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MEDICINAL PROPERTIES AND PHYTOCHEMICALS FOUND IN NAGA GARLIC (*ALLIUM CHINENSE* G.DON): A REVIEW PAPER

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ABSTRACT

Since ancient times, people have looked for drugs in nature to cure themselves from certain diseases. The use of medicinal plants in the beginning was instinctive. During those times, everything was based on experience because, at that time, there was little knowledge about the condition, or which plant could be used as a remedy. Fortunately, a wide range of technologies and techniques have been developed in the modern world to extract, isolate, and determine the precise uses of the plants. One such plant is *Allium chinense* George. Don, which is a perennial plant. It has flat, narrow, green leaves that are similar in appearance to grass. It produces small, round bulbs that are usually white or off-white in colour. The plant produces small, purple flowers in umbrella-like clusters. It is used as a culinary ingredient and also as a form of traditional medicine in almost all Naga households, and it is also used in Chinese traditional medicine, which aids to its beneficial medicinal values. *Allium chinense* G.Don consists of phytochemicals like flavonoids, alkaloids, saponins and others, that adds to its value as a plant.

KEYWORDS: *Allium chinense* G.Don, Phytochemicals, Medicinal properties, Nutritional content.

INTRODUCTION

People have been relying on medicinal plants since earlier times, and it is also used in ayurveda, siddha medicine, traditional Chinese medicine, etc. Plants consist of an enormous number of phytochemicals which has been a source of motivation for researches for drug discoveries and drug developments.[1] *Allium chinense* G.Don is a perennial plant, that produces leaves all throughout the year, while flowering takes place during summer, in August and September, and the bulb develops in autumn. The plant grows up to a height of 0.5m.[2] It belongs to the family Amaryllidaceae. The genus Allium, consists of over 1,100 species, which is the largest monocotyledonous genus.[6] *Allium chinense* G.Don is mostly used in Asia and it is originated in China and in India, it is grown in the north eastern region. It is an aromatic plant with a pungent taste, edible plant and it has an enormous number of medicinal properties.[2,5]

In today's world, the decrease in potency of synthetic medications and the rise in contraindication of their uses, leads to increase in the utilization and study of plant-based medicines. While there are no doubts about the numerous amounts of medicinal plants found in Nagaland, choosing *Allium chinense* G.Don is a strategic move due to its phytochemical composition, which includes organo-sulphur compounds, flavonoids, alkaloids, phenols, saponins, and its beneficial medicinal properties, as it improves digestive system, lowers cholesterol, anti-inflammatory, antidiabetic and antioxidant property.[4,5]

While there are enormous number of phytochemical compounds present in *Allium chinense* G.Don, a study by (Li, et al.,2023) shows that two new phenolic amide compounds , Alichinemide I and Alichinemide II, along with other existing amides were isolated, among which, 3-indolcarbaldehyde showed potential myocardium protective constituents, these were isolated from the dried bulb of the plant.[14] Another study by (Rhetso, et al.,2020) indicated that the hexane extract from the leaf of *Allium chinense* G.Don, exhibited higher antibacterial, antifungal and antioxidant activity than that of the extract from bulb, which was done using GC-MS.[5] A study by (Febriani, et al., 2025) showed significant antidiabetic effect of ethanol extract of *Allium chinense* G.Don in STZ-induced diabetic rat and also the flavonoid compound including quercetin and hydroxy flavanone, showed the capability to lower blood glucose and HbA1c levels.[4]

The above information is among the numerous existing studies done, which shows the potential of *Allium chinense* G.Don. Hence, this study is a collective survey of the valuable medicinal potential and phytochemical constituents of *Allium chinense* G.Don.

PHYTOCHEMICALS

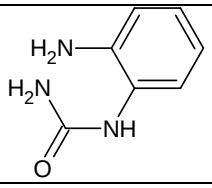
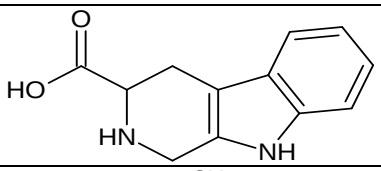
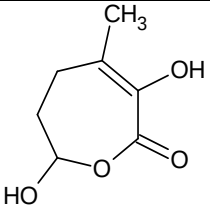
Phytochemicals are the non-nutritive, bioactive chemicals, found in plants. It acts as an immune system for the plants against diseases.[7] Phytochemicals have ample number of medicinal properties and health benefits for humans. Hence, plant extras have been used since ancient times for various diseases. Phytochemicals have a diverse classification which is further divided into primary and secondary metabolites. The primary metabolites include the common sugars, amino acids, proteins, purines and pyrimidines of nucleic acids, chlorophylls etc. While the secondary metabolites include chemicals such as alkaloids, terpenoids, flavonoids, steroids, curcumins, saponins and phenolics.[8] Secondary metabolites are the phytochemicals which gives the plants its medicinal properties.

