.	Common name (Botanical name)	Native range	Production rank in the world	Parts use	Principle phytochemical compound	Pharmacological activity
19.	Garlic [20, 21, 23] (<i>Allium sativum</i> L.)	Central Asia to NE. Iran	China, India, Bangladesh	Bulb/clove	Organosulfur	Anti-atherosclerotic, Antibacterial, Anticarcinogenic, Antifungal, Antihypertensive, Antioxidant, Antidiabetic, Renoprotective,
20.	Garcinia [20, 21] (<i>Garcinia gummi-gutta</i> (L.) Roxb.)	India	India	Fruit	a-Humelene, valencene, b-caryophyllene	Analgesic, Antibacterial, Anti-HIV, Anti- inflammatory, Antiobesity, Antioxidant, Astringent, Cancer suppressant, Hepatotic tonic,
21.	Ginger [20, 21, 23] (<i>Zingiber officinale</i> Roscoe)	India to S. Central China	India, Indonesia, Nigeria, China	Rhizome	Gingerol, shogoal, citral, zingiberene, ar-curcumene	Anticancer, Anticonvulsive, Anti- inflammatory, Antioxidant, Antiplatelet, Anti-ulcer, Cardiovascular
22.	Mint [20, 21, 23] (<i>Mentha × piperita</i> L.)	Europe to Central Asia	India, China, Brazil	Leaf/ terminal shoot	Menthol and Menthone	Anticancer, Anti-diabetic, Anti-inflammatory, Antimicrobial, Anti-obesity, Cardioprotective effects
23.	Mustard/Indian mustard [20, 21] (<i>Brassica juncea</i> L.Czern)	Southern and eastern Asia	—	Seeds	Sinigrin, Allyl isothiocyanate	Antibacterial/Fungicidal, Anticancer, Anti- inflammation, Anti-oxidation, Anti-tumor
24.	Mustard (Black) [20, 21, 23] (<i>Brassica nigra</i> (L.) Koch)	Eurasia	Canada, Denmark, Ethiopia, UK, India	Seeds	Sinigrin, Allyl-isothiocyanate	Antibacterial/Fungicidal, Anticancer, Anti- inflammation, Anti-oxidation, Anti-tumor
25.	Nigella [2, 21, 23, 25] (<i>Nigella sativa</i> L.)	Romania to W. & SW. Iran	India, Sri Lanka, Bangladesh	Seeds	Thymoquinone	Anticancer, Antidiabetic, Antihyperlipidemic, Antihypertensive, Anti-inflammatory, Antimicrobial, Antioxidant,
26.	Nutmeg [20, 21, 23] (<i>Myristica fragrans</i> Houtt.)	Maluku (Banda Islands)	India	Aril/seed kernel	Myristicin, eugenol	Antiamoebic, Anticancer, Antimicrobial, Antioxidant, Antibacterial, Hypolipidaemic, Insecticidal,

S.N.	Common name (Botanical name)	Native range	Production rank in the world	Parts use	Principle phytochemical compound	Pharmacological activity
27.	Onion [20, 21, 23] (<i>Allium cepa</i> L.)	Central Asia	China and India	Bulb	Organosulfur	Antihyperglycemic, Antimicrobial, Anti-mutagenic, Antioxidant, Cardiovascular protectives
28.	Oregano [20, 21, 23] (<i>Origanum vulgare</i> L.)	Mediterranean region	China and India	Leaf	Carvacrol, β -fenchyl alcohol, thymol, and γ -terpinene	Antidiabetic, Anti-inflammatory, Antimicrobial, Antioxidant
29.	Paprika [20, 21, 23] (<i>Capsicum annuum</i> L.)	Mexico to Guatemala	India, China	Fruit	Capsanthin, capsorubin	Aflatoxicogenic Anthelmintic, Anticancerous, Anti-inflammation, Antioxidant, Insecticidal
30.	Turmeric [2, 20, 21, 23] (<i>Curcuma longa</i> L.)	India	India, China, Myanmar	Rhizome	Curcumin, Zingiberene	Anticancer, Anti-inflammatory, Antimicrobial, Antimutagenic, Antiobesity, Antioxidant, Cardioprotective, Neuroprotective
31.	Vanilla [20, 21] (<i>Vanilla planifolia</i> Andrews)	S. Mexico to Brazil	Indonesia, Madagascar, Mexico, India	Fruit/ beans	Vanillin	Anticarcinogenic, Antioxidant, Neuroprotection, Sedative

