

Antioxidative and antimicrobial effects of crude extract prepared from Oriental medicinal plants in Korea

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Summary

There were many reports on the natural antioxidants, but only tocopherol has been widely used despite of its high market price because of its recognized safety. On the other hands, antimicrobial effects of various plant extracts also have been extensively studied. There exist many substances showing antimicrobial activity in plants and their activities have been studied.

To evaluate the antioxidative and antimicrobial activity, 80 Oriental medicinal plants included *Glycyrrhiza uralensis*, *Paeonia suffruticosa*, *Curcuma longa*, and *Artemisia argyi et.*, were extracted by 70% methanol. Antioxidative activities of the extracts were determined by measuring TBARS values of egg yolk lecithin after oxidation induced by FeSO₄-ascorbic acid. The extracts were also investigated for the antimicrobial activity against *Staphylococcus aureus*. Total phenolic content of each extract was determined by adding of Folin-ciocalteu's reagent. Chlorogenic acid was used for constructing a standard curve.

Total phenolic content of the extracts calculated as chlorogenic acid was 4.45 mM in *Rubus coreanus* Miq., 4.44 mM in *Rubus crataegifolius*, 3.98 mM in *Sanguisorba officinalis* L. They showed relatively higher phenolic content than other medicinal plants. The RAE TBARS (%) was shown as following order : *Caesalpinia sappan* (86.81%) >

Alpinia officinarum (75.05%) > *Glycyrrhizia uralensis* (74.89%). The resulting antioxidant effect may be due to the phenolic compounds of each extract. Antimicrobial effect of each medicinal plant extract was measured by the disk diffusion method. The extracts from *Caesalpinia sappan* formed clear zone distinctly. The growth of *Staphylococcus aureus* was inhibited completely at 1.0% concentration of the extracts of *Paeonia lactiflora*, *Caesalpinia sappan* L. and *Psoralea corylifolia*. Our findings suggested that the medicinal plant extracts may contribute to the antioxidative and antimicrobial effects.

Materials and Methods

1. Materials

Plant resources : *Compositae*, *Labiatae*, *Leguminosae*, *Ranunculaceae*,
Rosaceae, *Zingiberaceae*

The parts used : Cortex, flos, fructus, herba, lignum, radix, rhizome,
and semen of the plants

2. Preparation of Crude Extract

Extract with 70% MeOH (10 volume of sample weight) two times at
70°C, 3hrs

3. Antioxidative effect

Inhibition effect on lipid-peroxidation on egg yolk lecithin

Radical scavenging activity on DPPH (1,1-diphenyl-1-picryl hydrazyl)

Total phenolic content by modified Folin-Denis method

4. Antimicrobial effect (on *Staphylococcus aureus* ATCC 13565)

Viable cell forming unit (CFU)

Clear zone test (in *leguminosae*)

Minimum inhibition concentration (MIC) and minimum bactericidal
concentration (MBC) in *leguminosae*

Result

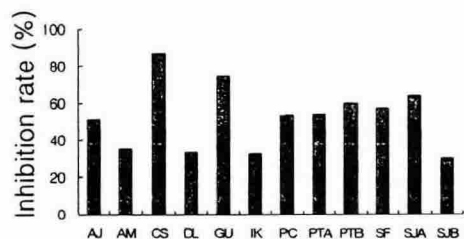


Fig.1 Inhibition effect of 12 plant extracts on peroxidation of egg yolk lecithin.

AJ: *Albizia pulcherrima* Durazz (cortex), AM: *Astragalus membranaceus* Bunge (radix), CS: *Cesalpinia sappan* L. (lignum), DL: *Dalichos lablab* L. (fructus), GU: *Glycyrrhiza uralensis* Fisch (radix), IK: *Indigofera keritowa* Max (radix), PC: *Psoralea corylifolia* L. (fructus), PTA: *Pueraria thumbergiana* Benth (flos), PTB: *Pueraria thumbergiana* Benth (radix), SF: *Sophora flavescens* Ait (radix), SJA: *Sophora japonica* L. (flos), SJB: *Sophora japonica* L. (fructus)

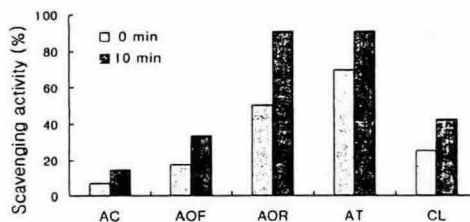


Fig.2 Scavenging activity of 5 plant extracts on DPPH radical

AC: *Antonia caroliniana* L. (fructus), AOF: *Alpinia officinarum* Hance (radix), AOX: *Alpinia oxyphylla* Miq (fructus), AT: *Alpinia katsumadai* Hayata (semen), CL: *Carum longum* L. (radix)

