https://doi.org/10.48047/AFJBS.6.5.2024.10412-10424

AfricanJournalofBiological Sciences

Exploring the environmental and medicinal significance of pavalam (coral) in siddha medicine

R. Deebiga[1]*B.Balajiprasath[2*] V.Anitha[3*]

[1*] ASSOCIATE PROFESSOR, SriSairam siddha medical college,

West Tambaram, Tamil Nadu - 600 064

[2*]Coastal and Marine Ecology Division, Gujarat Institute of Desert Ecology,

Bhuj-370001, Gujarat, India.

[3*] PROFESSOR, Sri Sairam siddha medical college,

West Tambaram, Tamil Nadu - 600 064

Article History
Volume 6, Issue 5, 2024
Received: 22 May 2024
Accepted: 03Jun 2024
doi:*10.48047/AFJBS.6.5.2024.10412-10424*

Abstract

Pavala parpam is a therapeutic agent used in Siddha medicine that is derived from marine life. It is made by calcinating corals and has been found to be effective in treating respiratory illnesses, bleeding issues, metabolic disorders such as diabetes mellitus, and malignant tumours. Additionally, it has antioxidant properties. Scientific reports confirm its efficacy and highlight its potential for future development. The marine ecosystem is a rich source of drug discovery and development, with pharmacological investigations providing evidence for its promising future in healthcare. Siddha physicians widely use Pavala parpam-based medicines to treat various ailments, including respiratory diseases, bleeding disorders, and lifestyle diseases such as cancer and diabetes.

Key words:Marine drug, Pavalam, Siddha medication, Pharmacological activity

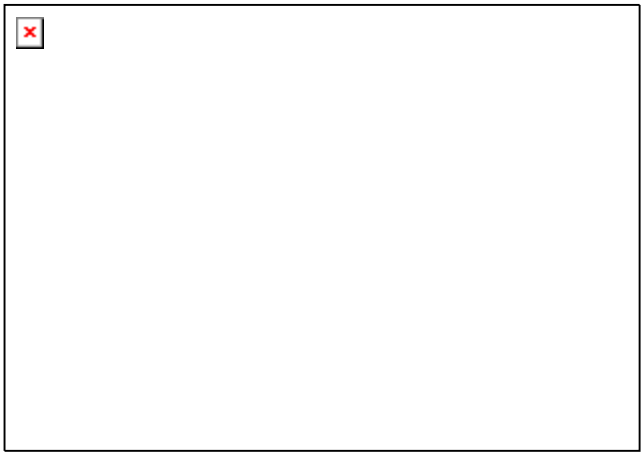
Introduction

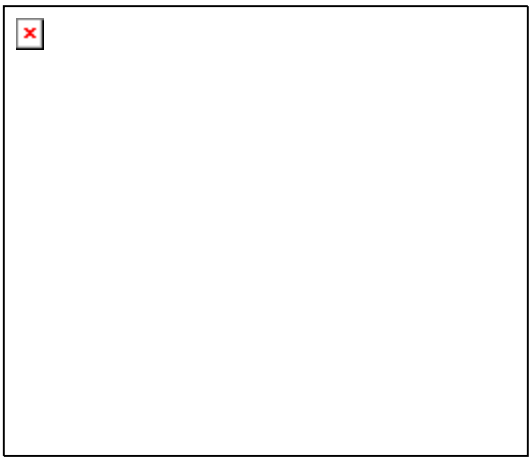
India has a vast coastline spanning over 8000 km that boasts an array of marine habitats, such as inter-tidal rocky, muddy, sandy shores, coral reefs, and mangrove forests. These habitats are abundant in potential for offering new drugs and biotechnological programs. However, their potential has remained largely unexplored thus far. Fortunately, selected institutes such as the National Institute of Oceanology, Goa; Central Drug Research Institute, Lucknow; Bose Institute, Kolkata; Central Institute of Fisheries Education, Mumbai; Regional Research Laboratory, Bhubaneswar of Council for Scientific and Industrial Research are currently working to explore this potential and discover life-saving

