



MEDIBEST PHARMA PVT. LTD.,

Regd. Office / Works : N-31, Sidco Industrial Estate, Hosur - 635 126 (T.N.)
Phone : 04344 - 276617 / 276393 , Mobile : 9487557528
E-mail : medibest06@gmail.com URL : www.medibestpharma.com
CIN : U24231TZ1985PTC003995



19/09/2022

To

The Principal,
JKK Munirajah Institute of Health Sciences College of Pharmacy,
TN Palayam.

Subject: Proposal for Research Collaboration – Reg.

Dear Sir,

Greetings. I am writing on behalf of **Medibest Pharma Private Limited, Hosur**, to propose a collaboration that aligns with our mutual interests and scientific objectives.

We are impressed by your institution's expertise and research capabilities, particularly in the area of pharmacology and the study of natural extracts. Our organization is keen to explore the possibility of engaging JKK Munirajah Institute of Health Sciences College of Pharmacy in conducting research on the "**Hypolipidemic Activity of Garcinia Cambogia**"

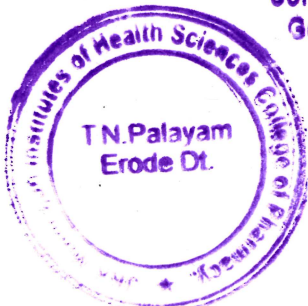
Our interest in this project stems from our dedication to advancing pharmaceutical research and developing innovative solutions to combat hyperlipidaemia. Given the esteemed reputation of your institution, we believe that a collaboration with JKK Munirajah Institute of Health Sciences College of Pharmacy would significantly enhance our research efforts in this specific area.

In this regard, we would like to propose that your institution undertakes the research project outlined above, with funding and logistical support provided by Medibest Pharma Private Limited. We are committed to ensuring the success of this project and will facilitate all necessary resources required for its completion.

Thanking you.

Principal

JKK Munirajah Institute of Health Sciences
College of Pharmacy, T.N.Palayam,
Gobi (Tk), Erode (Dt) - 638 506



Sincerely,

For MEDIBEST PHARMA PVT.LTD.,

P.V.VIGNESHWAR
DIRECTOR



JKK MUNIRAJAH INSTITUTE OF HEALTH SCIENCES COLLEGE OF PHARMACY

(Approved by Tamil Nadu Govt. & Pharmacy Council of India - New Delhi, Affiliated to The Tamil Nadu Dr. M.G.R Medical University, Chennai)
Thookanaickenpalayam, Gobichettipalayam (TK), Erode (DT) - 638506, Tamil Nadu.

DR. P. PERUMAL M.Pharm., Ph.D., FIC.,
Professor & Principal

22.09.2022

To

Medibest Pharma Private Limited,
SIDCO Industrial Estate,
Hosur – 635126.

Subject: Response to Proposal for Research Collaboration - Hypolipidemic Activity of Ethanolic Extracts of Garcinia Cambogia in Triton-X 100 Induced Hyperlipidemia in Rats.

Dear Sir,

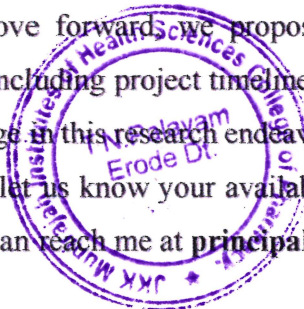
I hope this letter finds you well. We greatly appreciate your interest in collaborating with JKK Munirajah Institute of Health Sciences College of Pharmacy for the research project titled "**Hypolipidemic Activity of Ethanolic Extracts of Garcinia Cambogia in Triton-X 100 Induced Hyperlipidemia in Rats.**"

First and foremost, we are honoured and excited about the possibility of working with **Medibest Pharma Private Limited** on this significant research endeavour. Your organization's dedication to advancing pharmaceutical research resonates with our mission to contribute to the field of pharmacology and improve healthcare outcomes.

We have carefully reviewed your proposal, and we are enthusiastic about the potential impact of this collaboration. The research project aligns perfectly with our expertise and ongoing efforts in the area of natural extracts and their therapeutic applications. We believe that this partnership will not only enhance our research capabilities but also foster valuable contributions to the scientific community.

We would like to express our gratitude for your willingness to provide financial support and logistical assistance for this project. We are confident that this collaboration will yield substantial results and advancements in the understanding and treatment of hyperlipidaemia.

To move forward, we propose scheduling a meeting to discuss the specific details of the collaboration, including project timelines, budget considerations, and other essential aspects. Our team is excited to engage in this research endeavour and is committed to ensuring the successful completion of the project. Please let us know your availability, and we will coordinate a meeting that accommodates your schedule. You can reach me at principal@jkkmihsdp.org to coordinate further.




Principal

JKK Munirajah Institute of Health Sciences
College of Pharmacy, T.N.Palayam,
Gobichettipalayam, Erode Dt. 638506



JKK MUNIRAJAH INSTITUTE OF HEALTH SCIENCES COLLEGE OF PHARMACY

(Approved by Tamil Nadu Govt. & Pharmacy Council of India - New Delhi, Affiliated to The Tamil Nadu Dr. M.G.R Medical University, Chennai)
Thookanaickenpalayam, Gobichettipalayam (TK), Erode (DT) - 638506, Tamil Nadu.

DR. P. PERUMAL M.Pharm., Ph.D., FIC.,
Professor & Principal



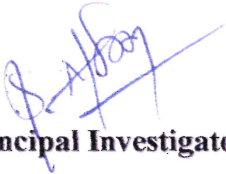
We look forward to a productive partnership and the opportunity to contribute meaningfully to the advancement of pharmaceutical research.

