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July– December 2020
Volume 5, Number 2

Contents

Original Article

RFP Journal of Biochemistry and Biophysics
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Impact of Pollutants in the River Water Ecosystem

P Jasmin Lena[1], S Maneemegalai[2]

Author's Affiliation: [1]Head and Assistant Professor, Department of Biochemistry, Prince Shri Venkateshwara Arts and Science College, Chennai 600073, India, [2]Department of Biochemistry, Bharathidasan University Constituent College for Women, Orathanadu, Thanjavur 614625, India.

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Abstract

Water is the foremost necessity of all living beings. The components which are dissolved in water determines the water quality for the growth of plants and animals. The requirement of adequate nutrients, pleasant and healthy environment is necessary for the growth of aquatic organisms. The productivity of the organisms present in water depends on the physicochemical characters.

The productivity is at its maximum by the presence of optimum levels of physico chemical parameters. Water quality of Varahanadhi River was assessed in the study at different locations for an annual year by measuring the various physico chemical parameters with the standard certified methods. Three different regions such as upstream, midstream and downstream and three different seasons were chosen for the present study.Downstream region was found to be polluted with heavy metals that might have adverse effects on the humans who consume the fishes from the river.

Keywords: River; seasons; pollution; water.

Introduction

Environmental pollution is a worldwide problem as heavy metals belong to the most important pollutants. Heavy metals are toxic at low concentration and cannot be easily destroyed, possess high density; found in earth's crust. Geochemical structure,waste from industries, have increased their levels (Sprocati *et al*., 2006). The progress of industries has led to increased emission of pollutants into ecosystems (Saleh *et al*., 2010). The absorption of heavy metals can be absorbed from various biological tissues exposed to pollutants is (Won *et al*., 2013).

The biochemical reactions taking place in water are influenced by the physico chemical parameters. The changing conditions of water are reflected by the changing parameters. Various researches was done by the scientists (Singh *et al*., 2004) to explore the variation between different seasons and the physico chemical parameters of rivers. Fishes such as (Catla (*Catla catla*), Mrigal (*Cirrhinus mrigala*), Rohu (*Labeo rohita*) Tilapia (*Oreochromis niloticus*) are the inhabitants of the river. Heavy metals are naturally occurring elements, and are present in varying concentrations in all ecosystems. Various types of heavy metals exist in different forms and it is because of the human activities an imbalance in them exists. Their accumulation and distribution

Corresponding Author: P Jasmin Lena, Head and Assistant Professor, Department of Biochemistry, Prince Shri Venkateshwara Arts and Science College, Chennai 600073.

E-mail: jasminmalligai@gmail.com

in soil, water and environment are increasing at an alarming rate causing deposition and sedimentation in water reservoirs and affects aquatic organisms as well (Hobbelen *et al*., 2004; Okafor and Opuene, 2007; Mohiuddin *et al*., 2010). Heavy metals like chromium, lead, cadmium, arsenic, etc. exhibit extreme toxicity even at trace quantities.

Heavy metals during their transport, undergo numerous changes due to precipitation, absorption and complexation phenomena (Abdel-Ghani and Elchaghaby, 2007) which affect their behavior and bioavailability (Nouri *et al* 2011). Hence they serve as the best bioindicators for assessing the environment. Geochemical distribution results have also been used as an aid in predicting potential contaminant mobility and bioavailability (Pueyo *et al*., 2003).

Materials and methods:

Varahanadhi River

Varahanadhi river basin is located in parts of Villupuram district in Tamil Nadu. It lays 12.04' N latitude and 79.34' E longitude. It covers a total area of 798ha. Varahanadhi River has 21 Km of catchment area. Varahanadhi basin is surrounded in east by Bay of Bengal, in north by Palar basin and Nallavur sub basin in south and west by Ponnaiyar basin.

The sampling point includes the upstream (US), midstream (MS) and downstream (DS) regions. Site A (upstream) which is situated in Gingee town and has its source at the hills of Melmalayanur in the South Arcot District of Tamil Nadu, site B (midstream) is the branch of the river that flows through Villupuram District and site C (downstream) part of the river called Sankaraparani that drains into Bay of Bengal. The three region selected was sampled in monsoon (June – September), pre-monsoon (January – May) and post-monsoon (October – December) seasons to study the variations due to contents present and the seasonal effect over the water body and the present study was carried out for a year in different sites.