Table 1.
 Status of major spices and condiments with their pharmacological content [16–19].

flavor i.e., pepper, cardamom, clove, nutmeg, cinnamon, etc., while condiments are also parts of plants which are used as food ingredients to enhance taste and flavor [12, 15]. So, spices and condiments are used for taste or flavoring, as well as preservatives, essential oils and coloring agents in many pharmaceutical and chemical industries (**Figure 2**). Along with being a taste enhancer, they are also known for rich nutraceutical properties which maintain the healthy immune system of the body. Specific phytochemical compounds are responsible for the aromatic, pungent, and coloring qualities of spice and condiments. These phytochemical compounds possess medicinal properties such as antioxidant, anti-inflammatory, anti-diabetic, anti-mutagenic, anti-carcinogenic, anti-microbial, anti-arthritic, and hypoglycemic activity which are beneficial in the prevention of many diseases like diabetes, inflammatory, cardiovascular, cancer, and neurodegenerative disorders. Some popular spices which are famous for their taste in every kitchen of the world and healing aid remedy are as follow- asfoetida, black paper, bay-leaf, carom seeds, capsicum, cardamom (small & large), coriander, cinnamon, clove, cumin, curry leaves, dill, fennel, fenugreek, ginger, garlic, mint, mustard, Nigella, nutmeg, onion, paprika, turmeric and vanilla, etc. International Organization for Standardization (ISO) listed 109 spices in the world of which 63 spices are grown in India. The list of major spice & condiments belonging to the land of India with their uses, principle phyto-constituents, and nutrient components are mentioned in **Table 1** [3, 15, 16, 20, 21, 25–28].

4. Nutraceutical

Nutraceutical is driven by “nutrition” and “pharmaceutics”. Which referred to natural plant products or food-based substances such as cereals, fruits, vegetables, spices, and beverages that are used for nutrition as well as therapeutic purpose. Nutraceuticals are grouped into three categories such as nutrients, herbal and dietary supplements. Spices and condiments are also special plant products that have both rich nutritional and medicinal properties. Nutritional components help to nourish

Spice & condiments	Nutritional value (100gms)	Common uses	Health benefits
Asafoetida (<i>Ferula assa-foetida</i> L.) [2, 22, 23]	Moisture: 16.0% Carbohydrate:7.8% Protein: 4.0% Fat: 1.1% Fiber: 4.1%	Seasoning food especially snacks and various types of pickles	asthma, epilepsy, stomachache, flatulence, intestinal parasites, weak digestion and influenza Help to cure asthma, bronchitis, whooping cough, epilepsy, stomachache, flatulence, intestinal parasites, weak digestion, and influenza
Indian bay-leaf (<i>Cinnamomum tamala</i> (Buch.-Ham.) T.Nees & C.H.Eberm.) [2, 21, 23]	Carbohydrate (g): 74.96 Protein (g): 7.61 Fat (g): 8.36 Ca (g) 0.83 Fe (mg): 43.0 Ascorbic acid (mg): 46.53	Flavoring food, meat products, soups, and fish	Reduced the risk of bacterial and fungal infections

