Review Article

Study on the therapeutic properties of herbs and their utilization in the development of value-addedproducts: A Review

Comment [DS1]: Need to use capital letter in the title

Abstract

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India has the largest population of cattle in the world and also ranks first in consumption considering it as having a huge demand for dairy and value-added dairy products. A wide range of dairy products is already available in the market like butter, cheese, labneh, ice cream, buttermilk, custard, etc. Yogurt is one of the oldest consumed dairy products with several benefits as it contains various microorganisms such as Lactic acid bacteria, *Lactobacillus* spp. and *Streptococcus* spp. which ferment the product and it helps in improving the nutritional value of the product. Yogurt contains a rich source of B vitamins, lactose, proteins, and minerals. To enhance its nutritional value herbs and fruits can be added to it. Herbs are a type of plant whose leaves and seeds have a wide range of use in medicines, adding flavor, cooking, etc. Herbs are anti-inflammatory, have antioxidants, boost the immune system, and have several other health benefits. Different types of herbs and their health benefits were studied such as Ashwagandha, Arjuna, Cinnamon, Sage, Aloevera, Tulsi, and Peppermint. Fruits are added to dairy products to enhance their flavor and nutritional value. Fruits are a good source of vitamins and minerals. In this review paper, we discuss the nutritional prospects of yogurt supplemented with herbs.

Keywords: Fruits, Herb, Microorganisms,Nutritional value, Therapeutic properties, Yogurt.

1. Introduction

Yogurt is a fermented product that is made from the fermentation of lactose in milk by specific microorganisms such as *lactobacillus bulgaricus* and *streptococcus thermophilus*.It can be noted that in the majority of countries yogurt a cultured dairy product has seen a popular demand. As fermented dairy products deliver a good nutritional value, they are widely consumed food all over the world.Beneficial microorganisms that help in gut health improvement are present in yogurt **[103].** In most countries, a cultured dairy product that has been increasingly getting popular is yogurt. This is because of spreading awareness among

consumers towards the health benefits of yogurt. Yogurt is a rich source of carbohydrates, protein, fat, vitamins, calcium, and phosphorous **[86]**. To produce fermented food products and milk products lactic acid bacteria have been used for thousands of years **[97].** The one which is best-known food that contains probiotics is yogurt. Probiotics are defined as "living microorganisms, which on ingestion in sufficient numbers, exert health benefits beyond inherent basic nutrition" **[71]**. Consumers accept foodstuff based on flavor, hence flavor is the key factor **[15].**As fruit makes dishes tasty, the addition of fruit in yogurt will make it more delicious therefore a variety of different fruits has been tested in yogurt manufacturing increasingly **[60]**. India has a wide range of fruits as it has a vast horticulture base but India is also at the top position in the world because of its post-harvest losses of perishables and semi perishables, this terms for a new approach for utilization of fruits in an efficient manner **[103]**. Using fruit in yogurt enhances its taste and makes it more delicious. Pectin and sugars that are present in fruit are mixed with the yogurt which helps to increase its consistency and viscosity leading to a good mouth feel. Commonly used fruits in yogurt are raspberry, blueberry, peaches, orange, pineapple, strawberry, cherry, lemon, peach**[13],**and mango **[103].** Other ingredients such as; herbs can be used such as holy basil(tulsi), cardamon, fenugreek, coriander, turmeric, cinnamon, wheat grass, ashwagandha, green tea, and many more. All these herbs have nutritional benefits. The addition of herbs in yogurt can increase its nutritional value and will add health benefits **[100]**.Tulsi is one of India's greatest healing herbs that was recognized thousands of years ago by rishi **[18]**.