Heavy Metals Quantification in Water:

Metal digestion was done using the Milestone Acid digestion method.

5 ml of water sample was pipetted into 20ml teflon tube. 6 ml of nitric acid (HNO3, 65%), 3 ml of hydrochloric acid (HCl, 37%) and 0.25ml hydrogen peroxide (H2O2) were added to each sample. 6ml HNO3 (65%), 3ml of HCl (37%) and 0.25ml H2O2 served as the blank. Water samples were processed by microwave digestion for thirty minutes. The samples were allowed to cool to room temperature after digestion and the solutions were diluted to 20 ml using distilled water. The liquid extract was then used for the determination of arsenic, chromium, cadmium and lead.

Heavy metals like chromium (Cr), lead (Pb), cadmium (Cd) and arsenic (As) in acidified water samples were analyzed using Inductively coupled plasma-atomic emission spectroscopy (ICP-AES). For the determination of total heavy metals, the extraction was carried out in Teflon containers, using strong acid mixtures, as described by Tessier et al., (1979). The reagents and chemicals used were of analytical reagent grade suitable for ultra-trace analysis.

Table 1: Heavy metal content analysis in the Varahanadhi river water sample

Values are expressed as mean values of samples taken in triplicates.

Parameters (WHO value)	Site	Pre Monsoon	Monsoon	Post Monsoon
Chromium (0.05mg/dl)	Upstream	0.06	0.05	0.04
	Midstream	0.06	0.04	0.07
	Downstream	0.10	0.11	0.13
Lead (0.05 mg/dl)	Upstream	0.03	0.04	0.06
	Midstream	0.04	0.02	0.05
	Downstream	0.13	0.12	0.15
Cadmium (0.005 mg/l)	Upstream	0.03	0.02	0.04
	Midstream	0.06	0.05	0.05
	Downstream	0.13	0.16	0.12
Arsenic (0.05 mg/l)	Upstream	0.06	0.02	0.04
	Midstream	0.03	0.03	0.06
	Downstream	0.15	0.13	0.14

Table 1 presented the heavy metals chromium, lead, cadmium and arsenic in water samples of pre monsoon, monsoon and post monsoon seasons, collected at different sites (upstream, midstream and downstream) of Varahanadhi River.

Results and Discussion:

A significant rise in the high level of all heavy metals in downstream site was observed in all seasons. Notable variations was also observed in the heavy metal contents between the upstream

and downstream regions of all seasons. Compared to the standard WHO values of heavy metals in water, significantly high level of heavy metals were observed in the downstream site of all seasons.

Cadmium is the most toxic element, is not essential for biological systems and not beneficial to the ecosystem and is found to cause harm. In the human population cadmium toxicity causes renal dysfunction and lung cancer, osteomalacia and hypertension.

Chromium has been found to be is used in the rubber manufacture, wood and leather industries. High levels of exposure cause hepatic and nephrotic damage, ulcers in skin and affects central nervous system and remove related disorders. It is also associated with the toxic effects on hematological problems and immune response in freshwater fish.

Human exposure to lead causes severe toxicity. Higher doses of lead may damage the fetus and is toxic to the central nervous system and gastrointestinal tract. Lead toxicity might disrupt hemoglobin synthesis and affect the kidneys and reproductive systems.(Ferner et al 2001). Airborne lead may cause the poisoning of agricultural food by the deposition on fruits, soils and water.

Arsenic toxicity symptoms depend on the chemical form ingested (Holum, 1983; Ferner, 2001). Arsenic has the ability to precipitate proteins, complex formation with coenzymes and inhibition of of adenosine triphosphate (ATP) production during respiration (INECAR, 2000). It is carcinogenic in all its oxidation states and severe exposure cause death (Ogwuegbu and Ijioma, 2003; USDOL, 2004).

