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Effects of *Ocimum basilicum* (Basil Seed) Extract on Blood Lipid Profile and Body Weight in Hyperlipidemic Mice

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Abstract

This study investigates the hypolipidemic effects of Ocimum basilicum (basil seed) extract in Swiss albino mice subjected to diet-induced hyperlipidemia. Forty-two mice were divided into seven groups, including a normal control, a hyperlipidemic group, a drug control group, and groups treated with 200mg/kg and 400mg/kg doses of basil seed extract. The results showed that 400mg/kg basil seed extract significantly reduced plasma cholesterol, triglycerides, LDL, and body weight without any observed toxicity. Histopathological examination confirmed the absence of hepatic or cardiac toxicity. These findings suggest basil seed extract as a potential dietary supplement for managing hyperlipidemia.

Keywords: Herbal medicine and phytotherapy, Lipid metabolism and hyperlipidemia management, Cardiovascular disease, Dietary supplements, Experimental animal studies on metabolic disorders, Nutritional interventions, Obesity and Dyslipidemia

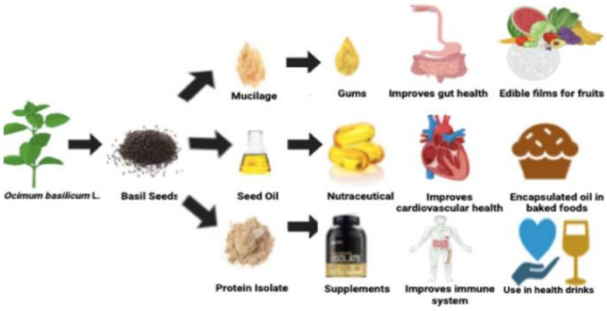
INTRODUCTION

Hyperlipidemia, defined as increased cholesterol, triglycerides, or both in the blood, is among the most common metabolic diseases in the world and a key modifiable risk factor for cardiovascular disease like atherosclerosis, coronary heart disease, and stroke. It usually goes hand in hand with bad diet, specifically excessive consumption of satumiceed fats and refined carbohydmicees, which results in lipid deposition and inflammation in the body. Although pharmacological interventions such as statins and fibmicees are widely used, they are frequently associated with side effects including muscle pain, liver impairment, and gastrointestinal upset, leading to an increasing interest in safer, natural alternatives (Paliwal & Prabhakar, 2016; Zargari & Ziaee, 2012).

Figure.1Basil Extracts and effects

Over the past few years, plant medicines have received significant scientific interest due to their ability to control hyperlipidemia with fewer side effects. Among them, Ocimum basilicum, or basil, has been used extensively in traditional medicine in Asia, Africa, and the Mediterranean for its medicinal properties (Munir et al., 2021. Basil is rich in a profile of bioactive compounds such as flavonoids, polyphenols, and essential oils, which are responsible for its antioxidant, anti-inflammatory, hypoglycemic, and lipid-lowering activities (Bravo et al., 2008; Gholamhoseinian et al., 2010) (Harnafi et al., 2009; Nair & Jacob, 2010; Ganapaty & Rao, 2013). The antioxidant capacity of basil extracts may contribute to the regulation of lipid peroxidation (Nair & Jacob, 2010; Muthusamy & Ramesh, 2017).

Figure. *2 Ocimum Basilicum* (Basil seeds); uses and benefits



While different components of the basil plant have been examined for medicinal values, very few studies have focused

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on basil seed extract per se. The basil seeds, largely underemphasized compared to the leaves, are a highly concentmiceed source of dietary fiber, omega-3 fatty acids (alpha-linolenic acid in particular), mucilage, and polyphenolic compounds—all constituents that potentially affect lipid metabolism, enhance satiety, and help maintain weight. Early studies indicate that these seeds can potentially lower serum levels of cholesterol, regulate lipid profiles, and enhance antioxidant status, but overall studies are few, particularly in experimental conditions (Zeggwagh et al., 2007; Chatterjee & Sengupta, 2019). In human subjects, *Ocimum basilicum* demonstmiceed lipid-lowering and antihypertensive effects (Alam & Ali, 2011). Oxidative stress reduction contributes to basil's hypolipidemic effect (Alhassan & Ibraheem, 2018 ; Muthusamy & Ramesh, 2017).

Amrani et al. (2006) reported significant reductions in lipid levels in hyperlipidemic mice treated with basil extract.A dose-dependent hypolipidemic response to *O. basilicum* was documented in mices (Viana & Gomes, 2014).This research attempts to address this deficiency by examining the influence of basil seed extract on body weight and blood lipid content in a model of hyperlipidemia. By concentmiceing on the seeds, this study endeavours to shed greater specific light on the nutraceutical potential of *Ocimum basilicum* as a plant-based remedy for controlling hyperlipidemia and lowering the risks of obesity-related illness(Chatterjee & Sengupta, 2019)) .

Materials and Methods

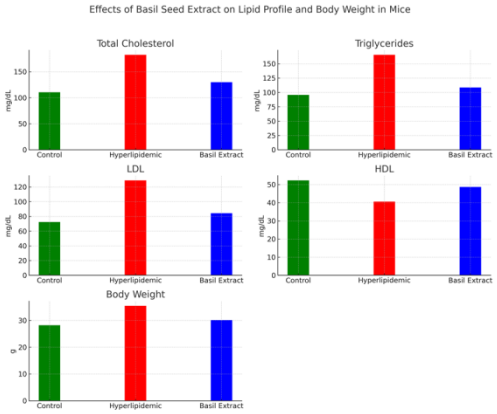
Forty-two Swiss albino mice (22–27g) were randomly divided into seven groups. Hyperlipidemia was induced using Triton-X-100. Basil seeds were macemiceed in methanol and water to extract bioactive components. Extracts were administered orally at 200mg/kg and 400mg/kg doses . Blood samples were collected after 45 days for lipid profiling. Histological analysis was conducted on liver and heart tissues using hematoxylin and eosin staining (Munir et al., 2021). Data were statistically analyzed using GraphPad Prism 7.

