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HYPOLIPIDEMIC EFFECT OF ETHANOLIC EXTRACT OF *AEGLE MARMELOS* AND *TERMINALIA ARJUNA* IN HYPERLIPIDEMIC RAT MODEL

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ABSTRACT

Hyperlipidemia is the one of the major risk factor for the development of coronary heart disease. Currently available hypolipidemic drugs have been associated with number of side effects. A number of herbal medicines are used for controlling hyperlipidemia because of the undesirable side effects and contraindications of synthetic drug.Aegle marmelos and Terminalia arjuna plants have been traditionally used for curing many human ailments. The present study was designed to investigate the hypolipidemic effect of Aegle marmelos (L.)leaves and Terminalia arjuna bark extracts in high cholesterol diet induced hyperlipidemic rats .Hyperlipidemia was induced by feeding the model rat with cholesterol(100g),cholic acid(50g)and coconut oil.Hyperlipidemia in experimental rats were evidenced by an increase in the levels of cholesterol,triglycerides.Ethanolic extract of both plants were administered orally at dose of 250mg/kg/day for 14 days. Extracts of both the plants showed significant hypolipidemic effect by lowering the serum levels cholesterol and triglycerides when compared to that of hyperlipidemic rats. The findings of the study reveals that ethanolic extracts of Aegle marmelos leaves and Terminalia arjuna bark can effectively control the blood cholesterol and triglycerides levels in dyslipidaemic conditions. The main reason of this study was to find alternative and safe drugs for the management of hyperlipidemia.

***Keywords**: **Aegle marmelos, cholesterol, hyperlipidemia, Teminalia arjuna, triglycerides**.*

I.INTRODUCTION

Hyperlipidemia contributes significantly in the manifestation and development of atherosclerosis and coronary heart disease (CHD) and is the most common cause of mortality and morbidity worldwide. The main cause of heart failure are, such hypertension, high fat diet, life style but high levels of cholesterol triglycerides,LDL is mainly responsible for onset of CHD.Reduction in serum cholesterol levels reduces the risk for CHD. According

to World Health Report 2002, cardiovascular diseases (CVDs) will be the largest cause of death by 2020 in India [1].

In India, persons suffering from the CHD are doubled in the last 20 years.In 2020 AD, 2.6 million Indians are predicted to die due to coronary heart disease which constitutes 54.1 % of all CVD deaths.The known hypolipidemic drugs, such as statins and fibrates have many side effects like hyperuricemia, diarrhea, nausea, gastric irritation, flushing, dry skin and also that they are not suitable for use during pregnancy, have made scientists look towards hypolipidemic agents of plant origin .[2,3] . Demand for medicinal plant is increasing, due to growing recognition of natural products, having no side-effects, easily available at desirable price and sometime the only source of health care available to the poor. In recent times, however, a large volume of work aimed at the efficacy of herbal remedies, as they are safe and effective alternatives to modern medicine.India a treasure of plant population of medicinal value has been using these herbal drugs since ancient times for the treatment of human ailments because of its inability to cause side effects and safer than synthetic ones. Out of a large number of herbal drugs stated to possess hypolipidemic activity in the Ayurvedic system, *T.arjuna and A.marmelos* are among these herbal plants due to their cardio protective and hypolipidemic properties [4, 5]. *Aegle marmelos* commonly known as Bael (family Rutaceae) is another Indian plant which has enormous traditional uses against various diseases and many bioactive compounds have been isolated from this plant[6,7].It is deciduous, glabrous, armed tree with trifoliate leaves, short flower and globular fruits. The plant is of very high value in treating cardiac disorders, dysentery, diarrhea, diabetes, fever, inflammation, and pain.[8] The plant has shown various activities including anticancer, hypoglycemic, anti-inflammatory, antihyperlipidemic, analgesic and antiviral properties.[9,10]*Terminala arjuna*(family Combretaceae) is large, evergreen tree found throughout the greater part of the Indian peninsula. It is an important medicinal plant widely used in the preparation of Ayurvedic formulations used against several ailments. The use of *Terminalia arjuna* bark in the management of hyperlipidemia has been widely reported [11, 12].A number of experimental studies have been proved that dried bark powder of this plant have cardio protective activity. [13].The present study has been designed to evaluate the lipid lowering activity of*A.marmelos* leaf extract and *T.arjuna* bark extract, separately in high cholesterol diet induced hyperlipidemia wistar rats.

II.MATERIAL AND METHODS

2.1 Collection of plant material

The leaves of *A.marmelos* and *T.arjuna* bark were collected from local area of Patna, Bihar .The leaves and the bark were dried ,grinned and powder was used for extraction.

2.2Preparation of plant extract

The leaves and bark powder were kept in percolator with 95% ethanol for 24 hrs.The residue was removed by filtration and the ethanolic extracts were concentrated on rotary evaporator to get the solid yield [14, 15].

2.3 Experimental animals

Male wistar rats 150-200gm were used in the present study. They were housed in polypropylene cages in a group of four animals per cage, under standard laboratory conditions of light, temperature and relative humidity. Animals were given standard rat pellets, high cholesterol diet according to their group and drinking water ad libitum.

