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# Review on Validation Preclinical and Traditional Claims of Allium cepa for Recent Clinical Use

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***Abstract: Allium cepa, an annual herb (onion). Its Latin name is Allium cepa, and it is a member of the Liliaceae family. It is referred to as Pyaj in Hindi.***
***A versatile food plant called an onion is used to make traditional Indian spices. It has long been utilised for nutritional and physiological benefits and is highly significant to human health.***
***India is the world's second-largest producer and exporter of onions. It also has flavonoids, proteins, vitamins, and minerals, as well as some substances that contain sulphur.***
***As a therapeutic agent, it aids in the treatment (reduction) of conditions like high cholesterol, diabetes, joint problems, digestive problems, appetite loss, gallbladder diseases, angina pectoris, high blood pressure, atherosclerosis, sore throat, asthma, bronchitis, cough, intestinal gas, and intestinal worms.***
***Numerous biological effects, including anti-oxidants, anti-inflammatory, anti-cholesterol, antihypertensive, anti-cancer, anti-arthritic, anti-bacterial, bronchodilator, expectorant, antispasmodic, antiseptic, carminative, anti-coagulant, fibrinolytic, anti-helminthic, anti-platelet, hepatoprotective.***
***Keywords: Allium cepa , flavonoids, traditional & clinical use.***

## I. INTRODUCTION

The onion, *Allium cepa* L., is a versatile food plant and a long-used spice with significant health benefits. When diced, onions have a strong flavour and contain chemicals that can irritate the eyes. [1]
Due to their association with numerous pharmacological effects, onions and other plants in the *Allium* genus have historically been used as herbal remedies for a variety of diseases.
This practise dates back to ancient times, when (*Allium cepa,* L.) Have been an important dietary resource and have also been of interest for medical purposes. [2]
The consumption of onions is said to provide both nutritional and health benefits. Known as the "Queen of the kitchen," they have flavour, scent, a unique taste, and therapeutic characteristics.
A large genus with 4000 species, Allium. [3,4] Other names for *Allium cepa* include Onion in English, Vaengayam in Tamil, Savala in Malayalam, Ullipayalu in Telugu, Ulligadde in Kannada, Payaz in Hindi and Punjabi, piyaz in Bengali, Dungri in Gujarati, Sawalo in Konkani, Kandaa in Marathi, and piaja in Oriya [5].
Onions require specific conditions for the best growth, including stone-free, loamy, sunlight, excellent drainage, well-irrigated soil [6] with significant amounts of nitrogen, phosphorus, and potassium are required for maximum yield [7].
A. Cepa contains sugar, carbohydrates, water, proteins, vitamins, fibre, potassium, vitamin C, B6, and trace amounts of the mineral schromium.
Variety, sulphate fertility in soil, water supply, which plays a key role in determining pungency and flavour, storage, environmental conditions, and flavour of it is due to sulphur compounds developing throughout the season, growth of onion under dry conditions will increases nutritional value can vary with temperature, which plays an important role in onion development as in hotter conditions more sulphur and pungent flavour will be produced[8].

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*A Taxonomical Classification Of Allium Cepa*

Table no. 1 Taxonomical classification

| | | |
|---|---|---|
| 1 | Scientific Name | *Allium cepa L.* |
| 2 | Kingdom | Plantae |
| 3 | Division | Magnoliophyta |
| 4 | Class | Liliopsida |
| 5 | Order | Asparagales |
| 7 | Genus | *Allium* |
| 8 | Species | *Allium cepa* |
| 9 | Edible parts | Leaves, flowers, seed, root |

*B. Organoleptic Properties[9,10].*

Colour - Red
Odour - Strong, cutting the bulb stimulates lachrymation.
Characteristic - Alliaceous
Taste - Spicy

*C. Nutritional Value of OnionValues per 100 gm Edible Portion*

Table no. 2 Nutritional value of onion

| | | | |
|---|---|---|---|
| Moisture | 86.6% | Calcium | 47mg |
| Protein | 1.2% | Phosphorous | 50mg |
| Fats | 0.1% | Iron | 0.7mg |
| Minerals | 0.6% | Vitamins c | 11mg |
| Fibre | 0.4% | Carbohydrates | 11.1% |

