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EFFICACY OF STEM OF *AMORPHOPHALLUS PAEONIIFOLIUS* ON ANTI HYPERLIPIDEAMIC ACTIVITY

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ABSTRACT

This study was an experimental study conducted in 9 Wistar albino rats in Trincomalee Campus, Eastern University of Sri Lanka. Hyperlipideamia has been ranked as one of the greatest risk factors contributing to prevalence & severity of coronary heart disease. Globally, a third of Ishemic Heart Disease is attributable to high cholesterol level. Plant *Amorphophallus paeoniifolius* is a perennial herb belongs to the family of Araceae. In Tamil it's known as *Karunai kilangu*. The stem of this plant traditionally claims antihyperlipideamic activity. As per the Siddha theory *Kozhupu* and *Iyam mihu gunam* results *Adimedhai noi.* However the antihyperlipideamic property of stem of the plant *Amorphophallus paeoniifolius* has not been proven yet. Thereby the present study deals with the efficacy of stem powder of plant *Amorphophallus paeoniifolius* in lowering the elevated lipid levels. Adult male Albino rats of weighing around 200-350gm obtained. The animals housed in polypropylene cages (three in each cage) under standard laboratory condition. Hyperlipideamia induced by intraperitoneal injection of Triton-X-100 (100mg/kg) after overnight fasting for 18 hours. The rats were divided into 3 groups 3 animals in each. Administered normal water and pellet for control group, standard group fed with Atorvastatin (10mg/kg) and test group fed with hot extract of stem of plant *Amorphophallus paeoniifolius*. After 72 hours of injection baseline cholesterol was evaluated, after treatment with drug for a week on 8th day blood withdrawal done for the analysis. Biochemical estimation carried out and result analyzed using simple statistical

method. Study showed, after the Trion-X-100 injection there is increase in Total Cholesterol level and reduction in HDL level and Artherogenic index. After the administration of test and standard drug there is reduction in Total Cholesterol level, increase in HDL level, Reduction in both weight and AI index. The quotation for general character of *Amorphophallus paeoniifolius* is proven scientifically from the above scientific study for hyperlipideamia.

KEYWORDS: Hyperlipideamia, Total Cholesterol, *Amorphophallus paeonifolius*, HDL, AI index.

1. INTRODUCTION

This study is an experimental observational study. Hyperlipideamia has been ranked as one of the greatest risk factors contributing to prevalence & severity of coronary heart disease (Grundy, 1986) Coronary heart disease, stroke, atherosclerosis, hyperlipideamia is the primary cause of death (Davy, 1993). Hyperlipideamia is characterized by elevated serum Total Cholesterol level, LDL, VLDL, Decrease High Density Lipoprotein levels. Hyperlipideamia associate with lipid disorders are considered to cause atherosclerotic disorders(Saravanan,2003).Atherosclerosis is the preliminary lipid disorder that affects the arteries and major factors contributing to its etiology and among them diabetes, glucocorticoid, diet, psychological factors are major one (Bopanna, 1997).

Country statistics and global estimate report in year 2015 suggest, hyperlipideamia has been ranked as one of the greatest risk factor contributing to the prevalence & severity of cardiac illness & death. WHO reveals that overall, raised cholesterol is estimated to cause 2.6 million deaths (4.5% of total) and 29.7 million disability adjusted life years, or 2.0% of total DALYS .Raised total cholesterol is a major cause of disease burden in both the developed and developing world as a risk factor for Ischemic Heart Disease and stroke (WHO, 2008).

Folklore claims that plant possess blood purifier property, treated for hemorrhoids, abdominal disorders, tumours, enlarged spleen, asthma, rheumatism and the plant has been proved to possess activities such as analgesic, antidiarrheal, anticonvulsant, anthelminthic, anti-inflammatory, antibacterial and anti-oxidative activities (Anuradha, 2014). But as per the citiation mentioned by Dr.K.S.Murugesamudaliyar in year 2008, page no: 234 states that the stem of the plant can be used for antihyperlipideamic activity, but it has not been clinically proven yet (Murugesamudaliyar, 2008).

சத்தகு தாங்குரத்தை துட்கபத்தை
மேதையதி

கத்தை விலக்குங் கறியமைக்கிற
் பத்தியமாஞ்

சீரணத்தையங்கொடிய தீபனத்தையுங்
கொடுக்குஞ்

சூரணத்தின் தண்டெனவே சொல்

(Murugesamudaliyar, 2008).

