ACTA
BOTANICA *PLANTAE*

Acta Botanica *Plantae* : 18–30 (2022)
http://www.actabotanica.org/

REVIEW ARTICLE

Allium cepa: A Treasure Trove of Therapeutic Components and an Asset for Well-Being

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Received 07 April 2022 | Revised 25 June 2022 | Accepted 02 July 2022 | Available Online July 10 2022

Citation: Nikita Nagpal, Pushpa C. Tomar, Natasha Baisla (2022). *Allium cepa:* A Treasure Trove of Therapeutic Components and an Asset for Well-Being. *Acta Botanica Plantae.* V01i01, 18-30. DOI: http://dx.doi.org/10.5281/zenodo.7099135

ABSTRACT

Allium cepa is one most common and utilized vegetables which can be cultivated throughout the world and are used both as a vegetable and for flavoring. The species belongs to the Liliaceae family and is known to be high in vitamins and minerals. Despite being used in nutrition on a large scale, it has been demonstrated to have a variety of advantageous impacts. It contains a high concentration of phytochemicals which helps in the prevention of several diseases. It plays a major role in preventing obesity, diabetes, and cancer. It has also shown positive effects in maintaining health. Onions play a significant role in the n cosmetic industry. It helps in minimizing the loss of hair, restoring and nourishing eyes, skin, and ears for a longer life span. The focus of this review article is to elaborate categorization of Allium cepa, its nutritional effects on human health, use of onions in the cosmetic industry.

Keywords: *Cosmetics, Flavonoids, Nutrition, Onions, Phytochemicals, Quercetin, Vitamins.*

INTRODUCTION

Onions belong to the Liliaceae family and are one of the most often utilized vegetables. It is the most frequently farmed species Genus *Allium*. These crops typically grow in all climatic situations and are consumed globally. Onions commonly found have flower stalks with no leaves that can reach a height of 2.5-6 feet. Short stems of onion plants contain greenish-blue, juicy, fleshy leaves. Bulbs, which are found near the plant's base, store nourishment to allow the plant to survive in a variety of hostile conditions. The thin, black seeds of the onion plant are used to grow the majority of commercially grown onions [1]. Some of the common varieties are red, white, green, yellow, sweet onions, shallot, and leek. Onions have a strong, pungent flavor, smell as well as a very robust taste. The onion bulb, followed by onion leaves, is the most consumed portion of the onion. An edible onion bulb can get as big as ten centimeters in diameter. Onion is known to include sulfur amino acids, as well as a variety of vitamins and minerals. Onions are grown in almost every temperature zone on the planet, from tropical to cold temperate areas. Onions have long been recognized not only for their culinary value but also for their medicinal benefits. According to Food and Agricultural organization reports. China tops the list with 23,849,053 tonnes produced, followed by India with 19,415,425 tonnes, and the United States with around 3,000,000 tonnes [2].

The global onion production per year is approximately 98 million tonnes, with India ranking second with 19 million tonnes of annual production (Food and Agriculture Organization-stat, 2019). Onions are utilized both as a vegetable as well as for flavoring purposes. Vegetables can be used raw and cooked. Blossoms and leaves can be utilized for culinary

purposes.

Almost all cultural diets use onion as a food and spice. Furthermore, extracts of onions can be used to produce a different range of products for Example juice or powder in a dehydrated form which can also be consumed as flavoring meals [3]. The presence of anti-cholesterolemic and bacteriostatic capabilities in onion extracts is particularly effective against Helicobacter pylori, a bacteria that causes gastritis and increases the risk of stomach cancer [4]. Also, onions contain cardioprotective anti-fungal and anti-cancer such as quercetin and kaempferol. It also helps in the treatment of digestive issues, and metabolic diseases, to prepare internal and external preparations, and prevention of insect bites [5]India. The information was obtained through open and semi-structured face-to-face interviews with the local knowledgeable people and professional traditional healers. The statistical analysis, use value, family use value, informants' consensus factor, fidelity level, frequency of citation, relative frequency citation and informants' agreements ratio were calculated for the quantitative study of ethnomedicinal data. Results A total of 118 plant species belonging to 95 genera and 55 families dominated by the families like Leguminosae, Asteraceae and Lamiaceae were enumerated with detailed information on parts used, method of preparation, mode of administration and ailments treated. Leaves were mostly used plant part and predominantly used herbal preparations were decoction and paste. Moringa oleifera Lam. was reported by all the interviewed informants and gives the highest UV of 3.9 with 78 use reports due to its diverse medicinal uses. Conclusion The present study demonstrated the need for importance of documenting the traditional knowledge of forest dwelling people. As a result of the study, Abutilon indicum (L..

