



The Study of Inhibitory Effect of Different Extracts of *Scrophularia striata* on Common pathogens, A Systematic Review

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Abstract

The necessity of using medicinal plants in that the common chemical drugs have side effects, the emergence of drug resistance as well as high economic costs on society and households. We have traditionally used medicinal plants to treat different kinds of infection in western regions of Iran and particularly Ilam since many years ago. There are the effective elements like Cinnamic acid, quercetine isorhamnetin- 3-O- rutinocide, nepitritin and acteoside 1 in the extract of aerial parts of *Scrophularia Striata*. The purpose of present research is to study the papers that evaluated the inhibitory effect of different extracts of *Scrophularia Striata* on prevalent pathogens. Present research is a systematic review study. In order to achieve the conducted researches on available information banks like Indian journals, pub med, SID, Google scholar, Irandoc, Iranmedex, Magiran and science direct, we used key words such as *Scrophularia Striata* and aqueous alcoholic, phenolic and hydro alcoholic extract to extract and analyze data. The obtained results from different studies show the inhibitory effects of different extracts of *Scrophularia Striata* on different pathogenic species. Its application can be considered as a medicinal plant and commercialization by pharmaceutical companies due to the low toxicity of the plant on living cells.

Keywords: Inhibitory Effect, *Scrophularia Striata*, Common pathogens, Systematic Review.

Introduction

The use of medicinal plants has a long history to treat diseases. Although the bulk of conventional drugs have chemical origin, but it is estimated that about one third of all medicinal products have herbal origin or transform after extracting from plants [1, 2]. Generally, the annual statistics of supply and demand for medicinal plants is increasing. World Health Organization (WHO) as policy making center and global monitoring in the field of health in 1978 notes that a major part of human society still believes in

herbal medicines and trying to meet their health and wellness using them. Therefore, the application of herbal medicines and generally traditional medicine was considered in 2000 public health [3, 4]. Hundreds of plants around the world are used in traditional treatment of bacterial infections that their antimicrobial effect has been proven in experimental conditions. The necessity of using medicinal plants is that the common chemical drugs have side effects, the emergence of drug resistance and high economic costs

on society and households. On the other hand, the ease of use and general acceptance has provided a good field for using medicinal plants [5, 6 and 7]. *Scrophularia Striata* plant is one of the most important medicinal plants of *Antirrhinum majus* family. The family consists of 3 subfamilies, 222 genera and 4480 species in the world. *Scrophularia* family has 60 one year, biennial and perennial species and subspecies in Iran that 28 species are endemic to Iran [8, 9] *Scrophularia* has global distribution and grows in temperate and tropical regions. So far many health effects have been reported of different species of the plant. For example, *S. copolie* is an isolated compound of A. Angrosid that has acceptable anti- cancer effect. Also different compounds have been purified of *S. frutescens* that have a strong inhibitory effect on the lines of cancerous cells of Mccog (2- Hep)[10, 11 and 12]. The methanolic extract of *S. Ningpoensis* has interesting anti- mutation activity [13]. In Chinese medicine, *S. Ningpoensis* species has been known as a medicinal plant. It has been used to treat fever, sweating, constipation, pharyngitis, neurological diseases and laryngitis. In addition, *S. Grossheini* and *S. Nodosa* species have been used in traditional medicine [14]. *S. Oldhamii* species has been used to treat inflammation in traditional medicine [15]. One of the important species of *Scrophularia* plant is *Striata* type that has anti- tumor activity and its complete extract can inhibit metalloproteinase's with least detoxification that are causing degradation of the extracellular matrix as tumors invade [16]. In addition, it has antimicrobial property and its extracts inhibit various protozoa. In addition, there are reports about the production of nitric oxide [17, 18]. Indeed *Scrophularia Striata* is one of the endemic plants of Iran. A wild plant grows in pastures, hillsides and rugged regions of Ilam and Khuzestan provinces. The local name of the plant is Tashneh Dari that traditionally has been used to treat wound, renal disease, eye and ear infections and reducing inflammation [19, 20 and 21]. In addition, several reports have been published regarding the existence of compounds with anti- inflammatory and antioxidant properties in the plants of *Scrophularia* family [22]. Indeed the extent of opportunistic fungal infections in susceptible individuals on the hand, and increasing trend of drug resistance and their harmful effects on the other hand increased the importance of studying antimicrobial effects of the plants [23, 24]. The cheaper and more effective traditional treatments are modern treatments in societies where medicinal plants are used that reduce the risk of acquiring infections with resistant pathogens [25, 26]. This has been a tendency for researchers to study the medicinal

properties of plants [27]. The purpose of present research is to study the inhibitory effect of aqueous, alcoholic and hydro alcoholic extracts of *Scrophularia Striata* on prevalent pathogens by a systematic review method.

Review Process

Present research is a systematic review study. In order to achieve the conducted researches in available information banks like science direct, Magiran, Iranmedex, Indian journals, Google scholar, SID and pubmed using key words such as *Scrophularia Striata*, diffusion method, aqueous extract, alcoholic extract, phenolic extract and hydro alcoholic extract, we found different paper in both English and Persian language. We extracted and studied data after classifying the collected studies and selecting the relevant papers.

Body text

Collecting Plant and Extraction:

Scrophularia Striata was collected in different time intervals and regions of western and southwestern mountains of Iran, Ilam according to the growing season and regions. Researchers have used different parts of the plant such as leaf, stem and root in the interested studies. They have used standard methods of extraction in different researches to prepare aqueous extract, phenolic extract and alcoholic extract.

