

The Effects of *Scrophularia striata* Extract on Apoptosis in Glioblastoma Cells in Cell Culture

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Abstract--- Studies show that some plant extracts have a role in inducing apoptosis in cancer cells leading to cancer cells death. *Scrophularia striata* Boiss belongs to Scrophulariaceae is one of the most important medicinal plants. The aim of this study was to determine the effects of *Scrophularia striata* extract on expression level of Bax apoptosis gene in *Homo sapiens* brain glioblastoma cells. In this laboratory experimental study, we used 0.1mg/ml of *Scrophularia striata* in cell culture. Expression level was determined using Real Time PCR method. The data were statically analyzed using ANOVA. The results showed that the administration of 0.1mg/ml of *Scrophularia striata* resulted in significant change in Bax expression level in *Scrophularia striata* extract receiving cells. Our findings indicate that *Scrophularia striata* extract can induce apoptosis in glioblastoma cells in cell culture.

Index Terms--- *Scrophularia striata*, Glioblastoma cells, Bax.

I. INTRODUCTION

Scrophularia striata is the member of flowering plants family called *Scrophulariaceae*. Many *Scrophularia* plants have long been used in Asian countries as a medicinal herb for the treatment of diseases; it has been applied for treating various inflammatory diseases such as allergy, rheumatics and chronic inflammatory disorders[1]. These plants are also annual or perennial herbs with flowers with bilateral or rarely radial symmetry. Members of the *Scrophulariaceae* have a cosmopolitan distribution, most of them found in temperate areas, including tropical mountains. This family consists of about 3000 species and 220 genera[2].

Some species of the family have been used traditionally to treat eczema, wounds, goiter, ulcers, cancer and fistulae. Some of them are boiled in milk to prepare a poultice which is applied to the abdomen to reduce abdominal pain, whereas their aqueous extracts have been used as a bath to alleviate rheumatic pains. Biologically active compounds of numerous species of the *Scrophularia* have been identified; they have been known to be rich in iridoid glycosides, mainly aucubin and catalpol. Iridoids represent a large group of cyclopentan-[c]-pyran monoterpenoids occurring as

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constituents of sympetalous plants including ornamental as well as wild ones. Members of the *Scrophulariaceae* have shown multiple biological activities including antimicrobial, antitumoral, hemodynamic, choleric, hepatoprotective and anti-inflammatory properties[3].

Bax is a proapoptotic protein which resides in an inactive form in cytosol and after activation it gets translocated to mitochondria and play an important role in mitochondria-mediated apoptosis[4]. Activated Bax either in homo-oligomeric form or as complex with other proteins are associated with mitochondrial outer membrane. Voltage-Dependent Anion Channel, truncated Bid (tBid) protein that forms pores on the outer mitochondrial membranes is associated with Bax[5]. These pores promote the leakage of ions, essential metabolites and cytochrome c from mitochondrion to cytosol leading to cell death[6]. Studies show that some plant extracts have a role in inducing apoptosis in cancer cells leading to cancer cells death. *Scrophularia striata* Boiss is claimed by some scientists to have anti-cancer effects. The aim of this study was to determine the effects of *Scrophularia striata* extract on expression level of Bax apoptosis gene in *Homo sapiens* brain glioblastoma cells.

II. MATERIAL AND METHODS

A. Extract preparation

Hydroalcoholic extract of *Scrophularia striata* was prepared and used in our study using routine method of plant extraction.

B. Protocol of Study

We determined Bax gene expression level using Real Time PCR method.

C. Statistical Analysis

Statistical significance was evaluated by one-way analysis of variance (ANOVA) using SPSS 19. Significance was measured using Fisher's least significant for the exact P values and significant differences are noted in the results. Differences with $P < 0.05$ were considered significant

III. RESULTS

Figure I represents Bax gene expression level in cells in response to 0.1 mg/ml of *Rhamnus frangola* hydroalcoholic extract of *Scrophularia striata*.

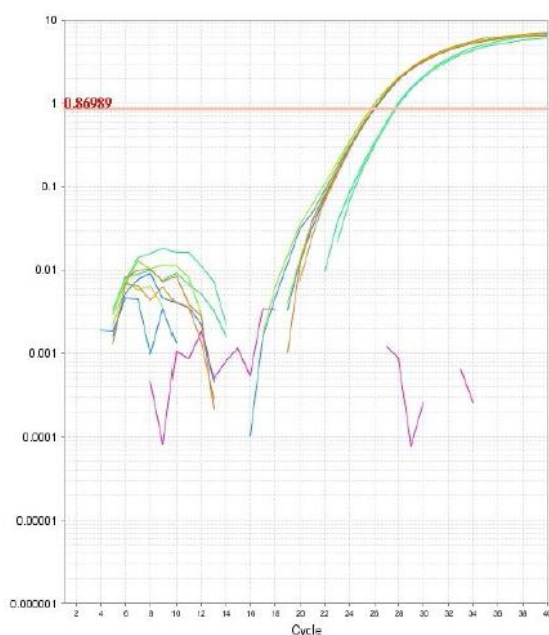


Fig. 1 Bax expression levels in response to 0.1 mg/ml of hydroalcoholic extract of *Scrophularia striata*.

The results showed that the administration of 0.1mg/ml, 1mg/ml and 10mg/ml of *Scrophularia striata* resulted in significant change in Bax expression level in brain glioblastoma cells.

IV. DISCUSSION

In our study, we reported that *Scrophularia striata* extract administration can induce apoptosis in brain glioblastoma cell by changing in Bax expression level. There are other studies showing that the extract of *Scrophularia striata* has anti-cancer effects.

S. striata also has anti-bacterial and wound healing effects [7]. The studies show that the high polarity methanolic fraction of aerial parts of *Scrophularia striata* has neuroprotective activity [8]. Five compounds, including cinnamic acid, three flavonoids (quercetine, isorhamnetin-3-O-rutinoside and nepitrin) and one phenyl propanoid glycoside (acteoside 1) were isolated from *S. striata* Boiss. by chromatographic techniques and the structures of compounds were characterized by spectroscopic methods [9]. Other reports indicate that the main components contained in *S. striata* extract are flavonoids, phenolic compounds and phenyl propanoids and treatment with extract is significantly cytotoxic to the tumour cell lines [9]. The filtered leaf extract of *S. Striata* also has shown a strong anticancer effect on 1321 cell line [10]. However, some studies show that the *S. striata* extract has anti- apoptotic effects [11]. The aerial parts of *S. striata* might contain various polar compounds that also inhibit matrix metalloproteinases expression [12].

V. CONCLUSION

We have shown that *Scrophularia striata* extract can induce apoptosis in brain glioblastoma cells. This discovery of the anticancer potential of *Scrophularia striata* may help in the development of chemopreventive drugs and may have therapeutic effects in the treatment of brain cancer.

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