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Therapeutic evaluation and bio evaluation of parsley seeds supplementation for the management of hypercholesterolemia

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Abstract: Parsley is an important culinary herb that is grown widely and used in food preparations. Parsley has vital health benefits and possesses anti-hyperlipidemic and anti-hypercholesterolemic properties. This study was investigated the anti-hypercholesterolemic potential of parsley seeds in male human subjects. It also investigated the chemical composition and phytochemicals of parsley seeds. Results showed that Parsley seeds contain moisture (11.2±0.31)%, ash (8.9±0.63)%, nitrogen free extract (47.5±2.71)%, crude protein (18.37±0.42)%, crude fiber (13.45±1.02)%, and crude fat (0.62±0.32)%. Findings showed that parsley seed contains magnesium (66.17±12.98), calcium (90.23±10.87), zinc (0.81±0.001), potassium (1120.1±13.86), iron (2.17±0.08) and copper (0.41±3.17). Total phenolic content and total flavonoid content were present in significant amounts. The experimental groups (G_1 and G_2) were given parsley seed powder in capsules of 300mg/d to the G_1 group and 600mg/d to the G_2 group for the time of 45 days. The result showed that G1 and G2 showed a decrease in plasma lipid parameters and increased high-density lipoprotein content in blood substantially as compared to G_0. Thus, it was concluded from the results that parsley seed powder depicts a significant impact on treating hypercholesterolemia.

Keywords: Hyperlipidemia, parsley, herb, culinary plant, hypercholesterolemia, total phenolic content, total flavonoid content, minerals, LDL, triglycerides, proximate analysis.

INTRODUCTION

Hypercholesterolemia is a condition characterized by an elevated lipid profile and this condition can be due to genetic factors or the presence of any other illness. It is not only widely prevalent in the western world where calorie intake is high but also in developing countries (Ibrahim *et al*., 2022). Hypercholesterolemia is the elevation of different parameters of the lipid profile including total cholesterol, triglycerides, low-density lipoproteins, and high-density lipoproteins. Elevation in these parameters is linked with other complicated, chronic, and fatal diseases like atherosclerosis and cardiac diseases (Hill & Bordoni, 2022). Due to all these reasons, it is very important to keep the parameters of the lipid profile within normal ranges. Hypercholesterolemia can be both primary and secondary. Primary hypercholesterolemia is usually familial while secondary hypercholesterolemia is usually acquired which can be due to underlying conditions like thyroid malfunctioning, unhealthy dietary choices, inactive and sedentary lifestyle, positive energy balance, diabetes and in response to medications (Bouasla *et al*., 2022). On the other hand, familial hypercholesterolemia is due to the genetics of a person and a family history of hypercholesterolemia. Familial hypercholesterolemia can only be prevented by lifestyle modification (Santos *et al*., 2016).

Plant-based remedies are practiced around the globe for the treatment of many diseases. Many plants have the potential of lowering the elevated liver profile including basil seeds, chia seeds, orange peel extracts, parsley, and lemon. Among this parsley will be investigated against hypercholesterolemia. Parsley is a widely used culinary herb that is grown on a larger scale in Europe and Asia. Parsley leaves, roots and seeds all are used for different purposes. Parsley is famously known for its anti-inflammatory, antidiuretic, antioxidants, anticancer properties, anti-hypercholesterolemic and anti-hyperlipidemia properties (Charles, 2012). To understand the anti-hypercholesterolemic properties of parsley, this research study has focused on chemical characterization including proximate analysis, mineral determination, phytochemicals analysis and the effect of different doses of parsley seeds investigated in hypercholesterolemia patients.

MATERIALS AND METHODS

Collection and preparation of raw material

Parsley seeds were collected from the local market, identified and chopped into pieces. All the dirt and debris

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were removed. Seeds were also cleaned with 70% alcohol and then washed with sterilized distilled water. It was dried in a laboratory hot air oven at 50°C overnight and then finely ground into powdered form by using an electric grinder (El-Beltagi *et al*., 2022). This refined powder of parsley seed powder was stored in air-tight containers and stored at room temperature (El-Shazly *et al*., 2017).

Chemical composition of parsley seeds

Proximate Profile of Parsley Seeds Powder

Parsley seeds powder was analyzed for the following proximate profile including moisture content, ash, carbohydrates, crude protein, crude fiber, and nitrogen-free extract (NFE) according to the AOAC method (Garcia-Amezquita *et al*., 2018).

Minerals determination

The following minerals zinc, magnesium, iron, phosphorus, potassium, and copper were analyzed by using atomic absorption spectrometry (Hernández *et al*., 2005).

Phytochemical features of parsley seeds powder

Phytochemical analysis of parsley seed powder investigated for determination of total phenolic content (TPC) and total flavonoid content (TFC) in methanol extraction. The amount of TPC AND TFC were measured in mg of quercetin equivalents (QE) per g of dry weight basis of the sample (M'hiri *et al*., 2015).

