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Phytochemical Investigation And Assessment Of Anti-Hyperlipidemic Potential Of Dianthus Chinenis Plant Extract On Wistar Rats

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ABSTRACT

The study aimed to explore the phytochemical profile and assess the anti-hyperlipidemic potential of *Dianthus chinensis* plant extract on Wistar rats. The methanol extract of *Dianthus chinensis* was subjected to qualitative and quantitative analyses to identify its phytoconstituents, including phenolic compounds, flavonoids, alkaloids, and saponins. The total phenolic content (TPC) and total flavonoid content (TFC) were estimated, and their antioxidant potential was evaluated through the DPPH assay. *In vivo* studies on Wistar rats induced with hyperlipidemia using a high-fat diet demonstrated a significant reduction in serum lipid profiles, including total cholesterol, triglycerides, low-density lipoprotein, and very low- density lipoprotein, along with an increase in high-density lipoprotein levels. The methanol extract exhibited comparable effects to the standard drug, lovastatin, suggesting its potential as an effective natural agent for managing hyperlipidemia. Furthermore, serum biochemical tests revealed the hepatoprotective properties of *Dianthus chinensis* extract. The findings highlight its therapeutic potential in managing hyperlipidemia and promoting liver health.

Keywords: *Dianthus chinensis, Anti-hyperlipidemic, DPPH assay, Serum lipid profile, Wistar rats, Hyperlipidemia.*

1. INTRODUCTION

Medicinal plants have been playing an essential role in the development of human culture. As a source of medicine, Medicinal plants have always been at forefront virtually all cultures of civilizations. Medicinal plants are regarded as rich resources of traditional medicines and from these plants many of the modern medicines are produced. For thousands of years medicinal plants have been used to treat health disorders, to add flavour and conserve food and to prevent diseases epidemics. The secondary metabolites produced by the plants are usually responsible for the biological characteristics of plant species used throughout the world. The microbial growth in diverse situations is controlled by plant derived products. In this review we gave general overview of the medicinal plants **(Yuan *et al.*, 2016).**

Hyperlipidemia is characterized by elevated serum lipid profile in the blood circulation. Hyperlipidemia has been ranked as one of the greatest risk factors contributing to prevalence and severity of coronary heart diseases, stroke, atherosclerosis and hyperlipidemia are the primary cause of death. The World Health Organization (WHO) reported that the high blood cholesterol contributes to approximately 56% cases of cardiovascular diseases worldwide and causes about 4.4 million deaths each year. In India it is presumed that more than 111% of the people's death by cardiovascular disease when compared to the year 1990. This is much higher than that predicted to any other region both in Asia as well as outside Asia. In India, the prevalence of CHD is much higher in south when compared to north India **(Alloubani *et al.*, 2021).** In this study, we examined the effects of an aqueous extract of *Dianthus chinensis* in hyperlipidemic rats. The study demonstrated that the aqueous extract of *Dianthus chinensis* has potential hypolipidemic effects, with a significant decrease in serum total cholesterol, triglycerides, low-density lipoprotein cholesterol, and very low-density lipoprotein cholesterol levels. The efficacy of the extract was found to be comparable to that of the standard hypolipidemic drug, fenofibrate. These results suggest that *Dianthus chinensis* could be a potential candidate for the development of hypolipidemic agents for the management of hyperlipidaemia and related cardiovascular diseases **(Dizaye and Chalaby 2015).**

2. MATERIAL AND METHODS

2.1 Chemical

Glacial Acetic Acid, Sodium Hydroxide, Nitroprusside and Ammonia was acquired from Merck. Fizmerck gave the Conc. H2SO4. The one Petroleum ether was supplied by Researchlab. Methanol was supplied by Molychem. Loba Chemie supplied the Folin-Ciocalteu Reagent. Sodium Benzoate acquired from Meru Chem. Devidas Dye Chem supplied Chloroform. Rudra Industries gave the 95% Alcohol. Prakash Chemicals supplied the Conc. HCl. Sodium Carbonate Solution acquired from Vinipul Inorganics. Oxford Lab gave the Magnesium.

2.2 Collecting plants

The plant material used in this study was *Dianthus chinensis* (Chinese pink whole plant), which was procured from a reputable local nursery/ botanical garden. The plant was identified and authenticated by a trained botanist or using appropriate botanical resources.

2.3 Extraction

The Soxhlet extraction method is commonly used to extract valuable bioactive compounds from natural sources.

$$\% \text{ Yield} = \frac{\text{Weight of extract Weight of}}{\text{Plant Material used}} \times 100$$

2.4 Quatitative Estimation of Phytoconstituents

2.4.1 Total Phenolic Content

To determine the total phenolic content of the methanolic extract of *Dianthus chinensis*, 40 µL of the extract (1 mg per 1 mL of methanol) or a standard gallic acid solution was added to a test tube along with 3.16 mL of distilled water and 200 µL of Folin-Ciocalteu reagent. The mixture was gently shaken to combine. After incubating for 8 minutes, 600 µL of sodium carbonate solution was added, and the mixture was thoroughly mixed. The solution was then incubated at 40°C for 30 minutes. After incubation, the absorbance was measured at 760 nm using a spectrophotometer, with a blank as the reference. A calibration curve was prepared using gallic acid standard solutions at concentrations of 10, 30, 50, 70, and 90 µg/m **(Rahman**