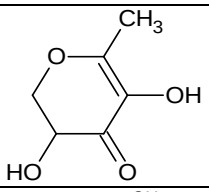
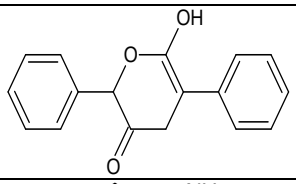
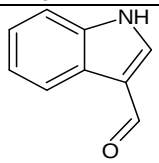
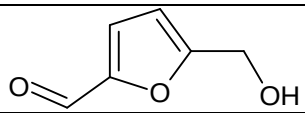
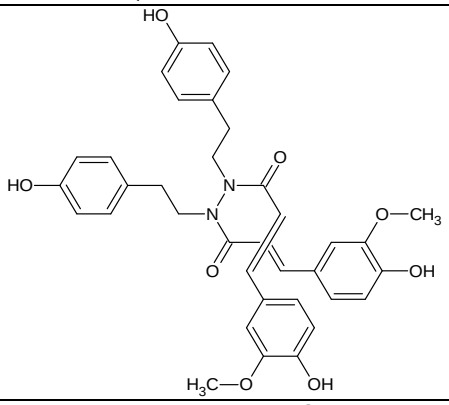
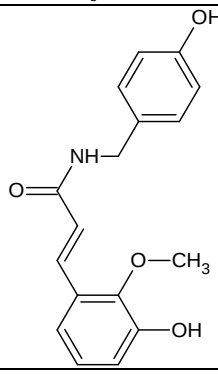
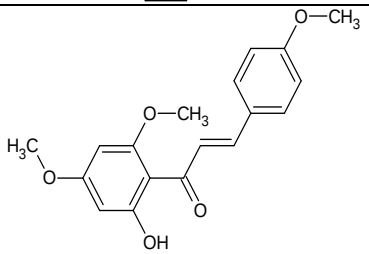
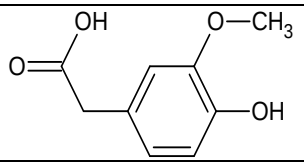
PHYTOCHEMICALS FOUND IN *ALLIUM CHINENSE* G.DON