Conclusion:

The toxic elements enter the body mainly through water, food and air. Cosmetics, dentistry, pharmaceuticals, particularly Ayurvedic and Unani drugs also contribute. These changes might be due to the adverse effect of discharge of pollutants such as sewage, industrial waste, heavy metals and anthropogenic sources in Varahanadhi River that the fishes inhabit. Collectively the pollutants that get accumulated in the downstream site of the Varahanadhi river results in detrimental effects in fishes. More research is needed to investigate which of these metals affect human health. Public awareness should be created. There should be monitoring and control over the concentration of these in cosmetics and anthropogenic activities.

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Review Article

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Role of Biological Tools in the Management of E-waste in India

Shweta Shrivastri[1], Sachin C Narwadiya[2]

Author's Affiliation: [1]Research scholar, NIScPR , Vigyan Sanchar Bhawan, Dr K S Krishnan Marg, Pusa Campus, New Delhi, 110012, [2]Scientist D, Vigyan Prasar, A¬50, Institutional Area, Sector 62, Noida 201309, India.

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Abstract

The unused or non-working electrical items are popularly known as e-waste or electronic waste, which are increasing day by day in our life, in today's world we are seeing the technology is growing fast and it has become a big part of our life, technology and its applications are now omnipresent in our daily life so, it is imperative to say that without technology we are not able to live for a while ,today computer, smartphone, television, internet have become our big need . Just we are getting the benefits of technology we are also facing its ill effects as well on us and on the environment, over the past two decades the growth rate of electrical and electronic equipment is increased continuously, on the other hand the life span of these products become shorter these e-waste if not properly dumped or managed it creates lots of health problems for us, so the principle aim of this paper to show the management of e-waste in India with the help of biological tools.

Keywords: E-waste; technology; management; biological tools; electronic equipment; smartphones.

Introduction

The expansion of technology has increased our facilities as well. In this changing world, we gradually become dependent on machines and electrical appliances today. The increasing number of these modern electrical devices and their waste after use has made our lives. It has a severe impact on our environment when this electric or electronic equipment becomes useless. The broken cell phones, broken AC, refrigerators, computers, laptops, printers, home-use machines Coolers etc. are put up in his category. For this reason, it is increasing today, after the USA and China in the world, India has reached third place in producing this waste.

The problems of e-waste are becoming deadlier day by day. All the expansion of technology has given us many facilities, the same and we are all falling prey to this electronic waste. The substances and gases generated by e-waste are killing our health in to severe extent. If this e-waste is disposed of in the open, that is, when burned, carcinogens - dibenzo para dioxin (TCDD) and neurotoxins like toxic gases are produced. These gases directly affect our body's physical development, fertility and immunity. The affected systems of the body can cause hormonal imbalance and diseases like cancer.

E-waste management is the need for the present time. It this managemnt applied properly and scientifically then it is possible to reduce toxicity

Corresponding Author: Shweta Shrivastri, B-37, Shirdipuram, Kolar Road, Bhopal, Madhya Pradesh 462042, India.

E-mail: shwetashrivastri@gmail.com

spreading due to generated E-waste. In an unscientific way, it separates the waste and keeps it in the open for several days by breaking, burning and immersing it in acid, and this may spoil the health of associated workers. It also pollutes our environment. The substances present in the electronic waste are long-run hazardous in nature. These substances are tangible, corrosive, reactive, toxic, explosive or infectious. The matter of e-waste management requires constant attention.

Table 1: Average duration of discarding electronics.

Electronic equipment's	Average duration of discard
Mobile phones	1-3 years
Personal computers	2-3 years
Camera	3-5 years
Television /lcd	5-8 years
Refrigerators	8-10 years
IT accessories	Very frequent

After USA and China, India is on the 3rd position for producing the e waste, these three countries together contributed 38% of total 53.6 million tones of e-waste generated worldwide in 2019.

Government Role in E-waste management

The Ministry of Electronics and Information Technology (MeitY) is engaged with many programs on awareness, recycling of E-waste. The mandate of this Ministry for the E-waste problem is "The charter for this programme is to bring together the triad of public, government and industry to adopt responsible measures for Sustainable electronics that is responsive to environmental needs. This needs proactive policy formation and mass deployment that would be the focus area."[5]
It is evident from the web site of The Ministry of Electronics and Information Technology (MeitY), the Reverse Logistic Group-India is engaged in the management of E-waste. As per the published report of the RLG-India (as put up in figure 1.0) the various activities undertaken was highlighted.