*D. General Phytochemicals Present In Plant Are Following*

Table no. 3 Phytochemicals

| Sr. No | Class | Phytoconstituents |
|---|---|---|
| 1 | Carbohydrates | Inulin, fructooligosacharides isorhamnetin-4-glucoside, galactose, glucose and mannose |
| 2 | phytoestrogens | coumestrol, zearalenol, isoflavones and humulone |
| 3 | essential oils | protocatechnic acid, thiocyanate |
| 4 | Vitamins | Vit A, B complex, C and E |
| 5 | minerals | selenium, phosphorus, iron, calcium and chromium) |
| 6 | flavonoids | quercetin, apigenin, rutin, myricetin, kaempferol, catechin, resveratrol, epigallocatechol-3-gallate, luteolin and genistein |
| 7 | Oganosulfuric compounds | thiosulphinates, cepaenes, cysteine, S-methyl cysteine sulfoxide, diallyl disulfide, allyl methyl sulfide, allyl propyl disulfide, gammaL-glutamyl-trans-S-1-propenyl- L-cysteine sulfoxide, S-propenyl cysteine sulfoxide, S-alk(en)yl cysteine sulfoxides and S-allyl cysteine sulfoxide) |
| 8 | allicin | Diallyl disulfide, diallyl trisulfide and ajoene |
| 9 | phenolic compounds | phenolics, phenolic acids, anthocyanins and hydroxycinnamic acid |
| 10 | Lipophilicantioxidant | Dialkyl disulfides |

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| Sr. No. | Isolated Phyto | Chem ID (pub chem) | Plant Part | Extract/ fraction method | Traditional use | Pharmacological activity | MOA | Ref. |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Pre-clinical | | |
| | | | | | | | FLAVONOIDS | |
| 1 | Fistein(3,7,3,4-tetrahydroxy flavone | 5281614 | Bulb | Ethanolic# | inflammation | Anticancer | Inhibitory activity in B 16melanoma cells (melanin) | Battagani deepthi et.al.2021 |
| 2 | 1)Quercetin-4-glucosides and 2)isorhamnetin-4glucoside | 5320844,44259381 | Peel | Ethanol # | Heart disease | Neuroprotective | AChE inhibitory activity | Manoj Kumar.et.al 2021 |
| 3 | 1) Flavones<br>2 flavonols | 597962, 11349 | Bulb | Methanol# | Malaria, tumor | Hypo-glycaemic &Antidiabetic | | A.Airaodion. et.al.2020 |
| 4 | 1)Epicatechin, 2)morin ,3)catechin, 4)Myricetin ,5)kaempferol | 72276, 5281670 | Peel | Ethanol, Methanol,# Aqueous extract | Reduce bloodglucose | Anticancer | Human colorectal adenocarcinoma (HT-29) cells | Manoj Kumar.et.al 2021 |
| 5 | 1)Quercetin | 5280343 | Peel | Ethanol# | Viral infection | Anti-obesity, cardioprotective | Triglyceride was reduced due to OPE upregulated themRNA levels of (CPT-1a) & FABP4 | Manoj Kumar.et.al 2021 |
| 6 | 1) quercetin<br>2) isorhamnetin | 5280343,5281654 | Seed | Methanol # | Hydroalcoholic ,ethanol , maceration | antihypertensive | prevent angiotensin-II-induced endothelial dysfunction by inhibitingthe overexpression of p47phox | M Kazem |
| 7 | 1)querectin | 5280343 | Bulb | Methanol | Viral infection | Anti-spasmodic and anti-diarrheal effects* | | F. Kianian. Et.al2020 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 8 | 1) Quercetin, 2) Kaempferol | 5280343, 5280863 | Root | Methanol | Inflammation , protect the liver | Anti-asthma effects* | Decreased nasal secretionsand edema | F. Kianian. Et.al2020 |
| 9 | 1)Quercetin | 5280343 | Bulb Juice | Methanol | Viral infection | Urogenital system* | Decreased cellular proliferation, inflammationand apoptosis in atypical prostatic hyperplasia | F.Kianian. Et.al2020 |
| 10 | 1)flavonols – 2)querectin and 3) kaempferol | 528063,5280343, 5280863 | Bulb | ethanol | Prevent metabolic disease | Anti-allergenic | | K p greeshma.et. al2020 |
| 11 | 1) quercetin | 5280343 | Peel | Aqueous | Viral infection | Anti-platelet | upregulation of cAMP levels and the reduction of TXA2, $Ca^{2+}$, cyclooxygenase-1 (COX-1), | arka jyoti Chakraborty .et.al2022 |
| 12 | Quercetin | 5280343 | Leaves | Hydroalcoholic | | Anti-obesity | Pancreatic lipase inhibition | Kim .H,Y 2005 |
| **PHENOL** | | | | | | | | |
| 13 | 1) Anthocyaninis ,2)phenolic acid | 145858, | Bulb | Methanol ,ethanol | Anti-diabetic, obesity | antibacterial | Inhibited by Listeria monocytogenes organism | Santas et al.2010 |
| 14 | 1)Methyl-4hydroxyl cinnamate | 5319562 | Bulb | Ethanol # | Fungal infection, inflammation | Cancer preventive | Reduce murine hepatoma(heap c1c7) cells | Joaheer d.teshika.et. al2018 |
| **ORGANOSULPHUR COMPOUND** | | | | | | | | |
| 15 | 1) S-methyl cysteine sulfoxide, 2) S-allyl cysteine sulfoxide | 115015,121922 | Bulb | Methanol , aqueous | Reduce bloodglucose level | Anti- diabetic * | Increased production and secretion of insulin, decrease in dietary glucose absorption | Farzaneh Kianian. Et.al 2020 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 16 | 1) diallyl disulfide, 2) s-allylcysteine (SAC), 3)allinase | 16590,9793905 | Bulb | Ethanol (95%)# | Treatment of cancer | Anti-cancer | | Kundan singh bara et.al |
| 17 | 1)S-alk(en)yl cysteine sulfoxide, | 115015 | Bulb | methanol | Inflammation, pain, swelling, fever | Atherosclerosis* | by inhibiting lipidperoxidation | Farzaneh Kianian. Et.al 2020 |
| 18 | 1)Diallyl sulfide, 2)diallyl disulfide, 3) trisulfide | 11617,16590,16315 | Bulb | acetone | Obesity, hypertension | antifungal | - | Irkin 2007 |
| 19 | Cepaenes, thiosulphinates | | Bulb | methanolic | | Neuroprotective | - | Richa shri etal2008 |
| 20 | 1) Cycloalliin | 12305351 | Leaves | ethanol# | - | Fibrinolytic* | - | R k Agarwal 1977 |
| 21 | 1)dialkyl disulfide (Alicin), 2)diallyl disulfide (DAS) | (2)16590, | | | | Serum testosterone levelincrease | reduced lipid peroxidation index [malondialdehyde (MDA)] and increased superoxide dismutase (SOD | Vahid 2014 |
| **PROTEIN/AMINO ACID** | | | | | | | | |
| 22 | 1)Methylcysteine, | 225710 | Bulb | Petroleum ether & ethanol # | Headache, heart diseases, parasitic infections | Antihyperglycemic | Not mentioned | Kumari.et.al |
| 23 | 1) lectin 2) agglutinin | | Bulb | | | Immunomodulatory | Macrophage activation | Vaddi k.prasanna. 2015 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 24 | 1) anthraquinone<br>2) coumarin | 323, 6780 | Bulb | Methanolic# | | Anxiolytic activity ,Anticonvulsant activity | Gaba agonism | Gummalla Pitchaiah et al |

