

## Antitumor Activities of Several Phytopolysaccharides

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**Abstract** □ Polysaccharides were isolated with alkaline extraction method from twelve pharmaceutical plants, which have been used against the various tumors in the oriental herb medicine, and examined for their antitumor activities. When the polysaccharides were administered i.p. at the dose of 10mg/kg/day for ten consecutive days to the male ICR mice, which had been implanted with  $1 \times 10^6$  cells of sarcoma 180 twentyfour hours before the first injection of polysaccharides, those from *Forsythia Coreia*, *Curcuma Zedoaria*, *Albizia Julibrissin*, *Prunus Persica*, *Foeniculum Vulgare* and *Daphne Pseudogenkwa* showed inhibition ratios of 88.0%, 61.1%, 73.0%, 72.8% 55.1% and 71.7%. The significant prolongation of life span was observed only in the case of *Forsythia Coreia* (18.1%). Other six polysaccharide fractions from *Olibanum*, *Lonicera Japonica*, *Rheum Coreanum*, *Scirpus Maritimus*, *Gleditchia Officinalis* and *Brassica Juncea* showed negligible inhibition ratios.

**Keywords** □ Polysaccharides, *Forsythia Coreia*, *Curcuma Zedoaria*, *Albizia Julibrissin*, *Prunus Persica*, *Foeniculum Vulgare*, *Daphne Pseudogenkwa*, *Olibanum*, *Lonicera Japonica*, *Rheum Coreanum*, *Scirpus Maritimus*, *Gleditchia Officinalis*, *Brassica Juncea*, Antitumor activity against sarcoma 180

Crude polysaccharides were extracted from the plant materials according to the method of Caldes et al.<sup>3)</sup> Plant material weighed 200g was ground in mixer in cold 0.5M NaOH. The ultimate volume of 0.5M NaOH was changed from material to material, but standard volume was 5ml per gram of plant material. Ground material was allowed to be settled overnight

in the cold room. The extract was filtered through gauze and filter paper. The filtrate was mixed with 3 volume of cold 95% ethanol or 95% acetone. After mixed filtrate was allowed to be settled in the cold room, supernatant was removed by decantation and centrifugation. Centrifugation was carried out at 5,000 rpm (rotor radius 14cm) for 10 minutes below 4°C. Precipitate was taken up into cold distilled water and treated with one volume of 15% cold trichloroacetic acid in ice bath for an hour. Following the centrifugation at 12,000g for an hour, supernatants were mixed with 4 volume of cold 95% ethanol or 95% acetone. After overnight's settling in the cold room, precipitate was taken up into 2% sodium acetate solution.

**Table I: Plant materials and their polysaccharide contents.**

Plant materials	Yields of polysaccharide fractions (mg/200g)	Polysaccharide contents (%) of the fractions
<i>Forsythia Coreia</i>	330	83.5
<i>Scirpus Maritimus</i>	460	61.4
<i>Curcuma Zedoaria</i>	600	48.2
<i>Prunus Persica</i>	230	49.9
<i>Rheum Coreanum</i>	250	59.2
<i>Foeniculum Vulgare</i>	210	34.8
<i>Daphne Pseudogenkwa</i>	520	58.5
<i>Brassica Juncea</i>	590	50.8
<i>Olibanum</i>	2,575	63.5
<i>Lonicera Japonica</i>	210	62.2
<i>Gledichia Officinalis</i>	790	82.1
<i>Albizia Julibrissin</i>	520	49.5

