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A PRELIMINARY STUDY ON ANTI-HYPERLIPIDEMIC ACTIVITY OF CINNAMON OIL IN WISTAR RAT

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ABSTRACT

The current pharmacological research work was to explore the anti-hyperlipidemic and antipyretic potential of Cinnamon Oil (25 miligram-kilogram/ or 50 miligram-kilogram/, p.o).hyperlipidemia is a largly growing disease. The predominance of hyperlipidemia in the United States is near 30 million and future projections anticipate that, if present patterns endure, one out of three grown-ups could have diabetes by 2050. Dexamethasone and Triton induced hyperlipidemia model was used to evaluate the anti-hyperlipidemic activity. In case of hyperlipidemia (50 miligram-kilogram/, p.o) is more effective comparison to 25 miligram-kilogram/p.o. Research outcome indicates that Cinnamon Oil (25 miligram-kilogram/p.o or 50 miligram-kilogram/ p.o) is having significant anti-hyperlipidemic potential.

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INTRODUCTION

Hyperlipidemia is described by raised serum levels of total cholesterol (TC), low- density lipoprotein (LDL), Very low - density lipoprotein (VLDL), and diminished serum level of high density- lipoprotein (HDL). According to American heart incorporation, a high level of fats known as hyperlipidemia. These fats consist of cholesterol and triglyceride. Lipids and fatty substances in the blood and is a greater risk factor in the growth of atherosclerosis and heart diseases. [1, 2] Hyperlipidemia is a dangerous substitute for gall stone, pancreatitis and xanthomas, or coronary artery disease (CAD), myocardial infarction (MI), hypertension. CAD could be contemplated as the most common source of death globally, including India, by 2020. Hyperlipidemic, being one of the major intricacies of CAD inflammatory disorder rising 8from the excessive inflammatory response to various forms of injurious stimuli to the artery wall.[3] Cinnamon (*Cinnamomum zeylanicum, and Cinnamon cassia*), the eternal tree of tropical medicine, belongs to the Lauraceae family.

Cinnamon is one of the most important spices used daily by people all over the world. Cinnamon primarily contains vital oils and other derivatives, such as cinnamaldehyde, cinnamic acid, and cinnamate. In addition to being an antioxidant, anti-inflammatory, antidiabetic, antimicrobial, anticancer, lipid-lowering, and cardiovascular-disease-lowering compound, cinnamon has also been reported to have activities against neurological disorders, such as Parkinson's and Alzheimer's diseases[4]. Cinnamon is mainly used in the aroma and essence industries due to its fragrance, which can be incorporated into different varieties of foodstuffs, perfumes, andmedicinal products [H.F. Yeh. et. al. 2013]. The most important constituents of cinnamon are cinnamaldehyde and *trans*-cinnamaldehyde (Cin), which are present in the essential oil, thus contributing to the fragrance and to the various biological activities observed with cinnamon [5]. A study on *Cinnamomum osmophloeum* (*C. osmophloeum*) indicated that the essential oil from cinnamon leaves contains a high level of Cin. Consequently, *C. osmophloeum* is also used as an

alternative spice for *C.cassia* [6]. One of the major constituents of essential oil extracted from *C. zeylanicum* named (E)-cinnamaldehyde has an antityrosinase activity, while cinnamaldehyde is the principal compound responsible for this activity. Cinnamon bark contains procyanidins and catechins [7]. The components of procyanidins include both procyanidin A-type and B-type linkages. These procyanidins extracted from cinnamon and berries also possess antioxidant activitiesCinnamon is a coagulant and prevents bleeding .Cinnamon also increases the blood circulation in the uterus and advances tissue regeneration .This plant plays a vital role as a spice, but its essential oils and other constituents also have important activities, including antimicrobial ,antifungal ,antioxidant and antidiabetic .Cinnamon has been used as anti-inflammatory ,antitermitic nematicidal mosquito parricidal ,insecticidal antimycotic, and anticancer agent .Cinnamon has also been traditionally used as tooth powder and to treat toothaches, dental problems, oral microbiota, and bad breath[8].

