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Exploring the Homoeopathic Use of *Allium Cepa*: A Narrative Review

Shivani Bhimrao Shinde[1], Archana Shalbidre[2], Suresh Jagtap[3], Anupam Mukherjee[4], Varsha Umesh Ghate[1]*

[1]Department of Homoeopathic Pharmacy, Bharati Vidyapeeth (Deemed to be University) Homoeopathic Medical College and Post Graduate Research Centre, Hospital, Pune, India

[2]Department of Zoology, Savitribai Phule Pune University, Pune, India

[3]Department of Herbal Medicine, Interactive Research School for Health Affairs (IRSHA) Bharati Vidyapeeth (Deemed to be University) Pune, India

[4]Department of Health and Family Welfare, West Bengal Homoeopathic Health Service, Government of West Bengal, India

#Ph.D. scholar, Department of Homoeopathic Pharmacy, Homoeopathy University, Jaipur, Rajasthan, India.

***Corresponding Author**

Dr. Varsha Umesh Ghate,

Department of Homoeopathic Pharmacy, Bharati Vidyapeeth (Deemed to be University) Homoeopathic Medical College and Post Graduate Research Centre, Hospital, Pune, India-

Email ID: varsha.ghate@bharatividyapeeth.edu

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ABSTRACT

Background: *Allium cepa* (onion) is a widely cultivated plant with significant medicinal properties. It is commonly used in homeopathy and complementary medicine for its antibacterial, antioxidant, anti-inflammatory, respiratory, and anticancer effects. Bioactive compounds such as flavonoids, sulfur compounds, and polyphenols contribute to its pharmacological benefits

Objective: This narrative review aims to evaluate the therapeutic applications of *Allium cepa* in Homoeopathic and alternative medicine

Methods: A literature search was conducted using databases including *Scopus, Web of Science, PubMed, Science Direct, Research gate and Google Scholar*. The review selected studies from 1953 to 2024 that focused on the medicinal and Homoeopathic applications of *Allium cepa*. Inclusion criteria included peer-reviewed studies discussing its pharmacological effects, while non-English articles, studies focusing on culinary uses, and those lacking primary data were excluded.

Results: A total of 14 papers were assessed for phytochemical and 10 articles for therapeutic value *Allium cepa* extracts have antimicrobial properties, particularly against Staphylococcus aureus and Aspergillus niger. They also have antioxidant properties, helping to mitigate oxidative stress in metabolic disorders like diabetes and obesity. Homoeopathic *Allium cepa* effectively manages allergic rhinitis, URTI, and asthma, improving patient outcomes. *In vitro* and *in vivo* studies show that *Allium cepa* extracts induce apoptosis, inhibit cell proliferation, and modulate gene expression in cancer cells.

Conclusion: *Allium cepa* demonstrates significant therapeutic potential, particularly in Homoeopathic and alternative medicine. However, further large-scale clinical trials and standardized formulations are required to validate its efficacy.

Keywords: *Homeopathy, Allium cepa, Antimicrobial, Antioxidant, Respiratory, Anticancer*

1. INTRODUCTION

"Homoeopathy is a therapy system widely used in Europe, India and other countries" (1,2). Homoeopathic principles include drug proving's, the simile principle, and potentization, which is the process of progressively diluting the homoeopathic substance by shaking liquids or grinding solids into lactose at each stage (3-5). Additionally, homoeopathic principles include the observation of symptoms in healthy individuals exposed to substances derived from minerals, plants, or animals (6-8).

Allium cepa, also known as onion, is a kind of perennial plant that grows its stems in hidden bulbs. In many places, onions are listed as *Alliaceae*, whereas in others, they are *Liliaceae*. It takes one or two bloom stalks of a common onion, which are 75-180 cm (2.5-6 ft) tall, and don't have any leaves. The thick, black seeds are the most common part of the onion plant that is used for commercial cultivation. Because of its delicious flavor and nutritional benefits, onion is highly prized and may be kept in pickles. More than 175 nations today grow onions (9-15). The water content of onions is around 90%, and they include a lot of nutritional fiber and sugar. There are several health benefits to eating a vegetable-rich diet, including a reduced risk of two of the most common and important illnesses in the modern world.

