



## A Brief Review of the Medicinal Effects of *Scrophularia striata*

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### ABSTRACT

*Scrophularia striata* is a valuable medicinal plant in traditional Iranian medicine. This plant contains a variety of chemical compounds, including flavonoids, saponins, glycosides, and phenolic acids. The therapeutic effects of *S. striata* include anti-inflammatory, antiviral, antibacterial, and anticancer properties. Studies have shown that this plant can be effective in treating chronic inflammations and inflammatory diseases such as rheumatoid arthritis. Additionally, its antiviral properties may be beneficial in combating viral infections like influenza. The antibacterial effects of *S. striata* could also be useful in treating bacterial infections, particularly against antibiotic-resistant bacteria. Furthermore, research has indicated that this plant has anticancer effects, potentially serving as an adjunct in cancer treatment by inhibiting cancer cell growth and inducing apoptosis in these cells. Overall, due to its wide range of medicinal properties, *S. striata* could play a significant role in the development of new herbal medicines with various applications.

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### Intorduction

*Scrophularia striata*, known in Iran as "Gol mimoni sazouei," is a significant medicinal plant with a wide range of therapeutic effects (Figure 1). This letter reviews these effects based on scientific studies. *S. striata*, recognized as an important species within the figwort family, primarily grows in mountainous and high-altitude regions. Native to Iran, it is abundantly found in the western and northwestern provinces, especially in Kurdistan, Kermanshah, West Azerbaijan, and East Azerbaijan. Besides Iran, this plant also grows in countries like Turkey, Iraq, and Syria. Due to its medicinal properties and adaptation to cold and mountainous climates, *S. striata* is well-established in these regions.



**Figure 1.** *Scrophularia striata* plant

## Taxonomic Classification Level of *Scrophularia striata* plant

Kingdom: Plantae

Phylum: Tracheophyta

Class: Magnoliopsida

Order: Lamiales

Family: Scrophulariaceae

Genus: *Scrophularia*

Species: *Scrophularia striata*

## Chemical and Phytochemical Compounds of *S. striata* Extracts

*S. striata*, also known as "figwort," belongs to the Scrophulariaceae family and has been used as an herbal remedy in traditional Iranian medicine. Phytochemical studies have revealed that various extracts of this plant contain diverse compounds such as flavonoids, terpenoids, steroids, glycosides, saponins, and phenolic acids. Notable compounds in its methanolic extract include chlorogenic acid, caffeic acid, and rutin (Gohari et al., 2011).

## Morphology and Physical Characteristics of *S. striata*

*S. striata*, referred to in Persian as "Gol Meimouni sazouei" is a perennial herbaceous plant in the Scrophulariaceae family. This plant naturally grows in the mountainous and high-altitude regions of Iran, particularly in the western and northwestern areas of the country.

### Plant Morphology

*S. striata* is an herbaceous plant reaching 30 to 80 cm in height. Its stem is square-shaped and longitudinally ridged, from which the plant's name derives. The stems are often branched and have a greenish-red color. The leaves are opposite, simple, and serrated. The leaves are typically 5 to 10 cm long and 2 to 4 cm wide. Their surface is usually rough and hairy, which helps reduce water evaporation in dry areas (Rechinger, 1982). The flowers of *S. striata* appear as racemes or panicles at the ends of the stems. These small, tubular flowers are greenish-yellow with distinct red stripes on the petals. Each flower usually has five petals, forming a tubular corolla at the base. There are typically two stamens and one pistil per flower (Mozaffarian, 1996). The fruits are two-chambered capsules containing numerous small brown seeds. These seeds are smooth, shiny, and dispersed by the wind (Rechinger, 1982).

### Physical Characteristics

*S. striata* is a drought-resistant plant that typically grows in rocky and sandy soils with good drainage. It requires full sunlight but can continue to grow in partial shade. *S. striata* is also cold-tolerant, going dormant in winter and regrowing from underground roots in spring (Mozaffarian, 1996).

## Chemical Composition of *S. striata* Essential Oil

The essential oil extracted from *S. striata* contains several aromatic and volatile compounds. A study on its essential oil identified beta-caryophyllene, alpha-humulene, limonene, and geraniol as the main constituents. These compounds are known for their anti-inflammatory and antioxidant properties (Shafaghath et al., 2012).

## Biological Properties and Medicinal Applications

Studies have shown that the extracts and essential oils of this plant possess numerous biological properties, including anti-inflammatory, antioxidant, antiviral, and anticancer activities. For instance, research has indicated that the methanolic extract of *S. striata* exhibits anticancer effects on human breast cancer cells by inducing apoptosis (Bahramikia & Yazdanparast, 2008).

### Anti-inflammatory and Antioxidant Activities

Several studies have demonstrated that the leaf and flower extracts of *S. striata* possess potent anti-inflammatory properties, which could be effective in treating inflammatory diseases. For example, research by Iranian scientists indicates that this plant helps reduce inflammation by decreasing the production of inflammatory cytokines and enhancing the activity of antioxidant enzymes (Rahimi et al., 2016). This antioxidant property can help prevent cellular damage caused by free radicals.

### Antimicrobial Effects

Research shows that *S. striata* extracts have antibacterial and antifungal properties. One study examined its antimicrobial effects on various bacteria and fungi, including *Escherichia coli* and *Candida albicans*, and found that this plant could be used as a natural agent against infections (Hosseinpour et al., 2018).

### Anticancer Activities

*S. striata* also plays a role in inhibiting cancer cell growth. Studies have shown that compounds in this plant can inhibit the growth of breast and lung cancer cells (Mohammadi et al., 2017). These effects are attributed to the presence of flavonoids and other active compounds in this plant, which induce apoptosis in cancer cells, preventing their proliferation.

### Neuroprotective Effects

Recent studies suggest that *S. striata* may protect neurons from oxidative stress-induced damage. This plant has been proposed as a neuroprotective agent by reducing neuronal cell death and enhancing the survival and growth of nerve cells (Asadollahi et al., 2019).

### Antidiabetic Effects

Another important effect of *S. striata* is its ability to regulate blood glucose levels. Animal studies have

shown that its extract can lower blood glucose levels in diabetic animals by increasing insulin sensitivity and reducing hepatic glucose production (Ghorbani et al., 2020). This property can help mitigate the complications associated with diabetes.

### Hepatoprotective Effects

Research indicates that *S. striata* can protect the liver from damage caused by toxic agents. Its extract helps maintain liver health by reducing liver enzyme levels and increasing antioxidant enzyme activity in the liver (Khalili et al., 2019).

### Conclusion

Given the numerous therapeutic effects of *S. striata*, this plant could be considered a crucial factor in treating various diseases, including inflammations, infections, cancer, diabetes, and liver and neurological disorders. Further research is needed on the mechanisms of action and clinical applications of this plant. Additionally, attention to safety and appropriate dosing, especially in clinical trials, is essential.

### Declarations

#### Conflict of interest

The author declare no conflict of interest.

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#### Ethical considerations

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