MATERIALS AND METHODS

Experimental Rodents: Wistar albino rodents of either sex weighing between 150-200g were used for this study. They were procured in the institute of pharmaceutical science and research,(IPSR) unnao recognized by the Institutional Animal Ethics Committee (IAEC). Polypropylene limits were used to house (3 for each pen) the animal at a temperature of 28 ±50C and 12 h light /dull cycle. Hindustan Lever chow pellets were used to feed the animal and water not basic. The animals were kept fasting medium –term going before the examination and this study was approved by IAEC for animal studies include all framework used in the research.

Drugs and Chemicals: Cinnamon oil and Triton were obtained from Sigma-Aldrich and Dexamethasone Phosphate Injection (Neon Laboratories Limited Andheri East Mumbai, Batch No.SLDS-325) and Gemfibrozil (Batch No. - 820280071) was purchased from Pfizer Pharmaceutical.

In Vivo- Anti-Hyperlipidemic activity Dexamethasone – induced hyperlipidemia in rats: Hyperlipidemia will be raised using dexamethasone a glucocorticoid is known to evoke plasma lipid raise. Dexamethasone (10 mg/ kg/day, subcutaneous) was administered to wistar rats for 8 days to influence hyperlipidemia. The creatures were separate into five groups each group contains six (n= 6) wistar rodents.

- Group1 (Normal control) - Administered normal saline solution
- Group 2 (Hyperlipidemic control) - Administered normal saline solution
- Group 3 (Standard group) – Gemfibrozil 10 miligram-kilogram/ day suspended in gum acacia in water
- Group 4 (Test group-I) – Cinnamon Oil 25 mg/ kg orally
- Group 5 (Test group- II) -Cinnamon Oil 50 mg/kg orally

All the rodents in groups II, III, IV, and V were administered a subcutaneous injection of Dexamethasone (10 miligram-kilogram/day S.C) for 8 days to produced hyperlipidemia. The animals in normal hyperlipidemia control groups were taken normal saline, while Group III rodents are taken Gemfibrozil (10 miligram/kilogram/day I.P. suspended in gum acacia in water and Group IV and V rodents taken by oral route in doses of 25 miligram/kilogram/day and 50 milogram/kilogram/day cinnamon oil, separately, throughout the 8 days experiments. After the experiment end, the overnight without food experimental rodents was sacrificed by decapitation under light ether anesthesia and blood was collected. Serum was isolated, and lipid profiles (biochemical parameters) were investigated [9].

Triton induced Hyperlipidemia: The rats were divided into five groups of six rats in each group & were treated with single dose/ day (p.o.) of standard drug or test drug.

Group – I: Normal control.
Group – II: Hyperlipidemic control Triton (100 mg / kg)] i.p.
Group –III: Standard Gemfibrozil (10 mg / kg) p.o.
Group – IV: Test 1 cinnamon oil (25 mg / kg) p.o.
Group – V: Test 2cinnamon oil (50mg / kg)

Hyperlipidemia was induced by single intraperitoneal injection of freshly prepared solution of Triton X-100 (100 mg/ kg) in physiological solution after overnight fasting for 18 hrs. This study was carried out for 7 days & the protocol of the present study was carried out for 7 day [10].After 8th day of treatment (after 18 hrs injection of triton X- 100), the blood was collected by retro orbital sinus puncture, under mild ether anesthesia. Serum obtained by immediate centrifugation of blood samples using ultra cooling centrifuge at 3000 rpm for 15 min at room temperature. Plasma was quantified using enzymatic kit.

Biochemical Estimation of Blood Serum: Plasma lipid levels include TC, TG, HDL, VLDL, LDL was determined by serum samples utilizing diagnostic commercial kits from Qualigens diagnostic Mumbai India. The samples were analyzed via utilizing semiautomatic analyzer.