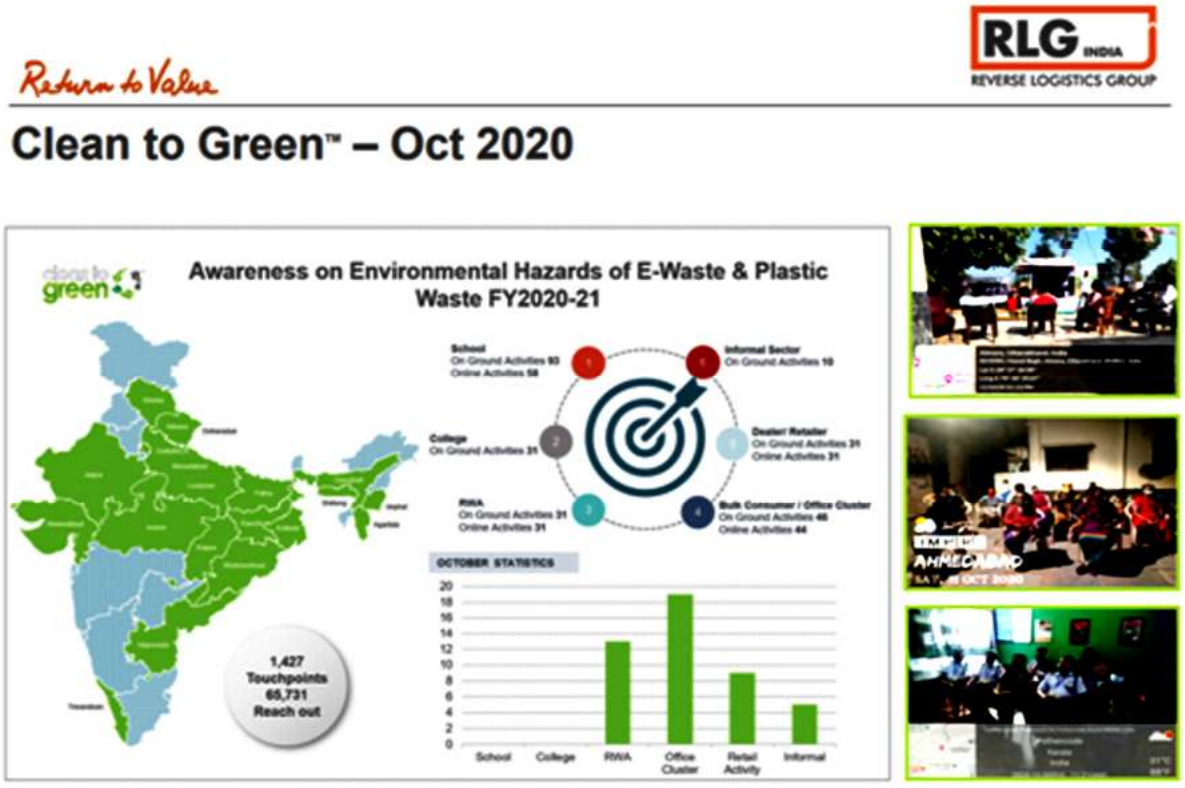

Fig. 1.0 : Reverse Logistic Groups-India activities on E-waste. (Ref. https://greene.gov.in/wp-content/uploads/2020/11/2020111190.pdf)

Biological tools for E-waste management

There are so many scientific ways and methods of management of e-waste but in this paper, we are focusing on the biological tools for the management of e-waste that is called bioleaching, this is also called as "green process" in which some bacterium is used as a carrier for recycling the e-waste,

however this process is gradual in nature, the bacterium Choromobacterium Violacium is known for producing antimicrobial agent called violacein.[2] With referenceto theconservation.com web site pyrometallurgy and hydrometallurgy are the present times technologies involved in the extracting and recycling e-waste metals. They require high temperatures and toxic chemicals. This makes them extremely harmful to the environment. Also, in addition they require lots of energy and produce large volumes of toxic gas too, creating more pollution and leaving a large carbon footprint. The modern mining industry has relied on it for decades, using microbes – mainly bacteria, but also some fungi – to extract metals from ores.[7]