Unique categorization of *Allium cepa*

Allium cepa is a plant that belongs to the kingdom Plantae. Magnoliophyta is the name of the division. The class name is termed Magnoliophyta. The family name is Alliaceae. Onions belong to the genus Allium. The edible parts are flowers, seeds, roots, and leaves. Onions have beneficial effects on fainting, dysmenorrhea, migraine, keloids, treat bruises, jaundice, and pimples, and also have properties such as carminative, expectorant, anthelmintic, aphrodisiac, etc. [6]. Flavonoids and alkenyl cysteine sulphoxides are two chemical groups common in *allium cepa* that have health benefits for humans [7]. Onions also contain allylsulfides and flavonoid, which have antioxidative properties and may prevent hepatocyte apoptosis; they also contain steroid saponins and sapogenins, including-chlorogenin, a typical steroid sapogenin. Organosulfur compounds, such as Ajoene, DATS, diallyl disulfide (DADS), and sallylmercaptocysteine (SAMC), are other *Allium cepa* components that have a cell cycle arresting impact in cancer cells [8]we assessed whether ANG II via its AT 1 -receptor enhances sPLA 2 -IIA-dependent lipid peroxidation in vitro and in patients with CAD. Stimulation of rat aortic smooth muscle cells with ANG II (10 -7 mol/L.

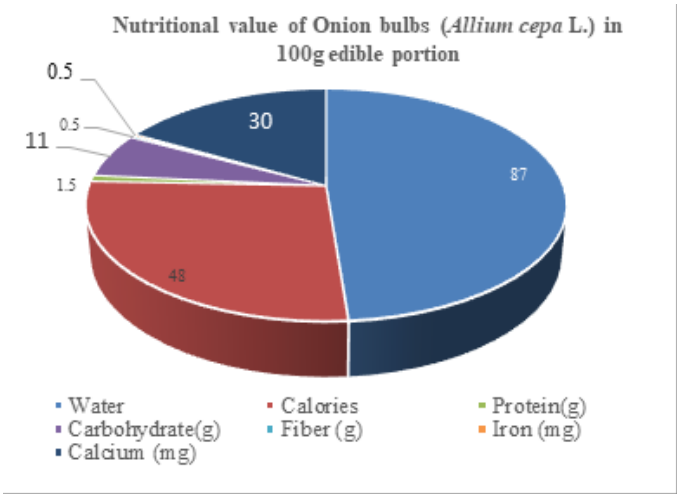

Figure 1 Nutritional value of onion bulbs.

Information source: [9]

Phytochemical Constituents

Onion contains a variety of phytochemical substances, including flavonoids, sulphur, and seleno compounds. Onions are also called herbal plants, and because they give a variety of health benefits, they are utilized in cosmetic products such as shampoo, antibacterial cream, gels, soaps, and many more. Onions are high in vitamins that are beneficial to our skin and assist to maintain it healthy and radiant. It also possesses antibacterial characteristics, which are the main reasons why onion is used for skin treatment. Onion includes vitamins A, C, and E, which keep our skin from aging prematurely. Vitamin C is one of the vitamins that contribute to the radiance of our skin. Onion's antibacterial properties protect the skin from acne and other bacterial infections. Onions are commonly utilized in anti-aging skin care. It contains vitamins A, C, and E, all of which have anti-aging properties. It also contains quercetin, one of the most potent antioxidants that preserve our

DOI: http://dx.doi.org/10.5281/zenodo.7099135

skin wrinkle-free. Onion's sulphur and vitamins also aid to keep the skin moist and elastic. Onion's sulfur-rich phytochemicals also aid in anti-aging. Onion is excellent for acne-prone skin. Onion's antimicrobial, antibacterial, and anti-inflammatory properties make it an excellent natural acne treatment. It is also a strong antiseptic that protects our skin from acne-causing germs and other skin problems. Onion juice is well-known for its ability to erase dark spots and pigmentation from the skin. Onion juice contains vitamin C, which aids in the removal of dark spots and pigmentation. Furthermore, the phytonutrients and antioxidants found in onion nourish the skin and remove pollutants. Onion has blood purifying properties, which aid in skin lightening by removing toxins and impurities from our bodies. Aside from that, the antioxidant components found in onions help to maintain our skin young and healthy. Furthermore, the phytonutrients, flavonoids, and phytochemicals in onion help to improve our skin tone and make it soft and radiant.

Table1: Different components present in *Allium Cepa* [10].