Statistical Analysis: The statistical analysis was completed utilizing Graphpad 5.0 software. Data were recorded as mean ± S.E.M. The statistical consequence of variation between groups was determined by analysis of variance (ANOVA) worked by Dunnett's test. Differences of $P<0.05$ were examined statically significant.

RESULTS AND DISCUSSION

The study was carried out to estimate the anti-hyperlipidemic of Cinnamon Oil at 25 or 50 miligram/kilogram doses. The result of the different typesof research work is given below.

Dexamethasone induced hyperlipidemia results of total cholesterol and total TG: Total cholesterol levels in the hyperlipidemia- the induced group have importantly raised compared to normal rats. The values have increased to 117.71 ± 1.329 miligram/deciliter compared to Group I (normal rodent group), in which values fib in the range 64.43± 0.933 mg/dl. This shows hypercholesteremia. In the treatment group used with Cinnamon Oil (25 mg/kg) or Cinnamon Oil (50mg/kg), the values are decreased to 84.23 ± 1.046 ($P< 0.001$) and 82.35 ± 0.885mg/dl ($P< 0.0001$), systematically. There is an important decrease in total cholesterol values in the Cinnamon oil treatment group. While Gemfibrozil also has importantly decreased serum total cholesterol levels to 73.70 ± 0.794 mg/dl ($P< 0.001$) [Table-1]. The TG levels have extended as 150.71 ± 0.518miligram/deciliter in

dexamethasone-induced group relatively to normal rats where the values are 63.75 ± 0.507 mg/dl. This shows triglyceridemea. In the group treated with Cinnamon Oil 25 miligram/kilogram and Cinnamon oil 50 mg/kg the values are importantly reduced to 79.50 ± 0.526 miligram/kilogram (P<0.001) and 75.25 ± 0.641 mg/dl (P<0.0001), respectively. In the Gemfibrozil treated group (Std.Group), the values are reduced to 68.33 ± 0.572 mg/dl (P<0.001) [Table-1].

Dexamethasone induced results of high-density lipoprotein cholesterol: High density containing lipid protein cholesterol in a dexamethasone-induced group has importantly reduced relative to normal rats group. The values have decreased to 24.75 ± 0.410 miligram/kilogram relative to normal rat group, 40.68 ± 0.711 mg/dl. In the group prevented with Cinnamon Oil (25 mg/kg) and Cinnamon Oil (50 mg/kg). The values were 25.79 ± 0.602 (P<0.001) and 28.40 ± 0.517 mg/dl (P<0.0001), respectively. In the Gemfibrozil treated group (Std.Group), the values were 34.50 ± 0.665 mg/dl (P<0.001) [1].

The atherogenic index in the dexamethasone-induced group hyperlipidemia control group is enhanced to 4.89 relatives to the normal rat group, 1.58. In the group prevent with Cinnamon Oil (25 mg/kg) and Cinnamon Oil (50 mg/kg) the values are importantly diminished to 3.26 and 2.89, respectively. Gemfibrozil has importantly diminished the values 2.13 [Table 1].

Triton induced hyperlipidemia results of total cholesterol and total TG: Total cholesterol levels in the hyperlipidemia-the induced group have importantly raised compared to normal rats. The values have increased to 118.81 ± 1.329 miligram/kilogram compared to Group I (normal rodent group), in which values fib in the range 65.43± 0.933 mg/dl. This shows hypercholesteremia. In the treatment group used with Cinnamon Oil (25 mg/kg) or Cinnamon Oil (50mg/kg), the values are decreased to 83.21± 1.046 (P< 0.001) and 82.35 ± 0.845mg/dl (P< 0.0001), systematically.