***et al.*, 2015).**

2.4.2 Total Flavonoid Content

The total flavonoid content was determined using the aluminum chloride colorimetric method. In brief, 0.2 mg of *Dianthus chinensis* was dissolved in 1 mL of deionized water. A 0.5 mL portion of this solution was mixed with 1.5 mL of 95% alcohol, 0.1 mL of 10% aluminum chloride hexahydrate (AlCl3), 0.1 mL of 1 M potassium acetate (CH3COOK), and 2.8 mL of deionized water. After incubating the mixture at room temperature for 40 minutes, the absorbance of the reaction mixture was measured at 510 nm using a spectrophotometer, with deionized water as the blank. Rutin was used as the standard to create calibration curves, with rutin concentrations of 10, 30, 50, 70, and 90 µg/mL. The calibration curve was then used to calculate the total flavonoid content, and the results were expressed as milligrams of Rutin equivalent per gram of dry extract weight **(Kamtekar *et al.*, 2014).**

2.5 Determination of antioxidant activity by the DPPH test

DPPH• exhibits a strong UV-VIS absorption spectrum. In this test, the radical solution undergoes decolorization when reduced by an antioxidant (AH) or a radical (R•), following the reaction: DPPH• + AH → DPPH•-H + A•, DPPH• + R• → DPPH•-R. A 50 µL aliquot of different concentrations (20–100 µg/mL) of *Dichanthium annulatum* extract in methanol was added to 5 mL of a 0.004% methanol solution of DPPH. After incubating the mixture for 30 minutes at room temperature, the absorbance was measured at 517 nm against a blank **(Xie and Schaich 2014).** The percentage inhibition of the free radical DPPH (I%) was calculated as follows:

% Scavenging Activity = 100[(Ac – As)/Ac]

Where, Ac and As are absorbances of negative control and sample, respectively

2.6 Acute Toxicity Study

Three animals were used in each phase of the step-by-step process for the acute toxic study according to OECD 423 guideline. The present acute oral toxicity study was approved by the Faculty Ethical committee **(Porwal *et al.*, 2017).**

2.7 High fat diet induced Anti-hyperlipidemic model

Experimental hyperlipidemia was developed by feeding with a high-fat diet (Powdered Normal Chow, 365 g; lard, 310 g; casein, 250 g; cholesterol, 10 g; vitamin mix and mineral mix, 60 g; DL methionine, 0.3 g; yeast powder, 0.1 g; and NaCl,

0.1 g were mixed to prepare 1.0 kg of HFD). The high fat diet contained 5.33 kcal/g while the normal chow contained 3.80 kcal/g.

2.8 In vivo study of Anti-Hyperlipidemic activity in wistar rats

2.8.1 Animals

Wistar albino rats (Either sex) weighing 180-220g selected from animal house of Pinnacle Biomedical Research Institute (PBRI), Bhopal, India. Animals were housed in polypropylene cages in a room where the congenial temperature was 27 ±1°C and 12 hrs light and dark cycles were maintained. The animals were allowed to acclimatize to the environment for 7 days and supplied with a standard pellet diet (Golden Feeds, New Delhi, India) and water ad libitum. The experimental protocol was approved and conducted as per the guidelines of Institutional animal ethical committee (IAEC) **(Bayne *et al.*, 2015).**

2.8.2 Experimental Protocol

Group I served as normal control without any treatment. Group II served as Negative control High Fat Diet (HFD) Group III involved Hyperlipidemia induced rats treated with standard lovastatin drug (10 mg/kg/day, B.W.) Group IV served as Hyperlipidemia induced rats received extract of *Dianthus chinensis* (200 mg/kg/day; B.W.) Group V include Hyperlipidemia induced rats received extract of *Dianthus chinensis* (400 mg/kg/day; B.W.) At the end of the

experiment, all the animals were taken group wise and blood was collected using the retro- orbital technique.

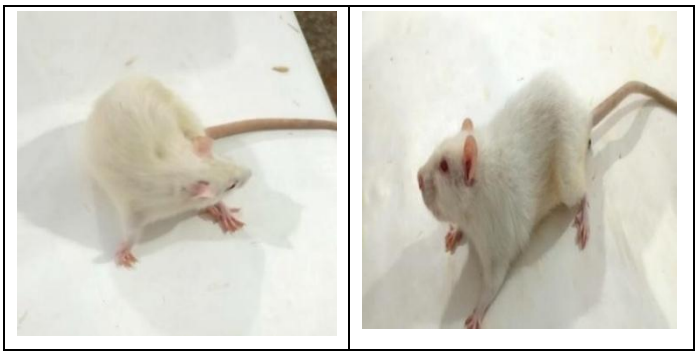


Figure 1:- Normal Wistar Rat

2.8.3 Estimation of serum lipid profile

The blood lipid profile, including total cholesterol (TC), HDL cholesterol, LDL cholesterol, and triglycerides (TG), was measured at three different points: initially (day 0), after 30 days of a high-fat diet, and finally after 15 and 30 days of a normal diet and drug treatment in both the control and experimental groups **(Lu *et al.*, 2016).** VLDL cholesterol was calculated as TG/5, and LDL cholesterol was estimated using a specific formula:

LDL (mg/dl) = TC − (HDL + VLDL)

2.8.4 Collection of blood samples and measurement of biochemical parameters

At the end of the experimental period, the animals from each group were sacrificed, and blood was collected through the retro-orbital method under mild ether anesthesia. The blood samples were immediately subjected to centrifugation at 3000 rpm for 15 minutes at room temperature to separate the serum. The concentrations of TC, TG, and HDL-C were measured using enzymatic kits according to standard procedures, and the measurements were conducted using an auto-analyzer **(Singh *et al.*, 2015).**

2.8.5 Serum biochemical parameters

- **ALP (Alkaline phosphatase)**
  - **Working reagent preparation**

Reconstitute one vial of Reagent 2 (pNPP substrate) and add 5.5 mL of Reagent 1 (AMP buffer) to create the "Working reagent."

