Arch. Pharm. Res. **13**(4), 371-373 (1990)

Hypoglycemic Activity of Medicinal Plants

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(Received September 10, 1990)

Abstract□The hypoglycemic activity of water extracts of fifty six medicinal plants were evaluated in the streptozotocin-induced diabetic mice. Twelve medicinal plants have significantly antidiabetic activity; Mori Radicis Cortex, Kwang Fang Chi Radix, Paeoniae Radix, Eugeniae Flos, Atractylodis Rhizoma, Ophiopogonis Tuber, Rosae multiflorae Fructus, Glycyrrhizae Radix, Tetrapanacis Medulla, Bigno, Forsythiae Fructus and Sophorae Radix.

Keywords□Medicinal plants, streptozotocin-induced diabetes, hypoglycemic activity, antidiabetic activity.

Many medicinal plants have been used for antidiabetic agents in oriental medicine. Some medicinal plants have hypoglycemic activity and so isolation of their antidiabetic principles have been studied; Saudin from *Cluytia richardiana* L. by Mossa[1], lithospermans from *Lithospermum erythrorhizon* roots by Konno[2], panaxans from *Panax ginseng* roots by Konno[3], moran A from *Morus alba* roots by Hikino[4], aconitans from *Aconitum carmichaeli* roots by Konno[5], ganoderans from *Ganoderma lucidum* fruit bodies by Hikino[6], ephedrans from *Ephedra distachya* herbs by Konno[7], dioscorans from *Dioscorea japonica* rhizophors by Hikino[8], atractans from *Atractylodes japonica* rhizomes by Konno[9], anemarans from *Anemarrhena asphodeloides* rhizomes by Takahashi[10], ursolic acid from *Corni fructus* by Yamahara[11], humulone and lupulone by Yamahara[12], quinquefolans from *Panax quinquefolium* by Ohima[13] and oleanolic acid by Fuzi[14].

We found that newly ten medicanal plants have antidiabetic activity and they inhibited the blood glucose, water consumption and weight loss in streptozotocin-induced diabetic mice during the course of our screening of the hypoglycemic activity in the world folk medicines for the isolation of plant-originated antidiabetic principles.

EXPERIMENTAL METHODS

Ganoderma applanatum collected at Provincial park in Canada and Bigno collected at Riodezaneilo in Brazil. Other medicinal plants were purchased at Kyung-Dong market in Seoul, Korea. All of medicinal plants extracted respectively three times with water on water bath for 3 hours, evaporated in the vacuum evaporator and dried by freezing drier. Male mice (ddY strain, 16~20g) were given food and drinking water freely, but fasted for 24 hours before determination of blood glucose. Water extracts of medicinal plants were dissolved in physiological saline solution and water extracts of medicinal plants were orally administered respectively 1 hour after injection of streptozotocin (200 mg/kg, i.v.)[15] and twice a day for 3 days. On day 4, blood sugar, water consumption and weight change were determined. Blood was drawn from the orbital sinus by microhematocrit tubes and blood glucose level was measured with a glucose analyzer by the glucose oxidase method[16].

RESULTS

Among the evaluation of the hypoglycemic activity of water extract of fifty six medicinal plant in the streptozotocin-induced diabetic mice, twelve medicinal plants showed significantly antidiabetic activity: they inhibited the increase of blood glucose, water consumption and weight loss in streptozotocin-induced diabetic mice.

Water extracts of Mori Radicis Cortex, Kwang Fang Chi Radix and Paeoniae Radix have the most antidiabetic activities; they inhibited significantly the blood glucose, water consumption and weight loss. Eu-

Table I. Effect of water extract of medicinal plants on blood glucose, water consumption and weight change in streptozotocin (200 mg/kg, i.v.)-induced diabetic mice