Table 1. Effect of Cinnamon oil in Dexamethasone injection induced Hyperlipidemia Wistar Rat

Group	Treatment/dose	Total cholesterol (milligram/decilit er)	Total TG (milligra/deciliter)	High density containing lipid protien (milligram/deciliter)	Low density containing lipid protein (milligram/deciliter)	Very low density containg lipid protein(milligram/ deciliter)	Atherog enic index
I	Normal-group	64.43 ± 0.933	63.75 ± 0.711	40.68 ± 0.795	14.59± 0.495	13.42 ± 0.455	1.58
II	Normal- control group	117.71 ± 1.329	150.71 ± 0.518	24.75 ± 0.410	56.32 ± 0.811	38.42 ±0.650	4.89
III	Standard group Gemfibrozil (10mg/kg)	73.70 ± 0.794**	68.33 ± 0.572**	34.50 ± 0.665**	23.35 ± 0.563**	19.75 ± 0.527**	2.13
IV	Test group-I Cinnamon Oil (25 mg/kg) –I	84.23 ± 1.046**	79.50 ± 0.526**	25.79 ± 0.602**	33.6 7± 0.609**	30.60 ± 0.441**	3.26
V	Test group-II Cinnamon oil (50mg/kg)	82.35 ± 0.885 ***	75.25 ± 0.641***	28.40 ± 0.517***	26.73 ± 0.55***	25.80 ± 0.505***	2.89

All values were described as mean± SEM. All the data were statistically analyzed by one-way ANOVA followed by Dunnett's multiple comparison test and values P<0.05 were studied to the significant. ******* P<0.0001 when compared to the control group.

Dexamethasone induced results of LDL-cholesterol and VLDL- cholesterol: LDL- cholesterol in a dexamethasone-induced group has importantly enhanced to 56..32 ± 0.811 mg/dl relative to normal rat group, 14.59 ± 0.495 mg/ dl. In the group prevented with Cinnamon Oil (25 mg/kg) and Cinnamon Oil (50 mg/kg). The values were diminished 33.67 ± 0.609(P<0.001) and 26.73 ± 0.551mg/dl (P<0.0001), respectively. There is an important decrease in LDL-cholesterol values in the Cinnamon Oil treatment group. Gemfibrozil has importantly diminished LDL- cholesterol level to 23.35 ± 0.563 mg/dl (P<0.001) [Table-5.3]. VLDL-cholesterol in the dexamethasone-induced group has importantly enhanced to 38.42 ± 0.650 mg/dl relative to normal rat group 13.42 ± 0.455 mg/ dl. In the group prevented with Cinnamon Oil (25 miligram/kilogram) and Cinnamon Oil (50 miligram/kilogram). The values were diminished 30.60 ± 0.441 (P<0.001) and 25.80 ± 0.505 mg/dl (P<0.0001), respectively. There is an importantly decreased Cinnamon Oil treatment group. Gemfibrozil has importantly diminished VLDL- cholesterol level to 19.75 ± 0.527 mg/dl (P<0.001) [Table-1].

Dexamethasone induced results of atherogenic index

$$\text{Atherogenic index} - \frac{\text{Total serum cholesterol}}{\text{Total serum High density containing lipid protein-cholesterol}}$$

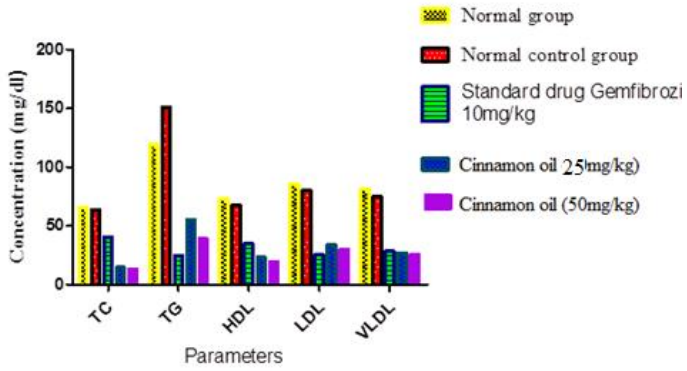
There is an important decrease in total cholesterol values in the There is an important decrease in total cholesterol values in the Cinnamon oil treatment group. While Gemfibrozil also has importantly decreased serum total cholesterol levels to 72.80 ± 0.794 mg/dl (P< 0.001) [Table-2]. The TG levels have extended as 151.71 ± 0.528miligram/kilogram in dexamethasone-induced group relatively to normal rats where the values are 62.65 ± 0.507 mg/dl. This shows triglyceridemea. In the group treated with Cinnamon Oil 25 mg/kg and Cinnamon oil 50 mg/kg the values are importantly reduced to 78.10 ± 0.526 mg/dl (P<0.001) and 75.25 ± 0.631 miligram/deciliter (P<0.0001), respectively. In the Gemfibrozil treated group (Std.Group), the values are reduced to 69.31 ± 0.572 mg/dl (P<0.001) [Table-3].