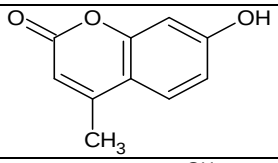
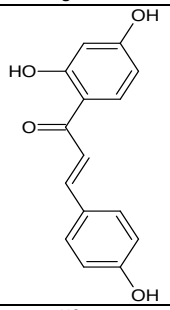
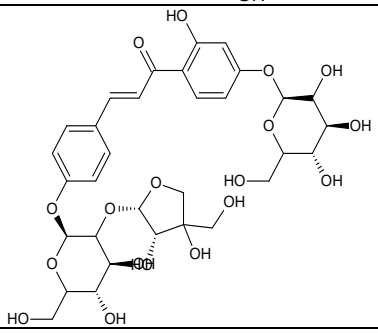
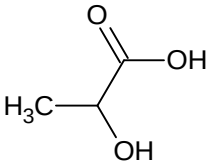
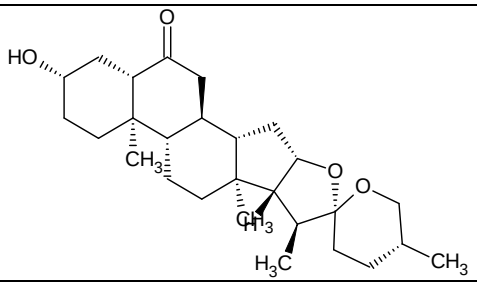
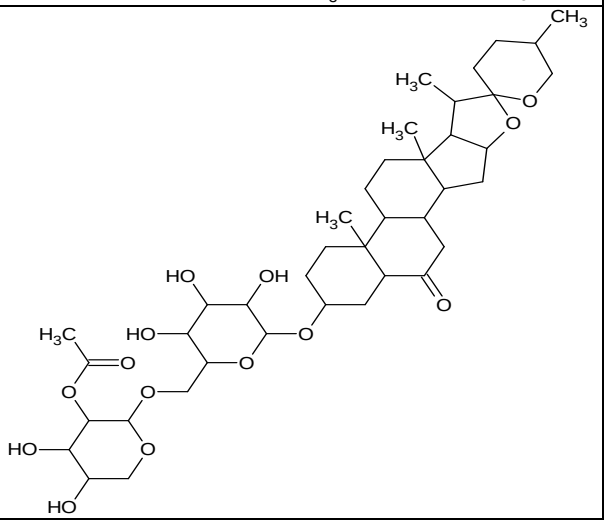
The researches done on *Allium chinense* G. Don by various researchers have shown that, it comprises of vast number of different phytochemical compounds which makes it a significant medicinal plant. In a study done by (Febriani, et al., 2025), different techniques like TLC and LC-HRMS were used for identification and isolation which indicated the presence of flavonoids like quercetin, 3-hydroxy flavanone, flavokawain A which are known for their antioxidant activity and phenolic derivatives like Homovanillic acid, Hymecromone and Shogaol, which are linked with oxidative stress and inflammation.[4] A study done by (Baba, et al., 2000) mentions that, after using different techniques like hot water extraction, bioassay-guided fractionation and silica-gel column chromatography, of the bulb of *Allium chinense* G.Don i.e., the Chinese crude drug Xiebai, different saponins like Xiebai Saponin -I, Laxogenin and Laxogenin diglycoside and chalcones like Isoliquiritigenin and Isoliquiritigenin-4-O- glucoside were extracted and isolated. Further research showed potential anti-tumour activity, in vitro investigation using 4-nitroquinoline-1-oxide (4-NQO) as a starter and glycerol as a facilitator, showed that, Laxogenin showed anti-tumour activity in the mice with stage-two