2.Yogurt

A milk product with coagulation, yogurt. The need for innovative products that can offer greater nutrition has become critical as customer lifestyles have changed in favor of health benefits. About 7 per cent of the milk required to make fermented dairy products is produced in India **[87]**. Milk is regarded as a nutritious food with numerous health advantages. Proteins, fatty acids, vitamins, and minerals that are abundant in dairy products are needed for maintaining healthy blood, the nervous and immunological systems, eyesight, muscle and nerve function, healthy skin, energy levels, and growth and repair in all areas of the body. Additionally, these items can enhance health or wellbeing, and when taken in the correct amounts, they provide advantages such as boosted immune system performance, lowered cardiovascular risk, lowered possibility of bone mass loss, and defence against free radical damage **[42, 61, and 102].**Fruits come in a variety of forms, including fresh, dried, powder, liquids, puree, pulp, fiber, and extract, giving food manufacturers the opportunity to enhance

the nutritional value of their creations**[85,83, 88, and 84].**Studies have been done on adding these products or their by-products to dairy products such as yogurt, ice cream, and cheese. In India, the yogurt market expanded at a CAGR (Compound annual growth rate) of 28.9 per cent between 2011 and 2015.*Lactobacillus delbrueckii*spp., *bulgaricus*and *Streptococcus thermophilus*work together to ferment lactic acid to produce yogurt, a fermented dairy product. Lactic acid produced as a result of this reaction with milk protein enhances the product's distinctive texture and sensory qualities **[91].**Yogurt is likewise a good source of protein, fat, calcium, potassium, and vitamins B(B_1, B_2, B_6, nicotinic and pantothenic acids) **[45 and 46].**Due to their desired functional qualities, such as their capacity to bind water, gel, and thicken, certain fruits and vegetable powders have been suggested as suitable stabilizers for yogurt. Besides, passion fruit by-products **[38],**apple pomace**[51 and 104]**, date fiber**[47],**apple, wheat, bamboo and inulin fibers**[99],**carrot juice **[38],**orange fiber**[39],**and pineapple peel and pomace powders **[82]** confirmed to improve the structure and decrease the syneresis of yogurts. Fiber-rich fruit powder may have functional qualities in addition to its nutritional value, such as the ability to hydrate after eating, absorb fat, and have viscosity and texture qualities **[36 and 84]**. Apple fiber was added to yogurt production to enhance the a* and b* values while decreasing the lightness (L*) value**[34 and99].**Orange fiber (0%, 0.6%, 0.8%, and 1% doses and different fiber sizes) obtained from orange juice by-products was added to yogurt **[39].**

2.1 Nutritional value of yogurt

Yogurt's nutrient profile is determined by the nutritional makeup of the milk it is made from, which is influenced by a variety of variables, including genetics and the individual mammal's variations in feed, lactation stage, age, and environmental factors things as the time of year and the season.

2.1.1 Vitamin B

Dairy products are typically regarded as a great high-quality protein, calcium, potassium, phosphorus, and other minerals the vitamins B niacin, riboflavin, and vitamin B_3; magnesium; and zinc; B_6 and B_{12} are vitamins**[25]**. A considerably higher vitamin loss than of minerals might happen when making yogurt because vitamin sensitivity to changes in environmental circumstances is greater, compared to minerals. The vitamin content of yogurt might vary depending on the bacterial cultures utilized during the fermenting process.Vitamin B are necessary for the development of LAB species; however, some Cultures can produce

vitaminB synthetically **[25].** Here's one Vitamin B_{12} is a kind of vitamin B that LAB uses **[79 and 93].** The range of vitamins needed for the development of LAB cultures strains from one. It is possible to restore significant vitamin B_{12} deficits, by the prudent application of additional LAB cultures that are able to produce vitamin B_{12} from scratch **[56]**. VitaminB folate is the finest illustration that some LAB species produce **[57 and 31].** Depending on the types of bacteria Yogurt's folate level might vary significantly depending on how it's consumed, from 4 to 19 g/100 g **[93].** The primary folate form found in milk is5-methyl-tetrahydrofolate **[106].** Recent research involved bacterial isolates, from a variety of species used in yogurt and milk fermentation. The ability of production to synthesize or make use of folate **[31].** Folate was produced by *S. thermophilus*, *Bifidobacteria*, and *Lactobacilli*, whereas it was depleted from the milk medium by *Lactobacilli*. The final fermented product's ultimate folate content increased thanks to the mixture of folate-producing microorganisms. Further research on the impact of variations in milk's vitamin B level on fermentation would be extremely useful.