Disk Diffusion Method:

Anti- fungal effect of plant extracts was studied by diffusion method in the studied papers. Blank disks were used in this method so that according to the related standard after accurate count of fungi and providing the standard suspension (cfu/2000 ml), it was transferred to the medium and was transferred to the medium and was cultured on Sabouraud Dextrose Agar (SDA) medium using sterile swab and blank disk was placed on it. Then, specific concentrations of interested extracts were inoculated on disks. The diameter of inhibition zones recorded after 24-48 hours [28, 29 and 30].

The Diffusion Embedding Sink Method:

In this method, some of the prepared suspension was cultured on Sabouraud Dextrose Agar medium by swab. Then, the bottom of sinks was closed by culture medium in sterile conditions after embedding sinks with 5mm diameter. There are 30 μ l of 10, 20, 40, 80

and 100 mg/ml concentrations of alcoholic and aqueous extracts in the sinks. After culturing, embedding medium and agar- diffusion, culture media are kept in 37c° for 48 hours.

Standard Species:

The effect of Scrophularia Striata extract on clinical pathogenic species isolated from hospitals, fungal vaginitis and standard species has been studied in different researches (Table 1).

Table 1. The studied standard species in different studies.

Different Species	Standard Strain
<i>E.coli O157:H7</i>	ATCC 43895, ATCC 8739
<i>Candida albicans</i>	ATCC 2091, ATCC 10231
<i>Candida glabrata</i>	ATCC 90030
<i>Salmonella typhimurium</i>	ATCC 14028
<i>Pseudomonas aeruginosa</i>	ATCC 9027
<i>Enterobacter aerogenes</i>	NCTC 10009
<i>Staphylococcus aureus</i>	ATCC 25923
<i>Staphylococcus epidermidis</i>	ATCC 14490
<i>Enterococcus faecalis</i>	ATCC 29212
<i>Enterococcus faecium</i>	ATCC 25778
<i>Streptococcus pneumonia</i>	ATCC 33400
<i>Staphylococcus saprophyticus</i>	ATCC 15305
<i>Streptococcus mutans</i>	ATCC 35668
<i>Streptococcus sobrinus</i>	ATCC 27607
<i>Streptococcus sanguis</i>	ATCC 10556
<i>Streptococcus salivarius</i>	ATCC 9222
<i>Bacillus cereus</i>	ATCC 1247
<i>Bacillus subtilis</i>	ATCC 6051
<i>Klebsiella pneumonia</i>	ATCC 10031
<i>Shigella dysenteriae</i>	PTCC 1188
<i>Shigella flexeneri</i>	NCTC 8516

Discussion

Nature around us is full of unknown species in terms of medicinal properties detection of their properties may require long time. Sometimes, in some areas, certain plant species are used as medicinal plants that have not been yet achieved by researchers. Today the consumption of medicinal plants has significantly increased. Statistics of developed countries confirms the point that significant percents of supplied drugs have plant origin in these countries so that research in the field of medicinal plants can help to community health and play an important role in economic development [31, 32]. Generally as a rule these drugs have less side effects than other drugs, of course there

are exceptions in this field too [33]. Scrophularia Striata grows in Iran in cold and mountainous regions of Zagros mountain range [34]. This plant has 5 sepals, 5 gamopetalus, 4 stamens and dilocular gamocarpous pisolite [35]. In this research, we studied the inhibitory effect of alcoholic and aqueous extracts of Scrophularia Striata on prevalent pathogens. Havasian et al, 2013 studied the inhibitory effect of hydro alcoholic extract of Scrophularia Striata on *Candida albicans*. The results show ineffectiveness of alcoholic extract and very weak inhibitory effect of aqueous extract. According to the existence of effective compounds in the studied plant, the use of phenolic extract is recommended for other researches [36].

Nazari et al, 2014 compared the inhibitory effect of different extracts of the plant on staphylococcus aureus, Pseudomonas aeruginosa and Helicobacter pylori. The results showed that the highest inhibitory effect related to aqueous and methanolic extracts and half- hour decoction of the plant so that it was noted that aqueous extract of the plant is one of the effective plant compounds for bacteria [37]. In the study of Bahrami et al, 2009 the high effect of aqueous extract of Scrophularia Striata in lower concentrations on bacterial infections is confirmed relative to common antibiotics that can be a new direction for treating infectious burns [38]. Sharafati- chaleshtori et al, 2014 studied the antibacterial effect of the Scrophularia Striata against E.coli in vitro. The results showed the inhibitory effect of ethanolic extract of the plant on E.coli [39]. Zangeneh et al, 2017 studied the effect of hydro alcoholic extract of the plant on staphylococcus aureus (ATCC No. 25923). The results showed significant antibacterial effect of the extract [40]. The results of research of Ghasemi Pirbalouti et al, 2009 showed the inhibitory effect of the extract of the plant on Candida so that the plant was referred to as natural anti- Candida [41]. According to the increase of resistance in different species of P. aeruginosa against common drugs, proof of the inhibitory effects of methanolic and ethanolic extracts of the plant can be very important for maintenance and health of society [42]. In addition, the effect of aqueous extract of the plant and Artemisia Siebri Besser on the growth of leishmania major in vitro was studied. Results showed that herbal medicine of Artemisia has anti- Leishmania effect in 20% concentration from the first day of consumption, but Scrophularia Striata lead to the complete destruction of parasites in 25% concentration from the third day of consumption. This shows the relatively strong effects of the extract on parasite species [43]. Antimicrobial effects of the extracts of Scrophularia Striata are due to the presence of effective elements like cinnamic acid, three flavonoids (quercetine, isorhamnetin-3-O-rutinoside and nepitring) and one phenyl propanoid glycoside (acteoside 1)[44].

Conclusion

The results of different researches show the inhibitory effects of different extracts of Scrophularia Striata on different pathogenic species. Its allocation can be considered as a medicinal plant and commercialization by pharmaceutical companies due to the low toxicity of the plant on living cells.

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