INDO AMERICAN JOURNAL OF PHARMACEUTICAL RESEARCH

AABRESHAM (*BOMBYX MORI*): A BOON TO MEDICAL SCIENCE FOR THE PREVENTION OF ATHEROSCLEROSIS

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ARTICLE INFO

Article history
Received 16/09/2017
Available online
20/10/2017

Keywords
Aabresham,
Hyperlipidemia,
Atherosclerosis.

ABSTRACT

The silkworm is the larva or caterpillar of the domesticated silkmoth, *Bombyx mori* and being a primary producer of silk is an economically important insect. These days, silk is emerging as a resource for solving a broad range of biological problems. The silk is popularly known as Abresham muqriz (muqriz means cut) in Unani medicine. Its cocoons are extensively used as an ingredient of various Unani formulations like Khameer-e- Abresham Sada, Khameere Abresham Hakeem Arshad Wala, Khameere Abresham Ood Mastagi Wala etc. and are used to treat many cardiac and nervous disorders. The hypolipidemic activity of this drug, along with *Nepata Hindostana* (Badranjboya) and *Terminalia Arjuna* (Arjun) has been documented. But the action of *Bombyx mori* cocoons as a single drug is not been documented yet. This review article will highlight the experimentally proven effects of Aabresham (B.mori) as a single drug along with a new formulation (decoction), for the prevention of atherosclerosis and hyperlipidemia.

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*Please cite this article in press as **Aliya Parveen** et al. Aabresham (Bombyx Mori): A Boon to Medical Science for the Prevention of Atherosclerosis. Indo American Journal of Pharmaceutical Research.2017:7(09).*

INTRODUCTION

Atherosclerosis is a condition where arteries become narrowed and hardened due to the formation of plaque around the arterial wall. The disease disrupts the blood flow to the vital organs posing serious cardiovascular complications like Cerebrovascular disease, Peripheral arterial disease, Aortic aneurysm, Visceral ischemia like renal arteries stenosis, mesenteric ischemia & infarction, Atheroembolic diseases etc.[1]The pathogenesis of atherosclerosis is a complex entity involving several contributing factors like oxidative stress affecting the Nitric oxide function and inducing chronic inflammation. The cellular changes stimulated under the influence of a number of factors and enzymes governing the development and progression of atheromatous plaque. The abnormalities in the lipids and lipoprotein metabolism and impairment of endothelial functions considered to be the main culprit for the development of atherosclerosis. Among them, raised LDL-C is considered to be the potent engender for the development of atherosclerosis. [2,3]

Cardiovascular diseases are the leading non-communicable diseases; nearly half of the 36 million deaths due to non-communicable diseases are caused by CVDs.10% of global disease burden is attributed to CVDs. [4] In India the mortality due to CVDs is reported as 2.94 million in 2015 [5]

A number of hypolipidemic drugs have been already introduced in the system of medicine to control & prevent atherosclerosis but their side effects and high cost made it unaffordable and non accessible to common people which exaggerates the prevalence of CVDs. Therefore, there is a need of drugs which not only possesses the property of hypolipidemic but also antioxidant, acts without affecting the normal physiological functions of human body and easily affordable to everyone. One of such drug is Aabresham(*Bombyx mori*), which is mentioned as Cardiotonic, Deobsruent, Demulcent, Purgative and Blood purifier in Unani system of Medicine.[6,7,8,910]

AABRESHAM (*BOMBYX MORI)*

Introduction

Silk is a natural protein fiber. The protein fiber of silk is composed mainly of fibroin and is produced by the larvae of silk moth to form cocoons. The cocoons or oval sacs are coverings, spun by a silk moth during their metamorphosis. Silk moth is about an inch long, half inch thick. The best known silk is obtained from the cocoons of mulberry silkworm -*Bombyx mori* (B.mori). It has shimmering appearance. The production of silk is called sericulture. The major silk producers are China (54%) and India (14%). In India, Tamil Nadu has the highest mulberry cultivation. In Unani system of medicine two types of B. mori are described-

a. Yellow
b. White

White Aabresham (Bombyx mori)

Yellow Aabresham (Bombyx mori)

Figure: Types of *Bombyx mori*

For medicinal purpose, some Unani physicians considered white variety better than yellow variety , without extracting its silk thread from cocoon and the one from which silk moth didn't come out and died in it, is supposed to be good.[10]

Scientific classification[11]

Table 1: Scientific classification of B.mori.

