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IN-VIVO EVALUATION OF HYPOLIPIDEMIC POTENTIAL OF ETHANOLIC EXTRACT OF *PYRUS PYRIFOLIA* FRUIT PEEL

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ABSTRACT

The present study was designed to evaluate the *in-vivo* hypolipidemic potential of the ethanolic extract of *Pyrus pyrifolia* fruit peel (EEPP) using high-fat diet-induced hyperlipidemic Wistar albino rats. Hyperlipidemia was induced by administering a mixture of vanaspati ghee and coconut oil (3:1, v/v) at a dose of 3 mL/kg body weight for 21 days, followed by treatment with the extract for another 21 days. The animals were divided into five groups-normal control, hyperlipidemic control, standard drug (atorvastatin 10 mg/kg), low-dose EEPP (200 mg/kg), and high-dose EEPP (400 mg/kg). Biochemical parameters including triglycerides (TG), total cholesterol (TC), HDL-C, LDL, VLDL and atherogenic index (AI) were estimated using standard diagnostic kits. The hyperlipidemic control group showed a significant rise in TG, TC, LDL and VLDL levels with a marked reduction in HDL-C. Treatment with EEPP significantly and dose-dependently restored lipid parameters toward normal levels. The high-dose extract exhibited a greater hypolipidemic effect, comparable to the standard atorvastatin-treated group. Additionally, a marked decrease in AI was observed, suggesting reduced atherogenic risk. These findings confirm that *Pyrus pyrifolia* fruit peel possesses potent lipid-lowering and cardioprotective properties, likely attributed to its flavonoids and phenolic constituents with antioxidant potential. Thus, EEPP may serve as a promising natural therapeutic agent for the management of hyperlipidemia and prevention of cardiovascular disorders.

KEYWORDS: *Pyrus pyrifolia*, Hypolipidemic activity, Ethanolic extract, Lipid profile, Atherogenic index, *In-vivo* study.

INTRODUCTION

Cardiovascular diseases (CVDs) are the leading cause of morbidity and mortality worldwide, and hyperlipidemia remains a major predisposing factor in their development.[1] Hyperlipidemia, characterized by elevated levels of total cholesterol, triglycerides, and low-density lipoprotein (LDL), is often associated with obesity, diabetes and metabolic disorders.[2] The persistent rise in serum lipid levels contributes to the formation of atherosclerotic plaques, leading to coronary artery disease and other complications.[3] Although several synthetic lipid-lowering agents, such as statins, fibrates and niacin are available, their long-term use is often limited by adverse effects including hepatotoxicity, myopathy and gastrointestinal disturbances. This has driven an increasing interest in exploring natural

products as safer and cost-effective alternatives for managing hyperlipidemia.[4,5]

Medicinal plants and their bioactive constituents have shown promising hypolipidemic and antioxidant effects due to their ability to modulate lipid metabolism, enhance antioxidant defense, and improve overall cardiovascular function.[6] *Pyrus pyrifolia*, commonly known as the Asian pear, belongs to the family Rosaceae and is widely consumed for its nutritional and therapeutic properties. Traditionally, the fruit peel of *Pyrus pyrifolia* has been used in folk medicine for treating inflammatory disorders, oxidative stress and metabolic abnormalities. Phytochemical investigations of *Pyrus pyrifolia* have revealed the presence of flavonoids, phenolic acids, tannins, and other antioxidant compounds known to possess lipid-lowering and hepatoprotective properties.[7,8,9]

Despite its traditional usage and chemical richness, the hypolipidemic potential of *Pyrus pyrifolia* fruit peel remains inadequately explored. Evaluating the *in-vivo* lipid-lowering effects of its ethanolic extract could provide scientific evidence supporting its pharmacological utility in the prevention and management of hyperlipidemia.[10,11,12] Therefore, the present study aims to assess the hypolipidemic activity of the ethanolic extract of *Pyrus pyrifolia* fruit peel in experimentally induced hyperlipidemic animal models. The research focuses on analyzing serum lipid profiles, including total cholesterol, triglycerides, LDL and HDL-C levels. The findings of this study may contribute to the development of natural, plant-based therapeutic agents for managing dyslipidemia and preventing cardiovascular disorders.

MATERIALS AND METHODOLOGY

Selecting and identifying plants

The fruit *Pyrus pyrifolia* will be purchased from the local area of Channapatna, Ramanagara district, Karnataka state. The fruit was identified, confirmed and authenticated by Dr. Thejesh Kumar M.P. M.Sc., Ph. D, Department of Botany (PG), Bharathi College, Bharathinagara.

