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Effect of Plant Part Extracts on Inflammation-related Biomarkers

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Objectives

Investigation of anti-inflammatory activity of plant resources and their utility

Materials and Methods

○ Materials

Plant extracts for the study including *Agastache rugosa* O. Kuntz extract have been provided from Plant Extract Bank (PJ007083201003 & PJ 007437201003) of NIHHS, RDA.

○ Methods

- Cell line for the study was RAW264.7 cell, which was incubated in culture medium of Dulbecco's Modified Eagle Medium (DMEM) with 10% fetal bovine serum (FBS), 100 U/mL penicillin, 100 mg/mL streptomycin in condition of 37° C and 5% CO₂. Final concentration of the extract samples dissolved in dimethyl sulfoxide (DMSO) were 5 µg/ml in the cell culture system.
- Assay of TNF- α and IL-6 secretion have been conducted on the supernatant of RAW264.7 cell culture system after treatment or no-treatment of sample and/or 100 ng/mL of LPS with enzyme-linked immunosorbent assay (ELISA) kit (eBioscience, San Diego, CA, USA).
- Assay of I κ -Ba, iNOS and COX-2 expression in RAW264.7 cells have been done by electrophoresis method after treatment against I κ -Ba, iNOS, COX-2 specific antibodies, then horseradish peroxidase (HRP, secondary antibodies), and subsequently with chemiluminescence reagents (Amersham Biosciences, Piscataway, NJ, USA), respectively.

Results

From the results, rhizome of *Alpinia officinarum*, fruit peel of *Citrus unshiu*. and flower of *Inula britannica* var. *chinensis* have ameliorated the reduction of I κ -Ba expression, and trunk peel of *Ulmus arvifolia*, root of *Gastrodia elata* have reduced iNOS expression. *Agrimonia pilosa* L. var. *japonica* (stem and leaf), *Gossyium nanking* (seed), *Lysimachia vulgaris* var. *davurica* (aerial part), *Lithospermum erythrorhizon* (root) and *Aster scaber* (aerial part) have showed effective inhibition activity on TNF- α , IL-6 secretion. We suggest that these plants would be studied the utility as anti-inflammation materials through further research.

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Table1. Inhibition of TNF- α , IL-6 secretion and I κ -Ba, iNOS, and COX-2 expression in RAW264.7 cells by the plant part extracts.

