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Antioxidant and antidiabetic activities of hexane extract of *Genista januensis* var. *lydia*

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The genus *Genista* L. (*Fabaceae*) has been of interest for human beings since ancient times with its cosmopolitan distribution. Since α-amylase and α-glucosidase are the chief enzymes of diabetes mellitus, this study aims to study the α-amylase and α-glucosidase inhibitory potential and antioxidant activity of *Genista januensis* var. *lydia* grown in the Trakya region. To the best of our knowledge, there has been no study on *G. januensis* var. *lydia* up to date. The α-amylase/α-glucosidase inhibitory activity and antioxidant activity of the hexane extract of *G. januensis* var. *lydia* were studied by spectroscopic *in vitro* experiments to search the potential relationships of both activities.

Keywords: *Genista januensis*, antioxidant activity, α-amylase, α-glucosidase

INTRODUCTION

Genista genus (*Fabaceae*), which includes 140 species in total, has been used by mankind since ancient times owing to its cosmopolitan distribution. Some of the *Genista* genera have been used in folk medicine to treat respiratory diseases, rheumatic disorders, diabetes, and ulcers mainly in the Mediterranean. Moreover, the genus is also well known for its yellow pigment (color) [1] by the local people.

Nowadays medicinal plants and their isolated bioactive compounds have gained attention in the management of diabetes mellitus which has become a widespread disease all over the world. Antioxidants have important inhibition roles on tissue damage in various human diseases such as cancer, inflammation and atherosclerosis. The causal correlation between oxidative stress and type 2 diabetes has been explained through molecular mechanisms [2]. Therefore, overproduction of reactive oxygen species can create an imbalance in the amount of antioxidants in the body, ultimately leading to an oxidative stress associated with hyper glycemia. For that reason, providing antioxidants and α-amylase / α-glucosidase inhibitors due to nutriments is a potential and feasible method for managing type 2 diabetes.

Although some *Genista* species have been used for many purposes, including for their antidiabetic properties [3], to the best of our knowledge, no study was found on *G. januensis* var. *lydia*. Hence, the aim of this work was to investigate the antioxidant and antidiabetic properties of *Genista januensis* Viv. var. *lydia* (Boiss.) (*Fabaceae*) growing in the Trakya region.

EXPERIMENTAL

General experimental procedures

Spectrophotometric measurements were performed on a Hitachi spectrophotometer, model 121-002 for antioxidant assay. All chemicals were reagent grade and obtained from commercial suppliers. α-Amylase and α-glucosidase inhibitory activities of the hexane extract were measured by using a 96-well microplate reader, SpectraMax 340PC384 (Molecular Devices, Silicon Valley, California, USA). Softmax PRO v5.2 software (Molecular Devices, Silicon Valley) was used for calculations and measurements of the bioactivity data. α-Amylase (EC. 3.2.1.1, from porcine pancreas), sodium chloride (NaCl), starch, Lugol solution, acarbose, 4-N-nitrophenyl-α-D-glucopyranoside (PNPG), α-glucosidase (EC. 3.2.1.20, from *Saccharomyces cerevisiae*) were purchased from Sigma Chemical Co. (Sigma_Aldrich GmbH, Sternheim, Germany). Hydrogen chloride (HCl), methanol, hexane, sodium carbonate (Na_2CO_3) were purchased from E. Merck (Darmstadt, Germany). Analytical grade chemicals and solvents were preferred in this study.

Plant material and extractions

The plant was collected from Trakya region. The specimens (EDTU 16813) were identified by Dr. Necmettin Guler at Trakya University, Faculty of Science, Department of Biology. After being dried at room conditions and sliced into small pieces, the

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plant was successively macerated using hexane, chloroform, ethyl acetate and methanol, respectively. The solvents were evaporated using a rotary evaporator, and the crude extracts were obtained.