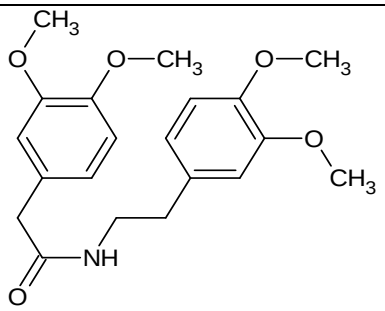
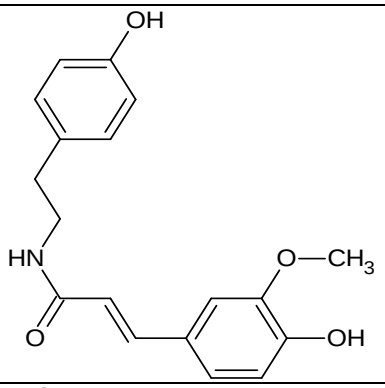
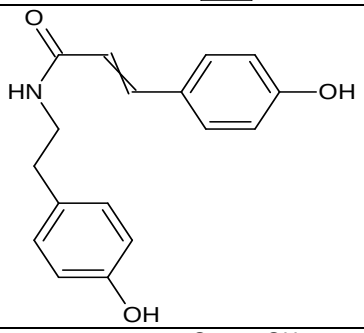
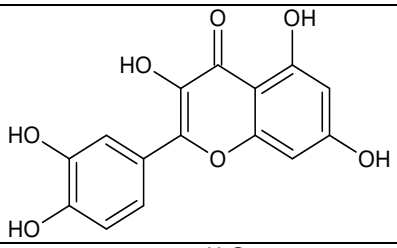
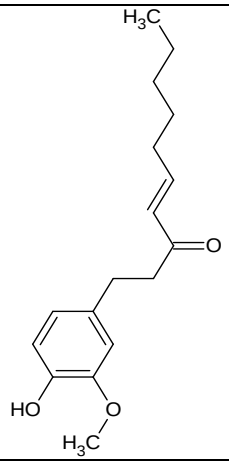
lung carcinogenesis and Xiebai Saponin-I and Laxogenin diglycoside showed high cytotoxicity in HeLa cells.[11] Another study conducted by (Li, et al., 2023) identified phenolic amides, specifically the isolation of two novel compounds Alichenimide I and Alichenimide II, along with six known amides, 3-indolcarbaldehyde, 1-(2-aminophenyl)urea, 2,3,4,9-tetrahydro-1H-pyrido[3,4-b]indole 3-carboxylic acid, N-trans-feruloyltyramine, N-trans-p-coumaroyltyramine, and N-(3,4 dimethoxyphenethyl) acetamide. Subsequently *in vitro* tests were performed to evaluate the Myocardium protective effects of the isolated eight compounds against Myocardium cells, against H_2O_2 induced H9c2 cells (Rat myocardial cell). The results indicated that, 3-indolcarbaldehyde showed the highest rate of survival from 49.96% to 69.41%, while the remaining seven compounds, alichenimide I and alichenimide II, 1-(2-aminophenyl)urea, 2,3,4,9-tetrahydro-1H-pyrido[3,4-b]indole 3-carboxylic acid, N-trans-feruloyltyramine , N-trans-p-coumaroyltyramine , and N-(3,4 dimethoxyphenethyl) acetamide also showed acceptable survival rates at 51.63%, 55.64%, 46.08%, 47.36%, 52.68%, 53.14% and 55.14%[14]. A study done by (Frans Grovy, et al.,2021) involved the preparation of an aqueous extract of *Allium chinense* G.don through maceration and the identification of the constituents was done by GC-MS, which indicated that furan compounds along with their derivatives were the predominant compounds found in the aqueous extract. The key constituents identified were 5-(hydroxymethyl)-2-furancarboxaldehyde (26.65%), 2,3-dihydro-3,5 dihydroxy-6-methyl-4H-pyran-4-one (14.64%), lactic acid (12.70%), 3,5 dihydroxy-2-methyl-5,6-dihydropyran (10.42%) and other furan derivatives that accounted for less than 2%, the test for antimicrobial activity of *Allium chinense* G.Don was carried out against gram positive bacteria and yeast which resulted in the largest inhibition in *Candida albicans* fungal strains and minor inhibitions in *E.coli* and *S.typhiin* bacterial strains.[12] A study done by (Qin, et.al., 2023) on the volatile constituents of *Allium chinense* G.Don, shows that, 115 volatile organic compounds were characterised using, Head space solid phase Microextraction couple with HS-SPME-GC-MS, among which the major compounds were sulphur, ketones and heterocyclic compounds. Further, *in vivo* experiment was carried out on Apolipoprotein E knockout (*ApoE-/-*)mice, fed with a diet high in fat and cholesterol, to study the lipid lowering effect and anti-atherosclerosis activity, it was seen that the sulphur containing compounds exhibited effects on lipid reducing and anti-atherosclerosis properties.[13]

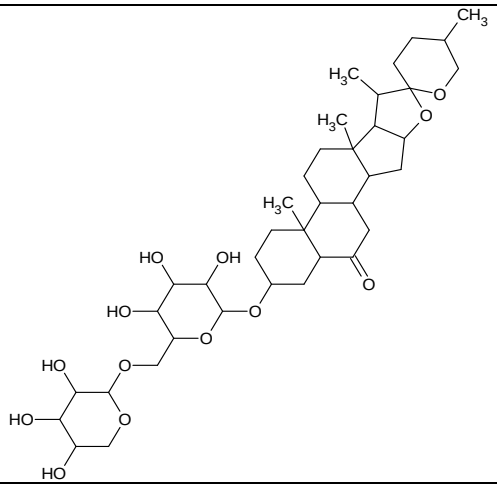
Table 1: List of the mentioned phytochemicals of *Allium chinense* G.Don.

Sl. No.	Name of the phytochemical	Class of the phytochemical	Molecular structure of the phytochemical
1.	1-(2-aminophenyl)urea	Phenolic Amide	
2.	2,3,4,9-tetrahydro-1H-pyrido[3,4-b]indole 3-carboxylic acid	Phenolic Amide	
3.	2,3-dihydro-3,5 dihydroxy-6-methyl-4H-pyran-4-one	Ketone	

4.	3,5 dihydroxy-2-methyl-5,6-dihydropyran	Pyran derivative	
5.	3-hydroxy flavanone	Flavonoid	
6.	3-indolecarbaldehyde	Phenolic Amide	
7.	5-(hydroxymethyl)-2-furancarboxaldehyde	Furan derivative	
8.	Alichenimide-I	Phenolic Amide	
9.	Alichenimide-II	Phenolic Amide	
10.	Flavokawain A	Chalcone	
11.	Homovanillic acid	Phenolic acid	

