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A REVIEW ON PHYTOCHEMICAL AND PHARMACOLOGICAL STUDIES ON ALLIUM CEPA

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ABSTRACT

Allium cepa is used as food additive and as medicine, due to their content of phytonutrients and used for the treatment as well as prevention of a number of diseases such as coronary heart disease, cancer, obesity, diabetes, hyper-cholesterolemia, disturbances of the gastrointestinal tract and inflammatory diseases. This review article focuses the phytochemical constituents and pharmacological activities of Allium cepa.

KEYWORDS

Onion, Pharmacological and Activities.

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INTRODUCTION

Allium Cepa commonly known as onions belongs to the family Liliaceae. The main onion producing states in India are Maharashtra, Madhya Pradesh, Karnataka, Tamilnadu etc.

Onions require specific conditions for the optimal growth. These include stone-free, loamy, well-irrigated soil, sunlight, excellent drainage¹ and require significant amounts of nitrogen, phosphorus, and potassium for maximum yield². The nutritional value of onions can vary with variety, water supply, growing temperature, sulfate fertility in soil, other environmental factors and length of storage. The flavor of the onion is due to sulfur compounds developing throughout the growing season. Water

supply plays a large role in determining pungency and flavor of the onion. Onions grown under dry conditions will have an increase in pungent flavors. Temperature has important role in onion development. In hotter conditions, the more sulfur compounds will be produced, leading to a more pungent flavor³.

PHYTOCHEMICAL CONSTITUENTS.

Onion contains a good percentage of water, sugar, protein, carbohydrates, fiber, vitamins, and fats. Onions are also a good source of vitamin C, B6, potassium, flavonoid quercetin and trace minerals chromium¹. They contain sulfur-compounds such as allyl propyl disulphide that contribute pungent odor⁴. Other researchers⁵ have reported that onions having strong antioxidant properties. These properties are due to many substances, including some vitamins, flavonoids, terpenoids, carotenoids, phytoestrogens, minerals, and volatiles compounds. Onion also contains polyphenolic compounds.

The lachrymatory principal is propane thial-S-oxide, which is converted from trans-(+)-S-propenyl-L-cysteine sulfoxide (PeCSO) by alliinase. Propane thial-S-oxide has a pungent taste and is easily degraded to various types of volatile compounds responsible for the characteristic onion odor⁶. Allium cepa bulb contains some anti-nutrients which do not pose any toxicity on consumption because of their low concentrations. It also showed the rich mineral composition and used in diseased conditions like ricket, osteomalacia and hypertension.

PHARMACOLOGICAL ACTIVITIES

Onions have been used in many medicinal practices. Onion has been reported to be an antibacterial, antiviral, antiparasitic, antifungal, antihypertensive, hypoglycemic, antithrombotic, and antihyperlipidemic, anti-inflammatory and antioxidant activity.

Antiplatelet activity

Current research has shown that the pungency of the onion is related to antiplatelet activity⁷. This is due to the sulfur compounds, chromium and vitamin B6.

Similarly atherosclerosis, cardiovascular disease, heart attack and stroke are all associated with platelet aggregation⁸.

Antidiabetic activity

Onion is used to treat diabetes and its other related complications^{9,10}. Onion soup is used for controlling Type 2 diabetes mellitus and other lifestyle diseases¹¹. Studies have shown that onions have antidiabetic activity due to the presence of allyl propyl disulfide which increases the amount of free insulin¹². Allyl propyl disulfide increase glucose tolerance in alloxan diabetic rabbits¹³ while S-methyl cysteine sulfoxide isolated from Allium cepa Linn. Shows anti-diabetic effects¹⁴. Chromium has been shown to decrease fasting blood glucose levels, improve glucose tolerance, lower insulin levels, and help lower triglyceride and cholesterol levels in the blood stream.