*- clinical activity#- Soxhlet method

| Sr no. | Publication number | Tittle | Assignee |
|---|---|---|---|
| 1 | US20020187207A1 * | Method for extracting, fractionating and purifying polyphenolic compounds originating from fresh plant sorting deviations using a high adsorption and elution performance resin | Institut National De La Recherche Agronomique Inra |
| 2 | WO2009141834A3 * | The present invention deals with a process of preparing quercetin enriched and microencapsulated flavoured bioactive fraction from red onion (*Allium cepa L*), which possesses significant antioxidant and chelation properties. | Council Of Scientific &Industrial Research |
| 3 | EP2454950A1 * | An onion extract which contains glutamyl methionine, quercetin and protocatechuic acid were identified | Takasago International Corporation |
| 4 | US10328067B2 * | Pharmaceutical oral dose formulation and composition of matter, p – glycoprotein efflux transporter | David W. Thrower |
| 5 | US5093122A | A method of preparing a composition comprising an extract of an Allium genus plant and S-allylcysteine | Wakunnga pharmaceutical co ltd |

*E. Utilizing Onions In Alternative Medicine*

*1)* It is mostly used as a traditional cold remedy.
*2)* It stimulates the respiratory system and aids in sputum ejection (phlegm).
*3)* It has essential oils that encourage perspiration by stimulating the sweat glands.
*4)* It makes blood pressure normal.
*5)* It makes you more hungry.
*6)* It aids in diarrhoea prevention.
*7)* It contains a lot of sulphur, a crucial ingredient that prevents or kills fungal diseases.
*8)* It prevents the formation of cancerous cells, particularly colon cancer. Traditional healers all around the world arewell aware of the anti-colon cancer qualities of green onions.
*9)* Vitamins A and C are present. It also contains calcium in the white portion.
*10)* It's a tasty starter.