  - **Procedure**

Add 1000 µL of Reagent A to 20 µL of animal serum sample and well mix. For one minute, the mixture was incubated at the 37°C assay temperature. After 30 seconds, the absorbance was measured. Read again every 30 seconds, or for a maximum

of 120 seconds, at a wavelength of 405 nm. It was calculated to get the mean absorbance change per minute.

- **AST (Aspartate Transaminase) or SGOT (Glutamic-oxalacetic transaminase)**
  - **Working reagent preparation**

Mix 1volume of R2 with 4volume of R1.

- **Procedure**

Add 1000 µL of Reagent 1 to 100 µL of the animal serum sample and mix thoroughly. Incubate the mixture at 37°C for one minute. After incubation, add 1 mL of Reagent 2 and mix well. Measure the absorbance after 60 seconds, and then continue to monitor the absorbance every 30 seconds for a total of 120 seconds at a wavelength of 340 nm. The mean absorbance change per minute is then calculated.

Calculation- AST activity (IU/L) =Δ A/minute × Kinetic factor Where

Δ A/minute = Change in absorbance per minute Kinetic factor (K) = 1768.

- **ALT (Alanine Transaminase) or Glutamic-pyruvic transaminase (SGPT)**
  - **Working reagent preparation**

Mixing four parts R1 Buffer Reagent with one-part R2 Enzyme Reagent.

- **Procedure:**

Mix 1000 µL of working ALT Reagent 1 with 100 µL of animal serum sample well. For one minute, the mixture was incubated at 37 degrees Celsius. After 60 seconds, the absorbance was measured. Repeat every 30 seconds for a total of 120 seconds at a wavelength of 340 nm. It was calculated to obtain the average absorbance change per minute.

- **Calculation- ALT activity (IU/L) = Δ A/minute × Kinetic factor Where**

Δ A/minute = Change in absorbance per minute Kinetic factor (K) = 1768.

- **Total Bilirubin**
  - **Reagent preparation**

A freshly made diazo solution should always be used. Mix Reagents 1 and 2 in the ratio of 4 + 1 (e.g., 400 µl of sulfanilic acid solution and 100 µl of sodium nitrite solution). The absorbance was measured at 546 nm wavelength. The mixing ratio should be observed precisely.

Total bilirubin concentration = A × 10.3 mg/d

The proximal interphalangeal joints from the adjuvant-induced arthritic rats were excised, fixed in 10% formalin, and used for histopathological examination **(Doig and Zhang 2017).**

3. RESULTS

3.1 Procurement of plant material

Table: 1 Percentage Yield of plant material

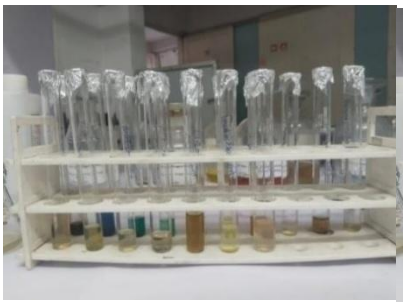
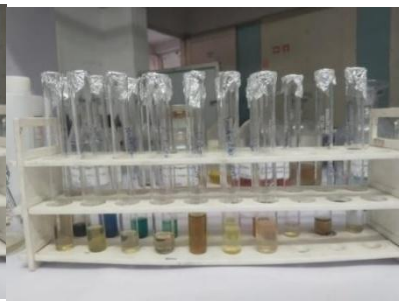
S. No	Plant name	Solvent	Theoretical weight	Yield(gm)	% yield
1.	*Dianthus chinensis*	Methanol	493	35.96	7.29

3.2 Phytochemical Test

Table 2: Phytochemical test of Leaves extract

S. No.	Experiment	Presence or absence of phytochemical test
		Methanol extract
1.	**Alkaloids**	
1.1	Dragendroff's test	**+ ve**

1.2	Mayer's reagent test	**+ ve**
1.3	Wagner's reagent test	**+ ve**
1.3	Hager's reagent test	**+ ve**
2.	**Glycoside**	
2.1	Borntrager test	**+ ve**
2.2	Legal's test	**+ ve**
2.3	Killer-Killiani test	**+ ve**
3.	**Carbohydrates**	
3.1	Molish's test	**+ ve**
3.2	Fehling's test	**+ ve**
3.3	Benedict's test	**+ ve**
3.4	Barfoed's test	**+ ve**
4.	**Proteins and Amino Acids**	
4.1	Biuret test	**+ ve**
4.2	Ninhydrin test	**+ ve**
5.	**Flavonoids**	
5.1	Alkaline reagent test	**+ ve**
5.2	Lead Acetate test	**+ ve**
6.	**Tannin and Phenolic Compounds**	
6.1	Ferric Chloride test	**+ ve**
7.	**Saponin**	
7.1	Foam test	**+ ve**
8.	**Test for Triterpenoids and Steroids**	
8.1	Salkowski's test	**+ ve**
8.2	**Libbermann-Burchard's test**	**+ ve**