12.	Hymecromone	Coumarin	
13.	Isoliquiritigenin	Chalcone	
14.	Isoliquiritigenin-4-O-glucoside	Chalcone	
15.	Lactic acid	Carboxylic acid	
16.	Laxogenin	Saponin	
17.	Laxogenin diglycoside	Saponin	

18.	N-(3,4 dimethoxyphenethyl) acetamide	Phenolic Amide	
19.	N-trans-feruloyltyramine	Phenolic Amide	
20.	N-trans-p-coumaroyltyramine	Phenolic Amide	
21.	Quercetin	Flavonoid	
22.	Shogaol	Phenolic ketone	

23.	Xiebai Saponin-I	Saponin	

NUTRITIONAL CONTENT OF *ALLIUM CHINENSE* G.DON

The nutritional composition of *Allium chinense* G.Don is shown in Table.1 obtained from a study done by (Li et al., 1989). In the study done by (Bah, et al., 2012) and (Shahrajabian M.H. et al., 2020), it is mentioned that *Allium chinense* G.Don consist of a rather complex nutritional composition which makes it a valuable plant. It is stated that the nutritional content varies, depending on the cultivation region. The macro nutrients found in *Allium chinense* G.Don are water, carbohydrate, protein, fat and fiber, where water has the highest content i.e. 73.5%, while carbohydrate consist of sugars and soluble sugars, it contains 1.71% of protein, the fat content is very low at 0.12% and the fiber content is 1.2% in bulb while in the roots it can be high as 40%. It contains vitamins, with Vitamin B1 content at a significant amount of 8.66% and a lesser amount of Vitamin C 0.16%. It consists of amino acids like Lysine, Asparginase, Aspartyl acid thtreonine, Arginine, B acid serine, Glutamate, Alanine, Methionine, y-aminobutyric acid and Leucine isoleucine. The plant is also seen to be rich in minerals like calcium, magnesium and phosphorus, with traces of elements like iron, manganese, strontium, copper and zinc. It comprises of key bioactive compounds, with high content of sulphur containing compounds, saponins and flavonoids. The presence of such components in *Allium chinense* G.Don makes it highly nutritional and significant.[2,3]

Table 2: Nutritional content of *Allium chinense* G.Don (Li et al., 1989).

NUTRIENT COMPONENT	CONTENT (%)
Water content	73.5
Protein	1.71
Sugar	11.51
Water soluble sugar	4.20
Vitamin B1	8.66
Vitamin C	0.16
Lysine	0.160
Asparginase	0.191
Aspartyl acid thtreonine	0.132
Arginine	0.127
B acid serine	0.130
Glutamate	0.071
Alanine	0.094
Methionine	0.027
y-aminobutyric acid	0.124
Leucine isoleucine	0.104

MEDICINAL PROPERTIES OF *ALLIUM CHINENSE* G.DON

Over the years, *Allium chinense* G.Don has been reported to have a diverse range of medicinal properties, as a result of its nutritional content (Table.2) and also its rich phytochemical composition (Table.1).

Traditional medicine

A review done by (Shahrajabian M.H. et al., 2020) indicates that *Allium chinense* G.Don is utilized in traditional Chinese medicine. It has been noted that the bulb of *Allium chinense* G.Don has been used as a crude for 'Xiebai', which is used for the treatment of chest pain, stenocardia, and heart asthma. The literature suggests that various studies have shown that, preparations derived from Xiebai exhibited multiple biological activities, such as anti-atherogenic, hypolipidemic, anti-platelet aggregation, antihypertension, antioxidant and analgesic effects.[3]

