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# Comparative Evaluation of Hypolipidemic Effects of Ethanolic Extract of Fruit of *Piper Chaba* and *Piper Nigrum* on Albino Rabbits

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## Abstract

### Background:

One of the main causes of cardiovascular disease is increased cholesterol in the body. Unfortunately the trend of cardiovascular diseases is still very prevalent and no longer specific to adult population.

### Objective:

The present study was designed to evaluate the effect of ethanolic extract of fruit of *Piper chaba* and *Piper nigrum* on lipid profile and to evaluate which extract is more beneficial and could be helpful in treatment of cardiovascular diseases.

### Methodology:

The study was conducted on albino rabbits weighing 1000 gms-1600 gms. The animals were administered ethanolic extract of *Piper chaba* 150 mg/kg and *Piper nigrum* 250 mg/kg which was further diluted in Di methyl sulfoxide (DMSO) and dose was adjusted in ml based on weight of animals. After 7 days dosing animal's blood was drawn and assessed for Cholestrol, HDL and LDL.

### Results and Discussion:

Our study showed that Ethanolic extract of *Piper chaba* possess significant hypolipidemic effects and lowers chlolestrol and LDL levels while shows significant effect on HDL levels too. Whereas *Piper nigrum* extract elevated cholesterol and HDL levels significantly and lowered LDL levels.

### Conclusion:

*Piper chaba* extract can be used in hyperlipidemia. *Piper nigrum* extract can be used to increase HDL and lower LDL. Further studies can be carried out to check effect on other organs for preferring the extracts in particular conditions.

**Keywords:** Cholesterol; *Piper chaba*; *Piper nigrum*; Hyperlipidemia; Cardiovascular disorders

## Introduction

The term herb refers to a plant used for medicinal purposes and is oldest form of healthcare [1]. Since the beginning of human civilization herbs have been used for treating various ailments [2]. In recent years, there has been an increasing interest by researchers worldwide in the medical use of traditional herbs. Studies shows about 25% of the drugs prescribed worldwide are derived from plants [3].

Hyperlipidemia is the indicator of an elevated lipoprotein or cholesterol levels in serum [4] and is a potent risk factor of metabolic diseases, such as atherosclerosis, type II diabetes and coronary heart disease (CHD), which are becoming world-wide problems [5]. Hyperlipidemia is present in a substantial proportion of young adults [6]. According to data from the National Health and Nutrition Examination Survey (NHANES) only 10.6% of adults aged 20–39 and 47.7% of adults age 40–64 with hyperlipidemia were on treatment [7,8].

*Piper nigrum* is commonly known as Black pepper [9,10]. *Piper nigrum* belongs to family Piperaceae [11]. The plant contains Phenols, Various derivatives of lignans, Terpenes, Flavonoid, Alkaloid,

Chalcones, Steroid, Piperamine, Piperolein B, Sarmentosine [12], Guineensine [13], Pentadienoyl as piperidine, [14], Piperamide , Piperettine [15], Pipericide and Piperine [16].

The plant possesses anti-apoptic activity [17]. It also possesses anti-obesity effects. Petroleum ether extract of root showed anti-oxidant activity by reducing lipid peroxide level and maintaining

glutathione level and also showed cardioprotective effect in myocardial ischemic condition [18].

The plant *Piper chaba* is important specie of genus Piper and belongs to family Piperaceae distributed commonly in the tropical and subtropical regions [19,20]. The plant is commonly known as Java long pepper or choi [21]. Previous phytochemical investigation of stem bark of *Piper chaba* had revealed the presence of Lignan [22] and alkaloids such as piperamine 2, 4-decadienoic acid piperidide, kusunokinin and pellitorine [23]. A unique piperine dimer Chabamide has also been isolated from stem bark [24].

*Piper chaba* has been used in traditional medicine as carminative, stimulant, anti-hypertensive, muscle relaxant [25]. Stem is useful in diarrhea, arthritis and rheumatic pains [26]. The fruit of Piper chaba is used as an anti-flatulent, gastro-protective, appetizing property, as an expectorant, anti-tussive, anti-fungal agent and also possesses cholesterol lowering properties [27]. Ethanolic extract of fruit of *Piper chaba* has also been shown to possess erythropoietic effects [28], CNS depressant and anxiolytic effects [29].