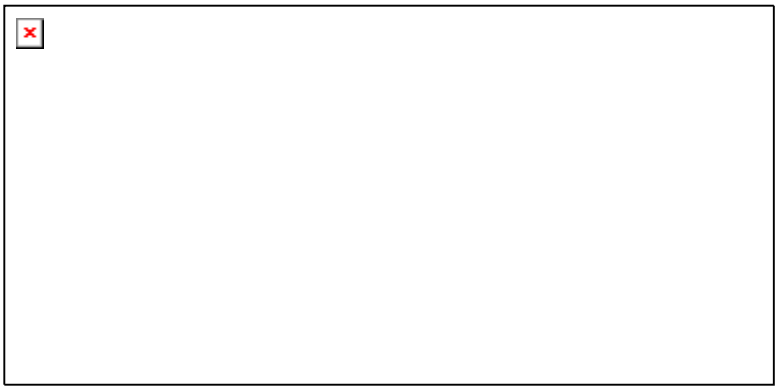
drugs from marine sources. In addition to these institutes, many other Indian universities, institutes, and pharmaceutical companies have recognized the importance of marine habitats and are actively pursuing research to unlock their potential. Globally, the oceans contain more than 80% of diverse plant and animal species. Marine organisms such as sponges, tunicates, fishes, soft corals, nudibranchs, sea hares, opisthobranchs, Molluscs, echinoderms, bryozoans, prawns, shells, sea slugs, and marine microorganisms are sources of bioactive compounds such as oils and cosmetics. Marine pharmacology has been extensively reviewed, but the potential of oceans as a source for developing new drugs still needs to be explored further, considering their abundance in nature and large-scale production. The drug industry is currently screening and isolating novel molecules with unreported pharmacological properties to develop new therapeutic agents for commercial use. This process involves identifying specific marine organisms, extracting and purifying bioactive compounds, and testing them for their efficacy in treating various diseases and conditions.

The ancient Siddha medical science has recently gained global attention for its potential to provide treatment possibilities for degenerative disorders with no or fewer side effects. Siddha medicines comprise numerous single and compound drug formulations that are highly efficacious and useful to humankind. Animal-based and marine products are extensively used in Siddha medicine, with 15-20% of Siddha medicines being based on animal products. The marine environment, in particular, provides a remarkable source of many animal species, including corals used in Siddha medicine for various ailments. Coral, also known as Pavalam, is a calcareous substance with calcium carbonate and is used extensively in Siddha medicine. It contains calcium and 74 other life-enhancing minerals and is recommended for its life-enhancing properties, detoxification, and as a cure for liver disorders. Coral is made into Parpam, Chenduram, and Chunnam, which are used therapeutically for various disorders such as severe fevers, respiratory diseases, polydipsia, cough, haemoptysis, hepatomegaly, and dropsy conditions. These formulations act as blood purifiers and general tonics and are effective in treating liver diseases and disorders of bile secretion. They are also helpful as a prescription for longevity and improvement in blood circulation. However, Siddha medicine needs more systematic research on physicochemical standardization and pharmacological studies based on modern science, which restricts the development of the characteristics of this system. In order to make it credible and acceptable to all, a detailed scientific study of their physical and chemical properties, quality standards, and processing methods using modern standardization tools is necessary to ensure their safety and effectiveness for better use. Extensive research work has been conducted on drugs of plant origin, but more research needs to go into drugs of animal and marine origin. Some of

the Pavalam-based medicines are evaluated against atherosclerosis, gastric ulcers, osteoporosis, and hepatitis. Siddha Medicine, one of the oldest Indian traditional medicines, describes a variety of marine-derived drugs, including fishes, shells, sponges, and corals. Recently, a number of studies have been actively conducted in drug discovery from marine-based drugs. Pavalasilasathu parpam (PSP) is one such marine-based Siddha drugs mainly used in the treatment of leucoderma, diabetes mellitus, certain infectious conditions such as tuberculosis, respiratory infections, syphilis and venereal infections. This drug is administered at the dose of 100 mg/day with ghee. Pavalam (coral), silasathu (selenite), Aloe vera, Cissus quadrangularis and tender coconut water are the five ingredients inthis preparation.[1] Usually, the preparation of mineral-based Siddha drugs is a lengthy procedure, and combinatorial and transmutation changes are believed to occur during the processing. A literature survey revealed that the chemical changes during this drug's processing and chemical composition have yet to be reported. Thus, the objective of the