Anti-cancer activity

A study done by (Yu, Zhihui, et al., 2015) showed that the saponins (ACSs) extracted from ethanol extract of *Allium chinense* G.Don exhibited cytotoxic effects in B16 melanoma and 4T1 breast carcinoma cell lines. The experiment was done by using Methylthioninium chloride and hematoxylin-eosin staining alongside Giemsa dyestuff after which, the cell lines were exposed to ACSs. It was observed that the morphologies of the cells underwent significant changes, with apoptosis occurring in both B16 and 4T1 cells as indicated by acridine orange/ethidium bromide double fluorescence staining, which increased with the rising concentration of ACSs. Additionally, the preliminary *in vivo* antitumor assay showed that, early treatment effectively inhibited tumour growth and also provided protection to the liver and spleen of C57 BL/6 mice from injury.[10] Another study conducted by (Baba, et al., 2000) reported that, a saponin known as Laxogenin obtained from the bulb of *Allium chinense* G.Don demonstrated anti-tumour properties in stage-two lung carcinogenesis. In this investigation, two compounds, Xiebai Saponin -I and Laxogenin were extracted from 'Xiebai' drug which is a traditional Chinese medicine containing *Allium chinense* G.Don. Further *in vitro* study using 4-nitroquinoline-1-oxide (4-NQO) as a starter and glycerol as a facilitator, showed that, Laxogenin showed anti-tumour activity in mice with stage-two lung carcinogenesis.[11]

Antidiabetic activity

Research done by (Febriani, et al., 2025) showed that the ethanol extract of *Allium chinense* G.Don significantly lowered the glucose level in diabetic rat models. Techniques such as TLC and LC-HRMS were used for initial screening and precise identification of phenolic compounds and flavonoids. Flavonoids namely, Quercetin, 3-Hydroxyflavanone, and flavokawain A, and Phenolic derivatives, Homovanillic acid, Hymecromone and Shogaol were identified, which showed that *Allium chinense* G.Don to be a potential antioxidant and anti-inflammation properties. Further, in vivo evaluation on Streptozotocin (STZ) induced diabetic rats were done for 28 days by assessing different parameters like fasting blood glucose, Hba1c, pancreatic hispathology and expression of insulin, which all showed positive results under controlled dosage.[4]

Anti-inflammatory activity

The study done by (Febriani, et al., 2025) mentions the identification of several flavonoids and phenolic compounds, which was done by LC-HRMS analysis of the ethanol extract of *Allium chinense* G.Don. The flavonoids detected included quercetin ($C_{15}H_{10}O_7$, RT = 7.462 min), flavokawain A ($C_{18}H_{18}O_5$, RT = 9.663 min), and 3-hydroxyflavanone ($C_{15}H_{12}O_3$, RT = 8.953 min), which are all known for their significant antioxidant and anti-inflammatory activities.[4]

Note: Here, the Retention time (RT) is a mechanism of separation and not a measurement that allows the effective isolation and identification of the compounds.

Antimicrobial activity

A study conducted by (Rhetso, et al., 2020) demonstrated that both the leaf and bulb extracts of *Allium chinense* G.Don showed antibacterial activity against *Staphylococcus aureus* and *Pseudomonas aeruginosa*.[5] In another study done by (Naibaho, et al., 2021) it was found that the aqueous extract of *Allium chinense* G.Don had strong antibacterial effects against Gram positive bacteria and significant antifungal activity against *Candida albicans*.[12] In both studies, researches evaluated the antimicrobial assessment using the agar disk diffusion method.

RESEARCH GAP

From this review paper, it is evident that *Allium chinense* G.Don is a valuable plant rich in phytochemicals with significant health benefits, though the culinary aspects are well established and it is seen that the whole plant is edible, it lacks scientific research when compared with *Allium sativum* (Garlic) and *Allium cepa* (Onion). As seen in the study by (Shahrajabian M.H. et al.,2020) *Allium chinense* G.Don has been utilized in traditional Chinense medicine known as Xiebai and has shown many medicinal benefits but, when it comes to scientific research it lacks certain aspects like undefined mechanism, bioavailability studies and lacks clinical trials. This work is a way to encourage future researches to explore in depth about the pharmacological and medicinal values of *Allium chinense* G.Don by implementing techniques to figure out the specific molecular pathways of the phytochemicals and also examining the co-action mechanism of *Allium chinense* G.Don with other drugs.

CONCLUSION

Through this review paper it is well established that, *Allium chinense* G.Don is a significant plant, featuring a rich array of phytochemicals and beneficial medicinal properties. It is seen that it contains secondary metabolites like flavonoids, saponins, organo-sulphur compounds and phenols which aids to its medicinal activities. The specific compounds isolated and identified are saponins like, Xiebai Saponin-I and Laxogenin diglycoside, flavonoids such as, quercetin, 3-hydroxy flavanone and flavokawain A, phenolic amides like, alichenimide I and alichenimide II and volatile organic compounds like, sulphur, ketone and heterocyclic compound. In terms of medicinal properties, it has been used in traditional Chinese medicine, particularly Xiebai which has been utilized for treating chest pain, stenocardia, and heart asthma and exhibits biological activities such as, anti-atherogenic, hypolipidemic, anti-platelet aggregation, antihypertension, antioxidant and analgesic effects. The saponins have demonstrated anti-cancer properties in melanoma and breast cancer cell lines, while Laxogenin showed anti-tumour effects. It was established that it showed antidiabetic activity as it lowered the glucose level in diabetic rats. Due to the presence of flavonoids and phenolic derivatives it showed anti-inflammatory and antimicrobial activities. This review paper thus highlights the valuable potential of *Allium chinense* G.Don.