Kingdom	**Animalia**
Phylum	Arthropoda
Class	Insecta
Order	Lepidoptera
Family	Bombycidae
Genus	Bombyx
Species	Mori

Table 2: Vernacular names of B.mori[12].

English	Silk cocoon
German	Serikos
Arabic	Aabresham
Tamil	Putloo puchie
Mahrathi & Konkani	Reshami chi keed
Gujrati	Resham na potan
Bengali	Pat

Phytochemistry[13,14,15,16]

Phytochemical studies has shown that the Silk cocoon consist of total protein (12-16%), fat (11-20%), carbohydrate (1.2-1.8%).

Glycine, alanine, and serine constitute about 82% of the amino acids present in the cocoon. Rest of the amino acids found in the cocoon are –histidine, lysine, aspartic acid, arginine, threonine, cystine, proline, tyrosine, tryptophan, valine, phenylalanine, methionine, leucine, isoleucine, glutamic acid. Whereas fat contents include alpha linolenic acid (ALA)- the essential fatty acid along with palmitic acid. There are five flavonol glycosides identified in silk cocoon responsible for potent anti-oxidant activity of B.mori.

Pharmacological actions[6,8,9,10,17]

Exhilarant & tonic for heart and other vital organs, Resolvent, Demulcent, Deobstruent, Blood purifier, Expulsion of phlegm and black bile, Desiccant, Stomachic, Brain tonic, Liver tonic

Therapeutic uses[6,8,9,10,17]

When silk thread is not extracted from Silk cocoon, cut by scissor into small pieces, decoction (3-10 g)[8,10] is prepared which is used to treat Palpitation and other cardiovascular diseases. Syrup and other compound formulation is used to treat Diseases of eyes, Pneumonitis, Diphtheria, Memorigenic, Eczema and Aphrodisiac. Moreover, its syrup can be used for the fairness of skin. Powdered is prepared by burning the silk cocoon that can be used to resolve Menstrual problems, Leucorrhoea, Gastritis & Chronic diarrhea.

SCIENTIFIC REPORTS

Anti- oxidant activity:[18,19]

The study of Saudi chemical society on wistar rats reported that the Cocoon of B. mori has a potent anti- oxidant property because of the flavonoids contained in it against doxorubicin induced cardiotoxicity and nephrotoxicity. Another study on 30 human subjects assigned randomly, showed significant reduction in MDA concentration after intervention (2 months follow up) with respect to baseline values ($p<0.001$) Decrease in MDA concentration indicates decrease in lipid peroxidation, ultimately preventing the oxidative stress. The anti oxidant activity of B. mori can be explicit by the presence of the flavonoids found in the cocoon of B. mori as they reduce lipid peroxidation by scavenging free radicals, chelate transition metal ions along with reducing macrophage oxidative stress by inhibition of cellular oxygenases or by activating cellular antioxidants such as glutathione system. Amino acids like Alanine, Cystine, Methionine, Glutamic acid and Glycine found in B.mori ,exhibit anti oxidant activity by donating an electron , prevents lipid peroxidation and interacts with superoxide to stabilize it, chelate copper and iron and prevents the production of hydroxyl radicals, possess superoxide dismutase activity, binds covalently to reactive degradation products of peroxidised lipids, preventing them from reacting with other cellular targets.

B.mori also contains the vascular anti-oxidant enzymes – SOD (Superoxide dismutases), Catalase and glutathione peroxidases. SOD, dismutate $O_2\bullet-$ to H_2O_2 and oxygen. Catalase, catalyzes the decomposition of H_2O_2 to water and oxygen. Glutathione peroxidases utilize glutathione to reduce H_2O_2 and fatty acyl peroxides to water and lipid alcohols respectively.

