

## **Research on the anticancer potential of Turkish medicinal plants, and factors affecting the distribution along with phytochemical contents of *Glycyrrhiza glabra* L.**

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Turkey has very rich and abundant plant resources of over 9000 species distributed throughout the country. With the advancement in the drug development and discovery in the recent years, bioactive compounds isolated from the plant are still used as a lead for the discovery of new drug. In addition to that, plant materials can be used as a supplement and/or prophylactic drug to avoid the emergent of serious health conditions which are difficult to detect such as cancer. Furthermore, the phytochemical content of plants that have wide distribution can be effected by the environmental factors which in turn make it difficult to obtain a plant with high quality. To tackle these issues, two research topics were investigated in this study. The 1<sup>st</sup> research focuses on the therapeutic potential of selected Turkish plants against gastric cancer while the 2<sup>nd</sup> research investigated factors effecting the phytochemical content and habitat suitability of *Glycyrrhiza glabra* in the Hatay region of Turkey.

### **1. Therapeutic Potential of Medicinal Plants against Gastric Cancer in Turkey**

#### ***A. Screening of the selected plants***

Gastric cancer is the fourth most common cancer in the number of cases and cause of death worldwide. In Turkey, the incidence and mortality of gastric cancer are 5.7% and 8.6 %, respectively. There are many risk factor that can be attributed to that such as poor diet (low fibers and high salt), chronic infection with *Helicobacter pylori*, and smoking. Early detection of gastric cancer is usually difficult to achieve, mainly because of its symptoms that are closely similar to stomach upset. Therefore, most patients do not start treatment until it reaches an advance stage which is difficult to cure. One way to handle this is the usage of the plant materials that has anticancer activity as a food and/or supplement to be consumed on regular basis. In this study, 20 plant species were selected from Turkey and were extracted with pure water, 50% ethanol, and 95% ethanol to prepare 84 plant samples. Human gastric cancer cell line (AGS) was used to examine the ant-proliferative activity of the samples. Out of 84 samples, five plants (*Tanacetum macrophyllum*, *Alchemilla mollis*, *Myrtus communis*, *Quercus coccifera*, and *Trigonella foenum-graecum*) have shown high growth inhibition activity against gastric cancer. Normal gastric fibroblast cells were used to examine the toxicity of *A. mollis*, *M. communis*, and *T. foenum-graecum* samples. The 95% ethanol extract of the aerial part of *A.*

*mollis* ( $IC_{50}$ :  $60.03 \pm 6.88$   $\mu\text{g/ml}$ ,  $LC_{50}$ :  $280.83 \pm 1.15$   $\mu\text{g/ml}$ ) and the 95% ethanol extract of the branches and stem parts of *M. communis* ( $IC_{50}$ :  $77.99 \pm 6.43$   $\mu\text{g/ml}$ ,  $LC_{50}$ :  $110.74 \pm 6.28$   $\mu\text{g/ml}$ ) showed higher selectivity toward cancer cells than normal cell. On the other hand, the 50% ethanol extract of the seed of *T. foenum-graecum* exhibit non selective inhibition to the growth of both normal and gastric cancer cells ( $IC_{50}$ :  $28.57 \pm 3.03$   $\mu\text{g/ml}$ ,  $LC_{50}$ :  $2.43 \pm 0.78$   $\mu\text{g/ml}$ ). Further studies are needed to examine the mechanism of cell death and the responsible compounds for the activity. From this study, *M. communis* was selected for further research.

#### B. Extraction and Phytochemical Investigation on *Myrtus communis*

This plant belong to Myrtaceae family and has been used in Turkey to treat diarrhea, gastric ulcer, rheumatism, hemorrhoid, anxiety, skin disease, and antiseptics among other usage. In this study, the leaves, branches, and stem of *M. communis* were used. The plant parts were extracted with 99% ethanol and fractionated into four fractions (hexan, ethyl acetate, butanol, and water fractions). The fractions were examined for their ant-proliferative activity against gastric cancer. Butanol fraction showed the highest activity against gastric cancer cells than other fractions. Isolation of the responsible bioactive compound from the butanol fraction can provide a new lead compound for cancer treatment.

#### 2. Effect of Geographic Distribution on the Bioactive contents of *Glycyrrhiza glabra*

The growth and quality of licorice depend on various environmental factors, including the local climate and soil properties; therefore, its cultivation is often unsuccessful. The current study investigated the key factors that affect the contents of bioactive compounds of *Glycyrrhiza glabra* root and estimated suitable growth zones from collection sites in Turkey. The contents of three bioactive compounds (glycyrrhizic acid, glabridin, and liquiritin), soil factors (pH, soil bearing capacity, and moisture content), and geographical information (slope, aspect, curvature, elevation, and hillshade) were measured. Meteorological data (temperature and precipitation) were also obtained. An analysis of variance and multivariate analysis of variance were performed on the data. The soil bearing capacity, moisture content, slope, aspect, curvature, and elevation of the study area showed statistically significant effects on the glycyrrhizic acid and liquiritin contents. A habitat suitability zone map was generated using a GIS-based frequency ratio model with spatial correlations to the soil, topographical, and meteorological data. The final map categorized the study area into four zones: very high (15.14%), high (31.50%), moderate (40.25%), and low suitability (13.11%). High suitability zones are recommended for further investigation and future cultivation of *G. glabra*.