Ethanolic extraction of *Pyrus pyrifolia* fruit peel (EEPP)

The *Pyrus pyrifolia* fruit peel were originally dried and ground into coarse powder. Finely ground fruit peel powder from which ethanol was extracted (60–80°C). Ethanol was selected based on the extractive value, which had a high percentage yield and a higher amount of flavonoid phenolic contents in the extract than other solvent systems. A Soxhlet device was used to extract the ethanol for 72 h at 40°C. Whatman No. 1 filter paper, filters the produced silt. The resulting plant extract was then subjected to additional vacuum concentration at 40°C using a rotating vacuum evaporator. The crude extract was weighed and stored at 4°C until further examination.[13]

Experimental animals

Healthy Wistar albino male rats of approximately same age (10 to 12 weeks), weighing between 130-150 gms were taken for evaluating hypolipidemic activity study. The animals were procured from Vaarunya biolabs pvt. Ltd., Bengaluru. The animals were acclimatized by keeping them in animal house facility of Bharathi College of pharmacy, Bharathinagara. They were housed in polypropylene cages containing bedding material as husk and maintained under standard husbandry conditions and 12hrs light and 12hrs dark cycle. They were fed with commercial pelleted rat chow with water ad. libitum. The animals were maintained in accordance with the CCSEA guidelines. The hypolipidemic activity study was conducted after obtaining the approval from Institutional Animal Ethical Committee (IAEC) with a reference no**. BCP/IAEC/2024/02** dated **13/09/2024.**

Experimental Protocol Induced Hyperlipidemia

The 30 male *Wistar rats* were randomly divided into 5 groups each containing six animals (n=6). The experimental hyperlipidemia was induced by Vanaspati ghee and coconut oil (V/V) in the ratio of 3:1 at 3ml/kg body weight through oral route for 21 days induced then start the treatment by administration of extract and standard for next 21 days, 10 min after the induced.

Group 1: Administered vehicle distilled water p.o., served as normal control.

Group 2: Administered High fat diet 3ml/kg p.o., served as hyperlipidemic control.

Group 3: Administered High fat diet 3ml/kg p.o. + Atorvastatin 10mg/kg b.w., suspended in distilled water p.o.

Group 4: Administered High fat diet 3ml/kg p.o. + EEPP 200mg/kg b.w., suspended in distilled water p.o.

Group 5: Administered High fat diet 3ml/kg p.o. + EEPP 400mg/kg b.w., suspended in distilled water p.o.

At the end of the experimental period, the animals were fasted overnight, blood was collected by cardiac puncture and serum was separated by centrifuging at 3000 rpm for 15 min and analyzed for various biochemical parameters like TGs, TC, HDL-C, LDL, VLDL and Atherogenic Index (AI).

Assay kits and reagents

The assay kits for cholesterol, HDL-C, LDL-C, triglycerides, were obtained from Agappe Diagnostics LTD, Agappe Hills, Pattimattom P.O., Dist. Ernakulum, Kerala, India. All other reagents used were of analytical grade.

Statistical Analysis

All the values were expressed as mean ± S.E.M and statistical significance is analyzed using one-way ANOVA followed by Dunnett's multiple comparison test. P values <0.001 were considered as highly significant, <0.01 were considered as moderately significant and <0.05 were considered as significant.

RESULT AND DISCUSSION

The biochemical analysis of serum lipid parameters in different experimental groups revealed significant alterations in lipid metabolism following administration of the ethanolic extract of *Pyrus pyrifolia* fruit peel. The results are summarized in Table 1. The hyperlipidemic control (HC) group exhibited a marked elevation in serum triglycerides (TG), total cholesterol (TC), low-density lipoprotein (LDL-C), and very low-density lipoprotein (VLDL) levels, accompanied by a significant reduction in high-density lipoprotein cholesterol (HDL-C) when compared with the normal control group. These findings confirm the successful induction of hyperlipidemia in the experimental model.

Table 1: Effects of *Pyrus pyrifolia* fruit peel extract on serum lipids at the end of 6th week of study.

Group	Biochemical parameters(mg/dL)					
	TG	TC	HDL-C	LDL	VLDL	AI
Group 1	58.54±1.89	50.77±1.03	16.08±0.38	26.06±0.79	11.70±0.37	2.16±0.09
Group 2	69.65±1.97***	56.07±1.69**	13.73±0.36**	31.81±1.36***	13.93±0.39***	3.10±0.18***
Group 3	59.20±0.98***	51.31±1.04 *	15.83±0.53**	26.45±0.80***	11.84±0.19***	2.23±0.11**
Group 4	62.68±1.78*	52.71±0.72*	15.64±0.69*	27.86±0.77*	12.53±0.35*	2.40±0.16*
Group 5	60.36±1.59 **	51.80±0.36**	15.83±0.63**	27.03±0.44**	12.07±0.31**	2.29±0.12**

Treatment with the ethanolic extract of *Pyrus pyrifolia* fruit peel produced a significant, dose-dependent reduction in serum lipid levels. The high-dose group showed a substantial decrease in TG (60.36 ± 1.59 mg/dL), TC (51.80 ± 0.36 mg/dL), LDL (27.03 ± 0.44 mg/dL), and VLDL (12.07 ± 0.31 mg/dL) compared to the hyperlipidemic control. Simultaneously, there was a notable improvement in HDL-C levels (15.83 ± 0.63 mg/dL). The low-dose group also demonstrated moderate hypolipidemic effects, though slightly less pronounced than the high-dose treatment. The standard drug-treated Group 3 showed near-normalization of lipid parameters, comparable to the normal control group, validating the efficacy of the experimental design.