2.1.2 Lactose

Dishes cooked using dairy components and dairy products are the only sources of lactose disaccharides in human diets. Lactose is degraded by the digestive tract before being absorbedgalactosidase (lactase) into glucose and galactose with a brush. These monosaccharides are ingested and utilized as fuel. Prior to fermentation, the yogurt mixture's lactose concentration typically is 6 per cent**[29].** One prominent bacteria-related illness is the fermentation process involves a shift called hydrolysis. To its absorbable monosaccharide, converting 20–30 per cent of the lactose disaccharide galactose and glucose as constituents **[23].**Additionally, some lactic acid is produced when glucose is consumed. Contingent upon others this hydrolysis lowers the lactose concentrations after the addition of components. Compared to milk, which partially explains why yogurt is better tolerated than milk by those with lactose intolerance **[81 and 58].**However, it also appears that additional elements are involved. For instance, subjects with lactose intolerance showed improved tolerance for yogurt with a disproportionately large quantity of lactose compared to milk with the same volume quantity of lactose **[81 and 58].**Another illustration is when bacteria in yogurt, like *L. Bulgaricus* and *S. thermophilus* functional expression of the enzyme that digests lactose is called lactase **[43].** This statement may also lead to increased lactose tolerance in yogurt than in milk by those who have lactose maldigestion**[58].**

2.1.3 Protein

Commercial yogurt often contains more protein than milk because non-fat dry milk is added during processing and concentration, which raises the protein level of the finished product. As bacterial pre-digestion of milk proteins in yogurt may occur **[93 and 78],** it has been proposed that protein from yogurt is easier to digest than protein from milk. This claim is confirmed by data showing that yogurt contains more free amino acids than milk, particularly proline and glycine. Proteolytic enzymes and peptidases continue to function throughout the yogurt's shelf life. Consequently, the focus of the amount of free amino groups doubles during the first 24 hours, then doubles once again during the next 21 days,preserving at 7 °C**[59].**The ability of some bacterial cultures to possess more proteolytic activity than other organisms. For instance, *L. bulgaricus* it was discovered that has significantly greater proteolytic activity. Then *S. thermophilus* during the fermentation and storage of milk was seen by increased levels of peptides and free following milk fermentation, amino acids **[17].** Casein coagulates more finely during fermentation as a result of both heat treatment and acid generation, which may also help explain why yogurt has a higher protein digestibility than milk. Due to the fermentation process' remarkable preservation of milk proteins' nutritious content, yogurt's and milk's proteins both have outstanding biological qualities **[48]**. Yogurt's casein and whey proteins are both abundant suppliers of all nine necessary amino acids, and studies have shown that the intestinal availability of nitrogen is high (93%)**[20 and 41]**.In research including human participants, **[40]**discovered that while both milk and yogurt's proteins were quickly degraded after consumption, the gastroduodenal transfer of dietary nitrogen was slower with yogurt than with milk.

2.1.4 Lipids

Additionally, during the metabolic transformation of milk fat, fermenting procedure. Free fatty acids are released in small quantities, in response to lipase activity **[29]**due to the fact that most yogurts both low-fat and non-fat products are offered for sale in the United States. Little is added by lipid hydrolysis to the characteristics of most yogurt-related goods. Yogurt, however, has been demonstrated to have greater milk from cows that have higher concentrations of conjugated linoleic acid (CLA), a long-chain biohydrogenated derivative of linoleic acid, which processed the yogurt **[95]** an item made from fermented milk dahi, an Indian food, has likewise been demonstrated to have greater compared to non-fermented dahi, conjugated linoleic acid content **[5].** The principal sources of conjugated linoleic acid in our diets come from ruminant animal products, which bacteria in the rumen produce conjugated

linoleic acid.According to reports, conjugated linoleic acid has immunostimulatory and anticancer properties **[111]**. In a current breast and colon investigation, **[54]** showed that the anticarcinogenic characteristics of conjugated linoleic acid may result from some conjugated linoleic acid isomers' capacity to prevent the progression by inhibiting the expression of cyclins G1 to S phase of the cell cycle. Additionally, conjugated linoleic acid caused the expression of the p53 tumor inhibitor.

