

## Hypoglycemic, diuretic and hypocholesterolemic effect of Winter cherry (*Withania somnifera*, Dunal) root

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Hypoglycemic, diuretic and hypocholesterolemic effects of roots of *W. somnifera* (ashvagandha) were assessed on human subjects. Six mild NIDDM subjects and six mild hypercholesterolemic subjects were treated with the powder of roots of *W. somnifera* for 30 days. Suitable parameters were studied in the blood and urine samples of the subjects along with dietary pattern before and at the end of treatment period. Decrease in blood glucose was comparable to that of an oral hypoglycemic drug. Significant increase in urine sodium, urine volume, significant decrease in serum cholesterol, triglycerides, LDL (low density lipoproteins) and VLDL (very low density lipoproteins) cholesterol were observed indicating that root of *W. somnifera* is a potential source of hypoglycemic, diuretic and hypocholesterolemic agents. Clinical observations revealed no adverse effects.

Winter cherry (*Withania somnifera*) also called ashvagandha, belongs to the family Solanaceae, is cultivated in the soils that are unsuited for other crops and requires little care<sup>1</sup>. The plant is known for its varied therapeutic uses in ayurvedic and unani practices in India<sup>2</sup>.

*Withanina somnifera* commonly known for its usefulness in the treatment of arthritis in combination with other drugs, is also credited to be hypoglycemic and diuretic<sup>3,4</sup>. The pharmacological effect of the roots of *W. somnifera* is attributed to *withanolides*, a group of steroidal lactones<sup>5</sup>. In animals, report is there about hypoglycemic activity of *trasina* (an ayurvedic formulation) consisting of *W. somnifera* as one of the important constituents, the activity being ascribed to its antioxidant property<sup>3</sup>. Earlier studies have reported the absence of any side effects of *W. somnifera* in animals<sup>6,7</sup>. To corroborate the promising results of animal studies<sup>3</sup> in humans, a study was conducted to assess the hypoglycemic, diuretic and hypocholesterolemic effect of *W. somnifera* on human subjects.

For the present investigation, 12 NIDDM subjects and 12 mild hypercholesterolemic subjects were selected from same socio- economic background through house survey, in the age group of 40-60 years. From each group six patients were used as control and six patients as test subjects.

The controls in NIDDM group were on treatment with oral hypoglycemic drug (daonil) and continued

with the same. The other subjects undergoing any treatment before the study period, terminated the same in consultation with the physician. This enabled us to study the different therapeutic effects of *W. somnifera* root powder. Only mild hyperglycemic and hypercholesterolemic patients were selected for the study.

For the present investigation, dried roots of the plant were collected from IMPCOPS (Indian Medical Practitioner's Cooperative Society) and powdered. It was filled in 500mg capsules and 6 capsules were given per day (two after every meal), accounting for a dosage of 3g/day<sup>4</sup>, for a period of 30 days to the test groups i.e. 6 from NIDDM and 6 from hypercholesterolemic subjects.

A questionnaire was framed to obtain information on general background, health history and dietary pattern with a suitable inventory to study the food intake of the subjects. The energy, protein and fat intake were calculated (Table 1) and a relation was drawn with hyperglycemia and hypercholesterolemia. The different parameters studied before and after the treatment period of 30 days in the control and experimental (test) groups to obtain the mean normal values are as given below.

Twenty four hour urine (8 a.m. to 8 a.m.) was collected in sterilised graduated bottles. Blood glucose,<sup>8</sup> sodium and potassium<sup>9,10</sup> in serum and urine, serum cholesterol<sup>11</sup>, triglycerides<sup>12</sup>, HDL

cholesterol<sup>13</sup>, LDL and VLDL cholesterol<sup>14</sup> were determined in the samples collected before and at the end of treatment period.

The results were analysed statistically using Student's *t* test.

Table 1—Mean nutrient intake of subjects

Subjects	Energy (k.cal/day)	Protein (g/day)	Fat (g/day)
Control group	2440.00	42.0	21.27
Experimental group	2682.34	38.7	26.2

Observations from the case study revealed that all the selected subjects happened to be sedentary workers and the mean calorie intake of the experimental (test) groups was higher than that of the control group (Table 1). The general dietary pattern remained the same through out the treatment period.