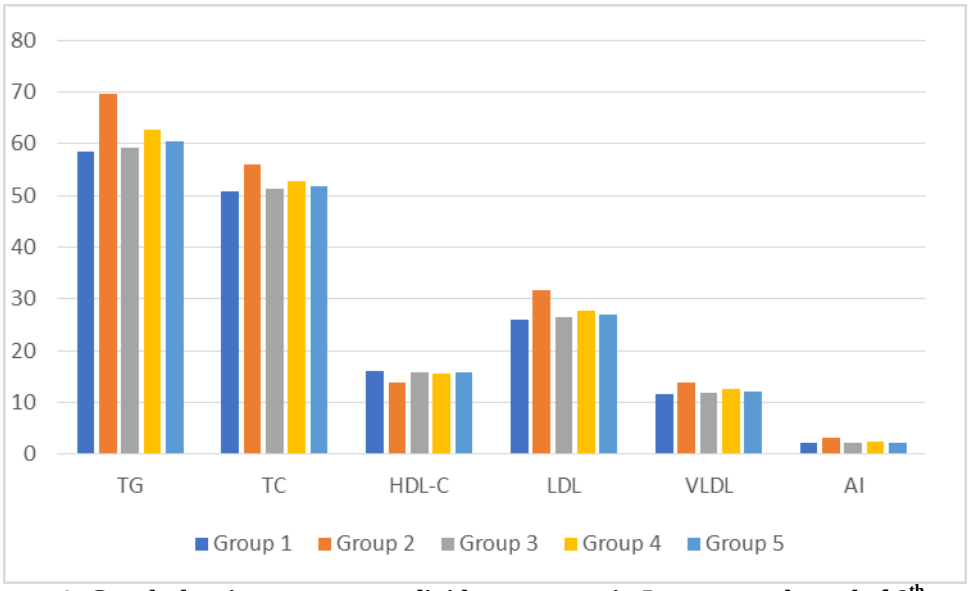

Figure-1: Graph showing mean serum lipid parameters in 5 groups at the end of 6th week.

Furthermore, the atherogenic index (AI), an important marker of cardiovascular risk, was significantly elevated in the hyperlipidemic control group (3.10 ± 0.18), indicating a higher tendency toward lipid deposition and atherosclerosis. Treatment with the *Pyrus pyrifolia* extract notably reduced the AI to 2.40 ± 0.16 (low dose) and 2.29 ± 0.12 (high dose), reflecting improved lipid homeostasis and reduced cardiovascular risk. The improvement in lipid profile parameters may be attributed to the presence of bioactive phytoconstituents such as flavonoids, phenolic acids and tannins, which are known to exhibit antioxidant and lipid-lowering properties by modulating hepatic lipid metabolism, enhancing LDL receptor expression and promoting reverse cholesterol transport.

The observed hypolipidemic effects of the ethanolic extract are consistent with earlier reports on the lipid-lowering potential of polyphenol-rich plant materials. The antioxidant activity of these compounds likely contributes to the prevention of lipid peroxidation and protection of hepatic tissues. Overall, the study findings indicate that *Pyrus pyrifolia* fruit peel extract possesses significant hypolipidemic activity, particularly at higher doses, suggesting its potential as a natural therapeutic agent for the management of hyperlipidemia and associated cardiovascular disorders.

CONCLUSION

The findings of this study demonstrate that the ethanolic extract of *Pyrus pyrifolia* fruit peel exhibits significant hypolipidemic activity in rats with diet-induced hyperlipidemia. Administration of the extract led to a dose-dependent normalization of serum lipid parameters, including triglycerides, total cholesterol, LDL and VLDL, while increasing HDL-C levels. The high-dose extract (400 mg/kg) produced the most pronounced effect, comparable to the standard atorvastatin group. Moreover, the reduction in the atherogenic index reflects a decreased cardiovascular risk, confirming the extract's cardioprotective efficacy.

The observed effects can be attributed to the presence of phytoconstituents such as flavonoids, tannins and phenolic compounds, which likely act by modulating hepatic lipid metabolism, enhancing LDL receptor expression, and preventing lipid peroxidation. The antioxidant potential of these constituents further supports their role in maintaining lipid homeostasis and protecting against oxidative damage.

Overall, the study provides strong scientific evidence supporting the traditional medicinal use of *Pyrus pyrifolia* and highlights its potential as a natural, safe and effective hypolipidemic agent. Future studies involving isolation of active components, molecular mechanism elucidation and clinical validation are warranted to establish its therapeutic utility in the prevention and treatment of hyperlipidemia and related cardiovascular diseases.

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