2.1.5 Minerals

Yogurt is a great source of calcium and phosphorus in addition to being a healthy source of protein. The role calcium plays in the mineralization and development of bones is one of its main functions. During periods of development, pregnancy, and nursing, more calcium is needed. However, women who can have children generally consume less calcium than is advised **[21]**. Additionally, during the years after menopause, women's calcium consumption typically declines even further **[37]**. For postmenopausal women, who are more susceptible to osteoporosis and bone loss, this is particularly crucial. In the rat model, calcium retention was higher when rats had a diet where lactose made up half of all the carbs, they consumed than when they consumed a control diet **[53]**. According to **[89]**, who used rat models to study the impact of dairy products on mineral absorption, lactose improves the absorption of calcium, magnesium, and zinc. The bioavailability of several minerals may be significantly impacted by yogurt's lower lactose level than milk, however, the impact is probably minimal. Yogurt's pH is acidic, which ionizes calcium and makes it easier to absorb intestinal uptake of calcium **[24]**. Yogurt's low pH might also diminish the inhibition of calcium absorption by dietary phytic acid bioavailability. Intestinal regulation is significantly influenced by vitamin D, taking in calcium. The saturable, active, transcellular the proximal jejunum and the duodenum's pathway of calcium absorption need the vitamin D-dependent calcium-binding protein calbindin-D **[69]**.

3. Fruits

Table 1 reports the impact of fruits on several attributes of specific dairy products. The information in this table displays the physicochemical characteristics of yogurt products that contain fruit and vegetable powder. In conclusion, adding fruits and vegetables to cheeses, ice creams, and yogurts results in functional dairy products with excellent nutritional benefits and acceptance. Dairy products are widely consumed, therefore enriching them will

successfully reduce or prevent illnesses linked to nutrient shortages**[42].**Protein, fatty acids, calcium, potassium, and vitamin B are abundant in dairy products, while iron, vitamin C, carotenes, and dietary fibers are lacking**[26, 27, and 46]**. The nutritional value and functional food qualities of these products will thus be enhanced by the addition of fruits, vegetables, and their by-products to cheeses, ice creams, and yogurts. The antioxidant molecules in fruits and vegetables that are thought to be the most naturally occurring include vitamins, polyphenols, and carotenoids. Compared to the artificial additions in dairy products, these natural chemicals can offer greater sensory, nutritional, and antioxidant qualities **[26].**

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Table 1Sensory evaluation of apple pomace and date fiber base yogurt

Dairy product	Fruit	Appearance	Color	Flavor	Consistency	Overall acceptability	References
Yogurt	Apple pomace : 2.5%	7.2	6.5	7.4	7.6	7.3	**(51)**
Yogurt	Date fiber: 1.5%	6.2	6.3	6.1	-	6.8	**(47)**

3.1 Mango

According to literature, mangoes [*MangiferaIndica Linn*(family Anacardiaceae)], a well-known fruit from the tropics, began on the Indian subcontinent before moving elsewhere and gaining popularity globally. India, China, Thailand, and Mexico are currently the leading mango growers and exporters **[8 and 92]**. 15 per cent of mango's calories come from carbs, 1 per cent from dietary fiber, 38 per cent from fat, and 82 per cent from protein **[70 and 35]**. The mango's leaves, fruits, stem bark, heartwoods, and roots are all rich sources of mangiferin**[50 and 1]**. Mangiferin, a crystalline powder with a light-yellow tint, has a low solubility in ethanol, a moderate solubility in methanol, a negligible solubility in water, and is nearly insoluble in diethyl ether, acetone, and n-hexane**[2].**Mango pulp is the primary and most immediately digestible component. accounts for mango pulp 50 to 60 percent of the weight of the entire fruit, and is used to make a variety of goods, including jam, puree, juice, and nectar. Numerous beneficial and nutritive substances may be found in pulp. The dairy and beverage industries employ mango pulp as a flavoring additive and in formulas for infant

food. With an annual growth rate of 5 per cent, the market for items connected to mangos is expanding consistently**[10 and 11]**. The World Health Organization (WHO) advises the 400 g of fruits and vegetables every day is recommended since their nutrients might chronic conditions include diabetes, cancer, heart disease, and obesity **[7]**. Excellent bioactive substances found in the mango pulp include phenolic acids, polysaccharides, sterols, alkaloids, and carotenoids (provitaminA, 3894 IU/100 g). Mango is a part of the TRAMIL list(a research project on medicinal plant resource in the Caribbean) because it is utilized by the native population to cure ulcers, gastritis, diarrhea, and fever**[80]**.