Investigation of therapeutic potential of parsley seed powder against hypercholesterolemia in human subjects

Selection of Hypercholesterolemia Male Subjects

60 hypercholesterolemia male subjects of age 40-60 years were randomly selected from the general community.

Exclusion criteria

Patients taking anti-hypercholesterolemia drugs and patients with other chronic complications along with hypercholesterolemia were not included in the study.

Inclusion criteria

All hypercholesterolemia male subjects went through blood biochemical analysis by checking their lipid profile at the start of the study was included.

Study duration

The study was conducted for forty-five days.

Treatment groups and treatment plan

Male subjects were divided into three groups of 20 subjects each, with the following.

Ethical approval

Ethical approval has been taken from the Biosafety Committee of the institute.

Descriptive statistical analysis using a two-sample t-test under a Completely Randomized Design (CRD) was 0carried out to investigate the level of significance ($p<0.05$). All statistical analyses are done with IBM SPSS Statistics 20.

RESULTS

The study was conducted to investigate the hypercholesterolemia therapeutic potential of parsley seed powder against hyperlipidemia to check its effectiveness in lowering lipid profile.

Table 1: Treatment groups and treatment plan

Groups	Title	Treatment
G_0	Control group	No treatment
G_1	Treated group 1	Capsule with parsley seed powder of 300mg
G_2	Treated group 2	Capsule with parsley powder of 600 mg

STATISTICAL ANALYSIS

Proximate composition of parsley seed powder

Parsley seeds contained moisture (11.2±0.31)%, ash (8.9±0.63)%, nitrogen free extract (47.5±2.71)%, crude protein (18.37±0.42)%, crude fiber (13.45±1.02)%, and crude fat (0.62±0.32)%. All these results were shown in table 2.

Table 2: Mean ± S.D for proximate % composition of parsley seed powder on a dry weight basis.

Proximate analysis	Composition (%)
Moisture	11.2±0.31
Ash	8.9±0.63
Nitrogen Free Extract	47.5±2.71
Crude protein	18.37±0.42
Crude Fat	0.62±0.32
Crude fiber	13.45±1.02

Mineral analysis

In the current study, parsley seed powder was also analyzed for the determination of mineral content including calcium, potassium, iron, zinc, magnesium, and copper depicted in table 3. Findings showed that parsley seed contains magnesium (66.17±12.98), calcium (90.23±10.87), zinc (0.81±0.001), potassium (1120.1±13.86), iron (2.17±0.08) and copper (0.41±3.17). These findings were shown in mg in 100g.

Phytochemical characters of parsley seed powder

The parsley seed powder was analyzed for TPC and TFC analysis. The parsley seed powder carried a significant amount of TPC (187.17±3.1) and TFC (24.23±0.4) depicted in table 3.

Table 3: Mean ±S.D for phytochemical analysis of parsley seed powder.

Antioxidant	Antioxidant content (mg QE/g)
TPC	187.17±3.1
TFC	24.23±0.4

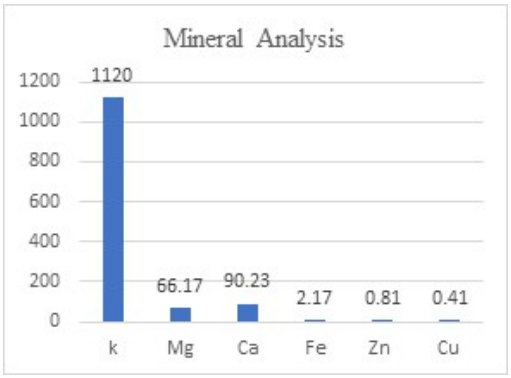

Fig. 1: Mineral composition of parsley on dry weight basis.

Investigation of antihyperlipidemic potential of parsley seed powder

The objective of this study was to investigate the nutraceutical and therapeutic potential of parsley seeds powder in lowering the elevated lipid profile in 60 hyperlipidemic male human subjects. Participants of the control group (G_0) were given no treatment while participants of treatment group-I (G_1) and treatment group- II (G_2) were given parsley seed powder in doses of 300 mg/d and 600 mg/d in capsulated form respectively for 45 days. Before the commencement and after the standstill of the trial, blood samples were gathered from each subject for analysis of lipid profile (HDL, LDL, triglyceride, total cholesterol).

Table 4: Mean±S.D for serum cholesterol level of male subjects

Duration	G_O	G_1	G_2
0 day	287.0±9.87	279.23±12.38	284.32±5.87
45th day	288.70±12.44	259.12±6.49*	221.34±5.36*

G_0 = No treatment , G_1=300mg/d of parsley seed powder, G_2= 600mg/d of parsley seed powder. All results were taken significant at $p<0.05$.