2.4Induction of Hyperlipidemia

High fat diet (HFD) was prepared by mixing cholesterol (100g), colic acid (50g) in 1litre of coconut oil [16].This diet was given with standard animal food for 2 weeks. To confirm the induction of hyperlipidemia, blood samples were collected and TC, TG was determined using diagnostic kit.

2.4Preparation of doses

The extract of both the plants were dissolved in distilled water and a dose of 250mg/kg body wt was given to the animals once in day along with HFD orally for 2 weeks. Both plants extracts were given separately to the grouped animals.

2.5Expermental design

The animals were divided into four groups, four animals each in group.
GroupI: Normal
GroupII: High Fat Diet Control
GroupIII: Hyperlipidemic rats treated with *Aegle marmelos*[250mg/kg b wt]
GroupIV: Hyperlipidemic rats treated with *Terminalia arjuna*[250mg/kg b wt]
At the end of experimental period, blood was collected, and centrifuged at 2000rpm for 30min to separate serum .Serum sample was analyzed for Total Cholesterol (TC), Triglycerides (TG).

III.RESULTS AND DISCUSSION

TABLE 1 and 2shows the effect of oral administration of ethanolic extracts *ofAegle marmelos* leaves and *Terminalia arjuna* bark on hyperlipidemic rats. The rats fed with HFD exhibited significant increase in serum cholesterol and triglycerides when compared to normal (Group I).Effect of 2 week treatment with *A marmelos* leaves extract (GroupIII) and *T.arjuna* bark extract (GroupIV) at a dose of 250mg/kg significantly reduced the elevated serum cholesterol and triglycerides when compared to the HFD treated group (GroupII).The treatment with *Terminalia arjuna* bark extract shows better effect than *A.marmelos*.. Similar results have been reported by Hossam M.M. Arafa 2005, feeding rats with an HCD for 7 consecutive days resulted in marked hypercholesterolemia. Also Palaninathan Varalakshmi et al;2006 have demonstrated that feeding Wistar rats for 30 days a high cholesterol diet increased the serum lipids. The mechanism of action of cholic acid is twofold: an increase in cholesterol absorption and a concomitant suppression of cholesterol 7a-hydroxlyase activity that results in decreased cholesterol excretion [19].

TABLE 1.Effect of the ethanolic extracts of *A.marmelos* leaves on lipid profile of hyperlipidaemic rats in diet induced hyperlipidemia. [Values are in mean ± SD; Number of animals in each group = 4.]

Group	Total Cholesterol(mg/dl)	Triglycerides(mg/dl)
I(Normal)	68.7±4.1	85.6±2.5
II(HFD)	172.5±2.4	195.0±2.5
III(A.marmelos250mg/kg/b.w/day)	95.7±2.6	102.4±3.8

TABLE 2.Effect of the ethanolic extracts of *T.arjuna* bark on lipid profile of hyperlipidaemic rats in diet induced hyperlipidemia. [Values are in mean ± SD; Number of animals in each group = 4.]

Group	Total Cholesterol(mg/dl)	Triglycerides(mg/dl)
I(Normal)	63.4±4.1	89.3±3.3
II(HFD)	177.6±6.4	189.0±1.9
IV(T.arjuna,250mg/kg/b.w/day)	88.5±5.4	92.0±2.5

In recent times, both experimental and clinical studies have shown that the dried bark powder of *Terminalia arjuna* has significant protective effects in ischemic heart disease. (Tripathi, 1993; Dwivedi, 1994; Miller, 1998). [17, 18]. The alcoholic extract of the bark of plant contains a large amount of flavones and tannins, which possess significant antioxidant activity (Packer et al., 1999) [20]. It has been reported that the leaf of *Aegle marmelos* posses hypolipidemic efficacy (Kesari et al2006) [21]. Fresh alcoholic leaf extracts of *Aegle marmelos* were reported to have a cardio tonic effects in mammals (Haravey,1968 and Nadkarni, 2000).T he levels of serum total cholesterol, triglycerides, LDL were significantly reduced in the plant extracts treated hyperlipidemic animals[22,23]. These results further suggest that *Aegle marmelos* and *Terminalia arjuna* may be useful in the therapy and management of hyperlipidemia.The present study suggests that the extract had synergetic hypolypidemic effect revealed by decreased serum lipid levels and therefore attribute to therapeutic value of the plant extracts of *A.marmelos* to combat the hyperlipidemic condition in rats. In last few decades, natural products are extensively studied for their medicinal properties by advanced scientific techniques and a variety of bioactive compounds have been isolated from the different part of plant and were analyzed pharmacologically. A sustained reduction in hyperlipidemia will decrease the risk of developing cardiovascular diseases (CVD) and will create a hope on new drug discovery in controlling heart disease.

IV.CONCLUSION

Hyperlipidemia is associated with the heart diseases, which is the leading cause of death in the world. The investigation of lipid lowering activity on herbs will be useful strategy in the discovery of new molecules eliciting improved activity by regulating through different mechanism of action. As the pharmacologists are looking forward to develop new drugs from natural sources, development of modern drugs from *A.marmelos* and *Terminalia arjuna* can be emphasized for the control of various diseases. It can be concluded from above study that ethanolic extracts of *Aegle marmelos* and *Terminalia arjuna* can effectively control the blood lipid levels in dyslipidemic conditions. Further studies are needed to elucidate the exact phytoconstituent and mechanism underlying the regulation of serum lipid levels.

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