3.2 Apple pomace

Apple seeds are found in pomace, which most of the fatty acids found in apples, mostly as the (18:2 n-6) linoleic acid and the (18:1 n-9) oleic acid**[19].** Studies have shown that linoleic acid is an important fatty acid indicating that it lowers the chance of developing atherosclerosis, lowers body fat, and improves poor glucose tolerance and fat accumulation**[68 and 73].** Carbohydrates make up around 14 per cent of the nutritional makeup of apples **[9].** The apple pomace consists of more carbohydrates per serving than apples. Because the sucrose level in apple pomace varied greatly apple cultivars differ greatly in terms of sugar content**[9 and 75]**. Fructose and glucose make up a sizable portion of the total carbohydrates in both apples and apple pomace**[19 and 9].**Apple pomace presumably contains more fructose and glucose than apples because of the addition of the seeds that contain sugar (Table 2).

Table 2 Comparison of the nutrient composition of whole apples versus apple pomace

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Constituents (fresh weight)	Whole apple[a]	Apple pomace[b]
Fat	0.16-0.18	1.1-3.6
Protein	0.24-0.28	2.7-5.3
Total carbohydrates	13.81	44.5-57.4

Fructose	5.8-6.0	44.7
Glucose	2.4-2.5	18.1-18.3
Total fiber	2.1-2.6	4.4-47.3
Insoluble fiber	1.54	33.8-60.0
Soluble fiber	0.67	13.5-14.6
Pectin	0.71-0.93	3.2-13.3

Source: **[9, 19 and 75]**

Few research has looked into the advantages of for one's health despite preclinical research showing positive benefits on lipid metabolism, body weight, gastrointestinal health, glucose management, and antioxidant activity, many still consume apple pomace**[19].**

4. Herbs

Herbs have been utilized as medicine and preservatives as well as culinary flavorings from the dawn of time. Diet habits and illness prevention are closely related; research has demonstrated how food affects conditions including diabetes, obesity, osteoporosis, hypertension, and cardiovascular disease**[6].**With the advent of fortified foods, there is an increase in health awareness and interest in using herbs as valued food additives in dairy and food products around the world **[12].**India is the world's greatest supplier of medicinal herbs and is known as the "Botanical Garden of the World"**[64].**According to a World Health Organization survey, between 70 and 80 percent of the world's population rely on complementary and alternative medicine, primarily herbal sources, for their primary healthcare **[28].** More than 60 percent of people worldwide and 80 percent in developing nations directly depend on plants for their medical needs**[96].**

4.1 Ashwagandha (*Withaniasomnifera*)

Winter cherry or Indian ginseng are other names for ashwagandha. One of the most revered medicinal plants, utilized for ages in Indian Ayurveda. It is a member of the Solanceae family

and is cultivated in India, Africa, and the Mediterranean. Ashwagandha is regarded as a vitalizer, adaptagen, and possesses antioxidant effects in addition to enhancing the capacity to tolerate adversities. Ashwagandha contains antistress compounds called sitoindosides and acylsterylglucosides. Alkaloids, flavonoids, and steroidal lactones are present in ashwagandha, which gives it its unique properties. Most alkaloids—nicotine, sominie, somniferin, somniferinine, withanine, withanonine, withanolides, etc.—are found in their root. The plant's roots have hypotensive, bradycardic, anticancer, respiratory stimulant, and immunostimulantproperties **[62 and 101].**