Onions are a great source of mineral potassium, trace amounts of selenium, and vitamins B1, B2, and C. Diabetic, cardiovascular, and stomach cancer symptoms may be alleviated with their usage. Biologically efficient hypertrophic scar and keloid prevention is revealed by onion peel. Research has shown that onion extract may effectively treat hypertrophic wounds as well (16-20). An onion a day can help ward against cancer (21). Onions protect the colon, liver, brain, stomach, ovaries, prostate, and breasts. The antiplatelet function is influenced by genotype, storage temperature, and the period of vegetable preservation. Onions, or *Allium cepa*, possess antioxidant properties attributed to their substantial concentrations of organosulfur compounds, polyphenols, and flavonoids, which are inherent antioxidants. Garlic and onion extract significantly inhibits the trypanothione-reducing enzyme in Trypanosoma brucei, resulting in the elimination of all parasites. The research further revealed that onions possess an antidepressant impact. Diseases associated with immunological dysregulation may have potential immunomodulatory therapeutic options in *Allium cepa* and its components, particularly quercetin. The anti-inflammatory and protective properties of *Allium cepa* regarding tracheal tolerance and pulmonary inflammation in asthmatic mice position it as a promising option for the treatment of airway disorders such as asthma (22,23). A. cepa preparations may prevent ethanol-induced liver damage, according to some research. The aqueous extract of *Allium cepa* bulb is an essential antioxidant for preventing ethanol-induced damage to the liver (24).

2. METHOD

The comprehensive review on the Homoeopathic uses of *Allium cepa* was reviewed using a systematic method. Relevant keywords such as "*Allium cepa*," "homeopathy," "antioxidant properties," "antimicrobial effects," and "respiratory benefits" were used to conduct comprehensive searches across numerous databases, including *Scopus, Web of Science, PubMed, Science Direct, Research gate and Google Scholar*. The search was limited to publications that were peer-reviewed and published during the 1953 to 2024. For certain investigations, citation monitoring yielded even more references. In order to ensure openness and rigor in research selection and data extraction, the review followed the PRISMA principles. In order to find relevant titles and abstracts, we first deleted duplicate information. The analysis comprised quality assessments of full-text papers that met the qualifying criteria. *Allium cepa's* treatment uses, pharmacological advantages, and action mechanisms were the subjects of quantitative and qualitative data extraction and synthesis.

Inclusion criteria

- Concentrated on the use of *Allium cepa* in medicine, homoeopathy, or pharmaceuticals.
- Available in English
- Provided quantitative or qualitative data on therapeutic outcomes.

Exclusion criteria

- Articles that were not full text (e.g., abstracts, conference proceedings, or posters).
- Focused on non-Homoeopathic applications of *Allium cepa*, such as purely culinary uses.
- Did not provide sufficient methodological details or lacked primary data.

3. RESULT

NUMBER OF PUBLICATIONS WITH DIFFERENT PHYTOCHEMICAL		
PARTICULARS	**CHEMICAL CATEGORY**	**NUMBER OF PAPERS**
Phytochemical	Quinone derivative	1
	Alcohol	2
	Organosulfur compound	1
	Anthocyanin	2

	Flavonoid	6
	saponin	2
	polyphenoid	4
	Sulfur amino acid	2
	Sulfur compound	2
	Alkanes	1
	Fatty acid	1
	Monoterpenoid	1
Total		23

Table 1: **Number of Publications with Different Phytochemical**

The table presents a summary of the number of research papers published on various phytochemicals, categorized based on their chemical nature. Flavonoids and polyphenols show the highest representation, with 4 papers each, highlighting their prominence in phytochemical research. Sulfur-containing compounds, including sulfur amino acids and sulfur compounds, account for 4 papers combined. Other important phytochemical groups, such as saponins, anthocyanins, and alcohols, have been documented in 2 papers each. Categories like alkanes, fatty acids, monoterpenoids, organosulfur compounds, and quinone derivatives have comparatively fewer publications, with only one paper each. Overall, a total of 23 research papers are included, reflecting the diversity of phytochemicals explored in scientific literature.

NUMBER OF PUBLICATIONS WITH DIFFERENT THERAPEUTIC USE		
SL NO	**THERAPEUTIC USE**	**NUMBER OF PAPERS**
1.	Antimicrobial	1
2.	Antioxidant	1
3.	Antiallergic	8
Total		10

Table 2: **Number of Publications with Different Therapeutic Use**

The table summarizes the number of research papers focusing on different therapeutic uses of various phytochemicals. The antiallergenic property is the most extensively studied, with 8 dedicated papers indicating strong research interest in exploring natural remedies for allergic conditions. In contrast, antioxidant and antimicrobial properties are each documented in 1 paper. This reflects a relatively lower focus on these properties within the selected publications. In total, 10 papers cover different therapeutic applications, emphasizing the growing scientific interest in evaluating the medicinal potential of phytochemicals.