Antihyperlipidemic & Anti Hypertensive activity:[18,20]

The studies conducted in animals showed that B. mori has hypolipidimc activity by lowering total cholesterol, LDL, Triglycerides and HDL to a significant level. However studies on human subject revealed lowering of lipid profile values except HDL that remains stable. The reduction in lipid profile values is on account of essential fatty acid, α-linolenic acid (omega 3 fatty acid), flavonoids and amino acids like Cystine, Methionine, Glutamic acid and Glycine that raised hepatic Glutathione content, lowers the cholesterol. Carnitine (dipeptide made of lysine and methionine) transports long chain fatty acids to mitochondria where they are consumed for energy production & lowers the cholesterol level. Taurine stimulates the flow of bile therefore reduces cholesterol level.

The hypotensive activity of B.mori is reported due the the presence of flavonoids, Arginine & Taurine.Taurine acts on nerves and reduces the signaling that decrease the resistance to blood flow .Whereas Arginine contributes in the production of Nitric oxide (natural vasodilator that helps to maintain normal blood flow in the vessels),thus reduces blood pressure.

Hepato-protective activity:[21]

B. mori cocoons decreases Atherogenic index and decrease the weight of liver in fatty liver cases.

Anti inflammatory activity:[18]

The essential fatty acid, quercetin glycosides & Glycine, exerts an anti inflammatory effect on coronary arterial cells exposed to tumor necrosis factor-α in vitro.

Anti thrombotic & Anti arrhythmic activity:[18]

Decoction of B.mori in human subjects showed anti thrombotic and anti inflammatory activites, that may be due to the presence of α-linolenic acid, quercetins and amino acids. Recent study has established that pre administration of glycine reduces the infarct size by 21%, which increases ventricular ejection fraction and fractional shortening. Taurine (organic compound formed by methionine and cystine) regulates the supply of potassium and calcium to the heart and can thereby eliminate cardiac arrhythmias. Thus, B.mori act as cardioprodective.

CONCLUSION

Aabresham (Bombyx mori) being just a silk cocoon possess a number of medicinal properties. No matter in what formulation it's been used but the thing is- its effects in the control and prevention of various diseases. However, Decoction of B. mori cocoons can be used widely that not only relieves the symptoms like palpitation, breathlessness, chest pain & blood pressure but also reduces the cause. Therefore it's found to be a potent antioxidant, anti inflammatory, anti arrhythmic, anti angiogenic, anti thrombotic, anti coagulant, anti hypertensive, cholesterol and LDL lowering effects in the atherosclerosis risk group. *Aabresham*(Bombyx mori) potentially inhibit the rate of progression of atherosclerosis. Hence, prevents cardiovascular diseases to a great extent. Now we can say that it's really a boon to medical science. But trials should continue on large sample size of human subjects to validate its efficiency globally, so that it can save lives. If used with other treatment modalities like weight management, dietary modification and increased physical activity, Bombyx mori is going to prove itself to be more efficacious in the control and prevention of CVDs than any other present drug with least side effects.

List of Abbreviations

B.mori	Bombyx mori
CVD	Cardiovascular disease
HDL-C	High density lipoprotein cholesterol
H_2O_2	Hydrogen peroxide
LDL-C	Low Density Lipoprotein Cholesterol
MDA	Malonedialdehyde
Ox-LDL	Oxidized low-density Lipoprotein
ROS	Reactive oxygen species
WHO	World Health Organization

ACKNOWLEDGEMENT

I explicit my gratefulness to Dr. Zarnigar, Lecturer, Dept. of Community medicine, National Institute of Unani Medicine, Bengaluru, for her excellent guidance ,critical suggestions & overall supervision to complete the work. Special thanks to Dr. Mohammad Saqlain,MD,Department of Kulliyat,AMU,Aligarh, for the sustained commendation, support & valuable advices during the course of the entire project.

There is no conflict of interest.

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