4.2 Arjuna (*Terminalia arjuna*)

Terminalia arjuna Wight &Arn is anevergreen and deciduous plant, a member of the Combretaceae family of trees. It is widely distributed in South Bihar, including all of Uttar Pradesh's Indo-Sub-Himalayan regions, near ponds and rivers are Madhya Pradesh, Delhi, and the Deccan area. It is also present in the jungles of Mauritius, Myanmar, and Sri Lanka. Ithas antioxidant and free radical scavenging capability, activity brought on by the presence of higher phenolic and flavonoid compounds content **[98].** The plant has a lot of natural antioxidants, so has application in both Yunani and Ayurvedic medical systems. It is claimed to have styptic, anthelmintic, and alexiteric qualities tonic and beneficial for urine discharges, cardiac conditions, fractures, anemia, tumor, asthma, biliousness, ulcers, excessive sweating, etc. Phytochemicals derived from *Terminalia arjuna* are regarded as one of the greatest cardiac supplements for a strong cardiovascular system. This herb's sitosterol decreases blood serum cholesterol levels via preventing the absorption of cholesterol.The participating elements there include tannins, triterpenoid saponin, Flavonoids, Gallic acid, ellagic acid, Calcium, magnesium, zinc, phytosterols, Oligomeric ProanthoCyanidines (OPCs), and copper, too**[74 and 94].**

4.3 Sage (*Salvia triloba*)

The dried leaf of a mint family plant is sage. The Sage leaves plants are well recognized for their anti-inflammatory and anti-oxidative qualities. The primary anti-oxidants in sage include carnosic acid, rosmadial, rosmanol, and epirosmanol in addition to carnosol as well as methylcarnosate**[33].**

4.4Cinnamon(*Cinnamomumverum*, synonym *C. Zeylanicum*)

Many ancient societies have long employed the plant cinnamon. They are tiny evergreen trees from the Lauraceae family native to South India and Sri Lanka. Along with being utilized as a Cinnamon is a spice and flavoring agent that is used in some foods for mouth-freshening outcomes**[52].**Cinnamon's essential oils have antifungal, antidiabetic, antibacterial, and antioxidant **[55].** Cinnamon demonstrates a full-spectrum antibacterial activity against food-borne microorganisms such as *E. Coli*, *S. Aureus*, *Salmonella typhi*, *Salmonella paratyphi A*, *Bacillus licheniformis*, and *Pseudomonasfluorescens***[4 and 67].**They exert inhibition also toward fungus strains. The Lowestprohibitory for cinnamon essential oil, concentration (minimum inhibitory concentration) readings varied from 1.25 to 5.0per cent**[49].**

4.5Peppermint (*Menthapiperita*)

A peppermint plant may reach a height of 2 to 3 feet. Fragrant dark green on either side of white blooms is leaves. The European native of peppermint a native species from Europe and Asia that thrives in wet, temperate regions various kinds are native to South Africa, South Australia, and America. The menthol-containing leaves and stems a volatile oil, are utilized in food flavoring and medicine**[22].** It is soothing and numbing in treating nausea, itchiness on the skin, headaches, digestive issues, menstruation cramps, flatulence, and stress related to depression. The primary ingredients menthol and methyl salicylate in peppermint has relaxing, antispasmodic, and anticonvulsant properties on the stomach and intestines**[14].**

4.6Aloe vera (*Aloe barbadensis miller*)

There are two primary parts of aloe vera leaves: the 1,8-dihydroxyanthraquinone-rich green skin derivatives, their glycosides, as well as the morerich pulp that is colorless containing complex carbs. Like parenchyma, mucilaginous jelly is called pulp or gel of aloe vera.This gel contains 95-99 per cent water, along with proteins, lipids, amino acids, and vitamins. In addition to carbohydrates, there are tiny organic molecules, inorganic chemicals, and enzymes. Several biological processes, including an antibacterial diuretic, radiation shielding, antioxidant, anti-inflammatory hypoglycemic as well as anti-tumor, anti-diabetic, and anti-allergic, the following effects: wound healing, immunomodulatory, and gastroprotective this plant gel is responsible**[32].**