Triton induced results of high-density lipoprotein cholesterol: HDL-cholesterol in a dexamethasone-induced group has importantly reduced relative to normal rats group. The values have decreased to 23.55 ± 0.410 mg/dl relative to normal rat group, 41.68 ± 0.784 mg/dl. In the group prevented with Cinnamon Oil (25 mg/kg) and Cinnamon Oil (50 mg/kg). The values were 24.29 ± 0.603(P<0.001) and 28.40 ± 0.527 mg/dl (P<0.0001), respectively. In the Gemfibrozil treated group (Std.Group), the values were 35.50 ± 0.675 mg/dl (P<0.001) [Table-2].

Table 2 Effect of Cinnamon Oilon in Triton induced Hyperlipidemiain Wistar Rat

Group	Treatment/dose	Total cholesterol (milligram/deciliter)	Total TG (milligram/deciliter)	HDL-Cholesterol (milligram/deciliter)	LDL-Cholesterol (milligram/deciliter)	VLDL-Cholesterol (milligram/deciliter)	Atherogenic index
I	Normal-group	65.43 ± 0.943	62.65 ± 0.621	41.68 ± 0.784	14.59± 0.565	12.92 ± 0.615	1.47
II	Normal- control group	118.81 ± 1.329	151.71 ± 0.528	23.55 ± 0.410	55.21 ± 0.831	39.41 ±0.640	3.79
III	Standard group Gemfibrozil (10mg/kg)	72.80 ± 0.794**	69.31 ± 0.582**	35.50 ± 0.675**	23.35 ± 0.573**	19.65 ± 0.527**	2.23
IV	Test group-I Cinnamon Oil (25 mg/kg) -I	83.21 ± 1.046**	78.10 ± 0.521**	24.29 ± 0.603**	31.77± 0.608**	31.20 ± 0.431**	3.06
V	Test group-II Cinnamon oil (50mg/kg)	82.35 ± 0.845 ***	75.25 ± 0.631***	28.40 ± 0.527***	26.73 ± 0.405***	25.80 ± 0.525***	2.89

All values were described as mean± SEM. All the data were statistically analyzed by one-way ANOVA followed by Dunnett's multiple comparison test and values P<0.05 were studied to the significant. ******* P<0.0001 when compared to the control group.



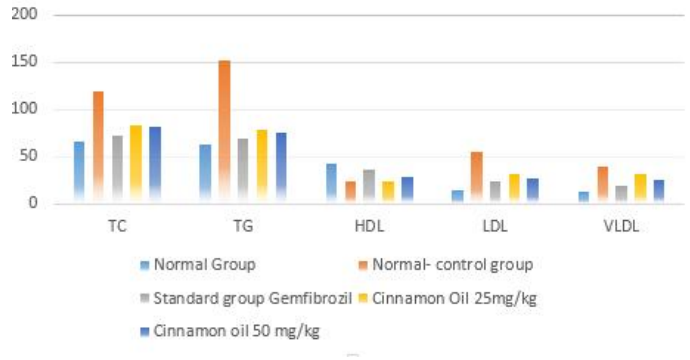


Figure 1. Column Graph Showing Effect of 25mg/kg and 50mg/kg against Dexamethasone Induced Hyperlipidemia
Figure 2. Column Graph Showing Effect of 25mg/kg and 50mg/kg against Triton Induced Hyperlipidemi