The present study was carried out to evaluate the hypolipidemic effects of *Piper chaba* and *Piper nigrum* and to check which of the extracts had better potential to be recommended for hyperlipidemia.

## Materials and Methods

The plants *Piper chaba* and *Piper nigrum* were provided by Dr. Iqbal Azhar from Department of Pharmacognosy University of Karachi.

### Extraction of plant:

The plants were first washed with water for reduction of microbial load. The fruits of *Piper chaba* and *Piper nigrum* were cut into small pieces and dried at 50C. They were then powdered. Next the powdered materials were macerated with 95% ethanol for 3 days. It was then filtered and reduced to dryness under pressure. The process of maceration was repeated twice and then dried using (vacuum) evaporator.

### Animals selected:

Albino rabbits of either sex weighing 1000- 1600 grams were selected for biochemical screening. Biochemical variations produced in rabbits and humans are comparatively similar therefore rabbits were selected for these tests [30]. The rabbits were equally divided into 3 groups, each containing 10 animals. First group served as Control, second was given Ethanolic extract of *Piper chaba*, Third group was given Ethanolic extract of *Piper nigrum*. The animals were kept in individual transparent cages in calm room under constant temperature of 23 ± 2°C inorder to acclimatize them with the environment.

Animals were handled as per specifications provided in Helsinki Resolution 1964 and study was approved by our Board of Advanced Studies and Research vide Resol.No, 09 Dated: 20-04-2011& 22-04-2011.

### Dosing regimen:

First group was taken as control and given DMSO (same calculated ml as other groups) orally. Second group was given 150 mg/kg *Piper chaba* [31] Third group was given 250 mg/kg *Piper nigrum* and the dose was adjusted based on weight of rabbits. Standard solution of 750 mg/10 ml (for *Piper chaba*) and 1850 mg/10 ml (for *Piper nigrum*) was prepared in DMSO and it was administered orally in ml by serial dilution method once daily for 7 days.

### Sample collection

7 ml of blood samples were drawn from rabbits after 7 day dosing by cardiac puncture. 5 ml blood was taken in gel tube for lipid profile.

### Estimation of lipid profile

Clotted blood samples were centrifuged for 15 minutes at 3000 rpm to separate serum using Humalyzer 3000, semi-automatic chemistry analyzer model # 16700 (Human Germany). The parameters were analyzed within 3 hours of sample collection using standard kits supplied by Human.

### Estimation of cholesterol

Cholesterol oxidase/peroxidase aminophenazone (CHOD-PAP method) which involves enzymatic colorimetric test for cholesterol with lipid clearing factor (LCF) was used to determine cholesterol in serum. Quinonimine is used as colorimetric indicator and the absorbance of sample and standard (200 mg/dl) was measured within 60 minutes, at 546 nm against the reagent blank [32].

### Estimation of HDL-cholesterol

Mostly laboratories use selective precipitation for removing VLDL and LDL, whereas supernatant fraction contains HDL which is enzymatically measured [33]. We used Human cholesterol test kit with precipitant, standard and HDL- cholesterol using Friedwald Method [34].

### Estimation of LDL-cholesterol

By using Friedwald Method estimation of LDL Cholestrol has been done [34].

By using SPSS Version 20 mean of all the values t are compared with means of control, *Piper chaba* and *Piper nigrum* and by One-way student signi icance T –test the signi icance of difference between means are determined. A value of $p< 0.05$ is considered signi icant, $p<0.001$ as more signi icant and $p<0.0001$ as highly signi icant (Table 1). By Alcarz and Jimenez method all statistical procedures have been performed [35].