Microorganisms are able to change metals chemically, thus releasing it free from the surrounding rock. They allow it to dissolve in a microbial soup. The metals can easily be extracted from microbial soup and purified. from which the metal can be isolated and purified. Bioleaching requires very little energy and so has a small carbon footprint. No toxic chemicals are used either, making it environmentally friendly and safe.[7]

Discussion:

Many bacteria play main role in e waste -management. They do so by various process like bioleaching, Bio absorption, bioaccumulation, Biotransformation, Phytoremediation, Phytoextraction, Biomineralization etc. Government plays a major role in creation of awareness about the problems of E-waste and their related management. The toxic and hazardous materials present in these wastes can lead to severe environmental and occupational hazards, if not handled properly. However, presence of significant quantity of valuable recoverable material makes it a potential secondary resource for metal extraction. Composition of E-waste is complex with 38% ferrous material, 28% non-ferrous material, 19% plastic, 4% glass, 11% other (wood, rubber, ceramic, etc.). Although the precious materials are only 1% by weight, it accounts to nearly 80% of the total intrinsic value.

Mass scale Public Movement is current need for reduce, recycle and regenerate related to E-waste.

Summary and Conclusion

The review study compiled the major ongoing research in E-waste management and also efforts for the creation of awareness among masses. In India there is need to control this problem before becoming uncontrollable demon in society. The E-waste are dangerous and hazardous to mankind. We all must know the proper standard of procedure of disposal of electronic items after use. There are several scientific ways of management of electronic waste but the biological method might be the best because these methods can be more sustainable and other techniques like heating, adding chemicals.

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Review Article

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Diets that are Aphrodisiac in Nature-A Review Study

Sachin Chandrakumar Narwadiya[1]

Author's Affiliation: [1]Research Scholar, School of Public Health, Poornima University, Jaipur, Rajasthan, India.

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Abstract

Diets have various effects on the human being. Since ancient times various diets were used as a medicine in the Indian system of medicine famous as Ayurveda. The diet has aphrodisiac effects too, which means diet can also stimulate one's sexual desire. A review study of various diets about aphrodisiac nature is essential as people are more interested in such diets as apple, milk, cloves, bay leaf, Asafoetida (Hing) and much more. The Ayurveda have suggested warm milk as a diet for men to increase their capacity to be sexually active. The variety of diets had variety of effects on us. Hence before eating any food think twice about the effects on our body and mind. The sexual desire in society is a changing phenomenon. Due to high use of cigarettes, alcohols impotence is prevailing in the society.1Thus, to combated with the arising problem peoples are in search of aphrodisiac foods. The present study showcased the effects of various diets on the enhancement of sexual desires.9The study is important for the readers, researchers who are working on the problems associated with sexual desires.

Keywords: Aphrodisiac; Asafoetida; Cloves; Milk.

Introduction

Diets have various effects on the human being. Since ancient times various diets were used as a medicine in the Indian system of medicine famous as Ayurveda. The diet has aphrodisiac effects too, which means diet can also stimulate one's sexual desire. A review study of various diets about aphrodisiac nature is essential as people are more interested in such diets as apple, milk, cloves, bay leaf, Asafoetida (Hing) and much more. The Ayurveda have suggested warm milk as a diet for men to increase their capacity to be sexually active. These various milk-based preparations can be helpful in an increase of hardness, an extension of the duration of hard erection and inhibit early ejaculation. Milk also increases Shukradhatu (semen). Milk acts as a vehicle and helps these herbs to reach tissues of the male reproductive system. Thus, the total male reproductive system rejuvenates, and doshas get balanced by the regular inclusiveness of milk in the diet. Fenugreek seeds have saponins that can help boost testosterone, the male hormones. It can increase male libido. Cardamom is a green miracle in increasing energy and relieves tiredness. The cloves help heat up the body and may boost the warmth proportion on the bed. The fennel or Saunf has an estrogen-like substance (estriol) that turns out libido. Ginseng belongs to 11 various varieties of a short, slow-growing plant with fleshy roots. Ginseng may restore and enhance well-being. It also improves male erectile dysfunction (ED). Saffron is useful for stimulation of sexual desires. Nutmeg was

Corresponding Author: Sachin Chandrakumar Narwadiya, H. No. 1081, GF, Sector - 5, Wave City, Chaziabad 201002 (Uttar Pradesh) India.