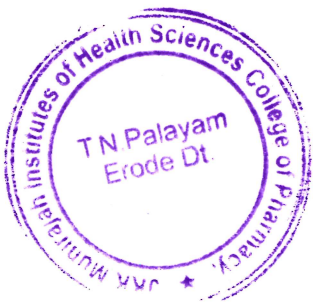
With reference to the letter dated 19/09/2022, JKKMIHSCP is permitting the following faculty members to do collaborative research with Medibest Pharma Private Limited, Hosur and a proposal on the mentioned title "Hypolipidemic Activity of Ethanolic Extracts of Garcinia Cambogia in Triton-X 100 Induced Hyperlipidemia in Rats" is submitted along with this letter. The faculty members were assigned to do research work with Medibest Pharma Private Limited, Hosur.


1. Dr. NAVANEETHAKRISHNAN. S, Assistant Professor, Department of Pharmacology.
2. Dr. BALAJI. I, Associate Professor, Department of Pharmacology.
3. Mr. PRAVEEN. G (Reg. No: 380020516514), Student, 2nd Pharm.D.
4. Mr. MICHEAL ARUL ANTONY. J (Reg. No: 380020516510), Student, 2nd Pharm.D.
5. Mr. KAVIARASAN. R (Reg. No: 380020516509), Student, 2nd Pharm.D.


Kindly permit the above faculty members to execute the above research work. We are expecting a positive reply from your end.

Thanking you,


Principal Investigator




Principal
JKK Munirajah Institute of Health Sciences
College of Pharmacy, T.N.Palayam,
Gobi (Tk), Erode (Dt) - 638 506


Principal
JKK Munirajah Institute of Health Sciences
College of Pharmacy, T.N.Palayam,
Gobi (Tk), Erode (Dt) - 638 506



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Thookanaickenpalayam, Gobichettipalayam (TK), Erode (DT) - 638506, Tamil Nadu.

DR. P. PERUMAL M.Pharm., Ph.D., FIC.,
Professor & Principal

BUDGET AND FACULTY DETAILS

Project Title: Hypolipidemic Activity of Ethanolic Extracts of Garcinia Cambogia in Triton-X 100
Induced Hyperlipidemia in Rats

Name of the Institution: JKK Munirajah Institute of Health Sciences College of Pharmacy.

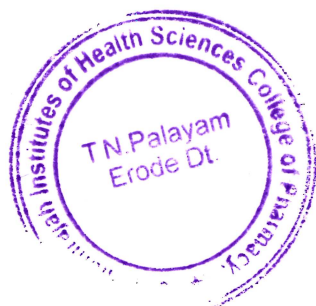
Project Duration: 6 months

Project Budget Estimation:

S.No	Detail of Expenditure	Amount in lakhs
1.	Animal + Maintenance cost	0.375
2.	Chemical cost (Garcinia Cambogia) + (Triton-X 100)	0.55
3.	Laboratory Supplies and Consumables	0.2
4.	Personnel Costs	0.1
5.	Miscellaneous Costs (Remaining Funds)	0.365
Total Budget		1.59 lakhs

Details of the Project Team:

Principal Investigator (PI):	Dr. NAVANEETHAKRISHNAN. S Assistant Professor, Department of Pharmacology, JKKMIHSCP.
Co-Investigators:	Dr. BALAJI. I Associate Professor, Department of Pharmacology, JKKMIHSCP.
Student Investigators:	Mr. PRAVEEN. G Mr. MICHEAL ARUL ANTONY. J Mr. KAVIARASAN. R



Thank you

Principal

JKK Munirajah Institute of Health Sciences
College of Pharmacy, T.N. Palayam,
Gobi (Tk), Erode (Dt) - 638 506

Yours Sincerely,


Principal

JKK Munirajah Institute of Health Sciences
College of Pharmacy, T.N. Palayam,
Gobi (Tk), Erode (Dt) - 638 506



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Phone : 04344 - 276617 / 276393 , Mobile : 9487557528

E-mail : medibest06@gmail.com

URL : www.medibestpharma.com

CIN : U24231TZ1985PTC003995



27.09.2022

Dear Principal,

Sub: Financial assistance for Project scheme - Reg.

This is to invite your attention to the reference cited and to inform that the project proposal titled **“HYPOLIPIDEMIC ACTIVITY OF ETHANOLIC EXTRACTS OF GARCINIA CAMBOGIA IN TRITON - X 100 INDUCED HYPERLIPIDEMIA IN RATS”** submitted by Dr. S. NAVANEETHAKRISHNAN as Principal Investigator, Dr. I. BALAJI as Co-investigator and Mr. PRAVEEN. G, Mr. MICHEAL ARUL ANTONY. J, Mr. KAVIARASAN. R as student investigators has been approved. An amount of ₹ 159000 /- is sanctioned by the **Medibest Pharma Private Limited**. The budget estimate of the project is as detailed below.

S.No	Detail of Expenditure	Amount in lakhs
1.	Animal + Maintenance cost	0.375
2.	Chemical cost (Garcinia Cambogia) + (Triton-X 100)	0.55
3.	Laboratory Supplies and Consumables	0.2
4.	Personnel Costs	0.1
5.	Miscellaneous Costs (Remaining Funds)	0.365
Total Budget		1.59 lakhs

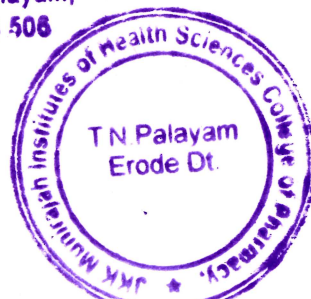
The PI has to submit the signed Terms and Conditions (as per the guidelines) and the date of start of the project within two weeks to the undersigned. The project should be completed within six months and submit the certified soft copy of the final report, Statement of Expenditure and Utilization Certificate counter signed by the Head of the Institution for releasing the grant.