Spice & condiments	Nutritional value (100gms)	Common uses	Health benefits
Black pepper (<i>Piper nigrum</i> L.) [2, 21, 23]	Carbohydrates (g): 66.5 Protein (g): 10.0 Fat (g) 10.2 Ca (g): 0.4 P (mg) 160.0 K (mg): 1200.0 Fe (mg): 17.0 Thiamine (mg): 0.07 Riboflavin (mg): 0.210 Niacin (mg): 0.8	Flavoring food, soups, and preservative	Help to cure flu, colds, fevers, rheumatism, chills, exhaustion, muscular aches, physical and emotional coldness, and as a nerve tonic
Carom seed/ Bishop's weed/Ajwain (<i>Trachyspermum ammi</i> (L.) Sprague) [21, 23, 28, 29]	Carbohydrate (g): 24.6 Protein (g): 17.1 Fiber (g): 21.2 Ca (g): 1.525 P (g): 0.443 Na (mg): 56 K (mg): 1.38 Fe (mg): 27.7	Use in curry dish for the aromatic and pungent taste	Digestive aid, colds, and flu, for relieving flatulence, dyspepsia and spasmodic disorders
Cardamom (Small) (<i>Elettaria cardamomum</i> (L.) Maton) [2, 21, 23, 28]	Carbohydrate (g): 68.47 Protein (g): 10.76 Fat (g): 6.70 Ca (g): 0.383 P (g): 178 Na (mg): 18 K (mg): 1119 Fe (mg): 13.97 Volatile oil: 2.80%	Sweet/savory flavor to desserts, main dishes, and beverages	Reduce bad breath, digestive disorders, relieving flatulence, and constipation
Cardamom (Large) (<i>Amomum subulatum</i> Roxb.) [21, 23, 28]	Carbohydrate (g): 68.47 Protein (g): 10.76 Fat (g): 6.70 Ca (g): 0.383 P (g): 178 Na (mg): 18 K (mg): 1119 Fe (mg): 13.97 Volatile oil: 8.30%	Rice preparation, meat dishes, desserts, and beverages	Help to cure mouth infections, digestive disorders, abdominal pains, heart and liver problems
Chili and paprika (<i>Capsicum frutescens</i> L.) [2, 21, 23, 28]	Carbohydrate (g): 58.20 Protein (g): 14.0 Fat (g): 6.70 Ca (g): 0.10 P (g): 0.32 Na (mg): 0.01 K (mg): 2.10 Fe (mg): 9.90 Niacin (mg): 14.20 Ascorbic acid (mg): 63.70	Pungent and hot flavor to the food	Help to cure asthma, coughs, and sore throats
Cinnamon (<i>Cinnamomum verum</i> J.Presl) [2, 3, 21, 23, 28]	Carbohydrates (g): 79.85 Protein (g): 3.89 Fat (g): 3.18 Ca (g): 1.23 Fe (mg): 38.07 Ascorbic acid (mg): 28.46	Seasoning food and preparing masalas	Help in insulin production and lowering blood cholesterol

Spice & condiments	Nutritional value (100gms)	Common uses	Health benefits
Clove (<i>Syzygium aromaticum</i> (L.) Merr. & L.M.Perry) [2, 3, 21, 23, 28]	Carbohydrates (g): 61.22 Protein (g): 5.98 Fat (g): 20.06 Ca (g): 0.646 P (mg): 105 Fe (mg): 8.68 Ascorbic acid (mg): 80.81	Flavoring food and masalas	Help to cure toothache, sore gums, fever, digestive problems, cough, cold, and chest pains
Coriander (<i>Coriandrum sativum</i> L.) [2, 21, 23, 28]	Carbohydrates (g): 64.99 Protein (g): 12.37 Fat (g): 17.77 Ash (g): 6.02 Ca (g): 0.709 P (mg): 409 Fe (mg): 16.32 Niacin (mg): 2.130	Leaves and seeds used in cooking	Help to cure sore throat, allergies, digestion problems, hay fever, joint pain, and rheumatism
Cumin (<i>Cuminum cyminum</i> L.) [2, 23, 28]	Carbohydrates (g): 0.88 Protein (g): 0.36 Fat (g): 0.44 Ash (g): 0.16 Ca (g): 18.62 P (mg): 9.98 Fe (mg): 1.37 Ascorbic acid (mg): 0.16	Used for cooking	Keeps the immune system healthy
Curry leaves (<i>Murraya koenigii</i> (L.) Spreng.) [2, 3, 21, 23, 30]	Moisture (g): 63 Carbohydrates (g): 18 Protein (g): 6.1 Fat (g): 1 Fiber (g): 6 Ca (mg): 830 P (mg): 57 Fe (mg): 0.93 Ascorbic acid (mg): 4	Used as an ingredient for seasoning	Lowering blood sugar, bacterial and fungal infections, febrile disorders, dysentery, diarrhea, and inflammation of the gums
Ginger (<i>Zingiber officinale</i> Roscoe) [3, 21, 23]	Carbohydrates (g): 70.70 Protein (g): 9.12 Fat (g): 5.95 Ash (g): 4.77 Ca (g): 0.116 P (mg): 148 Fe (mg): 11.52 Ascorbic acid (mg): ---	Used for giving specific flavor to food	Help to cure cough, cold and digestive disorders
Garlic (<i>Allium sativum</i> L.) [2, 21, 23, 28, 31]	Carbohydrates (g): 33.06 Protein (g): 6.36 Fat (g): 0.5 Ca (mg): 181 P (mg): 153 Fe (mg): 1.7 Ascorbic acid (mg): 31.2	Used for cooking and in the preparation of pickles	Help to cure cough, cold, and lowering of blood cholesterol
Fennel (<i>Foeniculum vulgare</i> Mill.) [21, 23]	Carbohydrates (g): 52.29 Protein (g): 15.80 Fat (g): 14.87 Ash (g): 8.22 Ca (g): 1.96 P (mg): 487 Fe (mg): 18.54 Ascorbic acid (mg): ---	Flavoring to food, pudding, and snack	Digestive stimulant action and reduces bloating, gas and heaviness,