Drugs[1)]	Dose (mg/kg, p.o.)	Blood glucose (mg/dl)	Water consumption (ml/3 days)	Weight change (%/3 days)
Control (untreated)	–	95.0±2.5[2)]	5.4±1.3[2)]	+9.8±3.8[2)]
Control (treated)	–	236.3±11.5	17.5±2.1	9.8±7.8
Achylanthis radix	1,000	220.5±10.7	10.3±2.5	−15.4±4.2
Aconiti tuber	1,000	224.8±16.7	10.8±1.4	−11.7±3.0
Alismae rhizoma	1,000	341.2±17.6	26.8±5.2	−28.2±3.2
Anemarrhenae rhizoma	1,000	249.3±27.6	16.8±3.7	−15.4±3.0
Arecae pericarpium	1,000	217.2±18.2	15.2±5.6	−17.7±6.2
Arecae seman	1,000	230.0±18.8	10.3±4.2	−10.5±7.0
Artemisiae capillaris herba	1,000	305.7±27.1	14.3±3.1	−19.0±2.9
Asparagi radix	1,000	244.2±20.8	16.7±1.7	−5.4±2.1
Astragali radix	1,000	228.3±20.3	11.2±3.6	−12.3±3.2
Atractylodis rhizoma	1,000	190.8±24.2**	8.6±3.1*	+2.0±4.3*
Atractylodis rhizoma alba	1,000	294.8±15.3	14.7±3.2	−23.0±3.1
Bigno	1,000	201.7±8.2*	15.0±2.4	−8.2±3.8
Cassiae torae semen	1,000	232.2±32.7	11.4±3.7	−13.5±2.2
Castaneae semen	1,000	273.3±11.9	16.7±2.7	−20.3±2.2
Codonopsitis radix	1,000	279.3±15.3	18.0±3.4	−11.5±3.1
Corni fructus	1,000	274.3±26.3	15.6±5.7	−3.1±1.7
Curbitae semen	1,000	263.2±1.1	18.4±5.0	−6.0±2.1
Cuscutae semen	1,000	294.5±37.8	19.4±7.5	−20.6±7.5
Dioscoreae radix	1,000	284.0±29.8	11.3±7.6	−1.7±1.7
Ephedrae herba	1,000	253.7±18.1	18.2±3.1	−22.7±3.7
Eucommiae cortex	1,000	218.5±26.5	13.2±2.7	−14.9±2.1
Eugeniae flos	1,000	173.3±19.0**	7.4±3.1*	+4.9±4.1**
Forsythiae fructus	1,000	201.3±26.8*	22.3±4.3	−27.6±0.9
Ganoderma fungus	1,000	254.4±21.3	11.4±3.6	−4.7±4.2
Ginseng radix palva	1,000	212.3±22.7	18.8±4.3	−24.6±3.0
Glycyrrhizae radix	1,000	197.8±21.0*	8.2±1.5*	+1.1±3.6*
Kwang fang chi radix	1,000	159.2±18.3**	7.2±3.1*	+3.6±0.4**
Imperatae rhizoma	1,000	226.8±25.9	11.5±3.7	−30.2±1.1
Lemnae herba	1,000	274.4±11.2	15.7±2.4	−3.6±0.8
Lithospermi radix	1,000	240.5±12.3	22.8±5.4	−17.3±3.2
Lycii fructus	1,000	216.0±34.5	10.7±5.1	−27.2±5.9
Lycii radicis cortex	1,000	229.5±22.2	11.3±7.2	+4.7±5.8**
Mori radicis cortex	1,000	148.0±19.2**	5.7±1.4*	+1.4±1.9*
Moutan radicis cortex	1,000	277.2±35.2	13.2±1.7	−17.4±4.9
Nelumbonis semen	1,000	269.5±25.8	27.4±1.5	−27.3±2.7
Ophiopogonis tuber	1,000	189.8±17.9**	7.4±3.2*	−3.3±4.7
Oryzae semen	1,000	255.3±15.4	12.5±3.5	−6.6±2.1
Paeoniae radix	1,000	169.8±17.9**	8.9±2.7*	+1.2±2.4*
Phaseoli semen	1,000	217.3±15.7	14.5±3.2	−21.7±1.5
Plantaginis semen	1,000	228.3±12.0	10.2±2.4	−15.2±2.9
Polygonati officinalis rhizoma	1,000	257.7±11.5	13.8±1.5	−16.8±3.2
Prunellae herba	1,000	256.0±12.0	16.2±3.1	−18.5±1.9
Rhemaniae radix aquosa	1,000	222.3±10.4	11.3±3.0	−10.3±3.2
Rhemaniae radix preparata	1,000	236.7±25.7	13.3±2.8	−14.6±4.2
Rhemaniae radix siccata	1,000	241.4±18.0	11.3±4.2	−27.9±3.4
Rosae multiflorae fructus	1,000	185.5±28.0**	8.2±1.5*	+2.3±1.8**
Schizandrae fructus	1,000	350.7±31.9	21.5±3.1	−19.4±1.1
Scutellariae radix	1,000	239.8±39.5	14.2±1.5	−19.3±3.4
Setariae semen	1,000	287.8±35.2	15.7±3.2	−17.6±6.5
Sophorae flos	1,000	240.5±28.2	12.5±1.5	−14.4±2.8
Sophorae radix	1,000	203.5±22.1*	10.3±1.5	−27.8±3.7
Tetrapanacis medulla	1,000	200.2±20.8*	7.8±3.2*	−5.2±1.8
Trichosanthis radix	1,000	232.8±18.7	27.0±5.3	−16.8±4.3
Trichosanthis semen	1,000	213.5±27.2	10.3±3.6	−19.5±6.9
Tritici semen	1,000	222.2±15.4	20.6±4.5	+0.2±1.0*
Typhae pollen	1,000	306.5±14.7	17.5±4.2	−19.1±4.3
Glibenclamide	1	139.3±14.3**	12.5±3.2	−7.6±2.4

[1)]Drug was administered 1 hr after injection of streptozotocin twice a day for 3 days.