Triton induced results of LDL-cholesterol and VLDL-cholesterol: LDL- cholesterol in a dexamethasone-induced group has importantly enhanced to 55.21± 0.831 mg/dl relative to normal rat group, 14.59 ± 0.56mg/ dl. In the group prevented with Cinnamon Oil (25 mg/kg) and Cinnamon Oil (50 mg/kg). The values were diminished 31.77 ± 0.609(P<0.001) and 25.80 ± 0.551mg/dl (P<0.0001), respectively. There is an important decrease in LDL-cholesterol values in the Cinnamon Oil treatment group. Gemfibrozil has importantly diminished LDL- cholesterol level to 23.35 ± 0.573 mg/dl (P<0.001) [Table-6.4]. VLDL-cholesterol in the dexamethasone-induced group has importantly enhanced to 39.41 ± 0.650 mg/dl relative to normal rat group 12.92 ± 0.615 mg/ dl. In the group prevented with Cinnamon Oil (25 mg/kg) and Cinnamon Oil (50 mg/kg). The values were diminished 31.20 ± 0.431 (P<0.001) and 25.80 ± 0.525 mg/dl (P<0.0001), respectively. There is an importantly decreased Cinnamon Oil treatment group. Gemfibrozil has importantly diminished VLDL- cholesterol level to 19.65 ± 0.527 mg/dl (P<0.001) [Table-2].

Triton induced results of atherogenic index

$$\text{Atherogenic index} - \frac{\text{Total serum cholesterol}}{\text{Total serum IIigh density containing lipid protein}}$$

The atherogenic index in the dexamethasone-induced group hyperlipidemia control group is enhanced to 3.79 relatives to the normal rat group, 1.47. In the group prevent with Cinnamon Oil (25 mg/kg) and Cinnamon Oil (50 mg/kg) the values are importantly diminished to 3.06 and 2.89, respectively. Gemfibrozil has importantly diminished the values 2.23 [Table-2]. All values were described as mean± SEM. All the data were statistically analyzed by one-way ANOVA followed by Dunnett's multiple comparison test and values P<0.05 were studied to the significant. ******* P<0.0001 when compared to the control group.

Conclusion

The current pharmacological research was exploring the anti-hyperlipidemic capability of Cinnamon oil (25 mg/kg and 50mg/kg). Cinnamon oildiminishes triglyceride cholesterol, very low-density containing lipid protein, and low-density lipoprotein and improves the concentration of high-density containing lipidprotein. Cinnamon oil shows a significant anti-hyperlipidemic effect in Wistar rodents after oral administration. So we can use Cinnamon oil drug for the management of dyslipidemia. Acute hyperlipidemia was induced by the administration of Dexamethasone (10 milligram/kilogram I.P) for 8 days in Wistar rat& Tritonadministration of (10 milligram/kilogram I.P) for 7 days. Administration of Cinnamon oil (25 milligram/kilogram and 50 milligram/kilogram) for 8 days in Dexamethasone induced hyperlipidemia models &Tritonadministration of (10 milligram/kilogram I.P) for 7 days. respectively, successfully prevented the elevation of TC, Total-glyceride, High density containing lipid protein, Low thickness containing lipid protein, Very low density containing lipid protein. In conclusion, the findings of the study suggest that Cinnamon oil drug 50milligram/kilogram is a more effective comparison to 25mg/kg in the case of hyperlipidemia. Starter test results are exported that Cinnamon oil (25 mg/kg and 50mg/kg) is having critical anti-hyperlipidemic potential.

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Author contribution: All author participated equally.

Conflict of interest –None.

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