Spice & condiments	Nutritional value (100gms)	Common uses	Health benefits
Fenugreek (<i>Trigonella foenum-graecum</i> L.) [2, 21, 23, 28]	Carbohydrates (g): 58.35 Protein (g): 23.00 Fat (g): 6.41 Ash (g): 3.40 Ca (g): 0.176 P (mg): 296 Fe (mg): 33.53 Ascorbic acid (mg): 3.00	Leaves use as green leafy vegetables and seeds for seasoning and preparing masalas	Lowering blood cholesterol, diabetes and helps to cure fever, vomiting, anorexia, cough, bronchitis
Mustard (<i>Brassica juncea</i> L.Czern) [2, 23]	Fat (total) (g): 28.76 Dietary fiber (g): 14.7 Protein (g): 1.88 Ca (g): 521 P (mg): 841 Mg (mg): 298 Fe (mg): 9.98 Ascorbic acid (mg): 3	Use as green leafy vegetables and seeds for cooking	Help in good blood circulation and reduces the risk of bacterial and fungal infections
Onion (<i>Allium cepa</i> L.) [23, 32, 33]	Carbohydrates (g): 11 Protein (g): 1.5 Fiber (g): 0.5 Ca (mg): 30 P (mg): --- Fe (mg): 0.5 Ascorbic acid (mg): 10	Used for cooking and eaten raw as salad	Prevent bacterial and fungal infections, stimulate hair growth
Saffron (<i>Crocus sativus</i> L.) [2, 3, 21, 23, 28, 34]	Carbohydrates (g): 65.37 Protein (g): 11.43 Fat (g): 5.85 Dietary fiber (g): 3.9 Ca (mg): 111 P (mg): 252 Fe (mg): 11.10 Ascorbic acid (mg): 80.8 mg	Used for cooking or coloring agent in many sweet dishes, also used in beauty products	Reduce the risk of skin diseases, cough, cold, and asthma
Turmeric (<i>Curcuma longa</i> L.) [2, 3, 21, 23, 28]	Carbohydrates (g): 64.93 Protein (g): 7.83 Fat (g): 9.88 Ca (g): 0.182 mg P (mg): 268 mg Fe (mg): 41.42 mg Ascorbic acid (mg): 25.85 mg	Used for cooking and as a coloring agent, and also used in skincare products	Reduce the risk of skin diseases, microbial infections, healing cuts, and wounds

Table 2.
 Nutritional profile, uses, and health benefits [16–19].

the body, improve health and give energy to work such as carbohydrates, proteins, vitamins-A, B, C, minerals, amino acids and fatty acids in which antioxidants, vitamins, and essential minerals are the most common nutrient found in many plants. Phytoconstituents are unique compound that occurs naturally in plant and plays a significant role in human health. It is responsible for the unique taste, color, and bio-activity to protect from many chronic diseases such as cancer, cardiovascular, neuro-degenerative, diabetes, inflammation, and liver disorder. Spices and condiments act as major nutraceutical agents and have both essential and nonessential phytonutrients which play a significant role in our daily lifestyle beyond making our food tasty. Both **Tables 1** and **2** combinedly explains nutritional and pharmacological properties with their common uses and health benefits.

5. Indian spice scenario

The diversity of spices has different origins therefore their use and taste are famous in the world. The Mediterranean region, South Europe and Asia have historically recorded lands from where many types of spices originate and distributed in many countries. At present spices are growing in many countries such as Bangladesh, Brazil, China, Ethiopia, Germany, Guatemala, India, Indonesia, Japan, Madagascar, Nepal, Pakistan, Sri Lanka, Turkey, and Vietnam. Among these countries, India is the leading spice-producing country with a 70% contribution of spices in the world's production and retaining a large quantity of its supply for national consumption, that's why India is known as the 'land of spices' [25, 35, 36].

In India, spices are cultivated in the regions of Bihar, Karnataka, Kerala, Madhya Pradesh, Odisha, Punjab, Rajasthan, Tamil Nadu Uttar Pradesh and West Bengal. Among them, Kerala is the leading state in the production of black pepper and small cardamom, whereas Andhra Pradesh is the leading producer of chilies, turmeric, and several spice seeds, and Madhya Pradesh and Gujarat are famous for ginger production. Rajasthan and Gujarat are famous seed spices producing states that's why they are known as the seed spices bowl of India. The area and production of spices in

Spices	2018–2019		2019–2020		2020–2021	
	Area (000'Ha)	Production (000'MT)	Area (000'Ha)	Production (000'MT)	Area (000'Ha)	Production (000'MT)
Ajwain	35	22	41	29	29	22
Cardamom	81	23	85	21	84	34
Chillies (Dried)	780	1743	626	1835	729	2092
Cinnamon/ Tejpata	2	5	3	8	2	5
Celery, Dill & Poppy	30	30	33	35	31	31
Clove	2	1	2	1	2	1
Coriander	470	592	529	701	662	832
Cumin	1027	699	1276	912	1241	856
Fenugreek	122	192	126	182	121	203
Fennel	90	157	83	140	79	127
Garlic	358	2910	352	2925	391	3185
Nutmeg	24	15	24	16	23	15
Pepper	245	137	259	104	260	120
Vanilla	0	0	0	0	0	0
Saffron	3	0	4	0	4	0
Turmeric	253	961	296	1153	291	1064
Mint (Mentha)	334	34	328	44	359	47
Total spices	4067	9500	4291	10,137	4528	10,679

Table 3.
Area and production of Indian spices [37].

