

## The Effects of *Scrophularia striata* Extract on HEK Cell Line in Cell Culture

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**Abstract:** Extracts of *Scrophularia* have been shown to have improving effects on various tissues. In this laboratory experimental study we assessed the effects of *Scrophularia striata* extract on normal kidney cells (HEK cell line) viability in cell culture. Extract of plant was prepared and different doses were used. HEK cells were exposed to 0.01, 0.1, 1 and 10 mg/ml of extract solution. MTT assay was used to determine cytotoxic effects of the extract. Our results showed that administration of 10 mg/ml of *Scrophularia striata* extract resulted in significant increased viability of HEK cells in cell culture. According to our finding, high dose of *Scrophularia striata* extract can improve HEK cells proliferation.

**Keywords:** *Scrophularia striata*, HEK cell line, Viability

### 1. Introduction

The genus *Scrophularia* of the family Scrophulariaceae comprises about 200 species of herbaceous flowering plants commonly known as figworts [1]. Species of *Scrophularia* all share square stems, opposite leaves and open two-lipped flowers forming clusters at the end of their stems. The genus is found throughout the Northern Hemisphere, but concentrated in Asia with only a few species in Europe and North America. Some species in this genus are known to contain potentially useful substances, such as iridoids, and several *Scrophularia* species, such as the Ningpo figwort or Chinese figwort (*S. ningpoensis*), have been used by herbal medicine practitioners around the world. The name *Scrophularia* comes from scrofula, a form of tuberculosis, because several species have been used to treat this disease. As a herb used in Traditional Chinese Medicine, it has found use in a formula to treat arthritis. *Scrophularia* exerts these significant analgesic effects with virtually no side effects. Extracts of *Scrophularia* have been shown to reduce edema, cell infiltration and proliferation of activated T-lymphocytes in joint tissues [2]. Additionally, *Scrophularia* has been shown to inhibit a number of inflammatory factors, including prosta-glandin E2, leukotriene B4, NO, interleukin-1beta, interleukin-2, interleukin-4 and interferon-gamma, but with no negative effect on the production of interleukin-10, a powerful cytokine involved in the regulation of inflammatory responses. Moreover, *Scrophularia* is the source of a unique glycoterpenoid, Verbascosaponin A, which is twice as potent as indomethacin for relieving inflammation and pain [3]. Also Human Embryonic Kidney 293 cells, also often referred to as HEK 293, HEK-293, 293 cells, or less precisely as HEK cells, are a specific cell line originally derived from human embryonic kidney cells grown in tissue culture. HEK 293 cells are very easy to grow and transfect very readily and have been widely used in cell biology research for many years. They are also used by the biotechnology industry to produce therapeutic proteins and viruses for gene therapy [4], [5].

*Scrophularia striata* which grows in Ilam province is used as a traditional medicine for treatment of diseases for years. Medical properties of this plant have not been documented yet.

The studies showed the extracts of the plants are used in the evaluation of plants for wound healing activities. Also this extracts can use in treatment leukemia and sickle cell disorder [6]-[8]. Also The studies showed the extracts of the different plants can be use to treat cancer-like symptoms[9]. The studies show these fractions affected proliferation of murine ES, and human embryonal, prostate, and breast carcinoma cells in a dose-dependent manner. Several phytochemical constituents were isolated; the antioxidant phytochemicals ellagic acid and gallic acid were shown to affect viability of cultured breast carcinoma cells[10]. In others studies showed cytotoxic screening and apoptosis assays suggest the potential anticancer activity of some plants used in Thai traditional medicine and provide information concerning their direct effects [11].The studies showed that the genus *Euphorbia* (*Euphorbiaceae*) could have cytotoxicity effect on the HEp-2 and CHO cell lines [12]. The studies showed that *S. striata* contains was shown to have anti-bacterial and wound healing effects while this effect was significantly more than SSD denoting to its use when needed for burn wounds infected to *P. aeruginosa*[13]. Also, dietary *S. striata* can beneficially affect the intestinal health and immune status[14]. Also the studies indicated that *S. striata* extract could inhibit leukaemia cell proliferation by inducing G2 /M phase arrest and apoptosis .[15] Other findings indicated that both leaves and seeds of *S.Striata* contain both anti cancer and cell growth enhancing agents[16]. But in other studies showed that *s.striata* in spite of using in trating inflammatory diseases but *Scrophularia striata* extract had no effect on cell viability [17].