4.7 Tulsi *(Ocimum sanctum Linn)*

Ocimumtenuiflorum, often known as holy basil, tulasi (sometimes written thulasi), or tulsi, is a fragrant perennial plant in the Lamiaceae family. Its synonym is *Ocimum sanctum*. Its original habitat is the Indian subcontinent, and it is widely farmed across the tropical regions of Southeast Asia. Tulasi is grown for its essential oil as well as for use in religion and purported traditional medicine. It has a role in the Vaishnava tradition of Hinduism, where adherents perform worship using holy basil plants or leaves, it is extensively used as herbal tea and frequently utilized in Ayurveda **[76].**The plants of the genus *Ocimum* that are members of the family Labiatae are particularly significant because of their therapeutic potential among plants that are known to have medicinal value. Tulsi (*Ocimum sanctum L*), RamTulsi(*Ocimumgratissium*), DulalTulsi(*Ocimumcanum*), Ban Tulsi(*Ocimumbasilicum*), *Ocimum kilim* and *scharicum*, *Ocimumammericanum*, *Ocimumcamphora*, and *Ocimummicranthum* are a few examples of well-known major species of the genus *Ocimum* that grow in various locations of the world. The tall, softly hairy, scented plant or undershrub *Ocimum sanctum L.*, often known as "Tulsi" in Hindi and "Holy Basil" in English, may be found growing all across India. Tulsi is frequently grown in gardens. Two different kinds of *Ocimum sanctum L*. are grown in cultivation: the Sri Tulsi plant, which has green leaves, and the Krishna Tulsi plant, which has purple leaves. *Ocimum sanctum L.* is revered by Hindus and is regularly used as a medicinal plant in Indian homes to treat a variety of illnesses **[72 and 77].**