[2)]Mean±S.E. from 10 mice.

Significantly different from treated control (*; $p<0.05$, **; $p<0.01$).

geniae Flos, Rosae multiflorae Fructus, Atractylodis Rhizoma and Glycyrrhyzae Radix decreased significantly the blood glucose, water consumption and weight loss. Ophiopogonis Tuber, Tetrapanacis Medulla, Forsythiae Fructus and Bigno decreased significantly the blood glucose and water consumption. Sophorae Radix decreased significantly the blood glucose (Table I).

LITERATURE CITED

1. Mossa, J.B.: Saudin, a novel hypoglycemic agent. *U.S. Pat.* 4,740,521, (1988).
2. Konno, C., Mizuno, T. and Hikino, H.: Isolation and hypoglycemic activity of Lithospermans A, B and C, glycans of *Lithospermum erythror hizon* roots. *Planta Med.* **51**, 157 (1985).
3. Konno, C., Sugiyama, K., Kano, M., Takahashi, M. and Hikino, H.: Isolation and hypoglycemic activity of panaxan A, B, C, D and E, glycans of *Panax ginseng* roots. *ibid,* **50**, 434 (1984).
4. Hikino, H., Mizuno, T., Oshima, Y. and Konno, C.: Isolation and hypoglycemic activity of moran A, a glycoprotein of *Morus alba* root barks. *ibid,* **51**, 159 (1985).
5. Konno, C., Murayama, M., Sugiyama, K., Arai, M., Murakami, M., Takahashi, M. and Hikino, H.: Isolation and hypoglycemic activity of aconitans A, B, C and D, glycans of *Aconitum carmichaeli* roots. *ibid,* **51**, 160 (1985).
6. Hikino, H., Konno, C., Mirin, Y. and Hayashi, T.: Isolation and hypoglycemic activity of ganoderans A and B, glycans of *Ganoderma lucidum* fruit bodies. *ibid,* **51**, 339 (1985).
7. Konno, C., Muzuno, T. and Hikino, H.: Isolation and hypoglycemic activity of ephedrans A, B, C, D and E, glycans of *Ephedra distachya* herbs. *ibid,* **51**, 162 (1985).
8. Hikino, H., Konno, C., Takahashi, M., Murakami, M., Kato, Y., Karikura, M. and Hayashi, T.: Isolation and hypoglycemic activity of dioscorans A, B, C, D, E and F, glycans of *Dioscorea japonica* rhizophors. *ibid,* **52**, 168 (1986).
9. Konno, C., Suzuki, Y., Oishi, K., Munakata, E. and Hikino, H.: Isolation and hypoglycemic activity of atractans A, B and C, glycans of *Atractylodes japonica* rhizomes. *ibid,* **51**, 102 (1985).
10. Takahashi, M., Konno, C. and Hikino, H.: Isolation and hypoglycemic activity of anemarans A, B, C and D, glycans of *Anemarrhena asphodeloides* rhizomes. *ibid,* **51**, 100 (1985).
11. Yamahara, J., Mibu, H., Sawada, T. and Fujimura, H.: Biologically active principles of medicinal plants. Antidiabetic principles of Corni Fructus in experimental diabetes induced by streptozotocin. *Yakugaku Zasshi* **101**, 86 (1981).
12. Fuji, M., Sawata, T. and Yamahara, J.: *Nippon Pat.* 59-59623 (1984).
13. Oshima, Y., Sato, K. and Hikino, H.: Isolation and hypoglycemic activity of quinquefolans A, B and C, glycans of *Panax quinquefolicum, J. Nat. Prog.* **50**, 188 (1987).
14. Fuji, M., Sawata, T. and Yamahara, J.: *Nippon Pat.* 55-122715 (1980).
15. Srivastava, L.M., Bora, P.S. and Bhatt, D.S.: Diabetogenic action of streptozotocin. *Trends Pharmacol.* **3**, 376 (1982).
16. John, A.L. and Kathie, T.: Evaluation of riender's glucose oxidase method for measuring glucose in serum and urine. *Clin. Chem.* **21**, 1754 (1975).