current study was to evaluate the chemical changes during the drug preparation process and also to evaluate the physical-chemical properties of pavalasilasathu parpam. This review focuses on different classes of marine drugs that are currently in use and at different stages of trials for approval and marketing in the future. Additionally, the review delves into the limitations and future trends of the drugs from marine sources, highlighting the need for further research and exploration of this exciting field.

Fig.1. Common medicines in siddha system of medicine made with pavalam (Source Rathinam et al 2014)

Name of the preparation	Book	Indication
Pavala veera chunnam	The pharmacopoeia of Siddha researchmedicines	Cough, Bronhialasthma, biliary colic, cholelithiasis
Narpavala chunnam	The pharmacopoeia of Siddha research medicines	Bronchial asthma, Cough, Hepatitis, Rickets, Tuberculosis
Pavala chunnam	Bogar karukkadai nigandu 500	Bronchial asthma, Relieves stress, Spermatorrhoea
Kodipavala chunnam	Anubogavaithya navaneetham Part III	Cough, Bronchial asthma, Tuberculosis

Table 1. Chunnam preparationmentioned in siddha literature (SourceRathinam et al., 2014)

Value of Pavalam in siddha medicine

The Siddha system of medicine offers a wide range of formulations to manage liver disease. A formulation that shows potential is "pavalaveerachunnam," a mineral and animal-based preparation taken from "The Pharmacopoeia of Siddha Research Medicines". This preparation, a higher order dosage form and specialized medicine in the Siddha system utilizes nanotechnology, making the nanoparticles easily absorbable, biodegradable, and compatible with the human body. An extensive review of literature and lateral research reveals that coral and pavalam, ingredients of PVC, are used in treating liver diseases. Liver disease, referred to as kalleralnoi in the Siddha system, is becoming increasingly important as the number of deaths from liver disease is rising worldwide. A comprehensive review was

conducted in several categories to better understand the drug and the disease. Siddha, geological, zoological aspects, and pharmaceutical reviews were conducted to establish the methodologies. The ingredients of the drug were identified and authenticated by experts in the Gunapadam and Geology departments. The trial drug was prepared according to classical methods, and the purification process eliminated toxins, increasing its efficacy. The grinding and Pudam process of this drug helped to change the particle size of the drug, making it more bioavailable. The pavalaveerachunnam was screened for various standardization parameters as per Siddha pharmacopoeial standards. The preclinical research resulting from the standardization can be used to evaluate the quality, purity, and efficacy of pavalaveerachunnam.

According to the thirithodam theory, the pitha increases in liver diseases. In panchabootha pasanam, veeram is Appubootham, and pavalam is a diuretic. Pitham is the Thee Bootham, so the line of treatment is called Ehirurai. Physico-chemical analysis of Pavalaveerachunnam showed that loss on drying (LOD) is 0%, indicating no moisture content in the prepared medicine. Increased moisture content is an issue for the instability of the drug and its lesser shelf life. Since Pavalaveerachunnam has been well prepared, it could achieve maximum stability and better shelf life. The total ash values of Pavalaveerachunnam were 3.9%, which is comparatively low. The total ash value indicates that the formulation's inorganic contents are below the limit. The acid-insoluble ash value of the prepared formulation (0.8%) shows that a minimal amount of the inorganic component is insoluble in acid. It indicates that adulteration of raw ingredients by substances such as silica and husk is significantly less. The test drug Pavalaveera chunnam, having a lower acid-insoluble value, will have better drug quality. 43.3% of the alcohol-soluble extractive value and 14.2% of the water-soluble extractive value of the formulation shows that the mineral contents of the formulations are more soluble in alcohol than water, and a lesser water-soluble extractive value (14.2%) of the formulation. Hence, honey should be used as an adjuvant for this preparation. Specific pathogens such as Salmonella sp., Staphylococcus aureus, E.coli, and Pseudomonas aeruginosa are nil, indicating that the test drug is free from microbial contamination and has standard quality. These findings suggest that pavalaveerachunnam can be an effective treatment for liver disease, and further research is waranted to explore its potential benefits. Several studies have been conducted to determine the potential health benefits of various medicinal substances. One such substance is Kodi Pavala chunnam, which has been the subject of several experiments to understand its effects on the body.