**Table II: Antitumor Activities of Polysaccharides against sarcoma 180 s.c. inoculated into ICR mice.**

Sample	N	Dose(mg/kg, day)	Tumor weight(g)	Inhibition ratio(%)	P value
Control	10	—	4.16±2.52	—	—
<i>Forsythia Corea</i>	8	10, 10	0.50±0.38	88.0	P<0.01
<i>Albizzia Julibrissin</i>	7	10, 10	1.12±0.71	73.0	P<0.01
<i>Prunus Persica</i>	8	10, 10	1.13±0.71	72.8	P<0.01
<i>Foeniculum Vulgare</i>	8	10, 10	1.87±1.19	55.1	P<0.01
<i>Curcuma Zedoaria</i>	10	10, 10	1.62±1.28	61.1	P<0.01
<i>Daphne Pseudogenkwa</i>	10	10, 10	1.70±1.00	71.7	P<0.01
Control	7	—	5.22±2.54	—	—
<i>Olibanum</i>	9	10, 10	4.89±2.15	6.4	N. S
<i>Lonicera Japonica</i>	5	10, 10	7.75±0.81	—	P<0.01
<i>Rheum Coreanum</i>	9	10, 10	6.06±2.38	—	N. S
<i>Scirpus Maritimus</i>	8	10, 10	4.87±2.68	6.8	N. S
<i>Gleditchia Officinalis</i>	8	10, 10	5.96±3.28	—	N. S
<i>Brassica Juncea</i>	9	10, 10	4.07±2.33	22.1	N. S

**Table III: Effects of Polysaccharides on life span of ICR mice inoculated i.p. with sarcoma 180 ascites.**

Sample	N	Dose(mg/kg, day)	Average survival days	Prolongation ratio(%)
Control	10	—	16.2	—
<i>Forsythia Corea</i>	10	10, 10	19.2	18.5
<i>Scirpus Maritimus</i>	10	10, 10	15.9	—
<i>Curcuma Zedoaria</i>	10	10, 10	16.4	1.2
<i>Rheum Coreanum</i>	10	10, 10	18.0	11.1
<i>Prunus Persica</i>	10	10, 10	16.0	—
<i>Foeniculum Vulgare</i>	10	10, 10	16.4	1.2
<i>Daphne Pseudogenkwa</i>	10	10, 10	15.9	—
<i>Brassica Juncea</i>	10	10, 10	14.7	—
<i>Olibanum</i>	10	10, 10	17.7	9.3
<i>Lonicera Japonica</i>	10	10, 10	17.4	7.4
<i>Gleditchia Officinalis</i>	10	10, 10	13.7	—
<i>Albizzia Julibrissin</i>	10	10, 10	16.3	0.6

Insoluble impurities were removed by vacuum filtration on the quantitative filter paper. Filtrate was mixed with 2 volume of cold ethanol or acetone and kept overnight at 4°C. Supernatant was removed by decantation and centrifugation at 12,000g for 15 minutes. Resulted precipitate was dissolved in water and dialyzed for 48

hours against running distilled water at 4°C. The dialyzed polysaccharide preparation was lyophilized. Polysaccharide contents were determined by anthron reaction. Antitumor test was carried out by the same way as that reported on the antitumor activity of lentinan<sup>4</sup>. Male ICR mice about 20g were implanted s.c. with

$1 \times 10^6$  cells of sarcoma 180 into the left groin at 24 hours before the start of sample administration. Samples were administered once a day for ten days by i.p. injection with each dose. On the 21th or 28th day after tumor implantation the mice were sacrificed and the solid tumors were excised and inhibition ratios were calculated from their weights. In order to determine the effects of samples on the life span of mice with tumor, male ICR mice were inoculated i.p. with 0.1ml of sarcoma 180 cell suspension,  $1 \times 10^7$  cell/ml and test samples were injected i.p. for consecutive ten days, starting on the first day after tumor implantation. Mean survival days were calculated according to the guideline of National Cancer Institute of U.S.A. and compared with that of control mice.

Polysaccharide contents of samples varied from 34.5% to 83.5% (Table I). Among the eleven samples, polysaccharides from *Forsythia Coreia*, *Curcuma Zedoaria*, *Albizia Julibrissin*, *Prunus*

*Persica*, *Foeniculum Vulgare* and *Daphne Pseudogenkwa* exhibited relatively strong activities (55.1%~88.0%), whereas those of *Olibanum*, *Rheum Coreanum*, *Scirpus Martimus*, *Gleditsia Officinalis* and *Brassica Juncea* showed almost negligible activities (0%~22.1%). We could find the significant prolongation of life span only in the case of *Forsythia Coreia* (18.1%) and this result was above the level NCI commented.

#### LITERATURE CITED

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