Thanking you,

Principal
JKK Munirajan Institute of Health Science.
College of Pharmacy, T.N.Palayam,
Gobi (Tk), Erode (Dt) - 638 508

Copy to:

Dr. Navaneethakrishnan. S
Assistant Professor, JKKMIHSCP.



Yours sincerely

For MEDIBEST PHARMA PVT.LTD.,

P.V.VIGNESHWAR
DIRECTOR



JKK MUNIRAJAH INSTITUTE OF HEALTH SCIENCES COLLEGE OF PHARMACY

(Approved by Tamil Nadu Govt. & Pharmacy Council of India - New Delhi, Affiliated to The Tamil Nadu Dr. M.G.R Medical University, Chennai)
Thookanaickenpalayam, Gobichettipalayam (TK), Erode (DT) - 638506, Tamil Nadu.

DR. P. PERUMAL M.Pharm., Ph.D., FIC.,
Professor & Principal

PROJECT COMPLETION REPORT

Title of the project : Hypolipidemic Activity of Ethanolic Extracts of Garcinia Cambogia in
Triton-X 100 Induced Hyperlipidemia in Rats

Category of the project : Research project

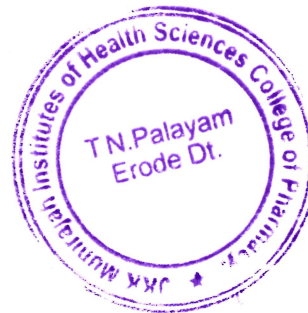
Date of approval of competent authority : 27/09/2022

Total cost of the project : Rs: 1,59,000/-

S.NO.	ITEMS	AMOUNT (₹)
1.	Animal + Maintenance cost	37500
2.	Chemical cost (Garcinia Cambogia) + (Triton-X 100)	55000
3.	Laboratory Supplies and Consumables	20000
4.	Personnel Costs	10000
5.	Miscellaneous Costs (Remaining Funds)	36500
	Total	159000

Date of start of the project : 27/09/2022

Date of completion of project : 25/03/2023



Name and Signature of Principal Investigator

Principal
JKK Munirajah Institute of Health Sciences
College of Pharmacy, T.N. Palayam,
Gobi (TK), Erode (Dt) - 638 506

Name and Signature of Co-investigator



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E-mail : medibest06@gmail.com

URL : www.medibestpharma.com

CIN : U24231TZ1985PTC003995



LETTER OF APPRECIATION

Date: 05.04.2023

To

The Principal,

JKK Munirajah Institute of Health Sciences College of Pharmacy,

T.N. Palayam, Erode, 638506.

Subject: Completion of project – reg.

Dear Sir,

With reference to above cited subject, Medibest Pharma Private Limited, Hosur, extend sincere gratitude towards JKK Munirajah Institute of Health Sciences College of Pharmacy, T.N. Palayam, for successfully completion of project "Hypolipidemic Activity of Ethanolic Extracts of Garcinia Cambogia in Triton-X 100 Induced Hyperlipidemia in Rats".

We also appreciate sincere efforts taken by **Dr. S. NAVANEETHAKRISHNAN**, for guiding and valuable suggestions provided for completion of this project. We look forward to the continuation of our successful partnership and to exploring new opportunities for collaboration.

Thank you

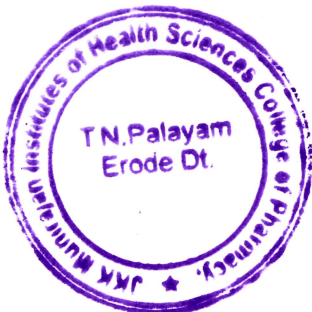
Sincerely,

For MEDIBEST PHARMA PVT.LTD.

P.V. Vigneshwar
P.V.VIGNESHWAR
DIRECTOR

[Signature]
Principal

JKK Munirajah Institute of Health Science:
College of Pharmacy, T.N.Palayam,
Gobi (Tk), Erode (DQ) - 638 506





JKK MUNIRAJAH INSTITUTE OF HEALTH SCIENCES COLLEGE OF PHARMACY

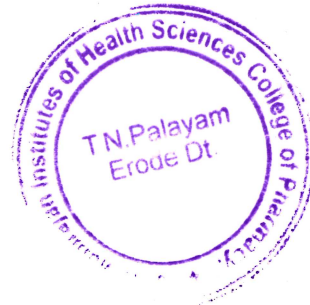
(Approved by Tamil Nadu Govt. & Pharmacy Council of India - New Delhi, Affiliated to The Tamil Nadu Dr. M.G.R Medical University, Chennai)
Thookanaickenpalayam, Gobichettipalayam (TK), Erode (DT) - 638506, Tamil Nadu.

DR. P. PERUMAL M.Pharm., Ph.D., FIC.,
Professor & Principal

UTILIZATION CERTIFICATE

Certified that out of Rs.1,59,000/-..... sanctioned by **Medibest Pharma Private Limited.** towards financial assistance for the student project titled “...**HYPOLIPIDEMIC ACTIVITY OF**.....
...**ETHANOLIC EXTRACTS OF GARCINIA CAMBOGIA IN TRITON X100 INDUCED**
...**HYPERLIPIDEMIA IN RATS**.....”, an amount of Rs.1,59,000/-..... was utilized for the purpose for which it was sanctioned, leaving a balance of Rs. ...**-NIL-**..... at the close of
...**25.03.2023**..... As shown in the Statement of Expenditure annexed.