Total phenolic / flavonoid content and antioxidant assay

The total phenolic content (TPC) was determined with Folin & Ciocalteu's phenol reagent and total flavonoid content (TFC) was determined by the $AlCl_3$-$NaNO_2$ method [4]. The ferric reducing power (FRAP), $ABTS^{\bullet+}$ scavenging activity and DPPH radical scavenging activity of the *G. januensis* hexane extract were determined for assessing the antioxidant properties [4].

α-Amylase / α-glucosidase inhibitory assay

The α-amylase / α-glucosidase inhibitory activities of the hexane extract of *G. januensis* were determined spectrophotometrically [5, 6].

RESULTS AND DISSCUSSION

Total phenolic/flavonoid content

TPC of the hexane extract of *G. januensis* was found as 45.74±1.71 µg CAT mg $extract^{-1}$, while TFC was determined by the $AlCl_3$-$NaNO_2$ method (Table 1). Hanganu *et al*. [7] determined the content of total phenolics in a 70% ethanol extract of *G. tinctoria* and *G. sagittalis* species as 33.52±0.21 and 15.71±0.35 mg GAE/g, respectively.

Antioxidant assay

The evaluation of the antioxidant activity of *G. januensis* in hexane extract was carried out by using ABTS, FRAP and DPPH assays. According to analyses, DPPH radical scavenging activity increased depending on the concentration and EC_{50} values were determined as 0.112±0.04 mg mL^{-1} (Table 1, Fig.1).

Table 1. Total phenolic/flavonoid content and antioxidant assay.

Hexane extract of *G. januensis*	
TPC (µg CAT mg $extract^{-1}$)*	45.74±1.71
TFC (µg CAT mg $extract^{-1}$)*	Nd**
$ABTS^{\bullet+}$(mmol Trolox mg $extract^{-1}$)	0.357±0.19
FRAP (µmol Fe^{+2} $g^{-1}extract^{-1}$)	520.54±3.84
EC_{50} values of DPPH capacity (µg mL^{-1})	112±0.04

*CAT: Catechin equivalent. **Nd: not determined. Data are expressed as the mean ± standard deviation (n ≥ 3).

Boubekri *et al.* [8] demonstrated remarkable results for the DPPH activity of the EtOAc and n-BuOH residues from the polar extract of *G. quadriflora* with a concentration dependence and the high antioxidant effect was attributed to the presence of phenolic compounds.

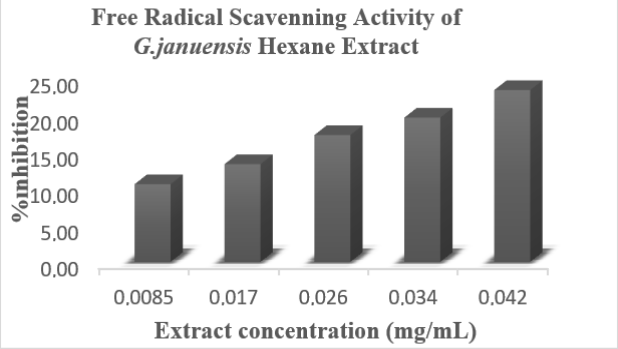

Fig. 1. DPPH radical scavenging activity of hexane extract of *G. januensis.*

α-Amylase / α-glucosidase inhibitory assay

The α-glucosidase and α-amylase enzyme inhibition activities were determined spectrophotometrically *in vitro*. According to the results, no significant activity was observed in hexane extract of *G. januensis* (Table 2).

Table 2. α -Glucosidase and α-amylase enzyme inhibition activities of *G. januensis.*

	α-Amylase Inhibitory Activity	α-Glucosidase Inhibitory Activity
Hexane extract of *G. januensis**	IC_{50} (µg/mL)	IC_{50} (µg/mL)
	> 400	> 400

*Values expressed herein are mean ± SEM of three parallel measurements, $p<0.05$.

This study is the first report on the antioxidant activitiy of the hexane extract of *G. januensis* and and on α-glucosidase and α-amylase enzyme inhibition.

Future research will be aimed at isolation of biologically active compounds such as flavonoids from *G. januensis*, as natural compounds for evaluation in pharmaceutical industry. Owing to their antioxidant activity they can benefit a good few disciplines.

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