

Screening of Korean Medicinal Plant Extracts for α -Glucosidase Inhibitory Activities

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Objectives

Glycosidases are widespread in microorganisms, plants, and animals. They are a very important class of enzymes, which catalyze a hydrolytic cleavage of glycosidic bonds in oligosaccharides or glycoconjugates. Among these glycosidases, α -glucosidase is able to catalyze the cleavage of glycosidic bonds involving terminal glucose connected at the site of cleavage through α -linkage at the anomeric center. They are involved in several important biological processes (like, digestion, biosynthesis of glycoproteins and lysosomal catabolism of glucoconjugates) related to metabolic disorders and diseases, such as, diabetes, obesity, glycosphingolipid lysosomal storage disease, HIV infections, and tumors. These observations indicate that the inhibition of glycosidases would represent a novel pharmacological approach towards the treatment of the above mentioned complications, including diabetes.

Materials and Methods

Extraction

The dried plant parts individually were chopped into small pieces and pulverized into a fine powder. The powdered plant materials (100 g, dry weight) were kept for extensive decoction in 80% methanol for 3 days at room temperature. The extracts were then concentrated using rotary vacuum evaporator at 20-30°C to obtain the dried crude extracts.

α -Glucosidase assay

The enzyme inhibition activity for α -glucosidase was evaluated according to the method previously reported by Shibano *et al.* (4) with minor modifications. The inhibition percentage of α -glucosidase was assessed by the following formula:

$$\alpha\text{-glucosidase}\% = 100 \times (\Delta A_{\text{Control}} - \Delta A_{\text{Sample}}) / \Delta A_{\text{Control}}$$

$$\Delta A_{\text{Control}} = \Delta A_{\text{Test}} - \Delta A_{\text{Blank}}$$

$$\Delta A_{\text{Sample}} = \Delta A_{\text{Test}} - \Delta A_{\text{Blank}}$$

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Results

Sr. No.	Plant name	Family	Plant part	α -glucosidase inhibition	
				% Inhibition	IC ₅₀ Value \pm (μ g/ml) ^a
1	<i>Actinidia arguta</i>	Actinidiaceae	Whole plant	33 \pm 1	--
2	<i>Meliosma oldhamii</i>	Sablaceae	Whole plant	67 \pm 3	150 \pm 3
3	<i>Aster tataricus</i>	Asteraceae	Stem	n. a.	--
4	<i>Capsella bursa-pastoris</i>	Brassicaceae	Whole plant	23 \pm 1	--
5	<i>Allium macrostemon</i>	Alliaceae	Whole plant	19 \pm 2	--
6	<i>Rhododendron schlippenbachii</i>	Ericaceae	Leaf	98 \pm 1	20 \pm 1
7	<i>Pyrola japonica</i>	Pyrolaceae	Whole plant	29 \pm 2	--
8	<i>Symplocos chinensis</i>	Symplocaceae	Leaf	52 \pm 2	220 \pm 5
9	<i>Juglans regia</i>	Juglandaceae	Whole plant	99 \pm 1	80 \pm 2
10	<i>Sinapsis alba</i>	Brassicaceae	Seed	22 \pm 2	--
11	<i>Aster tataricus</i>	Asteraceae	Root	17 \pm 3	--
12	<i>Magnolia kobus</i>	Magnoliaceae	Whole plant	4 \pm 1	--
13	<i>Inula helenium</i>	Asteraceae	Whole plant	9 \pm 2	--
14	<i>Digitaria violascens</i>	Poaceae	Whole plant	n. a.	--
15	<i>Dendropanax morbifera</i>	Araliaceae	Whole plant	39 \pm 3	--
16	<i>Sesamum indicum</i>	Pedaliaceae	Whole plant	11 \pm 2	--
17	<i>Allisma canaliculatum</i>	Allismataceae	Rhizomes	22 \pm 3	--
18	<i>Celtis sinensis</i>	Cannabaceae	Whole plant	25 \pm 1	--
19	<i>Astilbe chinensis</i>	Saxifragaceae	Rhizomes	95 \pm 2	30 \pm 2
20	<i>Corydalis remota</i>	Papaveraceae	Whole plant	23 \pm 2	--
21	<i>Phlomis umbrosa</i>	Labiatae	Whole plant	12 \pm 2	--
22	<i>Curcuma zedoaria</i>	Zingiberaceae	Whole plant	27 \pm 2	--
23	<i>Gleditsia japonica</i>	Fabaceae	Whole plant	n. a.	--
24	<i>Miscanthus sinensis</i>	Poaceae	Whole plant	30 \pm 3	--
25	<i>Heracleum moellendorffii</i>	Aplaceae	Whole plant	17 \pm 2	--
26	<i>Draba nemorosa</i>	Brassicaceae	Whole plant	11 \pm 1	--
27	<i>Vaccinium hirtum</i>	Ericaceae	Whole plant	46 \pm 1	--
28	<i>Smilax sieboldii</i>	Smilacaceae	Whole plant	24 \pm 3	--
29	<i>Euonymus sachalinensis</i>	Celastraceae	Leaf	99 \pm 1	10 \pm 1
30	<i>Sinomenium acutum</i>	Menispermaceae	Bark	28 \pm 2	--

Table 1. α -Glucosidase inhibitory activities and IC₅₀ values of the studied Korean plant extracts

Sr. no.	Plant name	Traditional indications
1	<i>Meliosma oldhamii</i>	Treatment of ailments of the liver
2	<i>Rhododendron schlippenbachii</i>	Discharge of cardiotoxic phlegm
3	<i>Symplocos chinensis</i>	Cold, fever, malaria, relief of cough, detoxification
4	<i>Juglans regia</i>	Antiinflammatory, astringent, anticancer, blood purifier, laxative, diuretic, anthelmintic
5	<i>Astilbe chinensis</i>	Antiinflammatory, anticancer, hepatoprotective, treating arthralgia, chronic bronchitis, headache
6	<i>Euonymus sachalinensis</i>	Treatment of stomachalgia

Table 2. Details of the traditional indications of the active plant extracts