4. DISCUSSION

The therapeutic applications of *Allium cepa* (onion) in homeopathy and alternative medicine have been extensively studied, demonstrating significant antimicrobial, antioxidant, anti-inflammatory, and respiratory benefits. This discussion delves into the scientific implications of these findings, highlighting both their strengths and the gaps that warrant further research.

Phytochemical Composition and Extraction Studies

Quinone Derivatives (1953)

The earliest exploration into the phytochemistry of *Allium cepa* dates back to 1953, when Garrigues and Buu-Hoi isolated para-benzoquinone, a quinone derivative, from onion root cells. Their experimental work highlighted its cytological impact, particularly its ability to inhibit mitosis in root tip cells. This early study established a foundation for further cytotoxic investigations into onion-derived compounds (25).

Alcohols (1954)

In 1954, Rollen A. identified octanol, a fatty alcohol, in *Allium cepa*. His work examined the effect of octanol on root meristematic cells, revealing its potential to disrupt mitochondrial function, which opened new directions for studying

alcohol-based compounds in onions and their cellular toxicity (26).

Organosulfur Compounds (1974)

The organosulfur profile of *Allium cepa* came into focus in 1974, when Augusti KI and colleagues isolated allyl propyl disulfide, a prominent organosulfur compound (27). Their pharmacological study demonstrated its hypoglycemic effects, with a 36% reduction in blood glucose in diabetic rats. This study reinforced the therapeutic value of onions in metabolic disorders, particularly in diabetes management.

Anthocyanins (1994)

In 1994, Terahara N. et al. undertook an extensive chemical analysis of red onion, leading to the isolation of malonylated anthocyanins (28). This research identified three novel anthocyanins, accounting for major pigments responsible for the red hue of onions. These findings not only expanded the anthocyanin database but also highlighted their role in the antioxidant potential of onions.

Flavonoids (2000-2015)

The flavonoid content of *Allium cepa* has been a major focus over the past few decades. In 2000, Yang XH et al. isolated a new flavonoid glycoside, enriching the chemical repertoire of onions (29). This foundational work was followed by Masuzaki S et al. in 2006, who mapped eight genes responsible for flavonoid biosynthesis in onions, linking genetic expression directly to flavonoid content (30).

In 2008, Rodríguez Galdón B et al. conducted a comprehensive chemical analysis of onion cultivars, quantifying flavonoid content and demonstrating its variability across varieties (31). They identified flavonoid concentrations ranging from 28.6 to 52.7 mg/100g, highlighting the impact of cultivar differences.

Further investigation into quercetin, the dominant flavonoid in onions, was conducted by Boyer J et al. in 2005, who showed that quercetin absorption increased by 42% when co-administered with fats (32). Later, Ko EY et al. in 2015 demonstrated that UV light exposure could further enhance quercetin content, reinforcing the importance of post-harvest handling in preserving onion phytochemicals (33). Most recently, Dobrydnev AV et al. in 2020 highlighted the anti-cancer potential of quercetin-amino acid complexes, demonstrating 50% reduction in cancer cell proliferation, emphasizing its potential in nutraceutical applications (34).

Saponins (2005)

In 2005, Corea G et al. identified and characterized four new saponins in onions. Their pharmacological studies demonstrated antispasmodic activity, showing that onion saponins could reduce intestinal contractions by 30% (35). This was a crucial contribution in understanding the bioactive roles of saponins in gastrointestinal health.

Polyphenols (2005-2018)

In 2005, Boyer J et al. comprehensively reviewed the broader polyphenolic composition of onions, identifying a wide array of polyphenols responsible for antioxidant activity (36). In 2018, Gregorio RP et al. further explored the impact of processing methods (boiling, frying) on phenolic content (37). Their review concluded that boiling reduced total phenolic content by 37%, indicating the sensitivity of polyphenols to heat and the importance of optimal cooking methods to retain health benefits.

Sulfur Amino Acids and Nonvolatile Sulfur Compounds (2011)

In 2011, Starkenmann C et al. identified and characterized S-alk(en)ylthio-L-cysteine derivatives through chemical analysis (38). They detected three major nonvolatile sulfur derivatives responsible for the characteristic pungent odor of onions. The analysis also demonstrated how these sulfur compounds contribute to the overall antioxidant and antimicrobial activity of onions, adding significant value to the functional properties of *Allium cepa*.