3.3 Quantitative Estimation of Phytoconstituents

3.3.1 Total Phenolic content (TPC) estimation

Table 3: Standard table for Gallic acid

S. No.	Concentration	Absorbanc
1.	10	0.125
3.	50	0.152
5.	90	0.200

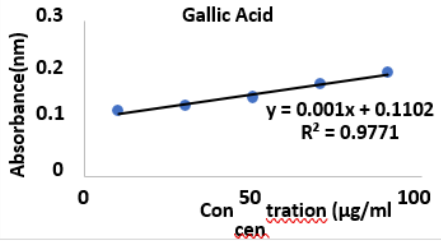


Figure 8: Represent standard curve of Gallic acid

3.3.1.1 Total Phenolic Content

Table 4: Total Phenolic Content in *Dianthus chinensis* extract

S. No	Absorbance	TPC in mg/gm equivalent of Gallic Acid
1	0.127	48.8 mg/gm
2	0.160	
3	0.192	

3.3.2 Total Flavonoids content (TFC) estimation

Table 5: Standard table for Rutin

S. No.	Concentration (µg/ml)	Absorbance
1.	10	0.123
2.	30	0.132
3.	50	0.149
4.	70	0.168
5.	90	0.192

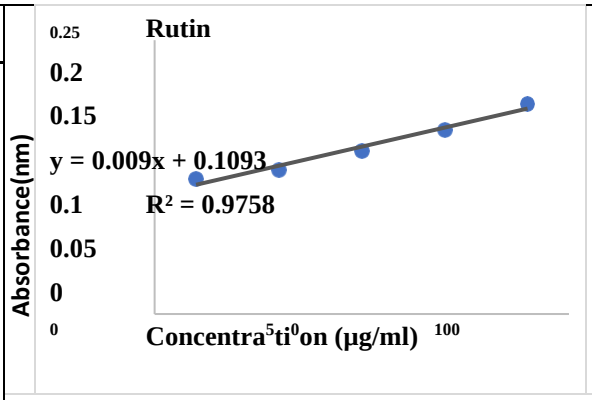


Figure 2: Represent standard curve of Rutin

3.3.2.1 Total Flavonoid Content

Table 6: Total Flavonoid Content in *Dianthus chinensis* extract

S. No	Absorbance	TFC in mg/gm equivalent of Rutin
1	0.120	4.18 mg/gm
2	0.148	
3	0.174	

3.4 Anti-Oxidant Activity

3.4.1 DPPH 2, 2- diphenyl-1-picryl hydrazyl Assay

Table 7: DPPH radical scavenging activity of Std. Ascorbic acid

Concentration (µg/ml)	Absorbance	% Inhibition
20	0.492	50.701
40	0.446	55.310
60	0.359	64.028
80	0.298	70.140
100	0.163	83.667
Control	0.998	
IC50 23.47		

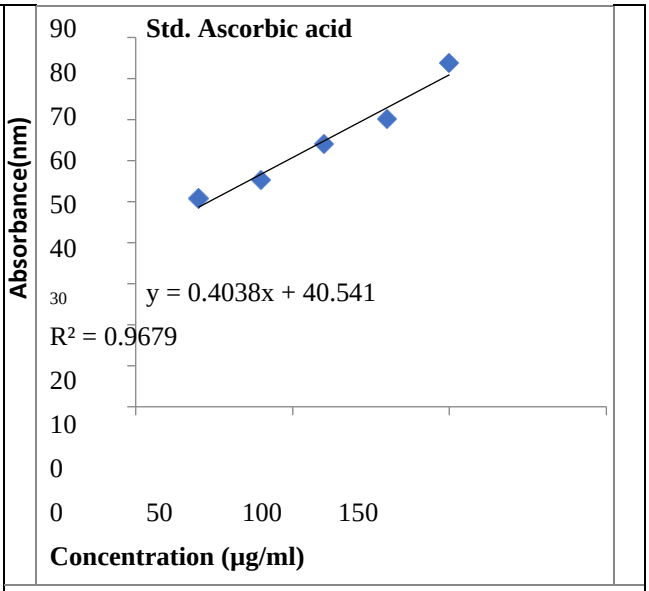
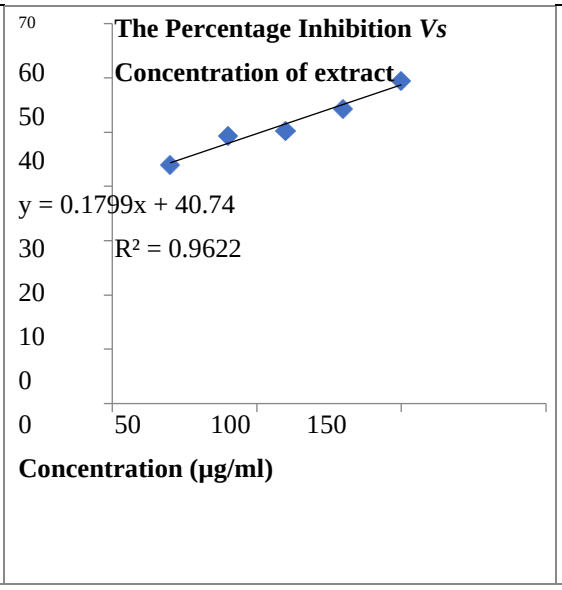