Family	Inhibition rate on lipid-peroxidation (%)	Scavenging activity on DPPH (%)	Total phenolic content (mM)
Labiatae			
<i>Elsholtzia ciliata</i> Hylander (herba)	73.66		
<i>Schizonepeta tenuifolia</i> Briquet (herba)		66.75	
<i>Lepturus sibiricus</i> L. (herba)			2.21
Leguminosae			
<i>Cesalpinia sappan</i> L. (lignum)	86.81*		
<i>Sophora japonica</i> L. (flos)		85.15	
<i>Pueraria thumbergiana</i> Benth (flos)			2.10
Rosaceae			
<i>Sanguisorba officinalis</i> L. (radix)	57.63		
<i>Rubus coreanus</i> Miq. (fructus)		79.23	4.45*
Zingiberaceae			
<i>Alpinia officinarum</i> Hance (radix)	75.05		3.85
<i>Amomum (Isa-ko) Crevois et Lemaire</i> (fructus)		90.52*	

Table 1. The selected plant from each family in antioxidative activities

Family	Inhibition concentration on zero of CFU (%)	Inhibition activity in zone test (%)	MIC (%) / MBC (%)
Compositae			
<i>Acanthia argus</i> Lev. Et Vant (herba)	1		
Labiatae			
<i>Elsholtzia ciliata</i> Hylander (herba)	1		
Leguminosae			
<i>Cesalpinia sappan</i> L. (lignum)	0.5	++	0.03
<i>Crataegus pinnatifida</i> Bunge (fructus)		++	
<i>Psoralea corylifolia</i> L. (fructus)	0.5	++	0.06
Ranunculaceae			
<i>Paeonia lactiflora</i> (radix)	0.5*		
Rosaceae			
<i>Rubus coreanus</i> Miq. (fructus)	1		
Zingiberaceae			
<i>Alpinia katsumadai</i> Hayata (semen)	1		

Table 2. The selected plant from each family in antimicrobial activities

	Inhibition concentration at zero of CFU (%)	Inhibition activity in zone test	MIC (%)/MBC (%)
Compositae			
<i>Arenaria arvensis</i> Lev. Et Vant (herba)	1	-	-
Labiatae			
<i>Elsholtzia ciliolata</i> Hylander (herba)	1	-	-
Leguminosae			
<i>Cassipouira sargani</i> L. (lignum)	0.5	+++	0.03
<i>Crotogeomys pinnatifida</i> Bunge (fructus)	-	++	-
<i>Psoralea corylifolia</i> L. (fructus)	0.5	++	0.06
Ranunculaceae			
<i>Paeonia lactiflora</i> (radix)	0.5*	+	-
Rosaceae			
<i>Rubus coreanus</i> Miq. (fructus)	1	-	-
Zingiberaceae			
<i>Alpinia katsumadai</i> Hayata (semis)	1	-	-

Table 3. The selected plant from each family in antimicrobial activities

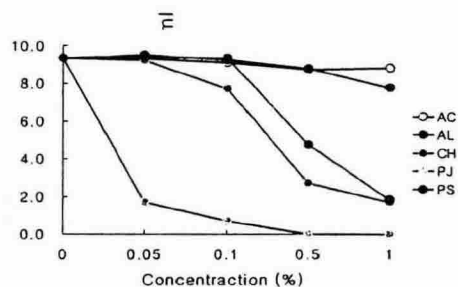


Fig. 3 Antimicrobial effect of *Ranunculaceae* on survival of *Staphylococcus aureus*.

AC *Acinimum coreanum* (radix), AL *Acinimum leucyanum* R. Raymond (radix), CH *Campanula trachelidifolia* Kom (rhizome), PJ *Psoralea corylifolia* L. (fructus), PS *Paeonia suffruticosa* Andr. (cortex)



Photo. 1 Inhibiting activity of Leguminosae on growth of *Staphylococcus aureus*.

a: *Albizia julibrissin* Durazz (cortex), b: *Psoralea corylifolia* L. (fructus), c: *Sophora japonica* L. (flos), d: *Persea thumbergiana* Beth (flos), e: *Sophora japonica* L. (fructus), f: *Dalmanella lablab* L. (fructus), g: *Andropogon kirilowii* Max (radix), h: *Persea thumbergiana* Beth (radix), i: *Sophora flavescens* Ait (radix), j: *Glycyrrhiza uralensis* Fisch (radix), k: *Astragalus membranaceus* Ege (radix), l: *Cassipouira sargani* L. (lignum)