So the research aims to elicit the therapeutic value of stem powder of *Amorphophallus paeoniifolius* in treatment to lower the blood cholesterol level.

2. OBJECTIVE

To assess the efficacy of stem powder of *Amorphophallus paeoniifolius* in lowering the serum cholesterol level.

3. MATERIALS AND METHOD

3.1. Plant material and chemicals

The stem of the plant *Amorphophallus paeoniifolius* were collected from the farmers in Eastern and Northern Province. The plant was identified and authenticated by Dr (Mrs.) V. Paheerathan, Head of the Department, Unit of Siddha Medicine, Trincomalee Campus, and EUSL.

Atorvastatin was obtained from the local pharmacy, Trincomalee. Diagnostic kits of estimation of cholesterol, high density lipoprotein and Triton-X-100 were bought from Faculty of Medicine, University of Peradeniya, and Peradeniya.

3.2. Preparation of plant extract

The collected fresh plant materials were dried and made into a coarsely powdered material. Fresh infusion is prepared by macerating the coarsely powdered material 185 mg for a short period of time with boiling water. Then it’s diluted up to 50 ml for each rat per day.

3.3. Experimental animals

Wistar albino adult male rats weighing 200-250gm were obtained from animal house of Medical Research Institute, Colombo. The animals were grouped and housed in

polypropylene cages with one animal per cage and maintained under standard laboratory conditions temperature was maintain at 16^0C-18^0C and the rats were given 12h light and 12 h dark cycles. The animals were allowed to acclimatize to the environment for 10 days. They were fed with standard pellet diet and water ad libitum (Geetha kodali, 2013).

3.4. Induction of Hyperlipidemia

Hyperlipideamia was induced in Wistar albino rats by single intraperitoneal injection of freshly prepared solution of Triton-X-100 (100mg/kg) in physiological saline solution after overnight fasting for 18hrs (Nimmy,2012).

Triton X-100 prevents the catabolism of triacyl glycerol rich lipoprotein by LPL (Lipoprotein Lipase) on Vitamin E distribution on rats (Nimmy, 2012).

3.5. Confirmation of induced Cholesterol level:

The blood sample was collected after 72 hours of Triton-X-100 injection (100mg/kg) 0.5ml of blood sample collected by amputation of the tail of the rat. Total Cholesterol level and HDL level measured by enzymatic method (Geetha, 2013).

3.6. Antihyperlipideamic studies

The rats were divided into three groups of three rats each. After the 72 hours triton injection the first group was given standard pellet diet and water ad libitum, second group of each 3 rats administered with standard 10mg/kg for 7 days and the third group received 185mg/250gm infusion of stem of the plant *Amorphophallus paeoniifolius* for 7 days (Geetha, 2013).

Group I : Triton induced control

Group II : Triton induced + Atorvastatin (10mg/kg)

Group III : Triton induced + Infusion of stem of plant *Amorphophallus paeoniifolius* (185mg in 50ml).

3.7. Collection of blood

On 8th day, blood was collected by amputation of the tail, under mild ether anaesthesia.in both experimental models.

3.8. Biochemical analysis

The collected samples were centrifuged for 15 minutes at 6400 rpm. Then serum samples were collected and analyzed for serum Total Cholesterol (TC) and, High Density Lipoprotein (HDL).

3.9. Statistical analysis

The result was analyzed using simple statistical methods.

4.0. Limitation

- ✓ This study is limited to fewer numbers of animals.
- ✓ The duration of study is limited.
- ✓ Procurement of animal is difficult.
- ✓ Obtaining the reagents for lipid analysis is hard.
- ✓ Lack of animal house lab technicians.
- ✓ Difficult to analyze the result with Total Cholesterol and High Density Lipoprotein.

4. RESULTS AND COMMENTS

4.1. Effects of Total Cholesterol

Figure 4.1 showed after the Triton-X-100 injection the mean values of baseline cholesterol were subsequently increased up to the level of 280.36mg/dl in Control group, 351.43mg/dl in standard group and 361.13mg/dl test group. Then the treatment was continued for 7 days and the total cholesterol was evaluated as its mean value results 276mg/dl in control group, 265.96mg/dl in standard group and 208.63mg/dl in test group.