Velpandian et al., 2013 conducted acute and sub-acute toxicity studies on Kodi Pavala chunnam under OECD guidelines. The results showed that the substance did not cause toxicity in acute and sub-acute toxicity studies. In addition, Velpandian et al., 2013 also reported that Kodi Pavala chunnam has hepato protective activity in experimental rats with liver damage induced by CCl4. The haematological and biochemical parameters were found to be near normal in the treated group, indicating that Kodi Pavala chunnam had a beneficial effect on the liver. Thanigaivelan et al., 2011 evaluated the hemostatic activity of Pavala parpam in Swiss albino mice. The results indicated that Pavala Parpam could significantly reduce bleeding and clotting time. The significant reduction in bleeding was comparable to that of standard. Prabhakara N. Reddy et al., 2003 evaluated the anti-osteoporotic activity of pravala bhasma. The study was conducted on female Sprague-Dawley rats that underwent ovariectomy followed by a low calcium diet to induce progressive bone loss. The results showed that pravala bhasma could significantly increase combined cortical thickness and cortical and periosteal area ratio, suggesting that it could effectively treat osteoporosis.

Moreover, the calcium and phosphorus excretion in urine was comparatively decreased in the treated group, further indicating that pravala bhasma was beneficial for bone health. Rosalind Marita et al., 1988 evaluated the anti-atherosclerotic activity of Anna Pavala chendooram on experimentally induced atherosclerosis in rabbits. The study separated plasma and aortic phospholipids into individual lipids and incorporated radiolabel from 14C-acetate into phospholipids. The results showed that Anna Pavala chendooram could reduce plasma cholesterol levels up to 65% and increase HDL levels. Additionally, it reduced atheroma formation and plasma sphingomyelin levels, indicating that it could be an effective treatment for atherosclerosis. In clinical studies, Velpandian et al., 2013 evaluated the clinical efficacy of Kodipavala chunnam in hepatitis patients. The results showed that after treatment, Kodipavala chunnam could normalize the raised liver parameters. Similarly, Himanshu S et al., 2008 clinically studied the effect of pravala bhasma in hyperacidity patients, and the results indicated that it was effective in improving hyperacidity symptoms. According to the article, pavalam has been found to possess multiple health benefits, including respiratory analgesic, anti-inflammatory, antibacterial, and anti-oxidant properties. This makes it a valuable natural ingredient for treating various ailments. The article explains that a preclinical investigation was conducted on a medication called Narpavala Chunnam, which includes pavalam as one of its primary ingredients—the investigation aimed to test the medication's bronchodilator activity by inducing histamine-induced bronchospasm in guinea pigs. The results showed that the medication had substantial bronchodilator activity, demonstrating its

efficacy in treating bronchial asthma. The study also measured Narpavala Chunnam's anti-histaminic effect using histamine-induced ideal contractions in guinea pigs. The medication's anti-histaminic action was proven robust, making it a viable option for treating allergies and other histamine-related conditions.

