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# 가래나무 줄껍질에서 분리한 galloyll glucopyranosides의 항산화 효과

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# Galloyl Glucopyranosides with Antioxidant Activity from the Stem-Bark of *Juglans mandshurica*

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## Objective

The plant *J. mandshurica* belonging to Juglandaceae family is distributed in Northeast Asia. It has been used as a traditional medicine for the treatment of cancer, gastritis, diarrhea, leucorrhoea. Furthermore, active oxygen species in living system has been known to react with bio-molecular constituents, including lipids, proteins, and DNA, leading to change their structures and functions. These may cause various diseases, for example cerebral ischemia, atherosclerosis, inflammation, gout, cancer, diabetes, Parkinson's disease, and other diseases. Hence, the search for antioxidants that can block the generation of active oxygen species is important.

## Materials and methods

*Extraction and isolation:* compounds **1** and **2** (Fig.1) were isolated from the ethyl acetate-soluble fraction (90 g) by using repeated column chromatography.

*Antioxidant method assays:* DPPH radical scavenging activity assay; $ABTS^{\bullet+}$ radical scavenging assay; Superoxide anion scavenging assay; Inhibitory effect on xanthine-xanthine oxidase assay; Lipid peroxidation assay; Lipoxygenase inhibition assay.

## Results and discussion

Isolated compounds (**1**, **2**) from the stem-bark of *J. mandshurica* exhibited both potent chain-breaking and antioxidant activity. Comp. **1** and **2** showed the strong scavenging activities against DPPH, $ABTS^{\bullet+}$ and superoxide radicals and remarkable mitochondrial lipid peroxidation-inhibiting activity (Table I). The strong scavenging superoxide radical comes from ability to inhibit generation of superoxide radicals by xanthine oxidase. The inhibition kinetics analyzed by Lineweaver-Burk plots found that **1** and **2** are competitive inhibitors with the xanthine at active site of xanthine oxidase. Moreover, **1** and **2** displayed significant lipoxygenase inhibitory activity with $IC_{50}$ values 16.6 $\mu$M and 10.4 $\mu$M, respectively, and the mode of inhibition was identified as competitive inhibitors. The antioxidant activity of compounds **1** and **2**, and gallic acid indicated that the number of galloyl units play an important role in their antioxidant activity.

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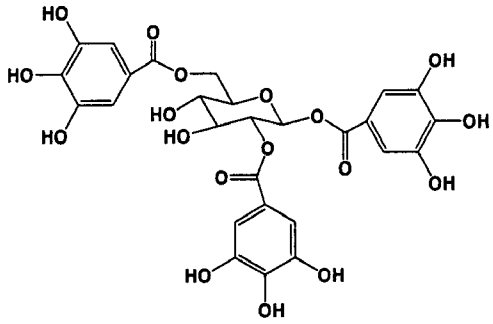
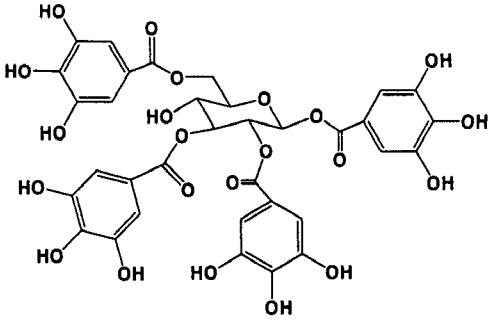


1,2,6-trigalloyl glucose (1)



1,2,3,6-tetragalloyl glucose (2)

**Fig. 1.** Chemical structures of compound 1 and 2 from *J. mandshurica*

**Table. 1.** Antioxidant activities of 1 and 2 from *J. mandshurica*

| Compounds | Antioxidant activities [a], $IC_{50}$ ($\mu$M) | | | |
|---|---|---|---|---|
| | DPPH | $ABTS^{\bullet+}$ | $O_2^{\bullet-}$ | MC |
| 1 | 4.9 ± 1.2 | 5.19 ± 0.09 | 3.7 ± 2.0 | 18.5 ± 2.1 |
| 2 | 2.3 ± 0.08 | 5.39 ± 0.07 | 2.5 ± 1.2 | 14.2 ± 1.6 |
| Gallic acid [a] | 8.1 ± 1.3 | 3.39 ± 0.05 | 6.7 ± 1.5 | N.D |
| (+)- Chatechin | 26.6 ± 2.3 | 1.31 ± 0.04 | 15.0 ± 2.2 | 9.1 ± 1.7 |
| Baicalein | 21.6 ± 1.8 | 2.77 ± 0.01 | 2.4 ± 1.3 | 13.1 ± 1.1 |

MC: Mitochondrial lipid peroxidation; N.D: Not determined; [a]Trolox equivalent antioxidant capacity (TEAC) is presented the concentration (mM) of Trolox having the same activity as 1 mM of sample; The values are the mean ± SD of triplicate determinations.


## Acknowledgements

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