Name & Signature of the Principal Investigator



Name & Signature of Head of Institution

Principal
JKK Munirajah Institute of Health Sciences
College of Pharmacy, T.N. Palayam,
Gobi (Tk), Erode (Dt) - 638 506

Principal
JKK Munirajah Institute of Health Sciences
College of Pharmacy, T.N. Palayam,
Gobi (Tk), Erode (Dt) - 638 506

**"HYPOLIPIDEMIC ACTIVITY OF ETHANOLIC EXTRACTS OF GARCINIA
CAMBOGIA IN TRITON-X 100 INDUCED HYPERLIPIDEMIA IN RATS"**

PRINCIPAL INVESTIGATOR

Dr. NAVANEETHAKRISHNAN. S
Assistant Professor
Department of Pharmacology

CO-INVESTIGATOR

Dr. BALAJI. I
Associate Professor
Department of Pharmacology

STUDENT INVESTIGATORS

Mr. PRAVEEN. G

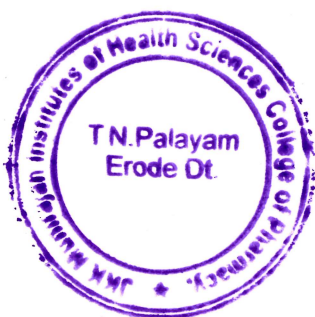
REGISTER NO: 380020516514

Mr. MICHEAL ARUL ANTONY. J

REGISTER NO: 380020516510

Mr. KAVIARASAN. R

REGISTER NO: 380020516509



Principal

**JKK Munirajah Institute of Health Sciences
College of Pharmacy, T.N. Palayam,
Gobi (Tk), Erode (Dt) - 638 506**

SEPTEMBER-2023

**JKK MUNIRAJAH INSTITUTE OF HEALTH SCIENCES
COLLEGE OF PHARMACY,
T.N- PALAYAM-638506, GOBI (TK), ERODE (DT),
TAMILNADU.**

CERTIFICATE

This is to certify that the Research entitled “**HYPOLIPIDEMIC ACTIVITY OF ETHANOLIC EXTRACTS OF GARCINIA CAMBOGIA IN TRITON- X 100 INDUCED HYPERLIPIDEMIA IN RATS**” submitted to The **Medibest Pharma Pvt. Ltd.** is the bonafide project work carried out in the Department of Pharmacology, JKK Munirajah Institute of Health Sciences College of Pharmacy, T.N-Palayam, Gobi, Erode, Under the guidance of **Dr.S.NAVANEETHAKRISHNAN, Pharm. D., Assistant Professor, Department of Pharmacology, JKK Munirajah Institute of Health Sciences College of Pharmacy, T.N-Palayam,Gobi, Erode.** During the academic year 2022-2023.

Place: T.N-Palayam

Date: 25.08.2023



Dr. P. Perumal. M.Pharm,Ph.D,FIC

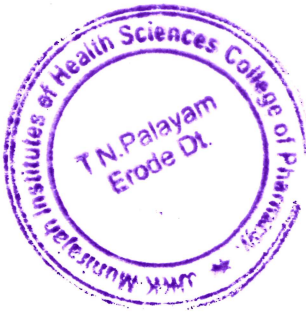
PRINCIPAL



Principal
JKK Munirajah Institute of Health Sciences
College of Pharmacy, T.N.Palayam,
Gobi (Tk), Erode (Dt) - 638 506

DECLARATION

This is to certify that the Research entitled “**HYPOLIPIDEMIC ACTIVITY OF ETHANOLIC EXTRACTS OF GARCINIA CAMBOGIA IN TRITON- X 100 INDUCED HYPERLIPIDEMIA IN RATS**” submitted to The **Medibest Pharma Pvt. Ltd.** is the bonafide project work carried out in the Department of Pharmacology, JKK Munirajah Institute of Health Sciences College of Pharmacy, T.N-Palayam, Gobi, Erode, Under the guidance of **Dr.S.NAVANEETHAKRISHNAN Pharm. D., Assistant Professor, Department of Pharmacology, JKK Munirajah Institute of Health Sciences College of pharmacy, T.N-Palayam, Gobi, Erode.** During the academic year 2022-2023.



Place: T.N-Palayam

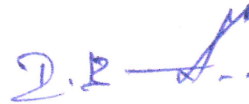
Date: 25-03-2023


Dr. S. NAVANEETHAKRISHNAN Pharm.D.,

Principal Investigator


Principal

JKK Munirajah Institute of Health Sciences
College of Pharmacy, T.N.Palayam,
Gobi (Tk), Erode (Dt) - 638 506



Dr. I. BALAJI Pharm.D.,

Co-Investigator

DECLARATION

The research work embodied in this work entitled “Hypolipidemic Activity of Ethanolic Extracts of Garcinia Cambogia in Triton-X 100 Induced Hyperlipidemia in Rats” was carried out by us under the direct supervision of Dr.S.Navaneethakrishnan Pharm. D., Assistant Professor, Department of Pharmacology, JKK Munirajah Institute of Health Sciences College of Pharmacy, T.N-Palayam, Gobi.

The Project submitted to the **Medibest Pharma Pvt. Ltd.** during the academic year 2022-2023.



Principal
JKK Munirajah Institute of Health Sciences
College of Pharmacy, T.N.Palayam,
Gobi (Tk), Erode (Dt) - 638 506



ACKNOWLEDGEMENT

First and for most we express our heartfelt sense of gratitude and faithfulness to God 'grace and our family members, which has enabled us to finish our project work successfully.

With the blessing of our Founder chairman Dr. J.K.K Munirajah, M.Tech, (Bolton). D.Litt., and Secretary Mrs. Kasthuripriya Kirupakarmurali, M.B.A.,

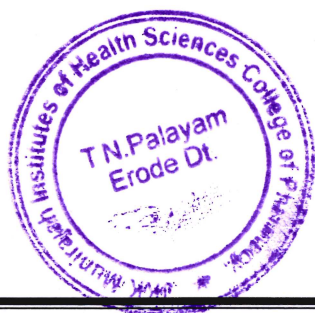
J.K.K Munirajah Institute of Health Sciences College of Pharmacy, T.N-Palayam, Gobi, Erode for providing all the facilities to carry out this work.