Sulfur Compounds (2007)

In 2007, Kumari K and Augusti KT focused on the pharmacological potential of S-methyl cysteine sulfoxide, a sulfur compound isolated from onions. Their studies demonstrated its ability to lower LDL cholesterol by 21% and triglycerides by 17%, providing strong evidence for its role in cardiovascular protection. These findings were pivotal in supporting the use of onions in managing hyperlipidaemia (39).

Alkanes, Fatty Acids, and Monoterpenes (2008)

The volatile composition of onions was extensively profiled by Jang HW et al. in 2008. Their experimental study identified a wide range of compounds, including hexadecane, octadecane, 1-hexadecanol, lauric acid, and several monoterpenes (40). These compounds collectively contributed to antioxidant potential, expanding the therapeutic profile of onion beyond flavonoids and sulfur compounds.

Therapeutic Applications of Allium cepa

The pharmacological and Homoeopathic uses of *Allium cepa* have evolved over the years, with increasing clinical validation for its diverse therapeutic applications. In 2013, Danno et al. conducted an observational multicenter study on flu-like and ENT symptoms, finding that Homoeopathic *Allium cepa* was as effective as allopathic treatments (40). Arora et al. in 2017 analyzed the antioxidant capacity of *Allium cepa* in different Homoeopathic potencies (MT, 30C, 200C), confirming retention of active phytochemicals (41). By 2021, Prajapati et al. examined the antifungal effects of *Allium cepa* in homeopathy, showing promising results against *Aspergillus niger* (42). In 2023, Yarnykh et al. conducted a clinical study on allergic rhinitis, demonstrating significant reductions in IgE levels and eosinophil counts ($p = 0.0000$) (30). The most recent study in 2024 by Manivannan et al. reviewed the anticancer potential of Homoeopathic *Allium cepa*, highlighting its apoptosis-inducing effects in cancer cells (42).

Antimicrobial Properties

Studies have demonstrated that *Allium cepa* exhibits substantial antimicrobial properties due to its high flavonoid, sulfur compound, and polyphenol content. Prajapati et al. (2021) examined ethanolic extracts of *Allium cepa*, revealing their superior antibacterial efficacy, particularly against *Staphylococcus aureus*, *Escherichia coli*, and *Klebsiella pneumoniae* (43). The proposed mechanism involves bacterial membrane disruption and interference with microbial metabolic pathways. Despite promising in vitro results, further in vivo studies are necessary to translate these findings into clinical applications.

Antioxidant Potential and Metabolic Benefits

Arora et al. (2017) studied *Allium cepa*'s antioxidant activity in Homoeopathic potencies, confirming the retention of bioactive compounds (41). Further, Gregorio et al. (2018) found that specific cooking methods, such as steaming, preserve 90% of *Allium cepa*'s antioxidant potential. Clinical studies have shown that dietary onion consumption positively impacts metabolic disorders. Kumari and Augusti (2007) reported that S-methyl cysteine sulfoxide significantly lowered LDL cholesterol by 21% and triglycerides by 28% in hyperlipidemic rats, suggesting a potential role in cardiovascular health (38).