Furthermore, the article highlights that Narpavala Chunnam demonstrated potent anti-inflammatory activity in a study that measured its effects on carrageenan-induced paw edema in rats. It also showed strong mast cell stabilizing effects in another study that used the degranulation of mast cells in rat mesentery to carry out its function. The medication's immunomodulatory properties were also investigated, and significant immunomodulatory activity was observed in animal models of neutropenia produced by cyclophosphamide. In conclusion, the study suggests that the tested Siddha formulation's action as a bronchodilator, anti-histaminic, anti-inflammatory, mast cell stabilizing, and immunomodulatory is primarily due to the inclusion of pavalam (coral). The article also highlights that pavalam is a potent bronchodilator, antihistamine, and anti-inflammatory, making it an effective medication for treating respiratory ailments, including bronchial asthma. The study investigated the anti-atherosclerotic activity of Anna pavala chendooram on trial atherosclerosis. Animals were given a cholesterol-rich (0.5%) diet for six months to induce atherosclerosis. The animals were then separated into different treatment groups, with the treated group receiving 50 mg of Anna pavala chendooram per day per animal for an additional six months. At the end of the study, plasma and aortic lipid segments were analyzed, and atherosclerotic injuries of the aorta were evaluated by histological assessment. The results showed that Anna pavala chendooram significantly reduced plasma cholesterol levels by up to 65%, increased HDL levels, and repressed atheroma formation. The drug also decreased plasma sphingomyelin levels. In another study, the haemostatic activity of Pavala parpam was evaluated in Swiss albino mice. The acute toxicity results showed that the 2000 mg/kg body weight of Pavala parpam was safe, so the animals were given 500 mg/kg through intraperitoneal route. The treated animals exhibited a decrease in clotting time and bleeding time compared to untreated animals, and the bleeding time was even better than the standard haemostatic drug. Moreover, according to the OECD guidelines of acute and oral toxicity reports, Pavala parpam is safe at 4000 mg/kg. Wistar rats were used to evaluate the hepatoprotective activity of Pavala parpam. The results showed that the animals treated with Pavala parpam had normal biochemical and haematological parameters levels, despite being induced with liver damage using CCI4. Finally, the anti-osteoporotic activity of Pavala parpam was evaluated using Female Sprague-Dawley rats induced with bone loss by ovariectomy and low calcium diet.

The results showed that the drug significantly improved femoral weight and density, reduced the amount of calcium and phosphorus in urine, and increased cross-sectional area, cortical thickness, Ca/P ratio, and medullary width in ovariectomized animals. Toxicity studies concluded that Pavala parpam is safe and did not cause toxicity in rats up to a dose of 2000 mg/kg. The subacute toxicity study also showed that Pavala parpam did not cause lethality or adverse changes in general behavior in rats. There were no observable adverse effects over 28 days. These studies suggest that Kodi Pavala chunnam, Pavala parpam, pravala bhasma, and Anna Pavala chendooram could have significant health benefits and be used as effective treatments for various health conditions.

Discussion

New research has uncovered the powerful anti-atherosclerotic properties of Anna pavala chenduram, a well-known herb used in Ayurvedic medicine. Studies show that this herb can significantly lower plasma cholesterol levels by up to 65% and increase healthy HDL levels. Anna pavala chenduram has been found to inhibit the formation of atheroma, a critical factor in the development of heart disease, and lower plasma sphingomyelin levels, which contribute to atherosclerosis.This herb contains essential minerals, including copper, iron, calcium, iodine, and magnesium, critical for regulating bodily functions. Iodine is necessary for thyroid hormone production, which regulates metabolism and other bodily functions. Calcium regulates calcium levels in the body and helps transmit nerve impulses, muscle function, and blood clotting. Copper is essential for optimal thyroid function, and copper deficiency can lead to sensitivity to cooler temperatures. Zinc and copper work together to maintain optimal thyroid function. Magnesium is crucial in various physiological functions, including protein synthesis, muscle and nerve function, and blood glucose control. Iron is necessary for synthesizing thyroid hormones, creating and metabolizing blood cells, and proper immune system function.Anna pavala chenduram is a rich source of these essential minerals, which can help maintain optimal bodily functions and prevent several diseases. Further research is needed to explore the therapeutic potential of this herb in treating and preventing various health conditions.