COMPONENT	MEAN VALUE
VITAMINS	
Thiamin (mg)	0.046
Niacin (mg)	0.116
Riboflavin (mg)	0.027
Vitamin E (mg)	0.02
Vitamin K (µg)	0.4
Vitamin C (mg)	7.4
Choline (mg)	6.1
Betaine (mg)	0.1
Lutein+zeaxanthin (µg)	4
Vitamin A(IU)	2
Pantothenic acid (mg)	0.123
Folate (µg)	19
Vitamin B6 (mg)	0.12
β-Carotene (µg)	1
Minerals	
Potassium (mg)	146
Phosphorous (mg)	29
Calcium (mg)	23
Magnesium (mg)	10
Iron (mg)	0.21
Selenium(µg)	0.5
Copper(mg)	0.039
Zinc (mg)	0.17
Manganese(mg)	0.129
Sodium (mg)	4
Proximates	
Energy(kcal)	40
Water(g)	89.11
Fructose(g)	1.29
Protein (g)	1.1
Dextrose (g)	1.97
Lipids (g)	0.1
Sucrose(g)	0.99
Sugar total (g)	4.24
Ash(g)	0.35
carbohydrates(g)	0.34
Fiber(g)	1.7
Lipids	
Phytosterols (mg)	15
Myristic acid (g)	0.004
Total Polyunsaturated acids (g)	0.017
Total monosaturated acids (g)	0.013
Linolenic acid (g)	0.004
Oleic acid (g)	0.013
Linoleic acid (g)	0.013
Stearic acid (g)	0.004
Palmitic acid (g)	0.034
Total saturated acids (g)	0.042
Amino acids(g)	
Tryptophan	0.014
Serine	0.021
Threonine	0.021
Proline	0.012
Isoleucine	0.014
Glycine	0.025
Leucine	0.025
Lysine	0.039
Methionine	0.002
Cysteine	0.004
Glutamic acid	0.258
Phenylalanine	0.025
Tyrosine	0.014
Alanine	0.021
Aspartic acid	0.091
Histidine	0.014
Valine	0.021
Arginine	0.104

Nutritional And Health Benefits Of Onion

Allium cepa exhibits great nutritional and health-promoting benefits, it has been utilized in traditional medicine for generations. Onion bulb contains a different percentage of nutrients including calories, water, proteins, Fat (Trace), carbohydrates, fiber, calcium, phosphorous, Iron. Onion has an

immensely complex nutritional profile. The most prevalent vitamin present in onion bulbs is ascorbic acid, which has a concentration 1.0 mg (dry weight). Onions contain saponins [11], which limit cholesterol absorption in the intestine. Onions main storage carbohydrates are fructans (polysaccharides), with fructooligosacharide as the main component. Onions were shown to have the largest amount of fructans in a study conducted by Roberford in 2007 and to have the ability to reduce the bacterial population. Quercetin generated from onion consumption is absorbed and accumulates in human plasma in the form of quercetin conjugate which plays a major role in preventing the oxidation of low-density lipoprotein by scavenging the action of reactive oxygen species. Intake of quercetin from onions results in quercetin conjugate[12], which is absorbed and retained in human plasma and mostly prevents the oxidation of low density lipoprotein by scavenging reactive oxygen species.

Due to quercetin's ability to prevent platelet aggregation, onions have been demonstrated to be effective in lowering the death rate from coronary heart disease [13]. The degree of quercetin and DPPH radical scavenging action rises from the onion bulb's center to its epidermis. Vegetables from the allium family have long been valued for their capacity to combat both gram-positive and gram-negative germs. Several products made with onion extracts have a longer shelf life due to onion's antioxidant capacity and antibacterial action against a variety of microorganisms [14]. Quercetin oxidation products have been shown to have antimicrobial action against Methicillin-resistant, multidrug-resistant *Staphylococcus aureus* and *Helicobacter pylori* [15]. Through the inhibition of fatty acid synthase, they also lessen the proliferation of adipocytes and cancer cells (FAS) [16]garlic, shallots, leeks, chives, and so forth . It prevents excessive heat loss and keeps the body hydrated throughout the hot summer months [17]. It reduces the likelihood of preterm birth, satiety, and hyperglycemia [18]. It has been shown that excessive onion eating lowers the risk of cancer. People who eat a lot of onions have a 50% lower risk of developing gastrointestinal, stomach, and respiratory tract cancers. 58NF-B and MMP-2/-9 signaling pathways are inhibited by onion quercetin, which prevents SAS human oral cancer cells from migrating and invading. An onion hydrophilic ethanolic extract was found to inhibit osteoclast activity while promoting bone formation in a 2003 study. Onion has been shown to be effective in preventing platelet aggregation in several epidemiological studies [19] . Studies on the antithrombotic effects of onions show that their aqueous extracts prevent the production of thromboxane, a key inducer of platelet aggregation [20] .