Antiallergic Properties

Homoeopathic applications of *Allium cepa* have been extensively studied in respiratory conditions. Danno et al. (2013) compared Homoeopathic *Allium cepa* with allopathic treatments for influenza-like illnesses and ENT disorders, finding no significant difference in efficacy (40). Yarnykh et al. (2023) conducted a clinical trial on allergic rhinitis patients treated with Homoeopathic *Allium cepa*, demonstrating significant reductions in IgE levels and eosinophil counts, supporting its role in immune modulation. Further research is necessary to establish the mechanistic basis for these effects and validate their therapeutic consistency (44).(Tarang, 2024) observed that common cold and fever are common in children, necessitating effective management to reduce discomfort. Homoeopathy provides a personalized approach with remedies tailored to individual symptoms, potentially easing congestion, cough, and fever. This holistic method may offer supportive care, complementing conventional treatments for pediatric ailments(16). (Gupta, 2024) employed a randomized controlled trial (RCT) design to evaluate the efficacy of homoeopathic treatments for allergic rhinitis (AR). Participants were randomly assigned to receive homoeopathic remedies, placebo, or conventional treatments. The trial was double-blinded to ensure unbiased results. Outcome measures included symptom severity, medication usage, quality of life, and the occurrence of adverse events. Remedies were prescribed based on individualized symptom profiles following Homoeopathic principles. Systematic evaluations were conducted using validated tools, and the data were analyzed statistically to determine the effectiveness and safety of the treatments. The methodology adhered to rigorous clinical research standards, providing reliable insights into the potential role of Homoeopathy in AR management(17). (Devi & Patil, 2022) Detailed case taking for individualized prescription. Remedies selected based on symptom similarity and susceptibility. Assessment of outcomes using the Wisconsin Upper Respiratory Symptom Survey (WURSS).Paired t-tests used for statistical comparison of pre- and post-treatment results. Significant symptom reduction was observed during treatment. High susceptibility was noted in 66.67% of cases, moderate in 33.33%.Marked improvement in 64.71% of acute URTI cases and 53.85% of recurrent URTI cases.The study concluded that Homoeopathy effectively treats URTI and prevents recurrence by addressing patient susceptibility(19). (Ghosh et al., 2013) finds, 34 patients with chronic allergic rhinitis received individualized Homoeopathic treatments, including *Natrum muriaticum*, *Psorinum*, *Lachesis muta*, *Allium cepa* and others, over one year and two months. The outcomes, assessed by IgE levels, eosinophil counts, symptom scores, and WHOQOL-BREF scores, showed statistically significant improvements ($P = 0.0000$). The study suggested potential benefits of classical Homoeopathy for allergic rhinitis, though larger randomized trials are needed. Statistical analysis was performed using a paired t-test (20).

Despite strong evidence supporting *Allium cepa*'s medicinal properties, several challenges persist. Standardization issues arise due to genetic and environmental factors influencing phytochemical composition, requiring better standardization methods. Limited clinical trials remain a concern, emphasizing the need for large-scale human studies. The efficacy of ultra-diluted Homoeopathic preparations remains controversial and warrants deeper investigation. Regulatory frameworks must be developed to provide clear guidelines for integrating *Allium cepa* into mainstream medicine to ensure efficacy and safety.

Allium cepa presents immense potential in antimicrobial therapy, metabolic health, respiratory medicine, and oncology.

While traditional and Homoeopathic medicine recognize its benefits, scientific validation through rigorous research is imperative. Future studies should emphasize standardization, clinical validation, and mechanistic insights to bridge the gap between empirical use and evidence-based medicine. By integrating *Allium cepa* into modern healthcare within a robust scientific framework, its therapeutic potential can be fully realized, offering a natural, cost-effective alternative in holistic medicine.

5. CONCLUSION

This comprehensive review highlights the multifaceted therapeutic potential of *Allium cepa* (onion) within homeopathy and broader complementary medicine. *Allium cepa* showcases notable antibacterial, antioxidant, anti-inflammatory, and respiratory effects due to its abundance of bioactive components such sulfur compounds, flavonoids, and antioxidants. These qualities form the basis of its long-standing medicinal usage and its contemporary utilization in the treatment of several medical issues, including as infections, metabolic diseases, and respiratory problems. Findings provide credence to *Allium cepa's* effectiveness in pharmaceutical and Homoeopathic settings; yet, obstacles including insufficient large-scale clinical studies and an absence of standardized formulations linger. We must address these shortcomings if we want to validate its action mechanisms and increase its credibility in evidence-based medicine. *Allium cepa* has tremendous potential as a natural medicinal agent due to its low cost, general availability, and lack of adverse effects. Through the integration of ancient knowledge with scientific research, it provides a method to incorporate holistic ideas into contemporary healthcare procedures. For *Allium cepa's* medicinal potential to be fully realized, future research should concentrate on standardizing procedures and performing substantial clinical studies. This study contributes to a deeper understanding of *Allium cepa*'s role in homeopathy and emphasizes its significance in advancing natural, sustainable, and effective healthcare solutions.

Author contributions

Shivani Bhimrao Shinde: Acquisition of data; Drafting the article; Final approval of the version to be submitted. **Anupam Mukherjee:** Conception and design of the study; Revising the article critically for important intellectual content; Drafting the article; Final approval of the version to be submitted. **Suresh Jagtap:** Revising the article critically for important intellectual content: Final approval of the version to be submitted. . **Varsha Umesh Ghate:** Conception and design of the study; Acquisition of data; Analysis and interpretation of data; Revising the article critically for important intellectual content; Drafting the article; Final approval of the version to be submitted.

Conflict of interest

The authors declare no conflict of interest in the entire study.

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