Developing drugs from marine sources is a complex process with various challenges that can make creating effective compounds difficult. One of the most significant challenges is the inconsistent environmental conditions that can produce different metabolites from the same organism. Another major challenge is that the microorganisms in the marine animal may produce the bioactive molecules, rather than the invertebrate marine hosts. Additionally,

obtaining a sustainable supply of isolated lead compounds can be challenging as these compounds may only be present in low quantities and may be technically difficult to isolate. The required quantity of the compound can also vary significantly depending on its intended use, ranging from a few grams needed for preclinical drug development and safety studies to kilograms required for clinical studies in different phases and even tons of cosmetics. To address these challenges, scientists have employed various strategies, including developing synthetic analogues or derivatives with customized properties or designing a pharmacophore of lower complexity with a more straightforward synthesis method. However, identifying bioactive compounds synthesized or hemisynthesized must be done concerning the compound derived from the biological source due to the structural complexity of the isolated compound and meager yield generally faced with marine compounds. Various methods have been proposed to overcome the issue of a regular supply, such as farming marine organisms in their natural environment, known as "Mariculture," or culturing the organisms under artificial conditions by the process called "aquaculture." Addressing commercial and market issues in the early development phase is critical for successfully developing marine drugs. Factors such as potential industrial use, the final cost per kg of the final bioactive material, the desired formulation and preferred route of administration of the compound, the process of manufacture being used, and whether the supply is sustainable, and how the product will reach the market chain are all important considerations. Despite these challenges, numerous institutes worldwide are actively engaged in researching and training in marine pharmacology, focusing on the discovery of potential novel compounds from marine organisms, extraction/isolation, safety and efficacy assessment, and large-scale commercial production, utilizing advanced technology and methodologies to overcome the inherent difficulties in marine drug development.

Conclusion

The marine environment has become a valuable source of natural products, molecules, and drugs that offer therapeutic potential. The vast diversity of marine organisms, combined with the uncharted areas of marine life, presents a significant opportunity to discover new products from the sea. The scientific community and industry have recognized the oceans as a potential goldmine for new drug leads, particularly in developing anticancer, anti-inflammatory, analgesic, and antiviral drugs. These drugs are undergoing different stages of preclinical and clinical testing worldwide, leading to the development of novel drugs that can tackle chronic and incurable diseases such as cancer. The success of marine natural products depends on the results of preclinical and clinical data, which determine their

marketing and commercial exploitation potential. Therefore, increasing current screening efforts for active natural products with a large and rapid random screening method is crucial to ensure that the most promising marine natural products are identified and exploited. Several research institutes and universities are working in this field to develop new molecules and train people to work in this area. Employing technology optimally in drug research, approvals, and launches will ensure that the most effective drugs are developed. Pharmacologists in India should consider further research in marine pharmacology to help develop new drugs in our country. The importance of Marine Pharmacology is summarized and its evolution as a specialty in India will help us optimize the use of rich marine resources around our beautiful country gifted with a vast coastline. By exploring and exploiting the marine environment, we can discover novel drugs that tackle some of the most challenging diseases and provide affordable and successful treatments.

Declaration of Competing Interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgement

Authors are highly thankful to the sri sairam siddha medical college, West Tambaram, Tamil Nadu for providing resources to gather information for compilation of this article.

Reference

Abdulla, S.M. (1975) Anuboga Vaidhya Navaneedam, Part I, II edn., APT SM Publications, Madras, 1975; 32-33.

Abdulla, S.M. In: R. Thiyagarajan (Ed.), Agathiyar Pallu Irunooru, II edn., Arulmigu Palani Thandayuthapani Temple Siddha Medical Books Publishing Company, Madras, 1957; 23-24. 10. Venkatesan, K. Aiyvu Nokkil Nattuppura Maruthuvam, Siddhar Kottam, Madras, 1976; 115-117. 11. Thiyagarajan R, Gunapadam – II & III Part – Thathu Jeeva Vaguppu., Pub: Indian Medicine and Homeopathy Dept. Chennai – 106. 2004; 348.

Alves RR, Rosa IL. Why study the use of animal products in traditional medicines? J Ethnobiol Ethnomedicine, 2005; 1:5. doi: 10.1186/1746-4269- 1-5.

Azamthulla M, Anbu J, Murali, A. Acute and Sub Acute Toxicity Studies of Pavala Parpam. J. dent.orofac. res., 2018; 14(02): 18-25.