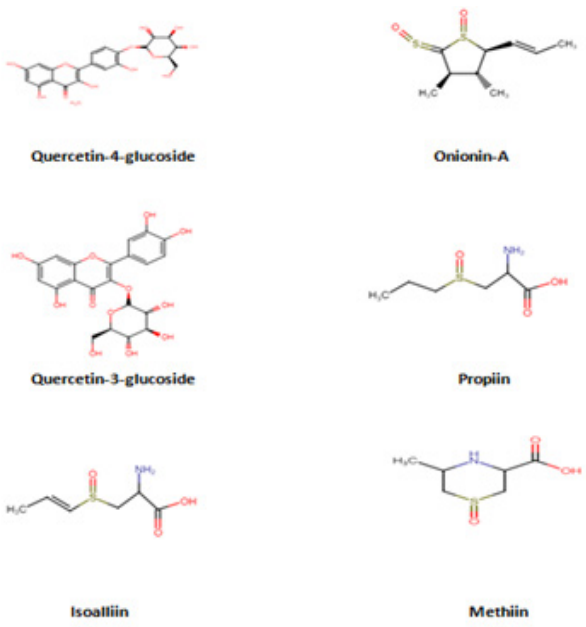

Figure 2 Phenolic compounds present in onion.

Benefits Of Onions In Cosmetics

Onions for skin

Onions are high in sulphur, which is beneficial for acne-prone skin since it helps to dry out the complexion and prevents acne caused by excess oil production in the sebaceous glands. Onions are also abundant in vitamins A, C, and E, which are beneficial to the skin. Retinol, derived from Vitamin A, is regarded as the anti-aging Holy Grail. The active component can boost cell turnover, remove hyper pigmentation, and restore skin equilibrium. Vitamin C acts as an antioxidant and neutralizes free radicals in the skin while also healing and hydrating a dull complexion. Regularly applying fresh onion can benefit for us to get rid of dull skin [21].

The antioxidant properties and vitamin supplements in the vegetable provide skin cells a significant aesthetic boost, resulting in glowing, healthy skin. It also has a photo- and anti-aging impact by shielding the skin from UV radiation and increasing collagen production, which helps minimize the creation of wrinkles and fine lines. According to studies, onion extract can also considerably diminish scars.

The presence of quercetin, a plant pigment that is one of nature's most effective antioxidants, is

DOI: http://dx.doi.org/10.5281/zenodo.7099135

a distinguishing attribute of onions for youthful, glowing skin. Also, it helps in getting rid of blemishes, patches, and pigmentation. The presence of Vitamin C in onions help to cure patches, dark spots, and other skin conditions. Onion juice is high in flavonoids and antioxidants, which aid in the reduction of pimples. Onions are excellent natural cleaners. Cleansers, toners, exfoliants, and masks are commonly used to eliminate pollutants from our skin. Onions also exhibits biological efficacy in pediatric patients for preventing median sternotomy wounds [22]. Its extract has been shown to have a medicinal impact. To treat keloids, a particular variety of human skin fibroblast cell is employed [23]. Onion peel extract has been shown to have biological efficacy in the prevention of hypertrophic scarring and keloid formation [24]. Onions extract gel also protects against presternal hypertrophic scars [25]. It is also utilized in topical treatments to treat and prevent postsurgical hypertrophic scars.

Similarly, Skin hypertrophic scars are treated with *A. cepa*-allantoinpentagly gel, which also enhances the aesthetics of post-surgical scars [27]. as well as burn scars [28] .To remove tattoos, onion extract, heparin, and allantoin gel are employed [29]. The topical application of onion extract is used to heal postsurgical scars. Onion juice is applied to burns and scalds in Africa to protect infection and blistering.

Usage of onion in Hair

Onions are also antiseptic, as well as antibacterial and antifungal. This implies it can prevent scalp infections and fight dandruff. Onions, in their pulp or juice form, help nourish your hair follicles. It also promotes hair growth and health by increasing blood circulation and facilitating keratin synthesis. Hair growth is aided by raw onion. Onions are high in sulphur, which helps to renew hair follicles (a skin organ that produces hair) by increasing blood flow to the head [30].