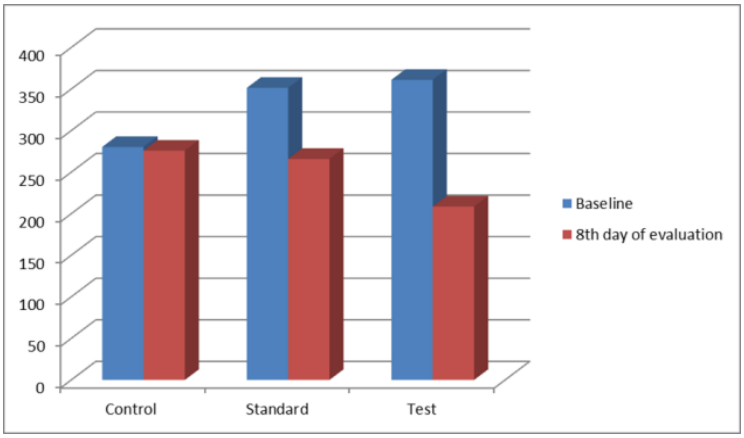

Figure 4.1-Effect of Total Cholestrol Level.

4.2. Effect of HDL Cholesterol

The info in Figure 4.2 suggest that after the Triton-X-100 injection subsequently the HDL level was decreased which takes mean value of 36.61 in control group, 34.20 in standard group and 33.03 in test group. After the medication on 8th day assessment it possess the mean values of 36.25 in control group and 45.37 in standard group and 51.27 in test group.

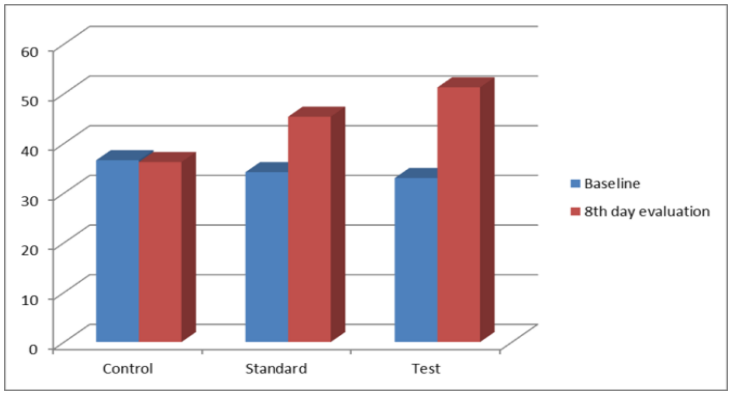

Figure 4.2 – Effect of HDL Cholestrol.

4.3. Effect of Artherogenic Index

Figure 4.3 describes after the Triton-X-100 injection there is increase in the AI index which encompasses 7.73 in control group 10.51 in standard group, 10.06 in test group but after the 1 week treatment the AI index has been reduced in range of 7.66 in control, 5.89 in standard group, and 4.07 in test group.

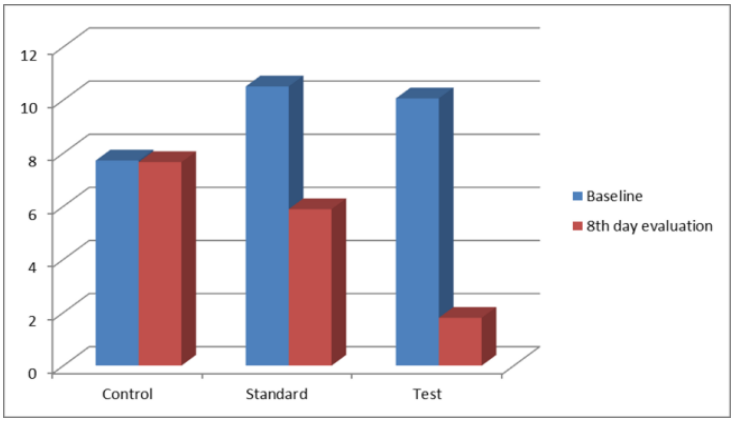

Figure 4.3- effect of AI.

5. DISCUSSION

Hyperlipidemia is associated with heart diseases, which is the leading cause of death worldwide. The lowering of the levels of harmful lipids to the satisfactory values has been confirmed by several experimental animals and interventional studies indicating lowered the

morbidity and mortality in coronary heart diseases (Speight, 1988). The aim of present study was to elucidate the role of stem of plant *Amorphophalllus paeoniifolius* in lowering the lipid levels in Triton-X-100 induced rats.

As an observational study, the results indicate the level of total cholesterol, HDL level, drugs effect on body weight and the AI index (TC/HDL).

This study revealed that the Total Cholesterol, AI Index, the body weight was reduced and HDL level was increased.