E-mail: snarwadiya@gmail.com

considered the most famous natural aphrodisiac. The study reveals that nutmeg has the same effect on mating behavior as Viagra. Cloves are associated with an increase in one's energy levels. They also have one of the best aromatherapy scents that help improve sexual behavior. The green chillies with garlic when taken together which is a tried and tested way of enjoying sex for a more extended period. Ginger increases sex drive and stimulates sexual performance.

Apple

Doctors advised us that an apple a day will keep doctors away. As all of us know, that apple originates in central Asia is observed to have a pleasant soothing effect on sexual health. The regular intake of 2 apples per week affects women to give them more sexually fulfilment both in relation to the frequency of intimacy and their satisfaction. The apple contains phloridzin, which is a molecule similar to estradiol-a primary female sex hormone. The apples also have vitamins (C, A, B), minerals and trace elements.[12]

Phloridzin, which is a phenolic compound having the chemical name phloretin 2′-O-glucoside, phlorizin, phlorizin, phlorhizin or phlorizoside, is a member of dihydrochalcones. It has good effect on diabetes control.[8,9]

Cardamom

Cardamom is a unique spice. It attracted us due to its aroma. It has effects on our senses to soothe the mind and body. These responses are also connected to our hormones, specifically testosterone.
Cardamom is a rich source of cineole. Cineole is an achiral aromatic component that stimulates and boosts blood circulation.[4]

Cloves

Clove (SyzygiumAromaticum) has an aphrodisiac effect. It is a libido enhancer with erectile health. It cna be a treatment for the premature ejaculation. Cloves has its origine from the Maluku Islands in Indonesia. It is also harvested mainly in Bangladesh, Indonesia, Malaysia, India, Madagascar, Zanzibar, Pakistan, Sri Lanka and Tanzania.[5,6]

Cloves are used in medicinal useagebecuase of their potent antioxidant and antimicrobial activities. Clinical studies have recognized its antibacterial, antifungal, antiviral and anticarcinogenic effects.[7]

Cloves are a commonly available herb that could come to the rescue if one needs a sexual stamina boost. It can flare up sexual desire, stiffening up the male organ, and enhances control over ejaculation.

Cloves improve Testosterone levels. Testosterone is one of the essential compounds for keeping up a man's sex drive and sexual performance. Cloves also increase nervous stimulation.[1]

Clove is a fantastic herb for sexual wellness. It is particularly effective in boosting testosterone levels. It also act by the imporvemnt of sexual performance by improving erectile health and one's control over ejaculation. Possessed with solid antioxidant and nervous stimulation properties, cloves are one of the most commonly available herbs for enhancing sexual desire.[7]

Ginger

Ginger as an Aphrodisiac

It is also excellent for weight loss, alleviating cold symptoms, joint pain, regulating the amount of sugar within the blood, and even treating insomnia—these things we already discussed previously within the article that I leave below.

It's been since precedent days, especially in Asian cultures. Ginger is natural Viagra, but you can take cenforce 100 and cenforce 200 for instant results.

Ginger is additionally a potent treatment for people with impotence problems because it improves erection and delays ejaculation.

Garlic

Garlic was used in ancient times in Greece used to improve physical prowess and performance in athletics. It is also an ingredient that removes lethargy also will give many beneficial changes. Garlic is an aphrodisiac becuse it can increases blood flow.

Many peoples are allergic to garlic, but most individuals who consume it never have any side effects. Garlic is used in a lot of everyday meals.

Nutmeg

Nutmeg has been used since AD 540, when it was brought from India to Constantinople. Nutmeg can also be taken like hallucinogen. Its essential oil is good for rheumatic pain.

Research dealing with the potency of nutmeg as an aphrodisiac substance found out that at low dosage. It can increase sexual activity. It can improve both libido and power.[1]

Conclusion:

The variety of diets have aphrodisiac effects on our body. Hence for many problems, a change in diet will be an option as additional therapeutics. People must choose diet meticulously because diet plays a vital role in lifestyle. The diet needs to be changed as per seasons, and as per the daytime frame like in the morning, in the afternoon and the evening, one need to choose diet.

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