Figure 3: DPPH radical scavenging activity of Std. Ascorbic acid

Table 8: DPPH radical scavenging activity of methanol extract of *Dianthus chinensis*

Concentration (µg/ml)	Absorbance	% Inhibition
20	0.529	44.021
40	0.478	49.417
60	0.469	50.370
80	0.432	54.285
100	0.382	59.576
Control 0.945		



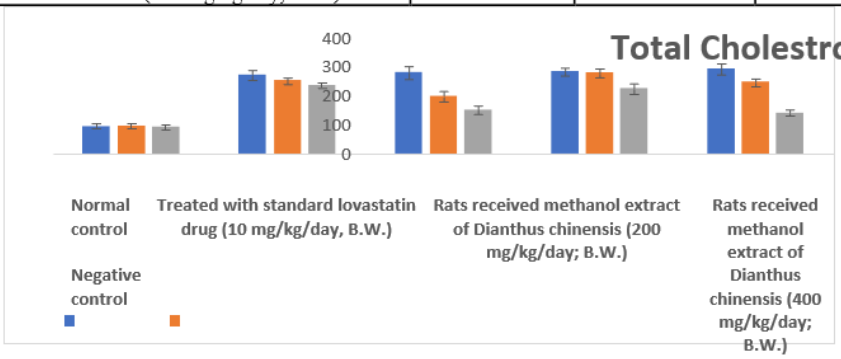
IC50 51.73	**Figure 4: Represents the Percentage Inhibition *Vs* Concentration of extract**

3.5 Estimation of serum lipid profile

3.5.1 Estimation of Total Cholesterol

Table 9: serum lipid profile of Total Cholesterol (TC)

S. No	Groups	Serum Lipid Levels (Mg/Dl) On Day(S)		
		0thday	15thday	30thday
1	Normalcontrol	94.06±8.66	96.02±8.71	92.03±8.75
2	NegativecontrolHighFatDiet	271.87±17.49	251.71±11.37	235.39±9.49
3	Treatedwithstandardlovastatindrug(2 mg/kg/day, B.W.)	280.26±22.61	198.40±18.35	140.16±14.46
4	RatsreceivedmethanolextractofDianthus chinensis (200 mg/kg/day; B.W.)	283.68±13.74	279.49±15.22	223.51±18.31
5	RatsreceivedmethanolextractofDianthus chinensis (400 mg/kg/day; B.W.)	293.15±19.43	246.35±13.40	150.63±10.41

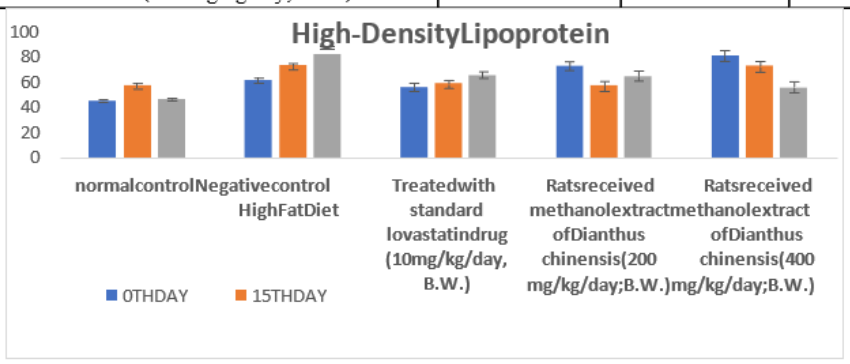


Graph 1: Bar graph of TC

3.5.2 Estimation of high-density lipoprotein

Table 10: serum lipid profile of high-density lipoprotein (HDL)

S. No	Groups	Serum Lipid Levels (Mg/Dl) On Day(S)		
		0th day	15th day	30th day
1	normal control	44.90 ± 1.25	56.92±2.32	46.35±1.03
2	Negative control High Fat Diet	60.91 ± 2.02	72.52± 2.53	81.93 ± 1.65
3	Treated with standard lovastatin drug (10 mg/kg/day, B.W.)	55.65 ± 3.26	58.46 ± 3.13	55.41± 2.65
4	Rats received methanol extract of Dianthus chinensis (200 mg/kg/day; B.W.)	72.46 ± 3.49	56.81± 3.96	64.66± 4.02
5	Rats received methanol extract of Dianthus chinensis (400 mg/kg/day; B.W.)	80.53± 4.28	72.41± 4.29	65.65 ± 4.39