In addition to sulphur, onions contain antioxidants such as quercetin, Vitamin C, folates-B9, potassium, and fructans, which have anti-inflammatory qualities. This treatment is effective for dandruff, psoriasis, and other scalp disorders. Albumin, alkyl propyl disulphide, allicin and diallyl sulphide make up the majority of an onion's chemical makeup. Additionally, it includes vitamins, magnesium, calcium, zinc, and potassium as well as other minerals. Iron aids in the oxygenation of the body's red blood cells. Onion has a favorable effect on the circulatory system, improving blood circulation and decreasing inflammation, as well as providing the ideal quantity of nutrition to stimulate hair growth [31]. Onion oil helps to prevent hair breakage, split ends, and thinning. Other nutrients found in onions help to keep hair from oxidizing. It also keeps the pH of the hair stable, preventing premature graying. It nourishes your scalp and increases blood circulation, resulting in thicker, stronger hair growth. Onion oil is also beneficial if you want to lengthen your hair; it is a low-cost remedy that will make your hair stronger and healthier, as well as promote rapid hair development. Onion oil nourishes the scalp and can be used as a conditioner before washing your hair. It functions as a natural conditioner, preventing dryness and controlling frizz. Onion oil is well-known for its anti-bacterial and anti-fungal characteristics, which assist to maintain the scalp infection-free and prevent the development of dandruff on the scalp, which is one of the most common causes of hair loss in most cases. Infection-free scalp implies less hair loss and healthier new hair development. Onions are also thought to improve circulation. The blood flow to hair follicles may be improved by applying onion juice to the hair and scalp, resulting in increased hair growth. In 2002, a group of people undertook a study to investigate the hair loss science action. The group that washed their hair with onion juice grew more hair than the group that washed it with tap water. In addition, men tended to benefit more than women [32].

Benefit of onions to eyes

Onions contain vitamins A, C, and E, all of which are important for eye health. Along with these vitamins, onions contain sulphur, which benefits the health of the eye's lens. It aids in the production of glutathione, a protein that acts as an antioxidant. Glaucoma and cataracts are linked to low glutathione levels. Onions contain selenium, which aids in the production of vitamin E in the eyes (which safeguards the eye's cells). Onions, according to study conducted in Iran, can hinder the growth of normal ocular flora. This suggests that onions could be used to treat conjunctivitis and blepharitis, two common eye diseases Onion extracts can also help to prevent formation of corneal haze [33].

Benefit of onions to Ears

A drop of warm onion juice in the ear is supposed

to help reduce earache. To pull pus from abscesses, a baked onion is utilized. Many of the traditional uses for onions are supported by modern scientific study. Onions contain thiosulphinate, a chemical that kills a wide range of bacteria, including *Salmonella typhi, Pseudomonas aeruginosa,* and *E. coli.*

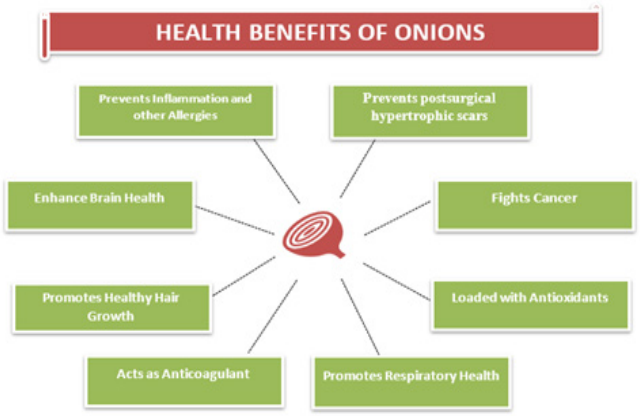

Figure 3 Benefits of onions in cosmetics.

Use Of Onion For Prevention Of Different Diseases

Antioxidant effects

Onions are high in antioxidants. They contain almost 25 distinct flavonoid antioxidants [34]. Antioxidants, or free radical scavengers, are substances that prevent oxidation, which damages cells and contributes to diseases like heart problems, diabetes mellitus, and cancer. Onions are high in flavonoid, organosulphur compounds, and polyphones, all of which have antioxidant properties [35]. Kim and his colleagues used ABTS "2,2′-azino-bis-3-ethylbenzthiazoline-6- sulphonic acid", ORAC "oxygen radical absorbance capacity", and DPPH to characterize the relationship between organosulphur compounds and their antioxidant potential on 3 different onion plants, including Allium ampeloprasum L, *Allium cepa* L, and m Allium Sativum L. Organosulfur compounds were found to be positively linked with antioxidant properties, and the plant variety Allium sativum L. exhibited the highest antioxidant potential of the three plants due to its higher concentration of organosulphur compounds, whereas *Allium cepa* exhibited significant antioxidant activity despite having the lowest concentration of organosulphur compounds [36]. Another study looked at the impact of phenol-rich *A. cepa* on the digestive system, immune system, digestion, and antioxidant activity in 400 broiler chickens. The Phenol rich extracts of *Allium cepa* were given to all the groups (100/ group) of subjects. Due to the high concentrations of flavonoids and phenol in the onion extract, the experiment demonstrated that extracts boosted antioxidant enzyme activities for a period of thirty five days [37]as a feed additive, was evaluated on the growth, carcass traits, behavior, welfare, intestinal histology, amino acid ileal digestibility "AID%," and the immune status of broiler chicks for 35 days. A total number of 400, 1-day-old broiler chicks (45.38 g ± 1.35. Anthocyanins, flavonoid plant pigments that give red onions their dark colour, are found in abundance in red onions. Many recent findings have discovered that people who consume anthocyanin-rich foods have a lower chance of heart disease. A study conducted with more than 42,000 males found that daily consumption of anthocyanin's as high as 612 mg were associated with a 14 percent reduced risk of non-fatal heart attacks [38]which fruits are most beneficial and what key constituents are responsible are unclear. Habitual intakes of flavonoids, specifically anthocyanins and flavanones, in which .90% of habitual intake is derived from fruit, are associated with decreased CVD risk in women, but associations in men are largely unknown. Objective: We examined the relation between habitual anthocyanin and flavanone intake and coronary artery disease and stroke in the Health Professionals Follow-Up Study. Design: We followed 43,880 healthy men who had no prior diagnosed CVD or cancer. Flavonoid intake was calculated with the use of validated food-frequency questionnaires. Results: During 24 y of follow-up, 4046 myocardial infarction (MI. Similarly, according to a study done on 93,600 women, those who ate a diet high in anthocyanins had a thirty two percent lower chance of a heart attack than those who ate the least of it. Also, anthocyanins have been related to lower cancer and diabetes risk [39].

Anti-Inflammatory effects

Inflammation is a biological process that occurs when tissue homeostasis is disrupted [40]. The antioxidants quercetin and kaempferol have been shown to help prevent inflammation [41]. Quercetin present in onion reduces allergy and inflammation whereas typhermide and alfrutamide found in onions affects the COX s activity and lipoxygenases [42]. Onions are high in flavonoids and other compounds that help combat inflammation, lower cholesterol, and lower triglycerides, all of which can help to lower the risk of heart disease. The steam distillate of onion sprouts (freeze dried) has anti-inflammatory and antioxidant properties [43]. Their anti-inflammatory

DOI: http://dx.doi.org/10.5281/zenodo.7099135

properties may also aid in lowering blood pressure and preventing blood clots. Onions contain a high concentration of quercetin, a flavonoid antioxidant. It may significantly minimize heart disease risk factors like high blood pressure because it's an anti-inflammatory. The presence of beneficial components such as tannin, flavonoids, anthocyanin, saponin, and others has been linked to anti-inflammatory activities of Allium species. *Allium cepa* contains flavonoids that can help with oxidative stress, inflammation, and diseases related to thermal and mechanical hyperalgesia. Arachidonic acid, along with its downstream pro-inflammatory prostaglandins and leukotrienes, can be inhibited by thiosulfates and cepaenes found in *Allium cepa*.

Sugar levels, swelling (inflammation), blood cholesterol, and lung constriction have all been shown to be reduced by quercetin, a component of *Allium cepa* [44]. Ajoene, an organic component extracted from Allium, has been found to have anti-inflammatory properties.

Anti-obesity effects

Obesity is defined by the buildup of extra body fat as an outcome of an imbalance between energy intake and expenditure [45]. In 2016, over 650 million people worldwide were diagnosed as obese (BMI >30 kg/m2), according to the WHO database, and over four million people died from obesity-related illnesses in 2017. According to a recent study, obesity increases the risk of COVID-19 concerns in infected patients [46]. Obesity raises the chances of heart disease, hypertension, osteoarthritis, sleep apnea, liver disease, polycystic ovarian syndrome among other disorders [45]. A dose of quercetin-rich onion extract (162 mg per day) was found to lower systolic blood pressure by 3-6 mmHg when compared to a placebo in a study of 70 obese individuals with high blood pressure [47].

To test the anti-obesity properties of onion peel extracts (OPE) high in quercetin, another experiment involving 72 obese and overweight people was conducted. After 12 weeks of consistent administration of 100 mg of OPE capsules, it was observed that body weight (from 70.0 to 69 kg), BMI (from 26.6 3.3 to 26.3 3.2 kg/m2), and waist circumference (from 91.9 7.6 to 89.9 7.7 cm) all decreased significantly. According to the paper, quercetin's antioxidant properties are responsible for these inhibitory effects. Additionally, onions have been demonstrated to reduce cholesterol levels. In a research involving 54 PCOS-afflicted women, consuming a lot of red onions for eight weeks lowered total and "bad" LDL cholesterol (40-50 grammes per day if overweight, 50-60 grammes per day if obese) [48]. Furthermore, animal studies suggest that consumption of onions can reduce heart disease risk factors like high triglyceride levels, inflammation, and blood clot formation [49]. Researchers used rats fed with a high fat diet to evaluate the antiobesity characteristics of onion oil. The weight gain in the HFD rats that had been given onion oil for two months continuously (92.6 mg/kg bw/d) was lower than the weight gain in the rats that had just been given a high fat diet (8.2 0.8 g/d), demonstrating that onion oil has antiobesity characteristics.

Anti-cancer effects

Cancer is the uncontrolled growth of abnormal cells in nearly all of the body's organs and tissues. Cancer is considered to be the second most common cause of death in 2018 according to the World Health Organization. *Allium cepa* contains anticancer and biological properties due to the presence of flavonoids, polyphones, organosulphur compounds, quercetin, and glycosides. Due to their role in activating detoxification enzymes that effectively eliminate cancer-causing chemicals, onions organosulfur compounds shows potent anti-carcinogens in numerous cellular studies and in vivo research [50]. Onions reduce the risk of certain cancers, especially abdomen and colorectal cancers. In a study conducted by 26 researchers, individuals who ate the most Allium vegetables had a 22 percent lower risk of developing cancer than those who ate the least of them [51]the odds ratios were 0.59 (95% confidence interval, CI, 0.25-1.41. Another study including 13,333 individuals discovered that those who consumed a high amount of onions had a 15% lower risk of developing colorectal cancer than those who consumed the least [52]. Also, onions contain onion in A, a sulfur-containing molecule that has been demonstrated in test-tube tests to reduce tumor formation and prevent the spread of ovarian and lung cancer. According to in vitro research, onion extract reduces mutagenesis, alters enzyme and cell signaling pathways, encourages free radical scavenging and death, and has immunomodulatory and other effects on cell and tumour growth [53]. Murayyan conducted a study that revealed onions are extremely effective at killing cancer cells. Onions promote the killing of cancer cells by activating

signaling pathways. They create an unfavorable environment for cancer cells and disrupt cancer cell communication, inhibiting their growth. Another study involved more than 50 breast cancer patients who were randomized into two groups: those who received 100-160 grammes of onion per day and those who received 30-40 grammes of onion per day for two months. Regular consumption significantly showed the reduction in insulin levels ($P<0.05$) and blood glucose levels (($P<0.001$) [54].

Using an MTT assay, Zamri and his colleagues examined the anticancer efficacy of various concentrations (10, 50, and 100gml) of crude extracts of onion (extracted in methanol, ethanol, and water) on cultured MCF-7 human breast cancer cells for three days. The *allium cepa* methanol extract yielded the lowest percentage of cell viability after three days of incubation, at a concentration of 50 g/mL.

The methanol extract of onions contained various organosulfur compounds, which were found to reduce cancer cell survival in a dose- and time-dependent manner [55]. The researchers examined how onion methanol extracts affected the cancer cell lines HepG2, HT 29, and PC 3. Findings revealed that the antioxidant and antitumor properties of quercetin glucosides found in onion extract hindered cancer cell line growth. Another rat study found that onions in A1, a thiolane-type sulphide derived from onions, suppresses the activation of M2 macrophages, which in turn limits tumour growth in mouse models for mouse osteosarcoma and mouse ovarian cancer (iMOC) (LM-8) [56]. Recent research has evaluated the anti-cancer characteristics of *Allium cepa*, and the findings show that regular consumption of onions reduces the incidence of colorectal, lung, liver ovarian, brain, stomach, prostate, and breast cancer [57].

Anti-Diabetic effects

Diabetes is a chronic metabolic condition that affects the kidneys, heart, blood vessels, nerves, and skin. It can also cause medical consequences such kidney failure, heart attacks, strokes, and blindness**.** Onion chemicals appear to lower blood glucose levels while also increasing insulin secretion. For example, the volatile oil allyl propyl disulphide [58], amino acid sulfoxides S-methyl cysteine sulfoxide and S-allylcysteine sulfoxide [59], flavanols quercetin [60] and kaempferol [61], and diphenylamine all appear to affect glucose metabolism [59], carbohydrate enzymes a-amylase and a-glucosidase. According to a World Health Organization factsheet, diabetes affects roughly 422 million people worldwide and is responsible for 1.6 million fatalities each year. A study was conducted in which two groups of people (fourteen type-1 and fourteen type-2) consumed 100 grammes of sliced onion. Results after four hours of test meals showed the reduction in glucose levels [62] . After 24 hours of oral administration, Gautam and his team found that ethanol extracts of *A. cepa* significantly lowered blood glucose levels in STZ-induced diabetic rats. The extract was thought to do this by stimulating pancreatic-cell regeneration, which led to the synthesis and secretion of insulin, which in turn-controlled blood glucose levels. Onion chemical compounds have been discovered to be useful in regulating diabetes-related illnesses. Several studies have also demonstrated the positive impact of controlling diabetes with flavanol and quercetin [63].

Quercetin and rutin were found in an ethanol extract of onions and it was observed that they were able to activate the PI-3-K/Akt signaling pathway and increase GLUT-4 protein synthesis and mobilization from the cytoplasm to the plasma membrane to regulate glucose transport in rat skeletal L6 myotubes. In another study, three groups of rats with alloxan-induced diabetes received varying doses of onion juice over the course of 14 days. The results revealed that the rats who received onion juice had considerably lower blood glucose levels than the rats that did not. Researchers discovered that glibenclamide and an aqueous extract of onions both decreased blood glucose levels in diabetic rats [64]. The findings suggest that flavonoids increase insulin secretion via regulating the hormones released by pancreatic cells, which stimulate cells to take up glucose, leading to controlled blood sugar levels [65]. In other studies, it has been discovered that *allium cepa* lowers blood glucose levels by encouraging improved glycogen storage and improves oxidative status by increasing glutathione peroxidase levels [66]. There's evidence that natural flavonoids can help avoid diabetes-related issues including advanced collagen glycation, which can lead to cardiovascular problems [67]. There have been numerous studies on onions, and the findings suggest that the bioactive substances including quercetin, allyl propyl disulfide, s-methyl cysteine sulfoxide, and polyphenols, which increase the behavior of NADP+ and NADPH and increase insulin sensitivity and secretion, are what give onions their antidiabetic effects [68].

DOI: http://dx.doi.org/10.5281/zenodo.7099135

Maintains Heart Health

Consumption of onions helps in maintaining heart health as it helps in lowering total and LDL cholesterol and blood pressure. Epidemiological research suggests that eating onions reduces the risk of heart disease, high blood pressure, and mortality [69]. According to a recent study, people who consumed more than 5g of onion per day had a 29 percent lower chances of mortality and a 35 percent lower chance of death from coronary heart disease. Another study found that Italians who ate more than 80 grammes of onion per week had a lower risk of myocardial infarction than those who did not eat onions [70]but the details of these benefits are still open to discussion. Only two epidemiological studies considered the relation between dietary intake of allium vegetables and cardiovascular diseases. Aim of the study: To provide further information we analysed the relationship between onion and garlic intake and acute myocardial infarction (AMI. Clinical studies have demonstrated that onions can reduce blood pressure and total and LDL cholesterol, each of which are risk factors for heart disease. A raw red onion-rich diet (80–100g/day if overweight and 100–120g/day if obese) or a control "low-onion" diet (raw red onions: 20–30g/day) was administered to fifty-four PCOS-afflicted women for eight weeks. The high onion diet group notably had lower total and LDL cholesterol (P=0.003 and P=0.022, respectively) than the low onion diet group [71]hypertension (HTN.

CONCLUSION

This review describes the benefits of onions in human life. *Allium cepa* has a long history of medicinal and cosmetic uses. Onion is invaluable food in the remedial sector due to its rich food values including protein, iron, vitamins, fat, carbohydrates, calcium, and fiber. Numerous studies have demonstrated that onions contain health-promoting phytonutrients like flavonoids and that they are useful in treating several disorders like diabetes, cancer, heart disease. Recently, there has been significant progress in the use of onions in cosmetic products. It's been shown that the use of onion extracts in cosmetic products has been beneficial for the nourishment of hair, skin, eyes, and ears. Due to *A. cepa*'s low toxicity and mild side effects, scientists can investigate the potential foretaste of onion research in the areas of cures for various diseases, hybrid modelling, and varieties of resistance to abiotic and biotic components, as well as in the food and cosmological sectors.

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