



A REVIEW ON MEDICINAL VALUES OF *ALLIUM FISTULOSUM*

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ABSTRACT

Plants have been utilized worldwide to cure several diseases since time immemorial and as per World Health Organization, about 80% of individuals globally still use them. In practically every culture, herbal medicine is an important aspect of traditional medicine. *Allium fistulosum* (Welsh onion) is a perennial onion species that originates in eastern Asia. It is an important cooking ingredient in eastern countries, such as China, Japan, and Korea. In western countries, it is primarily used as a scallion or salad onion. Phytochemical studies reported that organ sulfur compounds and polyphenol compounds were present in Welsh onion. From this review it is clear that *Allium fistulosum* shows anti-fungal, anti-oxidative, anti-hypertensive, anti-platelet, and anti-obesity effects.

KEYWORDS: *Allium fistulosum*, Antioxidant, Flavonoids, Hepatoprotective, Hyperlipidemic, Polyphenols Phagocytotic, Reoxygenation, Taxonomist.

INTRODUCTION

Medicinal plants are potential alternative for synthetic drugs. Most of the marketed drugs like antibiotics shown unwanted symptoms and emergence of resistant pathogenic microorganisms, adverse effect related to these drugs and withdrawal issues restricting their use in many countries, therefore more attention has been given to herbal products. In this context, *Allium fistulosum* L. can be utilized as a useful herbal drug candidate to treat various diseases. The large and widespread genus *Allium* contains a small number of economically important species. One of these, the Welsh onion, *Allium fistulosum* L., is widely cultivated in the Far East, particularly in Japan, China, and Korea. It is a traditional medicinal plant used for the treatment of colds, influenza, abdominal pain, headache, and heart disease.^[1]

BOTANICAL DESCRIPTION

The Welsh onion is a perennial herb with indistinct bulbs that grown in clusters. The base of stem is slightly swollen and leaves held erect coming under the family Amaryllidaceae. Its root system is string-shaped with few and short lateral roots. The stem is short and has a oblate shape. It is surrounded by the base of the leaf

sheath, and densely rooted in the lower part. The young leaves are hidden in the leaf sheath and form a round rod-shaped pseudo stem with the multilayer sheaths. The underground pseudo stem is white whereas the above-soil part is yellow green. The leaves are long, cylindrical, hollow, green or dark green, with a smooth and waxy surface. Each plant has 5–8 leaves arranged in a fan shape. The maximum height of the plant is 0.3 meter and the maximum crown width is 0.6 meter.^[2]

From a taxonomist perspective, *A. fistulosum* cultivars and varieties show variations in terms of stem color (green, white, red, or purple), stem thickness, leaf, bulb formation and flavor intensity, contributing to the overall diversity of the species. For agronomic traits, uniformity, disease resistance, plant growth habit and earliness are important considerations for growers and breeders. The characteristically stronger pungency of *A. fistulosum* contributes to the crop's unique flavor profile. Also, among green onions, a considerable amount of morphological diversity exists. Alliums are also generally hardy and adaptable to diverse environmental conditions, making the crops easily cultivated by home gardeners and commercial growers, irrespective of the

field of protected conditions. The adaptable nature of the crop makes it useful for consumption throughout the year, bridging seasonal gaps in fresh produce availability.

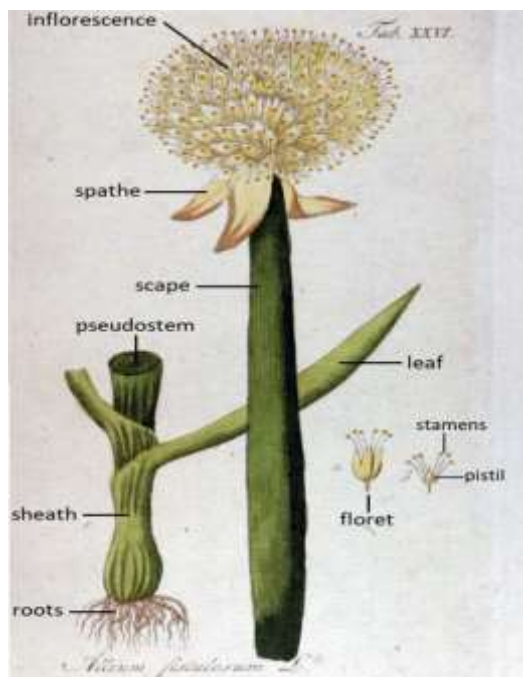


Figure 1: *Allium fistulosum*.