Changes in serum cholesterol level of male subjects

The investigation showed a significant ($p<0.05$) reduction in serum cholesterol levels in response to parsley seed powder capsules in both treatment groups. Group-I showed a reduction in the total cholesterol level from 279.23±12.38 mg/dl to 259.12±6.49 mg/dl while group II showed a reduction in serum cholesterol level from 284.32±5.87 mg/dl to 221.34±5.36 mg/dl. A Parsley seed powder dose of 600mg/day in G_2 showed better results than 300 mg/d in G_1. On the other hand, G_0 showed a momentous increase in cholesterol levels.

Reduction in serum triglycerides level of male subjects

Both experimental groups showed significant reduction in triglyceride levels from 169.20±24.67 mg/dl to 145.30±58.94 mg/dl in G and from 171.20±78.76 mg/dl to 139.40±36.62 mg/dl G_2. Although on the other hand, G_0 manifested no significant change in the TGC level as shown in table 5.

Table 5: Mean ± S.D for triglycerides level in male subjects.

Duration	G_O	G_1	G_2
0 day	174.30±31.13	169.20±24.67	171.20±78.76
45th day	175.70±34.43	145.30±58.94*	139.40±36.62*

G_0 = No treatment, G_1=300mg/d of parsley seed powder, G_2= 600mg/d of parsley seed powder. All results were taken significant at $p<0.05$.

Table 6: Mean ± S.D for HDL level in male subjects.

Duration	G_O	G_1	G_2
0 day	42.70±5.75	40.39±7.66	41.09±4.87
45th day	42.600±5.76	45.70±7.08*	49.36±5.31*

Table 7: Mean ± S.D for LDL level in male subjects.

Duration	G_O	G_1	G_2
0 day	137.60±11.19	141.60±9.35	139.00±13.80
45th day	142.20±16.17	129.60±14.14*	122.20±11.40*

G_0 = No treatment, G_1=300mg/d of parsley seed powder, G_2= 600mg/d of parsley seed powder. All results were taken significant at $p<0.05$.

Positive changes in the serum HDL levels

As compared to the G_0 group, HDL was increased in the experimental group G_1 and G_2. G_1 shows a change in HDL from 40.39±7.66 mg/dl to 45.70±7.08 mg/dl and G_2 shows an increase in HDL from 41.09±4.87 mg/dl to 49.36±5.31 mg/dl. While on the other hand, G_0 showed no significant change in the level of serum HDL as compared to G_1 and G_2 table 6.

Reduction in the serum LDL levels

A significant decline was observed in the experimental group after taking parsley seed powder for 45 days. G_1 and G_2 reported reduction in the level of serum LDL from 141.60±9.35 mg/dl to 129.60±14.14 mg/dl in G_1 and from 139.00±13.80 mg/dl to 122.20±11.40 mg/dl in G_2. On the other hand, G_0 showed no significant changes in the LDL level as compared to the groups taking parsley seed powder as shown in table 7.

DISCUSSION

Results determination of proximate composition was momentous in deciding the worth of raw materials being used. The parsley seed powder was investigated for varied characterizations, such as moisture, ash, crude fiber, crude proteins, fat and nitrogen-free extract (NFE) depicted in table 2.

These six constituents make up the whole composition of parsley seed powder majorly and these findings were close to previous studies (Fernandes *et al*., 2020). The mineral composition findings have shown that potassium, magnesium, and calcium are found in greater amounts than others and these findings are consistent with a previous study on the mineral content of parsley seed, leave and stem (Bouasla *et al*., 2022). Plants possess important phytochemicals which possess important phytochemical properties and antioxidant potential.

These phytochemicals are phenolic compounds containing hydroxyl groups that play a key role in preventing oxidative stress and scavenging free radicals. The phenolic compounds are extracted and investigated for their antioxidant activity. Due to this antioxidant potential parsley, seed powder showed the potential of lowering lipid profile and antiatherogenic effect.

These findings were similar to the findings of previous research studies (Jadczak *et al*., 2019). An investigation has shown a significant reduction in elevated cholesterol, triglycerides level and LDL level. However, serum HDL level has significantly increased. This reduction in lipid profile parameters is due to the chemical composition of parsley and the antioxidant profile of parsley seeds.

These antioxidants are helpful in lowering the oxidative stress thus reducing triglycerides and LDL. Increase in HDL level is a great indicator of the therapeutic potential of parsley seed. These findings were also observed in previous studies that investigated the therapeutic effect of parsley leaves, seeds, and extract (Oprică & Vochita, 2014).

CONCLUSION

Hypercholesterolemia is an elevated lipid profile, and it is associated with many other diseases including atherogenesis, and atherosclerosis. Hypercholesterolemia is also associated with fatty liver disease and other complications. This study has reported the anti-hypercholesterolemic effect of parsley seeds. Parsley seed powder contains a significant proximate profile, minerals, and phytochemicals. These helps lower the elevated lipid profile, but it needs to be further investigated through which mechanism of action lipid profile is reduced by using parsley.

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