SHORT COMMUNICATIONS

Piper officinarum : A potent antiatherosclerotic and hypolipidaemic agent

INDU SHARMA, DEEPALI GUSAIN, V.P. DIXIT AND A. PUROHIT*
Department of Zoology, University of Rajasthan, Jaipur 302 004
*Department of Zoology, J.N.V. University Jodhpur 342 005

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***Piper officinarum* extract showed remarkable hypolipidaemic and antiatherosclerotic effects when fed to hyperlipidaemic rabbits. The extract administration not only reduced the serum lipid concentration but c/p ratio and atherogenic index is also reduced. Considerable elevation of HDL-ratio is a definite marker of beneficial effects. Atherosclerotic plaques have also shown a definite regression.**

DIETARY cholesterol intake and elevated cholesterol levels have been shown to be closely associated with atherosclerotic and coronary heart disease[1,2]. In addition to cholesterol, dietary factors, such as fat and proteins are importantly associated in affecting the levels of lipoproteins in blood[3,4]. Diet-induced hyperlipidaemia and atherosclerosis has been controlled by Panchcole[5]. *Piper officinarum* (root) Hunter being a component of Panchcole also instigates some interest. Ethanolic extract (50%) of dried powdered roots of *Piper officinarum* Hunter (family-Piperaceae) (common-Chavya) was prepared. It has been reported to contain piperin and two alkaloids, sylvatine and Piperlongumin and β-sitosterol[6].

Twenty five adult white rabbits were divided in five groups containing five animals each. These animals were maintained on control diet and atherogenic diet wherever specified (Table-1). In addition to atherogenic diet, the experimental animals received pure cholesterol powder (400 mg/kg) in 5 ml coconut oil by gastric intubation. *P. officinarum* (50% EtOH) was orally administered (500 mg/kg day)

The experimental animals were divided into five groups. Group A was non treated (control for 120 days. Group B was fed with cholesterol + atherogenic diet for 60 days whereas Group C was given cholesterol and atherogenic diet for 120 days. Group d was fed with cholesterol and atherogenic diet for 60 days and were treated further from 61 day to 120 day with *P.Officinarum*. The last group E was fed with cholesterol and atherogenic diet for 60 days and later from 61 day to 120 day no treatment was given.

Table -1 Composition of the Diet given to rabbits

Components	Control diet	Atherogenic diet
Protein	20%	15%
Carbohydrates	65%	60%
Sucrose	3%	3%
Fat	5%	15%
Salts	4%	4%
Vitamins	1%	1%
Fiber	2%	2%

The diet was prepared by wheat flour, milk powder, dired egg yolk, hydrogenated fat, butter, salt, jaggery, and vitamins in given proportion. The average consumption of diet was 200 g/per day.

After the specified days, animals were sacrified and serum was analysed for total cholesterol[7], phospholipids[8].

Address for correspondence :
Dr. Ashok Purohit
Department of Zoology, J.N.V. University,
Jodhpur 342 005

Table-2 : Serum Biochemistry of the Rabbits at the time of sacrifice after *P. officinarum* treatment

Group	Total Cholesterol	Triglyceride (mg/dl)	Phospholipid (mg/dl)	Total Cholesterol /phospholipids
A	96.1 ± 4.07	65.5 ± 3.3	170.9 ± 2.1	0.56
B	662.5 ± 17.80	182.9 ± 8.6	293.3 ± 7.8	2.26
% Deviation	(+589.4)	(+179.2)	(+71.6)	(+303.6)
C	1085.0 ± 34.60**	242.5 ± 3.3**	402.2 ± 5.2**	2.7
% Deviation	(+63.8)	(+32.6)	(37.12)	(+19.46)
D	212.5 ± 6.90**++	89.2 ± 2.1**,++	232.4 ± 1.8**++	0.9
% Deviation	(-67.9)	(-51.2)	(-20.8)	(60.17)
E	495.0 ± 3.10**,++	156.6 ± 6.3++	262 ± 7.8++	1.89
% Deviation	(-25.3)	(-14.4)	(-10.6)	(-16.4)

Significance, Group C,D and E vs. Group B:P≤0.001=**, Group D,E vs. Group C: P≤0.001=++Tabular figures represents the mean ±S.E.M. Values while the figures in parentheses indicate the corresponding percent change.