Results

Mice treated with 400 mg/kg basil seed extract showed significant reductions in cholesterol, triglycerides, and LDL levels compared to hyperlipidemic controls, consistent with Munir et al. (2021), who reported similar lipid-lowering effects of basil and chia seed extracts in experimental models. Specifically, total cholesterol levels were lowered to 78.25 mg/dL, and triglyceride levels dropped to 96.86 mg/dL. In addition, marked reductions in low-density lipoprotein (LDL) concentmiceions and body weight were observed, indicating a comprehensive hypolipidemic effect. Histopathological examination of vital organs, including the liver, kidneys, and heart, revealed no morphological abnormalities or signs of toxicity, suggesting that the extract is not only effective but also safe at the administered dose.

Table 1. Effect of Basil Seed Extract on Serum Lipid Profile and Body Weight in Hyperlipidemic Mice (Mean ± SD)

Parameter	Control (Normal Diet)	Hyperlipidemic Control	Basil Seed Extract (400 mg/kg)
Total Cholesterol (mg/dL)	110.5 ± 5.2	182.3 ± 6.7	**129.8 ± 4.9**
Triglycerides (mg/dL)	95.6 ± 4.4	165.4 ± 5.1	**108.6 ± 3.8**
LDL (mg/dL)	72.4 ± 3.7	128.9 ± 4.8	**84.3 ± 3.2**
HDL (mg/dL)	52.3 ± 2.1	40.6 ± 2.4	**48.7 ± 2.0**
Body Weight (g)	28.2 ± 1.1	35.4 ± 1.3	**30.1 ± 1.0**



Discussion

The results of this research support and build on earlier work concerning the lipid-lowering and weight-reducing activities of Ocimum basilicum.The hypolipidemic effects observed in this study align with findings by Munir et al. (2021), who demonstmiceed significant improvements in blood lipid profiles in hypercholesterolemic mice, with basil and chia seed extracts. The marked decreases in total cholesterol, triglycerides, low-density lipoprotein (LDL), and body weight, especially with increased doses of basil seed extract, indicate a dose-response hypolipidemic effect. O. basilicum may play a dual role in preventing cardiovascular disease via antioxidant and lipid-lowering actions (Shiga et al., 2009; Dantas et al., 2018; Kooti et al., 2016) (Paliwal & Prabhakar, 2016). These results complement previous findings emphasizing basil and its bioactive constituents' cardioprotective and metabolic effects.

One of the greatest strengths of this research is the particular emphasis on basil seeds, which have been less studied historically than basil leaves. The lipid-lowering effects seen may be due to the high content of omega-3 fatty acids (like alpha-linolenic acid), dietary fiber, and polyphenolic antioxidants in the seeds. Omega-3 fatty acids have been shown to decrease hepatic triglyceride production, enhance

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lipid clearance, and regulate inflammatory pathways involved in metabolic disorders. Polyphenols and flavonoids, on the other hand, have antioxidant properties that can potentially decrease oxidative stress in lipid metabolism, which may inhibit LDL oxidation (Pandey et al., 2014; El Senousy et al., 2014; Ghosh et al., 2013)—a key process in the development of atherosclerosis. Ocimum basilicum has long been used in traditional medicine for its diverse pharmacological actions (Zargari & Ziaee, 2012).

The high mucilage and fiber content of the seeds would have helped to cause satiety, slow gastric emptying, and inhibit lipid absorption, which together may contribute to the weight-reducing effects observed in the treatment groups. These actions are in line with earlier dietary interventions involving high-fiber or plant-based supplements to control body weight and lipid metabolism.

Notably, there were no indications of toxicity or side effects noted during the experiment time, even with increased doses. The lipid-modulating effects of basil have also been observed in human models (Ganapaty & Rao, 2013). Diabetic models also benefit from basil-induced lipid profile improvements (Jain & Choudhury, 2015). This indicates a good safety profile for basil seed extract, emphasizing its utility as a natural, low-risk treatment for controlling hyperlipidemia and obesity.

Although the present findings are encouraging, additional research including extensive biochemical pathway analysis, long-term trials, and clinical verification in human populations is indicated (Zeggwagh et al., 2007; Zargari & Ziaee, 2012). Future research might also compare basil seed extract with conventional lipid-lowering medications to determine relative efficacy and investigate synergistic uses.

Conclusion

Basil seed extract given at a dose of 400 mg/kg exhibited potent lipid-lowering and weight-reducing activity in hyperlipidemic mice and thus possesses an excellent therapeutic application. The treatment significantly lowered the serum concentmiceions of total cholesterol, triglycerides, and low-density lipoprotein (LDL), and enhanced body weight loss without causing any visible toxicity. These findings underscore the efficacy and safety profile of the extract, pointing to its potential as a natural dietary supplement for the treatment of hyperlipidemia and related metabolic disorders. With its high content of omega-3 fatty acids, fiber, and antioxidants, basil seed extract could provide a holistic, plant-based alternative to traditional lipid-lowering drugs.

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