Our sincere gratitude to our beloved sir, Dr. P.Perumal, M.Pharm, Ph.D,FIC., Principal and Head of the Department of Pharmaceutical Chemistry, J.K.K Munirajah Institute of Health Sciences College of Pharmacy, T.N-Palayam, Gobi, Erode for his kindly support for our project work and for his encouragement and also providing all facilities in this Institute to the fullest possible extent enabling us to complete this work.

With the immense pleasure and pride, we would take opportunity in expressing our deep sense of gratitude to our beloved guide Dr.S.Navaneethakrishnan Pharm.D., Assistant Professor, Department of Pharmacology J.K.K Munirajah Institute of Health Sciences College of Pharmacy, T.N-Palayam, Gobi, Erode under whose active guidance, innovate ideas, constant inspiration and encouragement of the work entitled "Hypolipidemic Activity of Ethanolic Extracts of Garcinia Cambogia in Triton- X 100 Induced Hyperlipidemia in Rats" has been carried out.

We also express our grateful thanks to all the teaching and non-teaching staff members of J.K.K Munirajah Institute of Health Sciences College of Pharmacy for their valuable advice and cooperation.

We express our heartfelt gratitude to the almighty, for giving us the right way to achieve the best of our project.



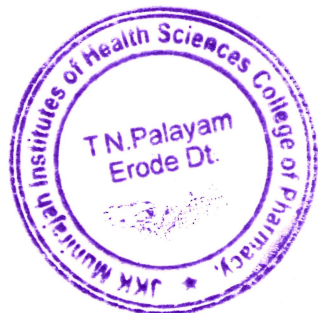

Principal
JKK Munirajah Institute of Health Sciences
College of Pharmacy, T.N.Palayam,
Gobi (Tk), Erode (Dt) - 638 505

We would like to give sincere thanks to our classmates for their timely help and co-operation.

We also extend our thanks to all staff members of Department of Pharmaceutical Biotechnology, Pharmaceutical Chemistry, Pharmacognosy, Pharmaceutics and Pharmacology for their co-operation.

We would like to Thank Medibest Pharma Pvt. Ltd. Madurai to give a Financial and moral support to completion of the project being a successful manner on the duration of 2022-2023.

Last but not least, great thanks from the heart to our beloved MOTHER and FATHER. They are our living god, as who guided us in the rightful way to achieve all our activities. They gave the incredible effort to become a successful for bright future in this world. Thanks a lot, to my parents.



Principal
JKK Murirajah Institute of Health Sciences
College of Pharmacy, T.N. Palayam,
Gobi (Tk), Erode (Dt) - 638 506

ABSTRACT:

Background and objectives:

Hyperlipidaemia, a global health problem, is associated with metabolic complications such as diabetes mellitus hyperglycaemia, hypertension, cardiovascular diseases, and loss of vision. The present study evaluated the anti-hyperlipidaemia and anti-diabetics effects of ethanol extract of *Garcinia cambogia* (L.) N. Robson (*G. cambogia*) fruit rind in a Triton - X – 100 induced hyperlipidemia Wistar Albino Rat model.

Materials and Methods:

Triton - X 100 in the dose of 400mg/kg per oral to induce maximum hyperlipidemia in albino rats. Seven groups of rats (n=6) - normal control, hyperlipidaemia, hyperlipidaemia treated with *G. cambogia* at 400 mg/kg and 800 mg/kg body weight, and hyperlipidaemia treated with Atorvastatin at 40 mg/kg body weight, were studied. Blood samples were collected after 48hrs of treatment. Serum total cholesterol levels (TCL), serum total triglyceride levels (TGL), high-density lipoprotein levels, and body weight were measured.

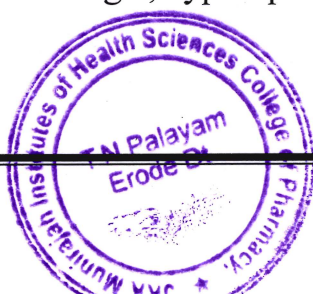
Results:

Although *G. cambogia* treatment decreased the serum TCL, HDL, TGs and body weight significantly ($P < 0.05$).

Conclusions:

Ethanol extract of *G. cambogia* fruit rind possesses anti-hyperlipidemic activity and significantly reduces total cholesterol and also triglycerides level.

Keywords: *Garcinia cambogia*, hyperlipidaemia, Triton –X-100, cholesterol.



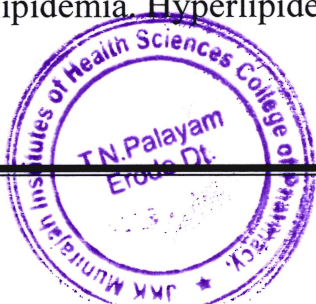
Principal
JKK Munirah Institute of Health Sciences
College of Pharmacy, T.N.Palayam,
Gobi (Tk), Erode (Dt) - 638 506


INTRODUCTION

Hyperlipidaemia is a condition that incorporates various genetic and acquired disorders that describe elevated lipid levels within the human body. Hyperlipidaemia is extremely common, especially in the Western hemisphere, but also throughout the world. Alternatively, a more objective definition describes hyperlipidaemia as low-density lipoprotein (LDL), total cholesterol, triglyceride levels, or lipoprotein levels greater than the 90th percentile in comparison to the general population, or an HDL level less than the 10th percentile when compared to the general population. Lipids typically include cholesterol levels, lipoproteins, chylomicrons, VLDL, LDL, Apo lipoproteins, and HDL.