Results showed a 12% reduction in blood sugar levels of *W.somnifera* treated NIDDM subjects which is similar to the decrease in blood sugar levels exhibited by control subjects who were on an oral hypoglycemic drug-daonil (Table 2). In spite of high

Table 2—Blood glucose, serum and urine profile of control and experimental groups

Parameter	[Values are mean $\pm$ SD ]			
	Control		Experimental	
	Initial values	Final values	Initial values	Final values
Blood glucose (mg/dl)	191.0 $\pm$ 24.39	168.16 $\pm$ 25.26 (12)	206.3 $\pm$ 24.45	181.66 $\pm$ 26.96* (12)
Serum profile				
Serum Sodium (meq/l)	142.66 $\pm$ 4.74	142.66 $\pm$ 5.40	144.83 $\pm$ 5.73	140.66 $\pm$ 4.99 (3)
Serum Potassium (meq/l)	4.41 $\pm$ 0.40	4.40 $\pm$ 0.31	4.85 $\pm$ 0.67	3.75 $\pm$ 0.55* (22)
Urine profile				
Volume (ml/day)	890.0 $\pm$ 21.60	890 $\pm$ 21.60	896.66 $\pm$ 18.67	948.33 $\pm$ 16.74* (6)
Sodium (meq/l)	109.33 $\pm$ 13.90	115.00 $\pm$ 11.60	109.66 $\pm$ 20.46	131.33 $\pm$ 20.20* (20)
Potassium (meq/l)	20.16 $\pm$ 4.05	18.85 $\pm$ 3.79	22.16 $\pm$ 4.09	20.20 $\pm$ 8.05

*P* values: \* < 0.01

Figures in parentheses indicate per cent decrease /increase

Table 3—Serum lipid profile of control and experimental groups  
[Values are mean  $\pm$  SD of 6 subjects]

Parameter	Control		Experimental	
	Initial values	Final values	Initial values	Final values
Total cholesterol (mg/dl)	192.5 $\pm$ 12.05	195.33 $\pm$ 12.00	195.0 $\pm$ 15.00	175.03 $\pm$ 13.13* (10)
Triglycerides (mg/dl)	161.83 $\pm$ 16.93	162.83 $\pm$ 16.51	180.0 $\pm$ 15.1	152.68 $\pm$ 12.98* (15)
HDL cholesterol (mg/dl)	39.33 $\pm$ 1.97	39.33 $\pm$ 1.97	40.33 $\pm$ 2.98	41.00 $\pm$ 3.05
LDL cholesterol (mg/dl)	120.8 $\pm$ 10.85	134.83 $\pm$ 12.19 (12)	118.66 $\pm$ 13.97	111.30 $\pm$ 11.0* (6)
VLDL cholesterol (mg/dl)	32.36 $\pm$ 3.39	32.56 $\pm$ 3.30	36.0 $\pm$ 2.94	30.53 $\pm$ 2.6* (15)

*P* value: \* < 0.01

Figures in parentheses indicate per cent decrease / increase

calorie intake of the experimental group (Table 1), *W.somnifera* exhibited reduction in blood sugar as observed in control (treated with daonil) indicating that *W.somnifera* contains an effective regulator of blood sugar and thus useful in diabetes. The hypoglycemic effect of *W.somnifera* root could be due to its property to increase the level of serum insulin and or the activities of catalase, superoxide dismutase and glutathione peroxidase, indicative of its antioxidant property<sup>3</sup>.

An insignificant decrease in serum sodium, a significant decrease in serum potassium and significant increased in urine sodium and urine volume were observed in the experimental group when compared to the control group (Table 2). Significant increase in urine sodium and urine volume is a good indicator of diuresis<sup>15</sup>. Hence present results indicate that *W.somnifera* is a good diuretic as reported and that it is highly effective in opening up the natural pores of the body, there by enhancing diuresis<sup>4</sup>.

Present investigation (Table 3) revealed a reduction of 10,15,6 and 15% in serum cholesterol, triglycerides, LDL and VLDL cholesterol respectively and a slight increase in HDL cholesterol in the experimental group inspite of this group being on higher calorie and fat intake whereas control group exhibited increase in the aforesaid parameters (HDL exclusive). The therapeutic effects observed here may be due to one or more active principles in the roots of the plant and it warrants their isolation and a separate study for their mechanism of action.

Results of clinical observation showed no detrimental side effects in *W.somnifera* fed subjects at the end of the experimental period.

In the traditional medical literature, the use of roots, leaves, seeds and bark of *W.somnifera* plant are

mentioned. The results of the preliminary trial suggested that the root of the medicinal plant *W.somnifera* had a definite potential therapeutic value for its being a source of hypoglycemic, diuretic and hypocholesterolemic agents with no detrimental side effects in humans.

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