## Results

| Test | Groups | Mean ± SD | P-value (control) | P-value (*Piper chaba* versus *Piper nigrum*) |
|---|---|---|---|---|
| **Cholestrol (mg/dl)** | control | 42.10 ± 0.60 | | |
| | *Piper chaba* | 30.91 ± 0.84 | ***0.0001 | ***0.0001 |
| | *Piper nigrum* | 61.65 ± 0.77 | ***0.0001 | |
| **HDL (mg/dl)** | Control | 6.47 ± 0.38 | | |
| | *Piper chaba* | 8.22 ± 0.35 | ***0.0001 | ***0.0001 |
| | *Piper nigrum* | 22.66 ± 0.33 | ***0.0001 | |
| **LDL (mg/dl)** | control | 37.71 ± 0.78 | | |
| | *Piper chaba* | 6.55 ± 0.29 | ***0.0001 | ***0.0001 |
| | *Piper nigrum* | 13.64 ± 0.23 | ***0.0001 | |

**Table 1:** Effect of ethanolic extract of fruit of *Piper chaba* and *Piper nigrum* on lipid profile.

## Discussion

Since the beginning of human civilization, plant containing phytochemicals when consumed by humans as a source of food are helpful in treating different diseases [36]. The use of herbal traditional remedies generally increases when conventional therapy efficacy reduces or adverse events are increased [37]. 80% of African and Asian countries population still prefers to use herbal medicines. Herbal medicines are becoming central part of world's medical system [38].

*Piper chaba* belonging to family Piperaceae has not been vastly investigated although it has been shown to possess a number of therapeutic effects.

The major contributing factors in the pathogenesis of atherosclerosis and resulting cardiovascular diseases are increased plasma lipids [39]. Cholesterol is main reason of unanticipated progression and development of atheroma plaque [40]. Past studies indicate that high cholesterol prompts atherosclerosis and heart diseases as well as diabetes mellitus and cancerous development. Lowering the cholesterol level has an impact on prostrate tumors i.e. it impedes their development [41].

There are also reports that LDL and HDL levels are more particular and sensitive biochemical markers of cardiovascular disease and HDL also serves to protect against advancement of atherosclerosis [42].

Our results show that *Piper chaba* fruit extract significantly reduced cholesterol and LDL level while elevating HDL levels. It has been reported earlier that fruit of *Piper chaba* possesses cholesterol lowering properties. Piperidine alkaloids including piperine, pipernonaline and dehydropipernonaline are responsible for producing this effect by activating AMP-activated protein kinase that regulate lipid metabolism.

According to research data PRPA'S administration significantly reduces body weight gain without changing food intake. It reduces high fat diet induced triglyceride accumulation in liver. The rabbits which were 1300-1500 grams lost weight too during 7 day dosing with *Piper chaba* so it proves that *Piper chaba* possess anti-obesity properties which are dose dependent.

Literature study has also shown that panchole extract of *Piper chaba* seed lowers lipid content of liver and ventricular heart muscles when it was given to cholesterol fed rabbits, this extract brought about regression of atheroma and inhibited plaque formation.

It has also been found that *Piper chaba* root has anti-oxidant property because of presence of piperine which serves additional benefit as cardio-protective agent in myocardial ischemic disease.

Our results showed that *Piper nigrum* extract also reduced LDL and increased HDL levels while cholesterol levels were elevated by it. These effects are due to presence of piperine. Piperine prevents the accumulation of plasma lipids and lipo-proteins significantly by modulating the enzymes of lipid metabolism. Elevation in cholesterol level might be due to highly significant increase in HDL. When *Piper chaba* was compared with *Piper nigrum* it showed that *Piper chaba* lowered cholesterol more than black pepper but Black pepper increased HDL highly significantly than *Piper chaba*, whereas *Piper chaba* lowered LDL more than *Piper nigrum*.

## Conclusion

From our study we came to conclude that both *Piper chaba* and *Piper nigrum* possess hypolipidemic effects however *Piper nigrum* increases HDL more as compared to *Piper chaba*. But overall effect of *Piper chaba* was better as compared to *Piper nigrum*. Further studies can be conducted to check the effects of these extracts on different organs and the extract of choice can vary depending on the conditions required.

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