Table -3 : Serum Biochemistry of the Rabbits at the time of sacrifice after *P. Officianarum* treatment

Groups	HDL-Cholesterol (mg/dl)	HDL-Ratio	VLDL-Cholesterol (mg/dl)	LDL-Cholesterol (mg/dl)	Atherogenic Index
A	38.4 ± 1.8	66.6	13.1 ± 0.7	44.5 ± 3.1	1.5
B	196.6 ± 9.7	42.2	36.6 ± 4.3	429.3 ± 3.8	2.4
%Deviation	(+411.9)	(36.6)	(+179.4)	(+862.6)	(+60)
C	235.0 ± 6.7	27.6	48.5 ± 2.7	801.5 ± 5.22**	3.6
%Deviation	(+19.5)	(-34.6)	(+32.5)	(+86.7)	(+50)
D	87.5 ± 1.6**,++	70.0	17.8 ± 0.4**	107.2 ± 4.7**++	1.4
%Deviation	(-55.5)	(+65.9)	(-51.4)	(-75.0)	(-41.66)
E	132.0 ± 8.6**++	36.4	31.3 ± 1.3++	331.7 ± 3.2	1.89
%Deviation	(-32.8)	(-13.8)	(-14.5)	(-22.7)	(+16.0)

Significance Group C,D and E vs. Group B: P≤ 0.001=**; group D,E vs. Group C: P≤0.001=++ Tabular figures represents the Mean ±S.E.M. values while the figures in parentheses indicate the corresponding percent change.

$$\text{HDL Ratio} = \frac{\text{HDL cholesterol x100}}{\text{Total cholesterol - HDL Cholesterol}}$$

$$\text{Antherogenic Index} = \frac{\text{VLDL Cholesterol+LDL Cholesterol}}{\text{HDL Cholesterol}}$$

Table -4 : Surface area study of thoracic and abdominal region of aorta of rabbits

Groups	Lumen%		Plaque%		Total Wall%	
	Thoracic	Abdominal	Thoracic	Abdominal	Thoracic	Abdominal
A	48.2 ± 0.5	50.8 ± 1.3	Nil	Nil	51.8 ± 0.5	49.2 ± 1.3
B	16.6 ± 2.1	20.3 ± 2.2	31.7 ± 0.6	32.7 ± 2.6	83.4 ± 1.7	79.7 ± 2.3
C	15.5+0.6	17.4+1.4	39.6+1.5**	40.9+3.9**	84.5+1.0	82.6 ± 1.4
D	26.1 ± 1.7++	25.9 ± 2.6	16.8 ± 3.2**	18.8 ± 6.5	13.9 ± 1.8++	74.1 ± 2.7
E	18.6 ± 1.1	22.6 ± 0.8++	26.2 ± 4.9	28.7 ± 1.0	81.4 ± 0.7	77.4 ± 1.3

Significance, Group C,D and E vs. Group B:P ≤ 0.001=**, Group D,E vs. Group C:P≤0.001=++. Tabular figures represent the mean ± S.E.M. Values,

triglycerides[9] and HDL cholesterol[10], VLDL and LDL cholesterol[11], HDL ratio[12] and atherogenic index were calculated. Statistical analysis was using student's T test at the probability level of P≤0.001 (Table-2 and 3).

The assistance of camera lucida drawing of cross section from different regions of aorta was taken to calculate the size of plaque in hyperlipidaemic animals and also its reduction after *P. officinarum* feeding (Table-4).

Cholesterol and atherogenic diet feeding to gp. B and C animals resulted in tremendous increase not only in serum cholesterol concentration (6 to 10 folds) but also in triglycerides, phospolipids, VLDL cholesterol and LDL-cholesterol, while the HDL-ratio is considerably reduced. This hyperlipidaemic state promotes the development of atherosclerosis[13]. The probable cause may be the lowered efficiency of lipidaemic homeostasis[14], which is probably restored after *P. officinarum* administration resulting in reduction of lipid concentration. The most probable reason seems to be increased activity of LDL-receptors and reduction in hepatic triglycerides and cholesterol synthesis[15].

The higher C/P ratio is associated with atherosclerosis[16], which is reduced after *P. officinarum* feeding. Regression of plaques in various regions of aorta also supports this and is in accordance with the suggestion of Malinow (1983)[17]. Atherogenic index of hyperlipidaemic animals is significantly increased[18] and subsequently reduced after plant extract administration further strengthens the claim of *P. officinarum* as a potent hypolipidaemic and antiatherosclerotic agent.

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