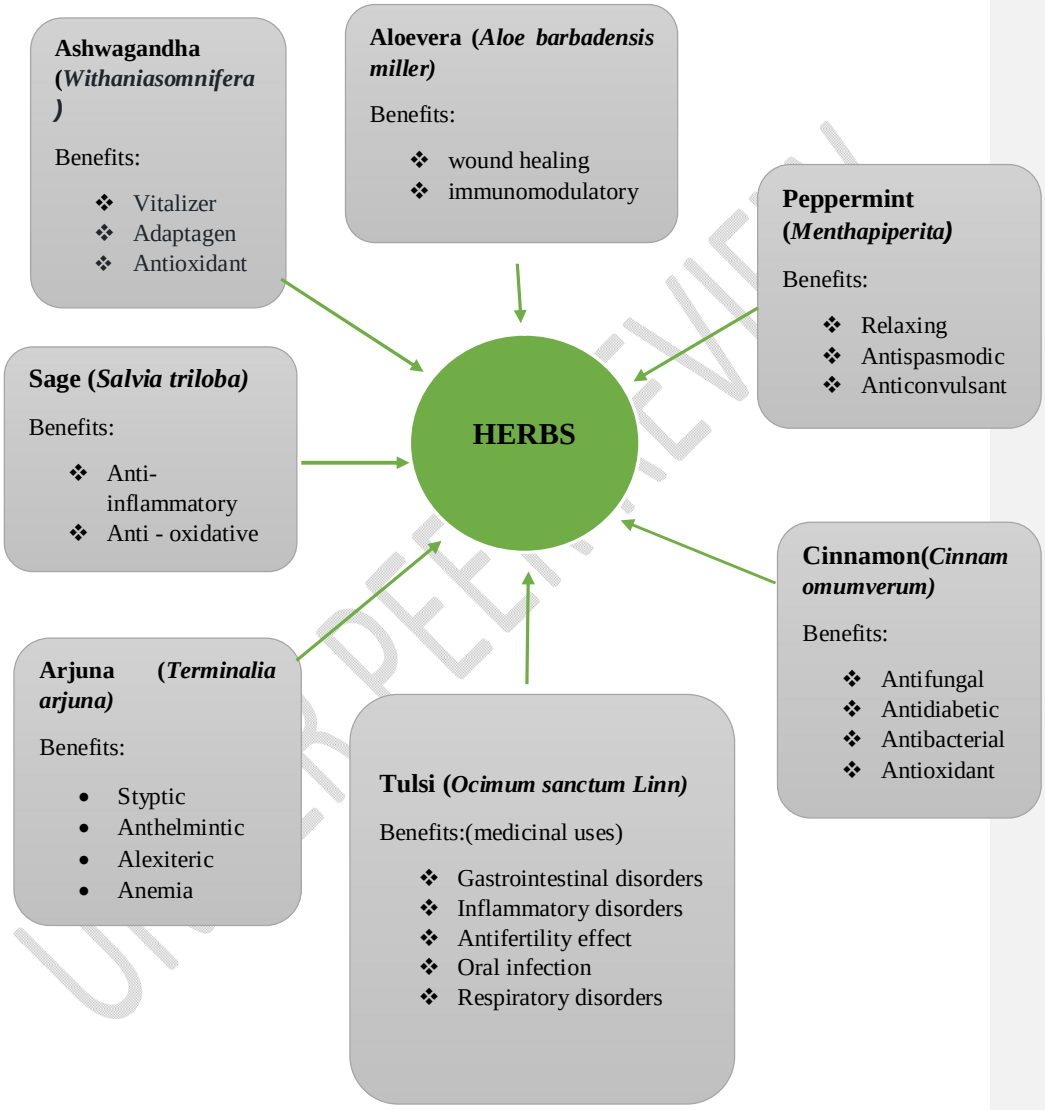

Figure: 1 Benefits of herbs

Source: 4.1 to 4.7 above information

4.7.1 Medicinal uses of tulsi

4.7.1.1 Gastrointestinal disorders

Patients with gastrointestinal and hepatic diseases are administered an aqueous solution of Tulsi leaves **[77 and72].** Herbal formulations comprising *Ocimum sanctum L.* have been put out as potential treatments to reduce the duration of the disease, clinical symptoms, and biochemical markers in viral hepatitis patients. Effective in boosting the GI tract's peristaltic motions. It aids in enhancing appetite. The juice of freshly picked tulsi leaves is often administered to patients to treat persistent fever, diarrhea, bleeding, and dyspepsia**[77 and 72].**Tulsi leaves also control vomiting and have been used as an anthelmintic. Tulsi has reportedly been shown to reduce gastric secretion and ulceration in albino rats **[90 and63].**

4.7.1.2 Inflammatory disorders

Tulsi blocks the enzymes in our systems that cause inflammation and are responsible for pain and other symptoms of inflammation. Tulsi has similar anti-inflammatory properties as ibuprofen, naproxen, and aspirin. Even better, tulsi improves adrenal function by reducing cortisol levels. As a result, the harmful effects of stress are diminished. Tulsi is very good in preventing any edoema from developing in the body. It helps treat any form of edoema in the body by improving blood circulation throughout the body **[44].**

4.7.1.3 Antifertility effect

The *Ocimum sanctum L.* leaf.allegedly have an abortifacient effect on females. *Ocimum sanctum L.* has an antifertility impact as well. One of the main components of Tulsi leaves, ursolic acid, is thought to have an antifertility impact on male mice and both sexes of rats. Because of its anti-estrogenic activity, ursolic acid inhibits spermatogenesis and lowers sperm counts**[16 and 66].**

4.7.1.4 Oral infection

Common mouth infections can be effectively treated with tulsi leaves. Additionally, chewing a few leaves helps keep your mouth healthy. The plant contains the antibacterial compounds carracrol and tetpene. A similar effect is also achieved by the sesquiterpene b-caryophyllene.

Tulsi naturally contains this ingredient, a food additive that has been authorized by the FDA**[3].**

4.7.1.5 Respiratory disorders

The common cold can be effectively treated with tulsi. Bronchitis, bronchial asthma, influenza, coughing, and colds can all be treated with a decoction of the leaves made with honey and ginger. The combination of leaves, cloves, and common salt in a decoction can also provide quick relief for influenza patients. Tulsi is a key component of several Ayurvedic expectorants and cough syrups. It is quite good for maintaining a highly healthy respiratory passageway since it aids in the mobilization of mucus in bronchitis and asthma. Tulsi leaf chewing improves cold and flu symptoms. When you have a sore throat, you should drink water that has been boiled with Tulsi leaves. Additionally, gargles can be made using this water**[90 and 65]**.

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