ABBREVIATIONS

TLC: Thin Layer Chromatography

GC-MS: Gas Chromatography- Mass Spectrometry

LC-HRMS: Liquid Chromatography- High Resolution Mass Spectrometry

STZ: Streptozotocin

HbA1c: Glycated haemoglobin

RT: Retention Time

HS-SPME-GC-MS: Head Space- Solid Phase Microextraction- Gas Chromatography-Mass Spectrometry

ApoE: Apolipoprotein E

REFERENCES

1. Ingle, Shyam G., Aniket K. Gade, and Ganesh B. Hedawoo. "Systematic review on phytochemicals structure and activity databases." *Phytomedicine Plus*, 2024; 4(4): 100644.
2. Bah, Amadou A., et al. "Phyto-characteristics, cultivation and medicinal prospects of Chinese jiaotou (*Allium chinense*)." *Int J Agric Biol*, 2012; 14(4): 650-657.
3. Shahrajabian, Mohamad Hesam, Wenli Sun, and Qi Cheng. "Chinese onion (*Allium chinense*), an evergreen vegetable: A brief review." *Polish Journal of Agronomy*, 2020; 42: 40-45.
4. Febriani, Husnarika, et al. "Exploring the Therapeutic Effects of *Allium chinense G. Don* Extract on Pancreatic Histopathology and Apoptosis Biomarker Modulation in Diabetic Rat Models." *Trends in Sciences*, 2025; 22(12): 10638-10638.
5. Rhetso, Thejanuo, et al. "Chemical constituents, antioxidant, and antimicrobial activity of Allium chinense G. Don." *Future Journal of Pharmaceutical Sciences*, 2020; 6(1): 102.
6. Teotia, Deepti, et al. "Ethnobotany, phytochemistry and biological activities of the genus Allium L." *Environment Conservation Journal*, 2025; 26(3): 1058-1076.
7. Molyneux, Russell J., et al. "Phytochemicals: the good, the bad and the ugly ?." *Phytochemistry*, 2007; 68(22-24): 2973-2985.
8. Koche, D. E. E. P. A. K., R. U. P. A. L. I. Shirsat, and M. A. H. E. S. H. Kawale. "An overerview of major classes of phytochemicals: their types and role in disease prevention." *Hislopia J* 9.1/2 (2016): 1-11.
9. Li, H. Z., X. L. Xiao, and X. Zhou. "Nutrition component analysis." *Journal of Hunan Agricultural College*, 1989; 15: 118-130.
10. Yu, Zhihui, et al. "Anticancer activity of saponins from *Allium chinense* against the B16 melanoma and 4T1 breast carcinoma cell." *Evidence-Based Complementary and Alternative Medicine* 2015.1 (2015): 725023.
11. Baba, Masaki, et al. "Saponins isolated from *Allium chinense* G. Don and antitumor-promoting activities of isoliquiritigenin and Laxogenin from the Sama Drug." *Biological and Pharmaceutical Bulletin*, 2000; 23(5): 660-662.
12. Naibaho, Frans Grovy, et al. "GC-MS analysis and antimicrobial activity of the aqueous extract from the bulbs of *Allium chinense* G. Don. cultivated in North Sumatra, Indonesia." *Asian Journal of Agriculture and Biology*, 2021.02 (2021).
13. Qin, Zifei, et al. "Characterization of volatile organic compounds with anti-atherosclerosis effects in *Allium macrostemon* Bge. and *Allium chinense* G. Don by head space solid phase microextraction coupled with gas chromatography tandem mass spectrometry." *Frontiers in nutrition*, 2023; 10: 996675.
14. Li, Xiaoqing, et al. "Two new phenolic amides from *Allium chinense*." Chinese Herbal Medicines, 2023; 15(4): 603-606.