Anticancer Activity

Allium contains flavonoid quercetin that shows good anticancer activity. It is able to inhibit the growth of various cancer cells. Allium cepa L. shows inhibitory effects on proliferation of cancer cells and adipocytes via inhibiting fatty acid synthase (FAS)⁹. Its ethanolic extract is used in the management of breast tumors¹⁵. Apigenin, a flavonoid present in onions, possess anticarcinogenic effects¹⁶. Onion's sulfur compounds have been found in studies to prevent the growth of tumors and cancer development by protecting cells from mutation and inducing apoptosis. Onion extract shows inhibition of mutagenesis/carcinogenesis¹⁷, modulation of enzyme and cell signaling pathways¹⁸, free-radical scavenging^{9,19,20}, apoptosis, immunomodulatory^{21,22} and other effects on cell proliferation and tumor growth in *in-vitro* studies²³.

Antimicrobial activity

Allium cepa red and white varieties showed strong antimicrobial and antioxidant activities. Allium cepa fresh onion extract and cold water extract shows antibacterial activity against four isolates include: E. coli, Staphylococcus aureus, Streptococcus pyogenes, and Streptococcus pneumonia. Allium cepa extract has antimicrobial activity against V. cholerae. Allium cepa (onion)

juices showed antibacterial activity against multidrug resistant bacteria viz.: *Pseudomonas aeruginosa*, *S. aureus*, and *E. coli* and *Salmonella typhi*.

Antioxidant Activity

Onions contain quercetin - a potent antioxidant. A large number of articles have shown that quercetin may act as scavenger of free radicals, and as inhibitor of the low-density lipoprotein oxidation. *Allium cepa* red and white varieties showed antioxidant activities²⁴. Quercetin-3'-O-beta-D-glucoside isolated from *Allium cepa* shows antioxidant activities²⁵. Onion flesh and onion peel enhance antioxidant status in aged rats²⁶. Antidiabetic and antioxidant effects of S-methyl cysteine sulfoxide isolated from onions (*Allium cepa* Linn.) as compared to standard drugs in alloxan diabetic rats²⁷. Dietary flavonols protect diabetic human lymphocytes against oxidative damage to DNA²⁸.

Hepatoprotective activity

Onion extracts showed hepatoprotective activity on cadmium-induced oxidative damage in rats²⁹. Onion extract preferred for dose-dependent hepatoprotection, prevent and protect cadmium-induced hepatotoxicity. Aqueous extract of *Allium*

cepa bulb has significant hepatoprotective activity against ethanol-induced hepatotoxicity³⁰.

Anti-inflammatory activity

Onion showing anti-inflammatory activity, because of the presence of flavanoid quercetin. Onions showed antiasthmatic³¹ activity and used for arthritis treatment³². Ajoene is a natural product isolated from *Allium* shows anti-inflammatory properties³³. Fistular onion stalk extract useful for the attenuation of atherosclerosis and the mechanism includes the regulation of the local inflammatory response³⁴.

NUTRACEUTICAL DIETARY USES

Onion is multipurpose food plant that is used as traditional Indian spices. These are used in salads, soup, or onion chutney. It is used as a thickening agent for curries and gravies. Onions pickled in vinegar are eaten as a snack. Onions are used in a number of ways. These are eaten raw or cooked in a variety of foods. When applied to the scalp it is said to promote growth of hair and on the face to reduce freckling. Its use in daily diet restores zinc deficiency.

S.No	Scientific classification	
1	Kingdom	Plantae
2	Phylum	Magnoliophyta
3	Class	Liliopsida
4	Order	Asparagales
5	Family	Alliaceae
6	Genus	<i>Allium</i>
7	Species	<i>Allium cepa</i>

CONCLUSION

Onion is one of the magical food used throughout the world. It has great importance now days because of the phytoconstituents. Many researchers are reported that onion contains water, sugar, protein, carbohydrates, fiber, vitamins (vitamin C, B6), fats, potassium, flavonoid quercetin, terpenoids, carotenoids, phytoestrogens, minerals, and volatiles helminthic, anti-inflammatory, Hepatoprotective, antiseptic, antispasmodic, carminative, diuretic,

compounds. Onion also contains polyphenolic compounds, trace minerals and contain sulfur-compounds such as allyl propyl disulphide. because of the presence of these compounds onion exhibiting different pharmacological activities such as anticancer, antidiabetic, anti-platelet, anti-thrombotic, anti-asthmatic, anti-oxidant, anti-microbial, anti-arthritis, fibrinolytic, anti-expectorant, febrifuge, hypoglycemic, hypotensive and hypo-cholesterolemic properties.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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