## II. PHARMACOLOGICAL ACTIVITY

*A. Antibiotic Activity*

Gram-positive and Gram-negative bacteria are both susceptible to the antibiotic effects of onions [11]. The *Allium cepa* fresh raw extracts have strong antibacterial properties against microorganisms that are resistant to antibiotics [12]. The antibacterial activity of onion extracts against the test organisms has been demonstrated [13].

*B. Antiviral Activity*

The organosulfur chemicals quercetin and allicin, which are abundant in onions and garlic and have antiviral properties, limit viral infection [14]. The natural chemicals present in garlic and onions can be exploited as potent inhibitors against the primary protease of COVID-19 by investigating the molecular docking of that enzyme [15].

*C. Antioxidants Activity*

Due to the presence of large amounts of naturally occurring antioxidants like polyphenols, flavonoids, and organosulfur compounds, A. Cepa has the potential to be an antioxidant [16,17]. Antioxidant properties of quercetin-3'-O-beta-D-glucoside obtained from *Allium cepa*[18].

*D. Effects of anti-obesity*

Onion peel extracts (OPE) high in quercetin have been shown to have anti-obesity effects. According to the findings, after 12 weeks of taking 100 mg of OPE capsules on a regular basis, there was a significant decrease in body weight (from 70.0 kg to 69.2 kg), BMI (from 26.6 kg/m2 to 26.3 kg/m2), and waist circumference (from 91.9 cm to 89.9 cm)[19].

*E. Anti-arthritic Properties*

The prevention of the main symptoms of arthritis and the reduction of joint damage brought on by CFA immune- mediate regulation monoarticular arthritis developed in rats were both demonstrated by extract of onion skin[20].

*F. Cancer Prevention*

Hepg2 cancer cells are resistant to an onion peel extract in ethanol (human liver cancer cell lines) Antigen- damaging action was found. Reduced intracellular ROS at doses of 1-100 g/ml. DNA damage in human leukocytes caused by reduced H2O2 and hydroxynonenal[21].

*G. Hepatoprotective Properties*

Onion extracts may be hepatoprotective against oxidative damage brought on by cadmium in rats. Onion methanolic extract significantly improves hepatoprotective action against hepatotoxicity brought on by paracetamol. In a dose-dependent way, *allium cepa* decreased total serum bilirubin and alanine aminotransferase. After the course of therapy, extract decreased the alanine aminotransferase level at 200 mg/kg by 15.79%, at 300 mg/kg by 20.67%, and at 450 mg/kg by 21.99% while also lowering the serum bilirubin[22].

*H. Hypertension Prevention*

The quercetin-containing hydroalcoholic extract of onion peel has anti-oxidant, antioxidant, and Ca2+ influx inhibitory properties in vascular smooth muscle cells[23]. Through inhibiting the overexpression of p47phox, a regulatory subunit of the membrane NADPH oxidase, a hypertension study using some rat models has shown that quercetin and its methylated metabolite isorhamnetin, found in onions, can lower blood pressure and prevent angiotensin-II-induced endothelial dysfunction. Nitric oxide had a high bioavailability as a result of the enhanced superoxide generation that followed[24,25].

*I. Antiplatelet Activity*

Inhibition of platelet aggregation was studied using various doses of quercetin and its glycosides, including quercetin (Q), quercetin-4′-O-monoglucoside (QMG), and quercetin-3, 4′-O-diglucoside (QDG). It was shown thatthe inhibitory impact of quercetin grew in a dose-dependent manner; 2.0 mg/ml demonstrated 100% inhibition of platelet aggregation, whereas 0.5 mg/ml nearly had no effect. Similarly, it was shown that quercetin glucosides at 2.0 mg/ml had 100% inhibitory effects on platelet aggregation. Quercetin-4′-O-monoglucoside (QMG) was more efficient than Quercetin-3, 4′-O-diglucoside (QDG) in the prevention of platelet aggregation, but both quercetin glucosides shown a distinct effect at 1 and 0.5 mg/ml.

*J. Hypolipidemic effEcts*

were demonstrated by sulphur compounds produced from onions, such as S-methyl cysteine sulfoxide and allyl propyl disulphide [26]. These have been demonstrated in rats and rabbits, and they reduce the effects of diet- induced atherosclerosis, preserve the action of hypolipidemia, and have inhibitory effects on platelet formation[27].