This study was exerted to determine the effects of *Scrophularia striata* extract on proliferation of HEK cells in cell culture.

## 2. Materials and Methods

*Scrophularia striata* plant was collected from Guilan province, Iran. The leaves and stems were washed, dried and ground to get powder using a blender. Extractions were performed in a Soxhlet apparatus with methanol. Different concentrations (0.01, 0.1, 1 and 10mg/ml) were prepared and used in our study. HEK cells (normal kidney cell line) were purchased from National Cell Bank of Iran (Pasteur Institute, Tehran, Iran). Cells were grown and incubated in standard situation. Then, cells were sub-cultured into 75cm<sup>2</sup> flasks, 96-well plates or 6-well plates. Cytotoxicity of different doses of the extract was assayed using MTT method. Analyses were conducted using the SPSS 20 and ANOVA.

## 3. Results

Our results showed that administration of 10 mg/ml of *Scrophularia striata* extract resulted in significant increase in viability of HEK cells compared to control group (P<0.05). However, there was no significant difference between viability of cells exposed to 0.01, 0.1, 1 and 10mg/ml and control cells (Figure I).

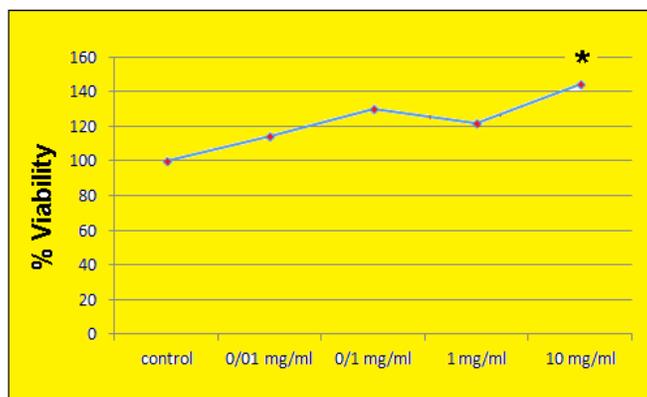


Fig. I. Viability of HEK cells compared to control group

## 4. Discussion

Our results indicated viability of HEK cell line receiving 10 mg/ml (high dose) of *Scrophularia striata* extract significantly decreased. Our results indicated that proliferation of HEK cells are reduced in response to more of 10mg/ml dose of *Scrophularia striata*. However, low doses of *Scrophularia striata* had no effect on proliferation of HEK cells.

Previous Studies showed that *Scrophularia striata* can influence proliferation of cells including cancer cells[16]. It has also been shown that *S. striata* extract could inhibit leukaemia cell proliferation by inducing apoptosis[15]. However, in contrast to this finding there are studies showing that *Scrophularia striata* extract had no effect on cell viability [17]. Other studies well established the antiproliferative effect of methanolic extract of *Dorema glabrum* seed and clearly showed that the plant extract can induce apoptosis and not necrosis in vitro. These results demonstrated that *Dorema glabrum* seed might be a novel and attractive therapeutic candidate for tumor treatment [18]. Other findings indicated the ability of *S. striata* to decrease ROS generation and cell apoptosis and also suggest the presence of neuroprotective agents in this plant [19].

## 5. Conclusion

We have shown that high dose of *Scrophularia striata* has impairing effects on normal kidney cell proliferation in cell culture.

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## 7. References

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