Through a vast array of trials and studies, it has been consistently shown that elevated levels of LDL cholesterol increase a person's risk for the development of atherosclerotic plaques and subsequent vascular disease. In stark contrast, high-density lipoprotein (HDL) cholesterol assists in regulating cholesterol levels to prevent imbalances that would increase the risk of atherosclerotic vascular disease. Each patient's LDL cholesterol goal is conditional on their overall cardiovascular risk, and medical therapy should be independently tailored to the patient. Managing risk factors, such as hyperlipidemia, to diminish the risk for atherosclerotic cardiovascular disease is referred to as "primary prevention." The grounds for lowering LDL cholesterol derives from widespread epidemiologic data that reveals a positive, continuous correlation between LDL cholesterol levels, cardiovascular events, and patient mortality.

Treatment of hyperlipidaemia continues to evolve as we better conceptualize the underlying pathophysiology, and we concurrently improve on preceding medical therapies. This article will overview the background, diagnosis, and most recent treatment guidelines for hyperlipidemia. Hyperlipidemia is a growing public health concern

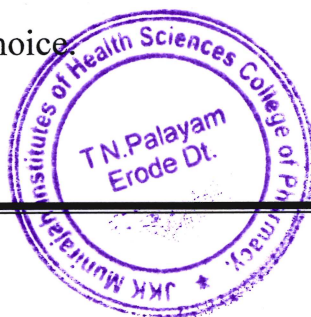



Principal
JKK Munirajah Institute of Health Sciences
College of Pharmacy, T.N. Palayam.
Gobi (Tk), Erode (Dt) - 638 506

worldwide. Obesity and overweight are important public health problems as their prevalence rates continue to rise. Worldwide, over 1 billion and 650 million adults are reported to be overweight and obese, respectively. Further, >60% live in Asia, mainly in India and China. Obesity increases the risk of developing diseases such as DM, cancers, cardiovascular disease, and musculoskeletal and neurological disorders. These in turn affect the health of citizens and directly impact the productivity and economy of the country.

Several therapeutic agents are used to treat obesity, hyperlipidemia. However, most of these agents pose undesirable side effects such as, lactic acidosis, hyperglycemia, diarrhoea, and flatulence, which impose an economic burden. Therefore, extensive research is going on worldwide to find alternative therapeutic strategies to minimize the side effects and cost. The major drug therapy for hyperlipidemia comprises statins, fibrates, bile-acid sequestrates, and nicotinic acid and acipimox. Dual drug therapies are often recommended in patients who are unable to achieve therapeutic goals with first-line oral hyperlipidemia agents as monotherapy. Despite the appreciable therapeutic benefits, the conventional dosage forms depict differential bioavailability and short half-life, mandating frequent dosage, and causing greater side effects leading to therapy ineffectiveness and patient non-compliance.

Increasing physical activity, and managing fat and sugar-rich products, are the keys to managing obesity. Indian medicinal plants and their plant products have traditionally been used since ancient times. These plant-based foods have novel protection, and are used as an alternative medicine to treat several medical conditions. Purified and crude extract contains numerous active phytochemicals which exert anti-inflammatory and antioxidant properties by regulating several signalling pathways]. The high degree of safety, good effectiveness, wide availability, acceptability, and affordability make plant-based therapy a preferable choice.



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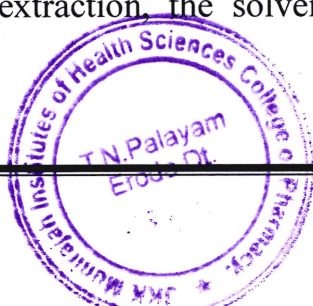
Garnicia cambogia (L.) N. Robson (*G. cambogia*), belongs to the family Clusiaceae, commonly known as “Malabar Tamarind” is found in the South-eastern regions of the world. This evergreen plant is about 12 meters long and is widely found in the dense forest of Southwest Indian states. The fruit of *Garnicia* can be yellow, orange, or red depending on the ripening condition, and each fruit has 6 or 8 seeds surrounded by a succulent aril. The dried rind of the fruit has been used as a food preservative and prevents bacterial infection in fish. The major phytoconstituents in *Garnicia* fruit is hydroxyl citric acid (HCA). The intake of *Garnicia* fruit is reported to result in weight loss. Additionally, this plant extract is reported to have several medicinal properties such as anti-inflammatory, anticancer, anti-helminthic, anti-ulcer, antioxidant, and hepatoprotective activities in various *in vivo* and *in vitro* models.

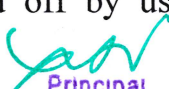
Considering the ancient Indian traditional medical system, which used chemical constituents of plants as alternative medicine, the present study aimed to evaluate the antihyperlipidemic effects of ethanol extract of *G. cambogia* fruit rind in a Triton – X-100 induced hyperlipidemic albino Rat model that mimics hyperlipidemia. Triton X – 100 most widely used non-ionic surfactants for lysing cells to extract protein and other cellular organelles or to permeabilize the living cell membrane for transfection.

MATERIALS AND METHODS

Preparation *Garnicia* fruit rind ethanol extracts

To prepare crude extract of *G. cambogia*, fresh, mature fruits were collected from a plantation. The fruit rind was shade dried and then powdered. The powdered rind (1000 gms) of *Garnica* fruit was loaded into the thimble of soxhlet apparatus, and ethanol (200 mL) was used as solvent for extraction. Extraction was continued till the exhaustion of constituents. After extraction, the solvent was distilled off by using a rotary flash




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evaporator. Evaporation of solvent lead to a reddish-brown semisolid *GC* extract, which was dried, weighed, and dissolved in distilled water. Two doses, 400 mg, and 800 mg/kg body weight, were used for treatment.