*K. Anticoagulant Activity*

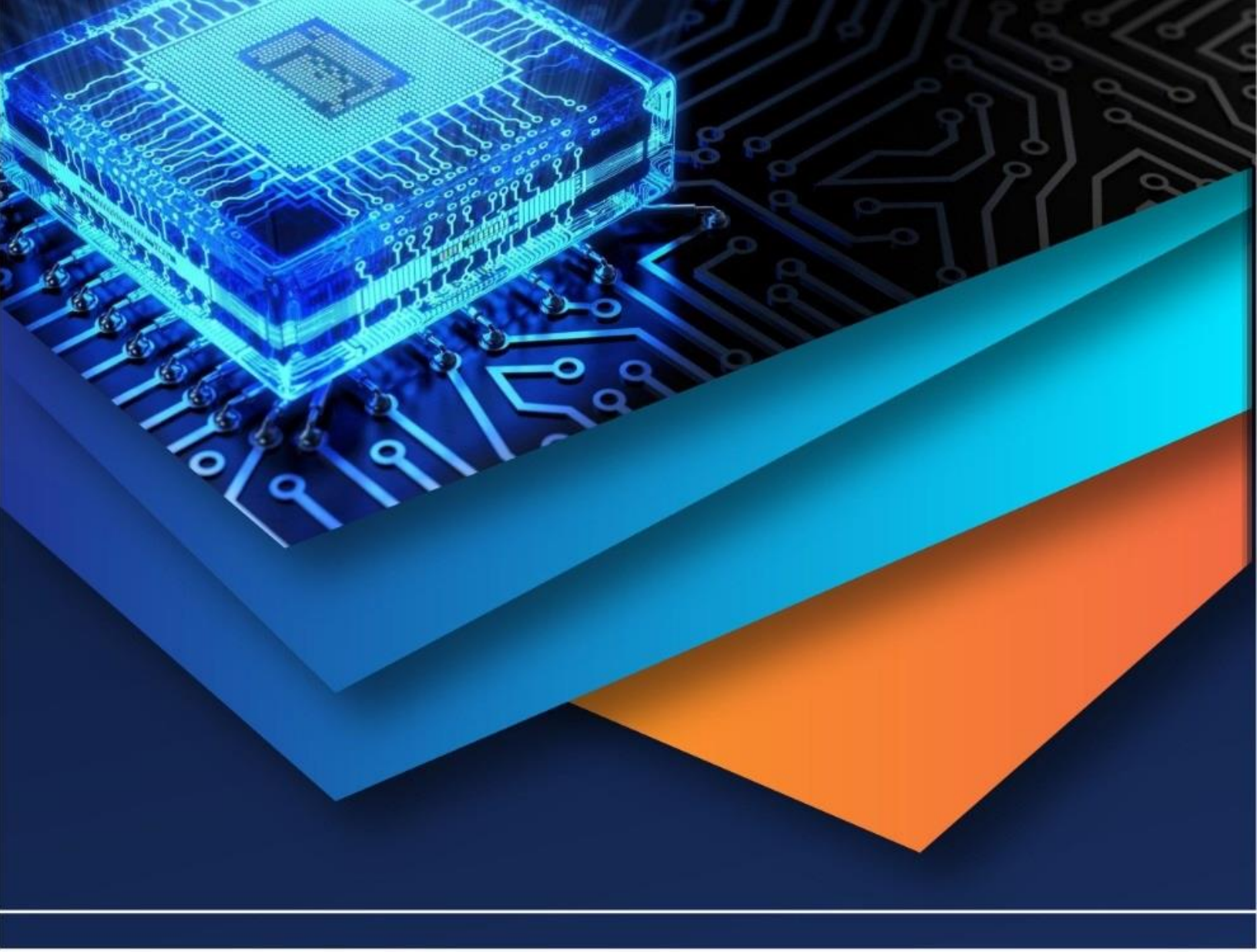
Red onion aqueous extract has anticoagulant activity and had investigated by using the principles of prothrombin time test in In-vitro study [28]. Onion extract has anticoagulantproperty through prohibition of clot formation and coagulation process [29].

## III. CONCLUSION

*Allium cepa* plant shows the presence of sulphur compounds, glycosides, quercetin, flavonoids, phenol compounds, diosgenin, organosulfur compounds, S-alk(en)yl cysteine sulfoxides, cycloallin, allylsulfides, seleno compounds, sugar, water, carbohydrates, proteins, vitamins, fibre, and potassium allium cepa. It also shows the presence of compounds demonstrating various therapeutic and pharmacological activity.as future aspect it may be shows various therapeutic importance.

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