BOTANICAL CLASSIFICATION

| | |
|-----------|------------------------|
| Kingdom | : Plantae |
| Clade | : Tracheophytes |
| Order | : Asparagales |
| Family | : Amaryllidaceae |
| Subfamily | : Allioideae |
| Genus | : <i>Allium</i> |
| Species | : <i>A. fistulosum</i> |

ORIGIN AND DISTRIBUTION

Allium fistulosum (Welsh onion or bunching onion) is a species of perennial onion originated in Eastern Asia. In terms of distribution, though green onions are cultivated in many areas across the globe, they are highly popular in East Asia, ranging from Siberia to tropical Asian countries such as China, Vietnam, Taiwan, Japan, the Philippines, the Republic of Korea, Malaysia and Indonesia. China is the world's topmost green-onion-producing country, with an estimated production area that exceeds 500,000 ha, ahead of production areas in Japan and the Republic of Korea, each of the latter two countries with an approximate production area of 25,000 ha. Significant production of green onions also occurs in America, Europe and Africa. In Europe, Germany has the biggest green onion production area, estimated at 1300–1400 hectares.^[3]

BIOACTIVE COMPOSITION

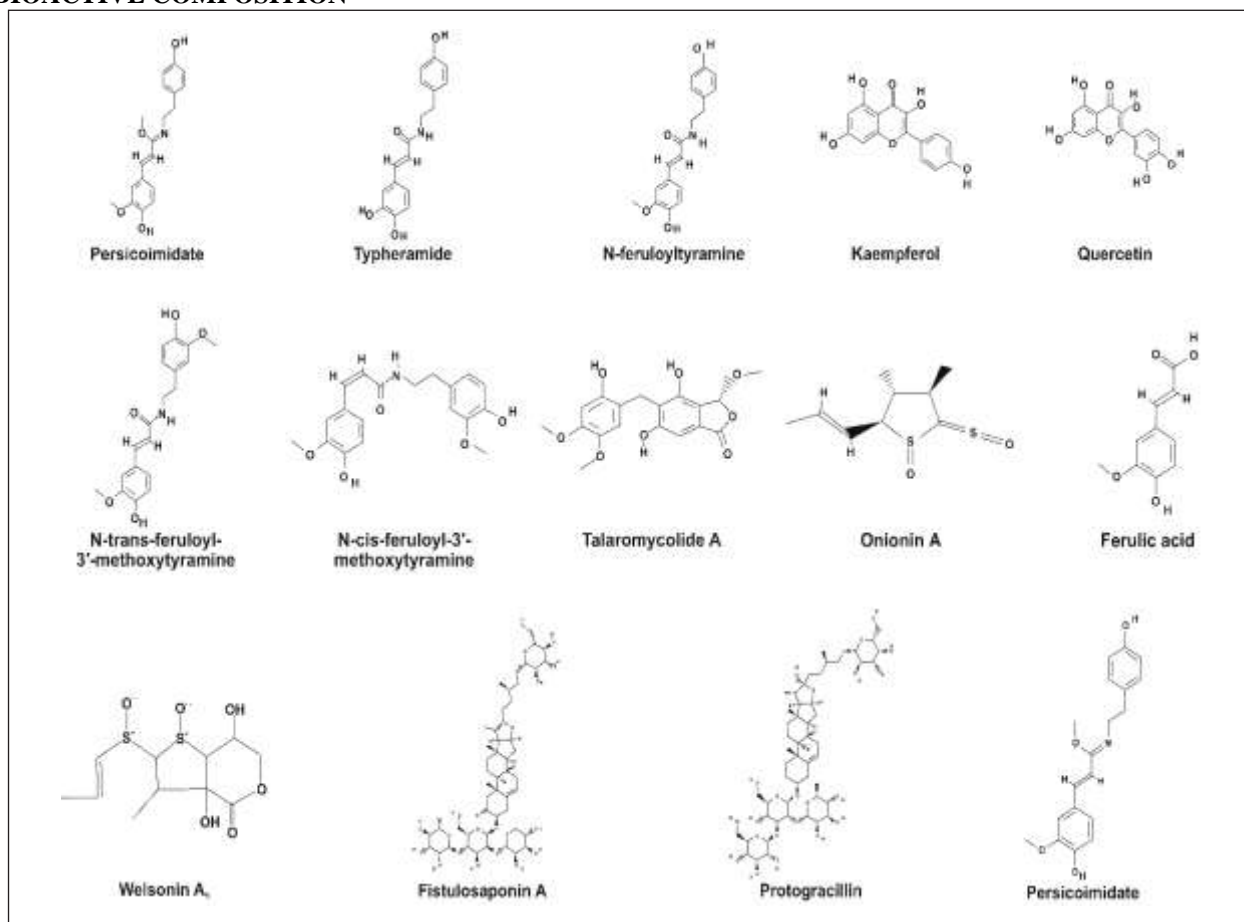


Figure 2: Bioactive compound.

MEDICINAL USES

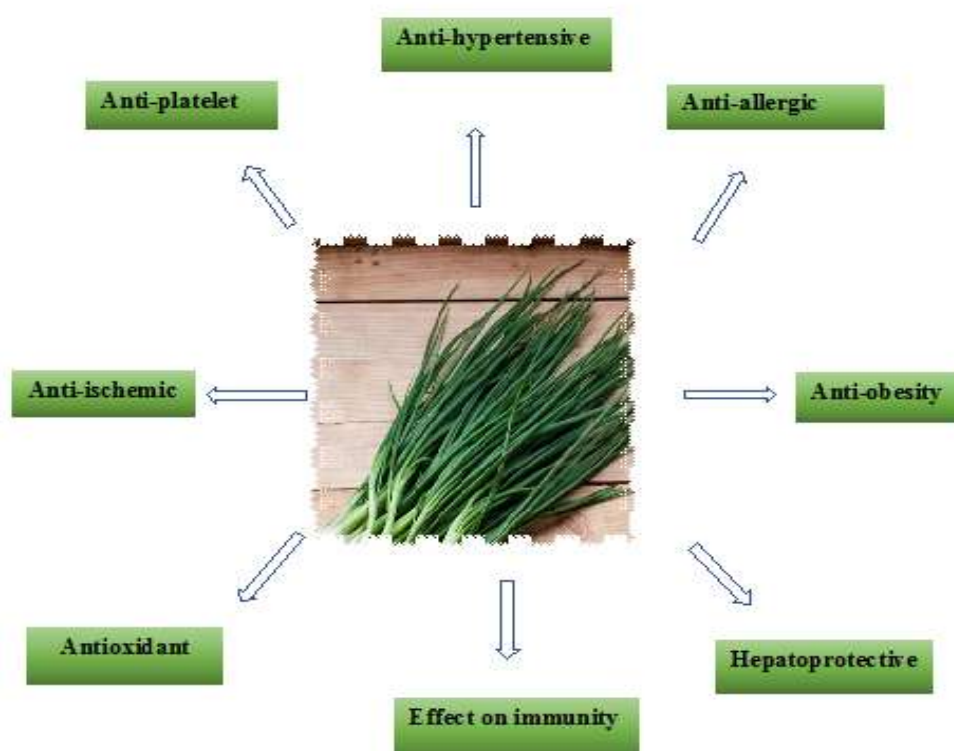


Figure 3: Medicinal properties.

