

AYURVEDIC CaCO₃ NANOPARTICLES PREPARATION AS NANOMEDICINE USING PLANT EXTRACT

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ABSTRACT

Introduction

Bhasma are the incinerated metallic or mineral preparation which used for the treatment of various diseases with the combination of herbal extracts. Mukta –Shukti is an aquamarine calcium carbonate compound which has been indicated in the treatment of rajyakshma, kasa, visham jwar, netra vikar, pachan samsthan disorder, swasroga, hridayaroga, chardi, amlapita, trishna, kasta aartav, asthi vikar.

Aim

To prepare Mukta Shukti Bhasma with the extract of Guduchi and to structural and the final sample subject to various analytical studies:–XRD, SEM

Methodology

Mukta sukti bhasam synthesized according to classical method like Shodhana, Bhavana, Marana and the analysis of final herbo-mineral preparation was carried out using following analytical methods like: X-ray diffraction (XRD) and scanning electron microscopy (SEM).

Conclusion-

The synthesis of Herbo-mineral medicine-Mukta shukti with Guduchi extract carried out and final preparation was successfully investigated by various analytical techniques.

Keywords: Herbo-mineral medicine, Mukta shukti, Guduchi, X-ray diffraction (XRD) and Scanning electron microscopy (SEM).

1. INTRODUCTION

The application of nanoparticles has attracted considerable attention as targeted delivery systems. In today's decomposed era of human life, Nanotechnology is lifting out as a boon for delivering drugs to specific cells using nanoparticles.^[1-2] The integration of Nanomedicine with biology is giving birth to development of diagnostic devices, contrast agents, analytical tools, and drug delivery vehicles. Traditional systems of medicines includes herbal medicines along with medicinal plants are continuing to play important role in providing healthy and disease free health care to large section of population, especially in developing countries. India is having a very unique distinction of six recognized systems of medicine in this category which are- Ayurveda, Siddha, