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Onion-Herbal medication and its applications

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Abstract
Onion, which has protective effects on human health, is one of the most common vegetables used in everyday diets. The market for onions from customers is due to the presence of different bioactive compounds and secondary metabolites. These are the additional nutritional constituents of plants present in very small quantity. The daily consumption of onion reduces blood pressure by antiaggregating the thrombyocytes, stimulates haematopoiesis, reduce asthma attack,anticholesterolemic, antidiabetic and effective against cardiovascular disease. Interest in the health benefits of phytochemical constituents is growing and has culminated in a thorough analysis of flavonols, a category of secondary metabolites commonly documented to have health benefits, primarily via their antioxidant and anti-inflammatory effects, which are non-nutritive plant polyphenols. It is found most of the plant, studied extensively in fruits and vegetables. Quercetin, glycosides, allicin (S-containing compound), vitamins and minerals are all bioactive substances rich in onions. Onion as vegetable has high medicinal values, widely used in cosmetics industries and as preservatives. Onion bioactive compounds and their health benefits have yet to be thoroughly investigated.

Keywords: Onion, traditional uses, bioactive compound, minerals, vitamins, preservatives.

Introduction
Onion is one of the most consumed vegetables worldwide. **"**The world production of onion annually is about 98 million tonnes and India ranked second in onion production with the production of 19 million tonnes per annum" [15]. In most temperature zones across the globe, from tropical to cold temperate climates, onions are grown. The transformation from leaf development to the creation of bulbs depends on the temperature as well as the duration of the day and the cultivars. The cultivars are typically split into groups dependent on increasing latitude. The onion belongs to the Alliaceae family and is biennial, although it is primarily grown annually for commercial production. The bulb composed of the stem's bloated base and some fleshy leaves or scales. Onion may differ greatly in bulb shape, color of the outer scales (yellow, red, white), pungency (from mild and sweet to very pungent), bulb storage life and dry-matter content[6]. The chemical content ranged between (82.99 and 82.77 percent), (14.146 and 14.772 percent), (4.74 and 2.32 percent), (6.5 and 5.7 mg), (46.9 and 25.7 mg), (50.6 and 30.3 mg) and (140 and 129 mg) respectively, for humidity, fructose, total sugar, vitamin C, Ca, P and K in onions[3]. Bioactive compounds, such as flavonoids, fructo-oligosaccharides (FOS), thiosulfinates and other sulphur compounds have been recognised as an essential source of useful phytonutrients. Flavonoids continue to attract attention as potentially useful agents with implications for inflammation, cardiovascular diseases, and cancer [29]. Quercetin, the most common and plentiful phytochemical constituent of onions, belongs to the family of flavonoids known as flavonols. A recently reported advantage of dietary flavonoids suggests that bone resorption can be prevented by these compounds [40]. In all terrestrial plant organs, including flower, fruit, leaf, stem and root, flavonoids are present. The distribution can differ considerably within a plant in terms of structural diversity and quantities. Onion quality is related to the external appearance, size of the bulb, colour, taste, firmness and chemical composition of the onion [33]. Factors such as genotype, pre-harvest control, duration of harvest time and post-harvest therapies describe these characteristics [9]. The bulb is the plant's storage organ. Onion bulbs are eaten not just for their flavor and fragrance, but also for the nutritious benefit of human diet, primarily for their sugar content and organic acid.In addition, onion extracts also proved to have important medicinal properties such as anti-asthmatic, anti-aggregating of thrombyocytes, anti-cholesterolemic and bacteriostatic with particular effectiveness against *Helicobacter pylori*, a bacterium that causes gastritis and increases the risk of stomach cancers [26].The value of onion is growing dramatically and is the second most valuable horticultural medicinal crop after tomato. Like organosulphur, anthocyanins, flavonoids, quercetin, kaempferol and polyphenols, it has some functional compounds. The numerous complex roles of onions having sound effects on human wellbeing are antioxidant,

antibacterial and anti-inflammatory properties. Fructo-oligosaccharides are present in abundant quantity which retards the growth of potentially harmful bacteria in the colon, thus reducing the risk of emerging tumours in the colon and also initiate the growth of healthy bifidobacterium [7]. In Asia Onion (*Allium cepa* L.) is the main crop, though it is grown all over the world. Onions are usually used as a flavouring agent and salads, spreads, stir-fry, dips, soups and other dishes. The presence of organosulfur compounds, collectively known as S-alk (en) yl-L-cysteine-sulf-oxides, is responsible for the smell of onion (ACSOs). The key ACSO compounds in onions are S-methylL-cysteine-sulfoxide (MCSO) and S-1-propenyl-L-cysteine-sulfoxide(1-PeCSO) [42]. The enzyme alliinase is released from vacuoles hydrolyzes the ACSOs in the cytoplasm after cell disruption and creates the complex volatile S compounds responsible for the characteristic taste and aroma of onion [11]. The lachrymatory element thiopropanal S-oxides is the main compound responsible for onion pungency while several other volatile sulfur-containing compounds have also been shown to contribute [25]. The commercially important major volatile compounds of onion include 3, 5-Diethyl, 1, 2, 4-trithionale and Propyl 1-propenyl disulphide whereas amongst non-volatile components sitosterol, gitogenin, oleanolic acid, amyrin and diosigenin are abundantly present [14].

Traditional uses of *Allium cepa*:

In the treatment of multiple illnesses, *Allium cepa* has historically been used for its remedial features. The essence of *A. Cepa* in ancient Greece was used by athletics as a blood purifier, Before the conquest of Rome, to shore up the muscles, gladiators used to rub down onion juice. The Greek and Phoenicians sailors consumed it to prevent scurvy. Moreover, the Greek physician Hippocrates used to prescribe onion as a wound healer, diuretic and pneumonia fighters. In the 6th century, onion was described as one of the indispensable vegetable or spice and medicine in India [20].In the present review it is found that the Asian nations, viz., India and Pakistan were among the majority to use onion for the treatment of various diseases. Overall, it was observed that, *A. cepa* was most regularly used in less developed countries. This could be probably due to the lack of medical facilities and the easy availability of traditional remedies including onion. For the prevention of infectious diseases, *Allium cepa* is usually taken raw or as a decoction. It is also used to relieve many illnesses, including intestinal issues, skin diseases, metabolic diseases, mosquito bites and others, in a wide range of preparations for internal and external use [38].

Impact of onion on Health

Onion (*Allium cepa*) is mainly known for their biological properties, Different phytochemical compounds in Onion has been identified, flavenols, sulphur and seleno compounds. Onions have the ability to accumulate selenium (Se) from the soil. These Se enriched plants shows greater protection against carcinogenesis than the other plants and two Se-compounds possessing anti-cancer activity have been dentified: Se-methyl selenocysteine and µ-glutamyl-Se-methyl selenocysteine [2]. Various studies reported that up to 250mg/Kg anthocyanin is present in Red onion [10]. Di-glycosides and mono-glycosides of quercetin present 93% of the total content of flavonols in onions [28]. Quercetin and its oxidative products are significant antioxidants and play very important role in oxidative stress related processes. It is one of the strongest anti-carcinogenic compounds. It reduces the incidence of stomach cancer; cancer of intestines and lungs, as well as other types of cancer. It is the most effective inhibitor of peroxidation of membrane lipids and thus can affect atherosclerosis [13]. Onion has 5 to 10 times higher content of quercetin as compare to the other species of vegetables and fruits. Besides quercetin, onion also contains flavones such as luteolin and kaempferol [26].

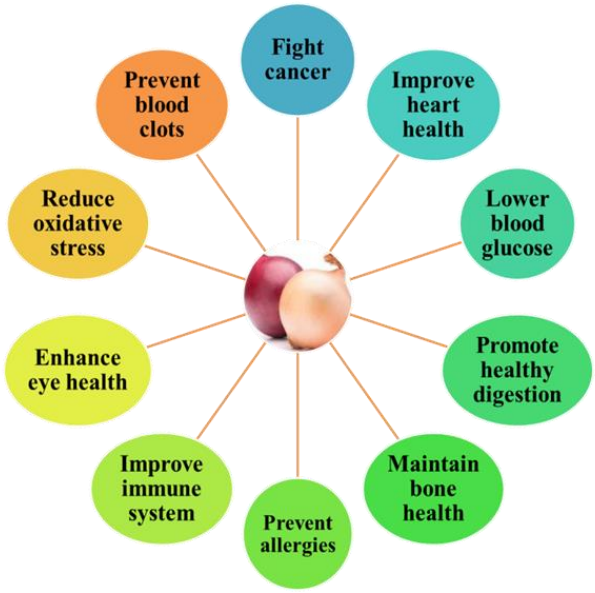

Fig 1: Potential health benefits of onion

Regulation of metabolism by oxidation/antioxidation and the role of onion

Spices contain the antioxidant ascorbic acid and tocopherols. However, they also contain very potent antioxidants, such as phenols, thiols and carotenoids [35]. All these compounds have the potential to scavenge oxidizing agents, such as reactive oxygen species (ROS) and recycling oxidized lipids, proteins, and nucleic acids. When present in excess, ROS increase the risk of atherosclerosis and chronic diseases [35]. Oxidation of lipids can cause destabilization of lipid membranes resulting n decreased survival of red blood cells [22]. Onion extracts has been shown to act as an antioxidant by scavenging ROS and preventing lipid oxidation and production of pro-inflammatory messengers [36]. A key mechanism for the

multiple effects of ROS s the activation of redox-regulated gene regulatory proteins that turn on genes for pro-inflammatory enzymes such as cyclooxygenase (COX) and lipoxygenase (LOX) [27]. Redox regulated genes are controlled by reduction and oxidation of components of the signal transduction pathways that control their expression. Expression of COX s upregulated by a surplus of ROS and downregulated by antioxidants. How much of these pro-inflammatory enzymes (COX and LOX) are synthesized is regulated by gene regulatory factors (transcription factors). One of these is nuclear factor *I*-kappa B or NFkB, a master control gene of the immune/inflammatory response, under normal conditions, NFkB remains inactivated by another factor, its inhibitor IkB. When NFkB is stimulated, more COX/LOX are synthesized and inflammation is triggered. This transcription factor is inturn, strongly regulated by dietary factors, it is activated under insufficient levels of antioxidants, particularly sulphur-containing ones [19].

Anti-Inflammatory Effects of Onion

Chronic COX or LOX (and even NFkB itself) overproduction induces unnecessary inflammation and leads to chronic pro-inflammatory diseases such as cardiovascular disease, diabetes, and others [16]. The messengers produced by LOX can also either stimulate programmed cell death or prevent it. Neurodegenerative disease, for example, involves unnecessary cell death, while inadequate cell death can lead to cancer [17]. Spices can also dampen the actual activity of the current pool of inflammatory enzymes, such as COX and LOX, in addition to restricting the amount of these inflammatory enzymes produced. COX and LOX both convert oxidized lipids to pro-inflammatory, hormone-like messengers, such as arachidonic acid (AA). COX releases prostaglandins that signal pain and induce inflammation, and a similar group of messengers, leukotrienes, is released by LOX [16]. Spices inhibit both COX and LOX activity presumably from the substance of its thiosulphinate and cepaene, inhibiting the synthesis and transfer of AA to pro-inflammatory prostaglandins and leukotrienes [1]. More specifically, onion cepaenes were shown to nhibit COX and LOX activity as well as blood platelet aggregation [1]. The same study also showed that onion extract can decrease the onset and development of tumors as well as have antiasthmatic effects.

Antimicrobial effects of onion

In addition to antioxidants and anti-inflammatory effect, onions also have antibacterial/antimicrobial properties [24]. Antibacterial activity of Onion extract may be due to the existence of flavonoids and polyphenols which are a strong source of natural additives to postpone food degradation [30]. It is suggested that *S*-propenylcysteinesulphoxide is the compound that exhibits antibacterial metabolism by the same mechanism as garlic [23]. Gram positive bacteria are more susceptible to the response of onion extract than gram negative bacteria because they are immune to onion extract [4].The purple onion extract demonstrated a significant antimicrobial activity against the gram negative bacteria *Vibrio Cholerae*. Onion extract inhibit the activity of *Streptococcus mutans*, a bacterium that causes strep throat, tonsillitis, bacterial pneumonia, as well as other diseases [1]. Onions have been observed to have antimicrobial, antioxidant activities which are key to cure many diseases.

Onions as preservatives for foods

Security of food from bacteria and spoilage species has historically been done through chemical processes, but market interest in the production of foods that contain low levels or are free of chemical preservatives has increased in recent years [39]. Onions can be considered a good source of natural food-retardant additives. However, due to their strong taste and biochemical volatility, the use of thiosulfinates and volatile compounds for food preservation is minimal [5]. Due to their antimicrobial and antioxidant effects, these properties center attention on the more durable flavonoids as additives to increase food shelf life by inhibiting microbial spoiling and oxidative degradation [32]. One study [8] also reported the medicinal uses of BHT and BHA are synthetic antioxidants and used as meat preservatives which are toxic and carcinogenic. Therefore synthetic antioxidant must be exchanged with natural antioxidant preservatives. It has also been confirmed that the antioxidant properties of onions and onion-by-products improve the shelf life of fresh, frozen and pre-cooked meat products. The active components of the onion by-product limit the growth of *Streptococci*, *Staphylococci*, *Proteus sp*, *E.coli* and *Salmonella sp* [8].

Onion demand in cosmetics industries

In particular, the purchasing power of individuals in the urban areas of developed and developing countries have increased. The main factors responsible for the growing use of cosmetic products are extreme atmospheric pressures; adverse impacts of emissions and global warming. The use of cosmetic products has been enhanced by questions about aesthetics and attractiveness among individuals. By 2022, Organics projected to hit $19.8 billion, posting a 10.2 percent CAGR over the 2016-2022 projection periods [37]. Mixtures of chemical compounds or herbal products, intended to improve the general look or used for personal grooming are organic cosmetics. Organic cosmetic products consist mostly of plant ingredients which do not contain chemicals which are potentially detrimental to the health of a person, such as parabens, phthalates, aluminium salts and petrochemicals. Keloids and hypertrophic scars are hyper-proliferative skin diseases that result in incomplete wound healing. In the prevention and treatment of keloid scars and hypertrophic scars, ointments containing heparin and onion extract are very significant. Enoxaparin achieved almost complete cell proliferation inhibition with a concentration of 500 µg/mL (91.5 percent reduction). Cell proliferation at a concentration of 250µg/mL was also significantly hindered by the onion extract. (a loss of 50.8 percent) [31]. Onions were the best inhibitors of type *I*-allergy, possibly due to their high content of quercetin 4′-glucoside [34]. The efficacy of the herbal fraction of onion against various events responsible for type *I* -allergic reactions shows that it has promising antiallergic profile that could be attributed to its potential antihistaminic, anti-inflammatory, and antioxidant activities [21].

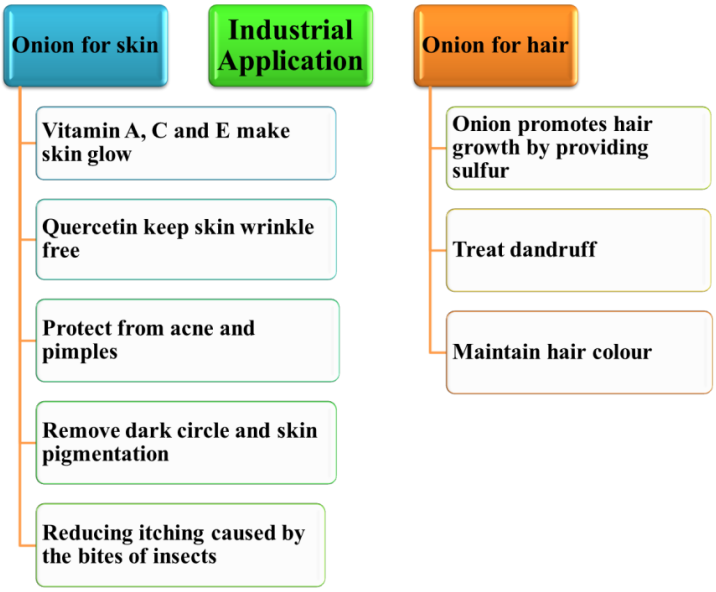

Fig 2: Role of onion in cosmetics

Conclusions

Onions grown in stress environment develop multiple bioactive compounds in order to avoid tension, which in turn may be beneficial in different ways. The need for the hour is to examine the antioxidant, anti-inflammatory and antimicrobial activities of an onion that is grown under stress condition. There is no indication of drug interaction from onion intake, so onion extract should be used to produce natural novel products that have less adverse effects on human health. Owing to the presence of quercetin, the onion intake avoids DNA damage and breakage. In comparison to gram negative bacteria; onion extracts have successfully blocked gram positive bacteria. Meat processing businesses and the cosmetics industry may use onions with high bioactive co-activity. The onion also has a beneficial flavanoids such as kampeferol and quercetin that display anti-allergic, anti-inflammatory, cardio-protective, vasodilatory, anti-carcinogenic, antibacterial and antifungal effects.

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