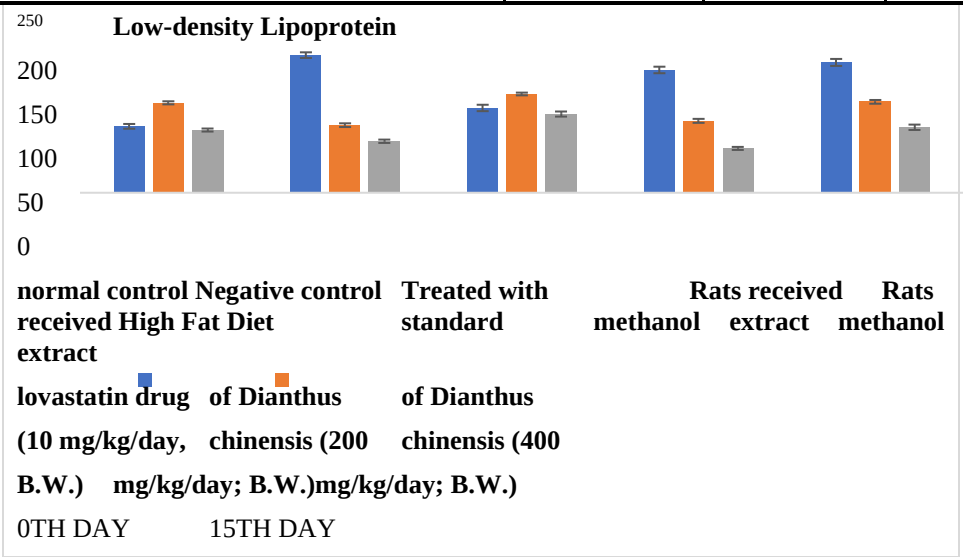


Graph 2: Bar graph of HDL

3.5.3 Estimation of low-density lipoprotein

Table 11: serum lipid profile of low-density lipoprotein (LDL)

S. No	Groups	Serum Lipid Levels (Mg/Dl) On Day(S)		
		0th day	15th day	30th day
1	normal control	102.01 ± 3.66	138.09 ±2.36	96.32 ±2.31
2	Negative control High Fat Diet	211.33 ± 4.36	103.80 ± 2.86	79.08 ± 2.56
3	Treated with standard lovastatin drug (10 mg/kg/day, B.W.)	130.23 ± 4.93	151.68± 2.10	100.88 ± 3.94
4	Rats received methanol extract of Dianthus chinensis (200 mg/kg/day; B.W.)	188.57 ± 5.02	110.42 ± 3.06	68.10 ± 2.34
5	Rats received methanol extract of Dianthus chinensis (400 mg/kg/day; B.W.)	200.14 ± 5.35	139.63 ± 2.85	120.57 ± 4.11



Graph 3: Bar graph of LDL

3.5.4 Estimation of Total Triglycerides

Table 12: serum lipid profile of Total Triglycerides (TG)

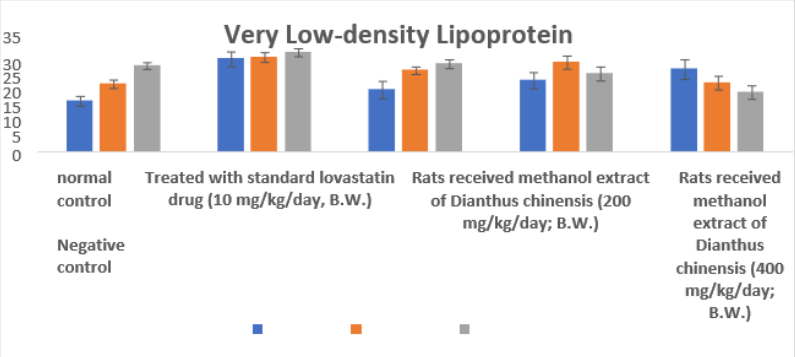
S. No	Groups	Serum Lipid Levels (Mg/Dl) On Day(S)		
		0th day	15th day	30th day
1	normal control	65.26 ± 2.06	68.32±1.76	71.02±3.02
2	Negative control High Fat Diet	145.39± 2.45	132.36 ± 2.96	120.53 ± 3.09
3	Treated with standard lovastatin drug (10 mg/kg/day, B.W.)	75.69 ± 3.62	80.60 ± 2.65	59.82 ± 3.63
4	Rats received methanol extract of Dianthus chinensis (200 mg/kg/day; B.W.)	168.18 ± 3.84	199.36 ± 3.02	105.58 ± 3.05
5	Rats received methanol extract of Dianthus chinensis (400 mg/kg/day; B.W.)	90.41 ± 4.03	85.53 ± 3.36	66.81 ± 3.85

Graph 4: Bar graph of TG

3.5.5 Estimation of very low-density lipoprotein

Table 13: serum lipid profile of very low-density lipoprotein (VLDL)

S. No	Groups	Serum Lipid Levels (Mg/Dl) On Day(S)		
		0th day	15th day	30th day
1	normal control	15.67 ± 1.54	20.96±1.31	26.62±1.03
2	Negative control High Fat Diet	28.69 ± 2.29	29.23 ± 1.52	30.74 ± 1.23
3	Treated with standard lovastatin drug (2 mg/kg/day, B.W.)	19.18 ± 2.69	25.16 ± 1.16	18.18 ± 1.36
4	Rats received methanol extract of Dianthus chinensis (200 mg/kg/day; B.W.)	22.05- ± 2.53	27.68 ± 2.03	24.16 ± 2.15
5	Rats received methanol extract of Dianthus chinensis (400 mg/kg/day; B.W.)	25.51 ± 3.06	21.33 ± 2.11	27.39± 2.09