Animals

Healthy adult Wistar Albino rats of either sex were provided from the local colonies of the Central Animal house facility (Department of Pharmacology). The animals were housed in polypropylene cages with sterile padded husk as beddings and maintained with relative humidity $55\pm 5\%$, room temperature $25\pm 2^\circ\text{C}$, and 12/12 h light/dark cycle. Animals were fed with commercial pelleted chow and water *ad libitum*. Animals were acclimatized for one week before the commencement of the study.

Chemicals

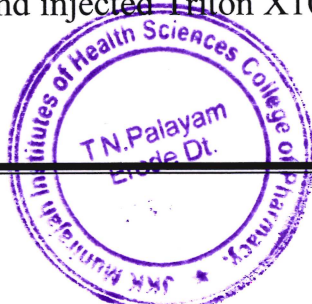
Triton X 100 was purchased from finer chemicals limited. All other chemicals and reagents used were of analytical grade.


Standardisation of Hyperlipidemic dose of Triton - X 100:

To induce the hyperlipidemia rats were kept in fasting for 18 hrs. with excess of water and subjected to triton X 100 at the dose of 300, 400, 500, 600 and 700mg/kg p.o. and the different lipoproteins was evaluated at 24, 48 and 72 hrs. It was observed that Triton - X 100 in the dose of 400mg/kg per oral can induce maximum hyperlipidemia after 48 hrs. Hence 400mg/kg per oral was considered the ideal dose for induction of hyperlipidemia. Atorvastatin was used as a standard drug, administered orally at a dose of 40 mg/kg body weight.

Experimental design:

Animals are divided into seven different groups in each 6 animals. Animals are kept fasting for 18 hrs and injected Triton X100 at a dose of 400 mg/kg p.o. prepared




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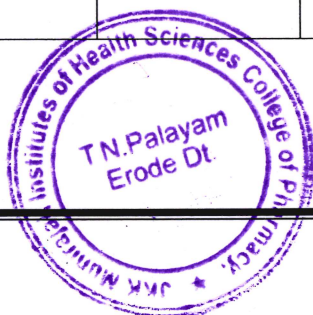
in saline solution. According to treatment protocol, the first dose of the drug treatment was given immediately after triton administration to animals from group 2 to Second and third dose was administered after 24 and 44 hrs respectively. After 4 hrs of third dose the animals are used for the study of various biochemical parameters. Blood was collected by puncture of retro orbital plexus of the rat under anaesthesia and centrifuge at 2000rpm for 30 min to get the serum and analysed for biochemical parameters.

Biochemical estimation

Blood samples were collected after 48 hours of triton injection by retro-orbital puncture. Blood was immediately centrifuged (2500 rpm for 10 min) and serum was analyzed for total cholesterol (TC), Triglycerides (TG), High density lipoprotein (HDL), low density lipoprotein (LDL) and very low density lipoprotein (VLDL).

Table 1: Hypolipidemic Activity of Ethanolic Extract of Garcinia Combogia (Eegc) in Triton X-100 Induced Hyperlipidemia

Treatment	Serum TG	Serum TC	Serum HDL	Serum LDL	Serum VLDL
Normal	16.90±1.76	81.0±1.56*	34.6±1.05	42.23±4.31*	2.541±0.12
Hyperlipidemic control	89.97±2.88*	123.10±2.44	16.11±0.58*	81.10±3.52	18.9±0.57
Atorvastatins	37.33±1.76*	91.24±1.26**	47.56±1.55*	34.20±1.66*	7.66±0.35
EEGC 300mg/kg	35.27±2.11**	80.68±1.86**	44.13±1.28*	42.01±4.16*	10.21±0.21*
EEGC400mg/kg	36.56±1.37*	90.45±6.57**	46.56±1.57**	36.33±4.86*	8.12±0.12*



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Values are expressed as mean \pm S.E.M; n=6, *P<0.05, **P<0.01, ***P<0.001 considered for significance, (ANOVA followed by Dunnett's test).

Statistical Analysis

All results are expressed as mean \pm standard error. The data was Analysed using one ways of analysis of variance (ANOVA). The statistical significance of the different of the means was evaluated by Dennett's test.

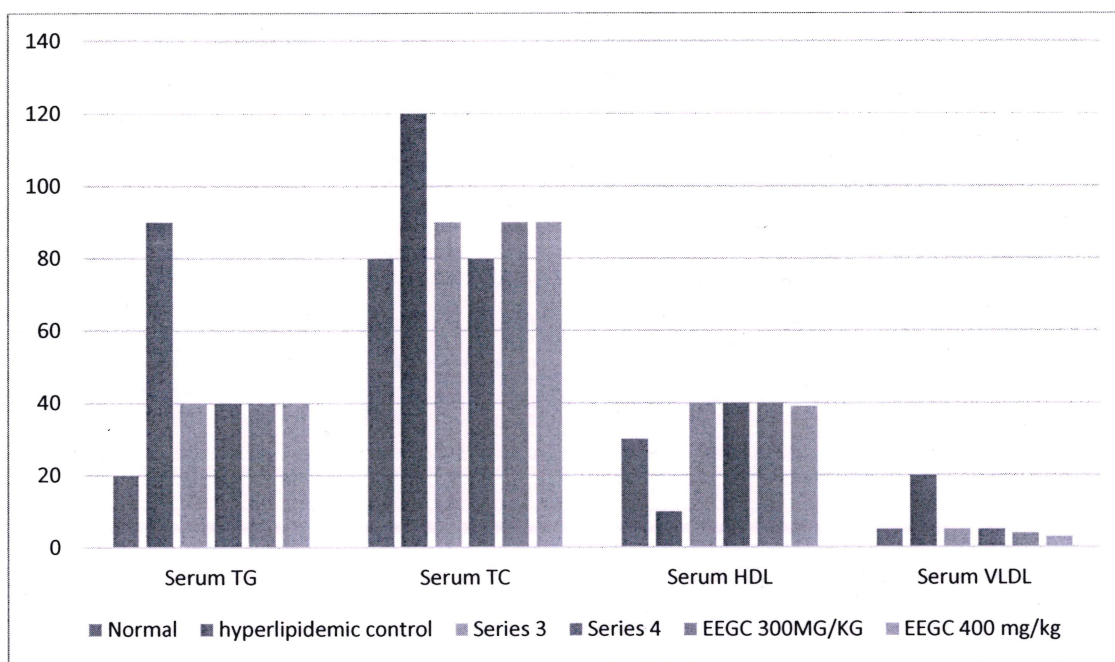
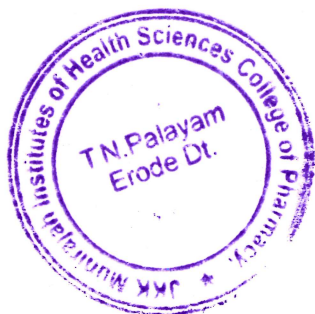