Anti-hyperlipidemic activity

The ethanolic extract, p-coumaric acid, quercetin, ferulic acid, and kaempferol from Welsh onion were investigated for anti-hyperlipidemic activity against delipidated serum (DLPS; a mixture of mevalonate and rosuvastatin)-treated HepG2 cells. The extract significantly reduced the low-density lipoprotein receptor (LDLR), pro-protein convertase subtilisin/kexin type 9 (PCSK9), hepatocyte nuclear factor 1 α , sterol regulatory element-binding protein-2 (SREBP 1c) gene expressions, as well as, LDLR protein expressions without affecting the cell viability.^[4]

Anti-oxidant activity

Allium fistulosum was reported to be a strong antioxidant evident by various studies. The extracts from different parts (root, stem, and leaf) were prepared in rice wine (Michiu Tou; 34% alcohol and Michiu; 19.5% alcohol) and exhibited an anti-oxidant effect with 6.2–15.5 mmol TE/g in Trolox equivalent antioxidant capacity. Further, extracts showed a scavenging effect with IC₅₀ ranging between 14.6 and 26 μ g/ml in 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay.^[5]

Hepatoprotective activity

The ethanolic extract of *A. fistulosum* significantly reduced the lipid accumulation, mRNA expression of SREBP1c, and fatty acid synthase (FASN) in oleic acid (OA) induced non-alcoholic fatty liver disease model using HepG2 cells, without affecting the cell viability. Moreover, the extract significantly attenuated body, liver,

and epididymal fat weight, food efficiency ratio, and plasma levels of ALP, ALT, and AST in the western diet-fed obese mice.^[6]

Effects on bone growth

The Welsh onion roots aqueous extract increased the longitudinal bone growth by promoting insulin-like growth factor-1 and transforming growth factor signaling, with a significant decrease in body weight gain, retroperitoneal, visceral fat, serum osteocalcin, and total area under the curve, along with a notable increase in fasting serum glucose, insulin, HOMA-IR, serum ALP, femur, tibia bones length, and hypertrophic growth.^[7]

Anti-allergic activity

Allium fistulosum leaves ethanolic extract (200– 1,000 μ g/ml) exerted anti-allergic activity on calcium ionophore A23187 stimulated mast cell line (RBL-2H3) by notably reducing β -hexosaminidase and indicating a suppressive effect on the degranulation of RBL-2H3 cells.^[8]

Effects on immune response enhancement

The mucus extract from green leaves of *A. fistulosum* showed significant enhancement of TNF- α and monocyte chemotactic protein-1 (MCP-1) in leukemic monocytes (RAW 264) and IL-12 in macrophage-like J774.1 cell in vitro and also increased the TNF- α , IL-12 and phagocytotic activity in peritoneal cells, LPS-interferon- γ (IFN- γ) production in spleen cells and the activity of natural killer cells of mice in vivo. These findings

revealed that *A. fistulosum* can enhance natural immunity and can be used as a major defense against various diseases.^[9]

Antimicrobial activity

Allium plants are known for their antimicrobial properties due to their high content of thiosulfates, especially allicin, polyphenols or flavonoids. The hydroalcoholic extracts of six *Allium* species obtained by cold percolation were analyzed regarding their phytochemical compounds and antimicrobial activity.^[10]

Anti-ischemic activity

The fistulosaponins and protogracillin of *Allium fistulosum* seeds displayed an anti-ischemia effect against hypoxia/reoxygenation stimulated injury in human umbilical vein endothelial cell.^[11]

Anti-obesity activity

The oral administration ethanolic and water extract of *Allium fistulosum* significantly reduced body weight, adipose tissue and liver weight and fat accumulation in a mouse model obesity. In addition, it also improved serum levels of triacylglycerol, total cholesterol, total cholesterol, free fatty acids and HDL- cholesterol. *Allium fistulosum* may be useful as a functional food material or therapeutic agent for the treatment of obesity and obesity associated metabolic syndrome.^[12]

Anti-platelet activity

Potent antiplatelet effect of onion is probable mediated by TXA2 synthase inhibition and TXA2/PGH2 receptor blockade.^[13]

CONCLUSION

The information about phytochemicals and various medicinal uses of *Allium fistulosum* were discussed in this review. The plant contains various phytochemicals such as alkaloids, flavonoids, phenols and steroids etc., which shows wide variety of pharmacological activities like antioxidant, antimicrobial, antiplatelet, antiobesity, antiischemic, antiallergic, and antihyperlipidemic activity etc. From this review it is clear that it can be used in the effective management of various diseases due to the presence of various bioactive constituents.

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