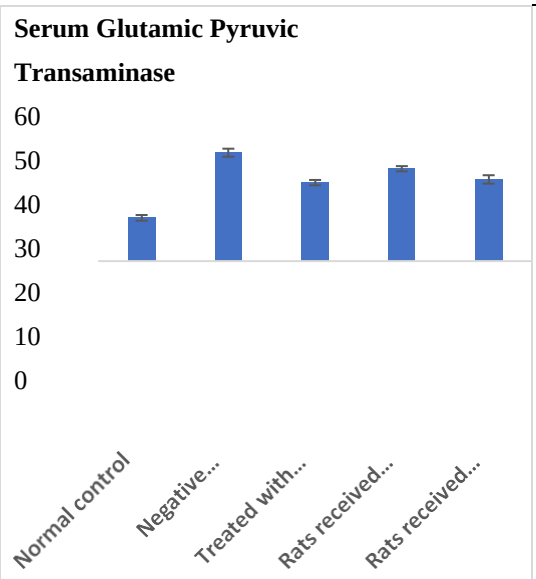
Graph 5: Bar graph of VLDL

3.5.6 Serum biochemical parameters

3.5.6.1 Serum Glutamic Pyruvic Transaminase Test (SGPT)

Table 14: Serum Glutamic Pyruvic Transaminase Test results

S. No	Treatment Group	Results (Mean±SD)
1.	Normal control	20.25±1.325
2.	Negative control High Fat Diet	50.75±1.887
3.	Treated with standard lovastatin drug (10 mg/kg/day, B.W.)	38.75±1.25
4.	Rats received methanol extract of *Dianthus chinensis* (200 mg/kg/day; B.W.)	43.25±1.22
5.	Rats received methanol extract of *Dianthus chinensis* (400 mg/kg/day; B.W.)	36.25±1.96

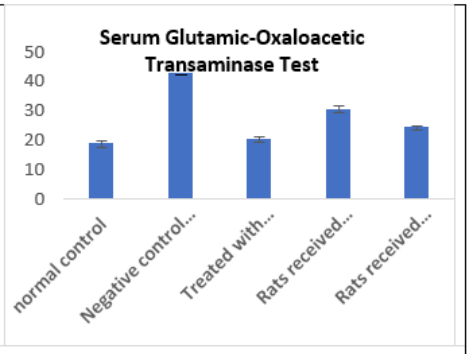


Graph 6: Bar graph represents the Serum Glutamic Pyruvic Transaminase test results

3.5.6.2 Serum Glutamic-Oxaloacetic Transaminase Test (SGOT)

Table 15: Serum Glutamic-Oxaloacetic Transaminase Test results

S. No	Treatment Group	Results (Mean±SD)
2.	Negative control High Fat Diet	42.75±0.854
4.	Rats received methanol extract of *Dianthus chinensis* (200 mg/kg/day; B.W.)	30.75±1.25

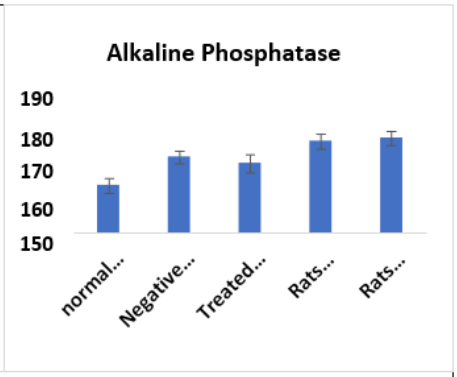


Graph 7: Bar graph represents the Serum Glutamic-Oxaloacetic Transaminase test results

3.5.6.3 Alkaline Phosphatase (ALP) Test

Table 16: Alkaline Phosphatase (ALP) Test results

S. No	Treatment Group	Results (Mean±SD)
1.	normal control	130±7.53
2.	Negative control High Fat Diet	174±4.08
3.	Treated with standard lovastatin drug (10 mg/kg/day, B.W.)	122±2.89
4.	Rats received methanol extract of *Dianthus chinensis* (200 mg/kg/day; B.W.)	133±2.38
5.	Rats received methanol extract of *Dianthus chinensis* (400 mg/kg/day; B.W.)	129±2.25