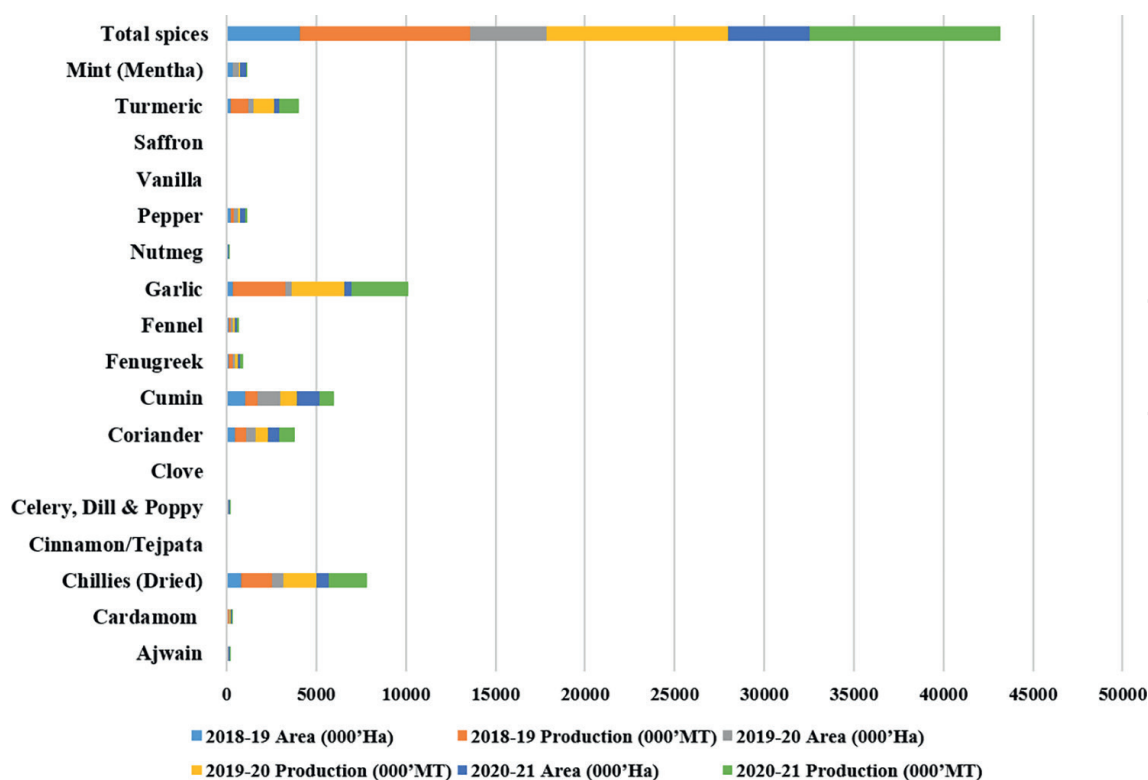


Figure 3.
 Area and production of Indian spices chart.

2018–2019 was 4067Mha and production 9500MT and in 2020–2021 both slightly increase by area of 4528 Mha and production of 10679MT, as given in the **Table 3** and area & production for each spices are shown in **Figure 3** [25, 35, 37, 38].

6. Conclusion

India's vegetation is rich with many spices and condiments species on which various occupations are dependent. Since ancient India's food was very popular for its taste and fragrance in the world, therefore it became a point of attraction for many explorers or traders for coming to India. Spice & condiments are an essential part of our daily life from the morning with tea or herbal beverages to a good night drink with turmeric milk. They play the biggest role in the nourishment and refreshment of the body. The ancient literature also reveals that dried parts of the plant are very popular for their use to cure various types of diseases beyond enhancing the taste of food. Unique phytochemical compounds found in particular spices not only enhances the taste of food but also helps to enhance the nutrients present in vegetables or fruits or other food preparation in which they are used, beyond this goodness they are also helpful to suppress the worse effect of another chemical in our body. They strongly fight bacterial and viral infections and make our immune system healthy. Some spices are very popular in the world for their use in every culinary and medicinal practice to cure diseases. The specific phytochemicals such as curcumin in turmeric, piperine in black pepper, gingerol in ginger, eugenol in clove, eugenol, and cinnamaldehyde in cinnamon, linalool in coriander, cuminaldehyde in cumin, diosgenin in fenugreek, thymol in carom seeds and murrayacine in curry leaves possess antioxidant, anticancer, anti-inflammatory, anti-diabetic, anti-mutagenic, anti-microbial, anti-arthritis,

and hypoglycemic activities against many diseases. Our farmers are very intelligent and they know every particular effect of these spices on health and they are using them for ages but the over-chemical fertilizer use in the cultivation of these nutraceutical crops reduce their nutritional qualities and that is the biggest reason, they are notable to fight against all the diseases. Another biggest reason is food adulteration, which is a severe problem nowadays with many food supplements. The common adulterants of spices such as sand, dirt, earth gritty matter, artificial color, starch, chalk powder, bark, and papaya seeds are used to increase the quantity of various powder spices. These adulterants degrade the quality of spices and can lead to serious health complications. The safest way to avoid adulterated spices is to purchase raw spices and otherwise fully packed approved spice powders. Promote organic cultivation to retain the nutraceutical values of plants and create awareness among the farmers about harmful chemical effects. Proper planning and intensive research should be initiated for the conservation of spices & condiments for future health.

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