As per the Siddha theory the concept of biochemical analysis via blood explained as.

Medhovaha sronitham is considered as one of the body channel where it provides nutrition to the fat or adipose tissue. Blood is one of the location of *Kapham*. It originates from kidney and omentum, it undergoes *vetru nilai valarchi* thus the intraperitoneal injection is given to induce the level of cholesterol and it was detected by withdrawal of blood (Shanmugavelu, 2009;Uthamarayan, 2010).

Discussion for the lipid lowering activity (4.1, 4.2, and 4.3) based on Siddha System.

Still no actions were proved in stem of plant *Amorphophallus paeoniifolius*, so the process of lowering the lipids level discussed according to the organoleptic character of the stem of the plant *Amorphophallus paeoniifolius* together with *Trihumours* and *Saptha dhatu.*

The Siddha System of Medicine suggests lipid molecules are known as *kozhupu (Saptha dhatu)*.lipid disorders are due to *Kapha* vitiation (*Trihumours*) and stem of the plant *Amorphophallus paeoniifolius* possess the organoleptic characters such as (Shanmugavelu, 2009).

Suwai: pungent; *Veeriyam*: hot; *Vipakam:* pungent.

A quotation states that increase *Kapha* can be reduce by characters such as *Ilaaghu, Ushnam, and Pungent* (Shanmugavelu, 2009) page no 160.

‘சொல்லும் கபம் தன்னை சோதிக்க
மாறுகுணம்

வல்ல இலகு தீயும் வறட்சியுடன் வல்லக்

கடினமுடனே கரகரப்பு காரம்

புடியப் பரிகாரம் பார்.’

This explains the characters possessing *Ushnam* and pungent reduces the level of *Iyam*, thus the stem of plant *Amorphophallus paeoniifolius* also contains these actions to reduce the level of *Kapham*.

5.1 Discussion based on *suwai*

Kaarpu (pungent)

Kaarpu composed of *Vatham* and *Agni*; it has the properties of cure obesity, break the clot and other obstruction and alleviate *Kapham*. Also it increases *Vatham*, *Pitham* and balance *Kapham*. It produces light, hot and unctuous. In comparison to modern aspect each taste takes up various chemicals and pungent owes to NH and CH, which increase *Vatham* and decrease *Kapham* will indicate pungent taste composed of *Vatham* and *akayam* producing lightness of the body (Shanmugavelu, 2009).

Kaarpu is consisting of *Gunas* such as *ruksha, ushna, Ilaaghu*.

Table 5-1: Actions of subsides the level of *Kapham* (Shanmugavelu,2009;Uthamarayan 2010).

	Ilaaghu	*Ushnam*	*Ruksha*
Panchabhutha composition	*akayam+vayu+anal*	*Anal*	*Vayu+agni+piruthuvi*
Taste	Astringent, bitter	Sour,salt, pungent	Pungent, astringent, bitter
Vipakam	Astringent	Pungent	Pungent
Veeriyam	*Ushanm*	*Ushnam*	*Ushanm*

This table explains that taste, *Veeriyam, Vipakam* indicating the action of subsiding the level of *Kapham*. Pungent combine with astringent and bitter also possess the activity of lowering the *Kapham*. So the cholesterol level is decreased.

5.2. Discussion based on Veeriyam

The plant possesses *Ushna Veeriyam*, where it increases *Pitham* and reduces both *Kapham* and *Vatham*, so the cholesterol level is decreased.

5.3. Discussion based on *Vipakam*

This plant owes to the action of pungent. *Vipakam* is the outcome of digestion and metabolism occurs due to digestive enzymes. The drugs we administer undergo 2 phases (Uthamarayan, 2010).

Avastha pakam and *Nishtha pakam*, as considering *the nishtha pakam* the *pancha bhuta* compositions converted to basic compounds.
E.g. *kaarpu* divided into *munn+neer+ thee*

Metabolic output of this product has characterized by *pulipu nishtha pakam* and *kaarpu nishtha pakam*. So combination of these two become *laghu*, which causes reduction in weight and reduce the level of cholesterol.

Therefore stanza for *Amorphophallus paeoniifolius* mentioned in *Gunapadam* text was scientifically proved through this study.

6. CONCLUSION

As per this experimental study, the data reveals the plant possessing the antihyperlipideamic activity.

The quotation for general character of *Amorphophallus paeoniifolius* is scientifically proven from the above study for antihyperlipideamic activity.

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