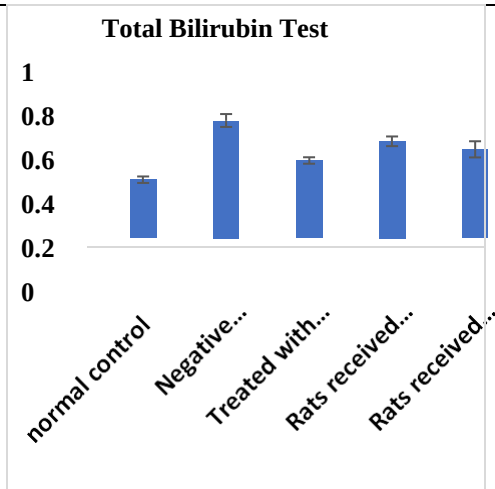


Graph 8: Bar graph represents the Alkaline Phosphatase (ALP) test results

3.5.6.4 Total Bilirubin Test

Table 17: Total Bilirubin Test results

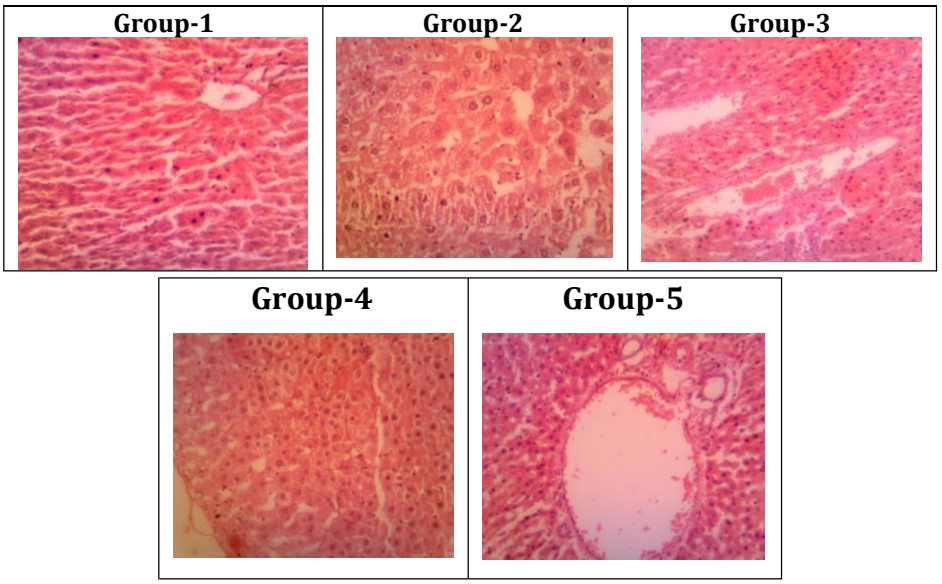
S. No	Treatment Group	Results (Mean±SD)
1.	normal control	0.36±0.02
2.	Negative control High Fat Diet	0.73±0.04
3.	Treated with standard lovastatin drug (10 mg/kg/day, B.W.)	0.48±0.02
4.	Rats received methanol extract of *Dianthus chinensis* (200 mg/kg/day; B.W.)	0.60±0.03



Graph 9: Bar graph represents the Total

5.	Rats received methanol extract of *Dianthus chinensis* (400 mg/kg/day; B.W.)	0.55±0.05	**bilirubin test results**

3.6 Histopathological examination



4. DISCUSSION

The procurement of *Dianthus chinensis* plant material involved selecting healthy specimens, which were then processed for extraction. The extraction was carried out using methanol as the solvent. The theoretical weight of the plant material was 493 grams, and after the extraction process, the yield obtained was 35.96 grams. This resulted in a percentage yield of 7.29%. Alkaloids, glycosides, carbohydrates, proteins, amino acids, flavonoids, tannins, phenolic compounds, saponins, and triterpenoids/steroids were all detected through various standard tests. The results showed that the *Dianthus chinensis* extract had a TPC of 48.8 mg/g equivalent to gallic acid for an absorbance of 0.127. The results indicated that the extract had a TFC of

4.18 mg/g equivalent to rutin for an absorbance of 0.120. Higher absorbance values (0.148 and 0.174) corresponded to increased flavonoid content, suggesting that *Dianthus chinensis* is rich in flavonoids. At 100 µg/ml, the extract achieved a 59.58% inhibition, and its IC50 value was calculated to be 51.73 µg/ml, indicating moderate antioxidant activity.

In contrast, the lovastatin-treated group demonstrated significant reductions in TC, Low- Density Lipoprotein (LDL), and Triglycerides (TG), highlighting its effectiveness in managing lipid imbalances. The Dianthus chinensis extract (200 mg/kg/day) showed a moderate reduction in TC, but HDL levels decreased slightly, suggesting potential benefits in lipid modulation. The high-dose Dianthus chinensis (400 mg/kg/day) displayed the most pronounced lipid-lowering effects, particularly in reducing TC, TG, and Very Low-Density Lipoprotein (VLDL) levels, though it caused a slight reduction in HDL. Overall, both lovastatin and Dianthus chinensis exhibited beneficial effects on lipid profiles, with the extract showing dose-dependent improvements.

5. CONCLUSION

The study on *Dianthus chinensis*, investigates both the Hyperlipidemia, a medical condition marked by high levels of lipids (fats) such as cholesterol and triglycerides in the bloodstream.The phytochemical screening of the plant extract revealed a rich composition of bioactive compounds, including alkaloids, flavonoids, tannins, saponins, and phenolic compounds.

To assess its anti-hyperlipidemic potential, the plant extract was administered to Wistar rats that were induced with hyperlipidemia using a high-fat diet. The rats were divided into different groups, including a control group, a hyperlipidemic group, and a treatment group that received the *Dianthus chinensis* extract. The rats in the treatment group showed a significant improvement in their lipid profiles, with notable reductions in total cholesterol, triglycerides, and LDL (low-density lipoprotein) cholesterol levels. These findings indicate that *Dianthus chinensis* extract is effective in modulating lipid levels and improving the balance between "good" and "bad" cholesterol, which is crucial for cardiovascular health.

Furthermore, the study examined the antioxidant activity of the extract, which plays a critical role in preventing oxidative

stress, a contributing factor to the development of hyperlipidemia and cardiovascular diseases.

The results of this study underscore the presence of bioactive compounds such as flavonoids, alkaloids, and phenolic compounds plays a crucial role in the plant's ability to lower harmful lipid levels, improve the overall lipid profile, and prevent oxidative stress. The reduction in cholesterol levels, particularly the decrease in total cholesterol and LDL cholesterol, combined with the increase in HDL cholesterol, strongly supports the anti-hyperlipidemic properties of the extract. Furthermore, the improved antioxidant enzyme activities and lack of liver toxicity confirm the safety and effectiveness of *Dianthus chinensis* in the treatment of hyperlipidemia.

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