Ekateria,Chemical diversity of soft coral steroids and their pharmacological activities, Pub med, Marine drugs, 2020 dec 2. doi:10.3390/md18120613.

Gunapadam Thathu Jeeva Vahuppu, part II & III compiled by Dr.R.Thiagarajan, 348.

Himanshu S. Tiwari, Patgiri B, Prajapati PK. A Comparative study on Pravala mula bhasma and Pravala shakha bhasma in amlapitta J.R.A.S., 2008; 31(3): 123-128.

Holt S. Natures Benefit from Coral Calcium. Newark, NJ: Wellness Publishing, 2003.

Kannan GA. Toxicity study on Pavala parpam (Doctoral dissertation, Government Siddha Medical College, Palayamkottai), 2019.

Kunin WE and Lawton JH. Does biodiversity matter? Evaluating the case for conserving species. In: GASTON KJ (Ed), Biodiversity: Biology of numbers and differences, Oxford: Blackwell Science, 1996; 283-308.

Meena VN, Nagendra P and Kalirajan K Infrared spectral studies on Siddha drug Pavalaparpam. Int J Pharma Bio Sci., 2010; 1(4): 474-483.

NOAA. What is a coral reef made of? National Ocean Service website, https://oceanservice.noaa.gov/facts/coralmadeof.htm l, 06/25/Calc

Pillai CK. Kannusamy paramparai vaidyam (Tamil). B. Rathna Nayakkar & Sons Publishers, Chennai, India. 2006. P.388.

Prabhakara N. Reddy, Lakshmana M, Venkatesh Udupa U. Effect of Praval bhasma (Coral calx), a natural source of rich calcium on bone mineralization in rats. Pharmacological Research, 2003; 48: 593–599.

Rathinamala Rathinam, Murugesan Moonandi. Pavalam: A valuable Siddha mineral drug. Int. J. Res. Ayurveda Pharm. 2014;5(3):367-371

sRathinamala,R. Preclinical safety and efficacy studies of a Siddha Herbomineral preparation for Swasakasam from mgr repository, june 2015

Romulo RN Alves Lerece L. Rosa, Why study the use of animal products in traditional medicines? J Ehnobiol Ethnomed, 2005; 1: 5.

Rosalind Marita and Radha Shanmugasundaram K. Effect of Anna Pavala sindhooram on plasma and aortic lipids in experimental atherosclerosis. Atherosclerosis, 1982; 45: 331-343. 29. Rosalind Marita, Shanmugasundaram KR Anna pavala sindhooram, A novel hypolipidemic agent reduces phospholipid levels in atherosclerosis. Pharmacological research communications, 1988; 20(7): 591-600.

Rosalind Marita, Shanmugasundaram KR Anna pavala sindhooram. A novel hypolipidemic agent reduces phospholipid levels in atherosclerosis. Pharmacological research communications, 1988; 20(7): 591-600.

Sagunthala R. A Toxicity study on Pavalaveera Chunnam (Doctoral dissertation, Government Siddha Medical College, Palayamkottai), 2013.

Thanigaivelan V, Victor Rajamanickam G, Kaliyamurthi V, Lakshmana Kumar V, et.,al, Antibacterial and haemostatic activities of a Siddha formulation – Pavala parpam Pharmacology online 2011(cited on, Aug, 2012; 1: 613-624.

Velpandian V, Anbu J, Prema S. Evaluation of hepatoprotective activity of Kodi pavala Chunnam in carbon tetrachloride induced Liver damage in rats. Int J Pharm Bio Sci., 2013; 4(1): 829-839.

Velpandian V, Ashwini anjana, Anbu J, Prema S. Acute and sub - acute toxicity studies of Kodi pavala chunnam in rodents. Asian journal of pharmaceutical and clinical research, 2012; 5(4): 36-41.

Velpandian V, Pitchiahkumar M, Gnanavel IS, Anbu N, Abdul Kadher AM. Clinical evaluation of Zodiacal chunnam in the treatment of infective hepatitis, drug induced hepatitis and alcoholic hepatitis. International Research Journal of Pharmacy, 2013b; 4(4): 152-157.