Sample No.	Scientific name	Used part	Inhibition rate (%)		Fold intensity of I κ -Ba expression to control (%)	Fold intensity change	
			TNF- α secretion	IL-6 secretion		iNOS expression	COX-2 expression
1	<i>Agastache rugosa</i> O. Kuntz	whole plant	-0.8 \pm 0.8	35.1 \pm 8.5	18.51	-0.3	-0.27
2	<i>Agastache rugosa</i> O. Kuntz	whole plant	4.5 \pm 4.1	23.3 \pm 8.6	24.42	-0.29	-0.24
3	<i>Rosa laevigata</i> Michx	fruit	-1.1 \pm 1.7	23.6 \pm 2.8	16.20	-0.22	-0.08
4	<i>Alpinia officinarum</i> Hance	rhizome	-5.6 \pm 4.1	36.8 \pm 6.7	34.19	-0.34	-0.51
5	<i>Citrus unshiu</i> Markovich	peel of fruit	5.0 \pm 8.5	21.9 \pm 7.5	53.73	-0.32	-0.38
6	<i>Inula britannica</i> var. <i>chinensis</i> REGEL	flower	-1.2 \pm 5.2	37.8 \pm 5.0	25.71	-0.25	-0.51
7	<i>Crataegus pinnatifida</i> Bunge	fruit	5.5 \pm 3.1	19.0 \pm 8.6	19.54	-0.74	-0.7
8	<i>Viola mandshurica</i> W. Becker	aerial part	8.2 \pm 4.4	33.8 \pm 12.7	-4.49	-0.12	-0.32
9	<i>Agrimonia pilosa</i> L. var. <i>japonica</i> Nakai	stem	15.9 \pm 4.6	28.0 \pm 6.9	-1.25	-0.17	-0.41
10	<i>Agrimonia pilosa</i> L. var. <i>japonica</i> Nakai	leaf	21.7 \pm 1.7	22.2 \pm 7.5	-4.99	-0.15	-0.45
11	<i>Cedrela sinensis</i> A. Juss	leaf	7.5 \pm 3.0	10.2 \pm 3.3	-2.74	0.06	-0.26
12	<i>Torilis japonica</i> D. C.	fruit	16.2 \pm 1.8	28.6 \pm 15.4	-10.47	0.02	-0.59
13	<i>Ulmus arifolia</i> JACQ	peel of trunk	12.8 \pm 6.9	6.2 \pm 17.8	2.79	0.13	-0.54
14	<i>Gastrodia elata</i> Blume	root	-2.5 \pm 8.3	28.0 \pm 13.0	-2.00	0.26	-0.65
15	<i>Cnidium officinale</i> Makino	root	16.3 \pm 3.5	30.5 \pm 5.5	0.18	-0.06	-0.14
16	<i>Ulmus arifolia</i> JACQ	peel of root	9.7 \pm 8.1	6.3 \pm 2.9	1.75	-0.17	-0.26
17	<i>Elsholtzia splendens</i> NAKAI	whole plant	7.2 \pm 0.6	-8.2 \pm 8.7	2.63	-0.17	-0.27
18	<i>Gossyium nanking</i> MEYEN	seed	27.9 \pm 3.4	33.9 \pm 6.1	1.75	-0.2	-0.19
19	<i>Rumex acetosa</i> L.	aerial part	17.3 \pm 2.4	26.4 \pm 13.9	2.46	-0.06	-0.27
20	<i>Rumex acetosa</i> L.	root	10.7 \pm 1.2	9.8 \pm 14.8	4.21	-0.14	-0.38
21	<i>Rumex acetocella</i> L.	whole plant	12.9 \pm 10.7	21.9 \pm 6.8	3.68	-0.14	-0.33
22	<i>Lysimachia vulgaris</i> var. <i>davurica</i> (LED.) R. KNUTH.	aerial part	42.5 \pm 50.3	22.0 \pm 7.6	5.25	-0.46	-0.47
23	<i>Lithospermum erythrorhizon</i> S. et Z.	aerial part	-1.2 \pm 4.6	21.1 \pm 5.7	2.79	-0.68	-0.36
24	<i>Lithospermum erythrorhizon</i> S. et Z.	root	12.6 \pm 3.2	26.1 \pm 6.5	1.48	-0.48	0.01
25	<i>Aster scaber</i> THUNB.	aerial part	11.6 \pm 0.9	33.0 \pm 5.7	2.30	-0.51	-0.01
26	<i>Polygala tenuifolia</i> WILLDENOW	root	-0.1 \pm 4.8	-2.9 \pm 11.2	2.22	-1.76	-1.81
27	<i>Valeriana officinalis</i> var. <i>latifolia</i> MIQ.	root	-6.2 \pm 6.5	7.8 \pm 17.0	-4.07	-1.35	-1.36
28	<i>Quercus acutissima</i> Carruth.	peel of trunk	-2.0 \pm 3.9	4.6 \pm 18.3	-1.11	-1.82	-2.08
29	<i>Geranium thunbergii</i> Siebold & Zucc.	aerial part	-5.4 \pm 4.4	-10.8 \pm 13.0	0.37	-2.31	-2.41
30	<i>Geranium thunbergii</i> Siebold & Zucc.	root	-13.5 \pm 2.4	-37.0 \pm 10.3	0.00	-3.85	-4.12
31	<i>Elsholtzia ciliata</i> (Thunb.) Hyl.	whole plant	-10.7 \pm 2.2	-3.3 \pm 4.7	2.96	-2.53	-3.16
32	<i>Schizonepeta tenuifolia</i> (Benth.) Briq.	whole plant	1.4 \pm 0.1	-3.4 \pm 4.6	0.37	-3.29	-3
33	<i>Chamaecrista nomame</i> (Siebold) H. Ohashi	whole plant	3.4 \pm 0.7	22.7 \pm 16.5	0.61	-0.18	-0.02