Figure 1: Effect of Eeca on Serum Tg, Serum Tc, Hdl, Ldl And Vldl



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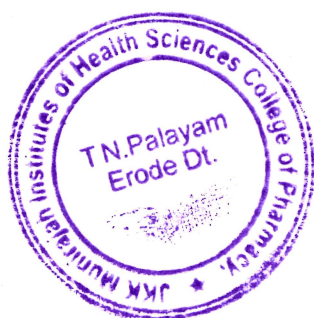
RESULTS

The Preliminary phytochemical investigation of the EEGC showed the presence of glycosides, flavonoids, triterpenoids, volatile oils, Sugars and resins.

As mentioned in the table 1, Estimation of Serum TG levels of the anti-hyperlipidemia drug like Atorvastatin, EEGC300 mg/kg and 400 mg/kg were 37.33 ± 1.76 , 35.27 ± 2.11 , and 36.56 ± 1.37 respectively. Estimation of Serum TC levels of Atorvastatin and EEGC300 mg/kg and 400 mg/kg were 91.24 ± 1.26 , 80.68 ± 1.86 , 90.45 ± 6.57 .

Respectively. Estimation of Serum HDL levels of Atorvastatin, EEGC 300 mg/kg and 400 mg/kg were 47.56 ± 1.55 , 44.13 ± 1.28 , 46.56 ± 1.57 respectively. Estimation of Serum LDL levels of Atorvastatin, EEGC 300 mg/kg and 400 mg/kg were 34.20 ± 1.66 , $42.01 \pm 4.16^*$, $36.33 \pm 4.86^*$ respectively. Estimation of Serum VLDL of Atorvastatin and EEGC 300 mg/kg and 400 mg/kg were 7.66 ± 0.35 , $10.21 \pm 0.21^*$, $8.12 \pm 0.12^*$ respectively.

In the present study revealed that, ethanolic extract of *Garcinia combogia* comsignificantly decreases the levels of serum TG, serum TC, LDL and VLDL and increase HDL levels. The order of activity, increased of hypolipidemic output was $400\text{mg} > 300\text{mg}$. The hypolipidemic activity demonstrated by the text extract of 400mg/kg was significantly lesser than standard drug atorvastatin. All the results were stastitically significant ($P < 0.05$) and compare with normal and control group.



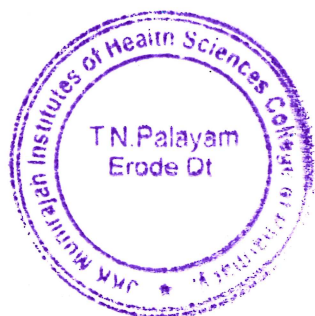
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DISCUSSION

Triton acts as a surfactant and suppresses the action of lipases to block the uptake of lipoproteins from circulation by extra hepatic tissues, resulting into increased blood lipid concentration. The biphasic nature of Triton X 100 Induced hyperlipidemia is helpful in understanding the mode of action of hypolipidemia agents. Drugs interfering with lipid biosynthesis or uptake will be active in the synthesis phase and metabolism will be active in the excretory phase. In the present study, the EEGC reduced the cholesterol and triglycerides in a manner similar to the reduction facilitated by Atorvastatin. The hypolipidemic activities of Atorvastatin and EEGC were evident in both synthesis and excretory phases of triton X 100 - induced hyperlipidemia in rats.

Triton induces hyperlipidemia by increasing the hepatic synthesis of cholesterol and triglycerides. So, it can be assumed that *Garcinia combogia* inhibits the biosynthesis of cholesterol and triglycerides and therefore can be used for the prevention (prophylactic) of hyperlipidemia.

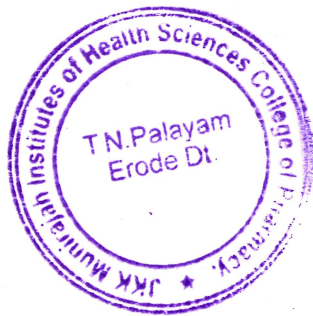
In the present study, EEGC reduces the level of cholesterol, triglycerides and LDL and increase the level of HDL, which may probably be due to the presence of flavonoids, triterpenoids and glycosides.



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CONCLUSION

In conclusion, from the present findings, it is well documented that the *Garcinia combogia* has the active principle to counteract the hyperlipidemic condition occurring in triton induced hyperlipidemia in rats. Further studies to isolate, identify and characterize the active principle(s) and to elucidate the mechanism of action are in the progress.



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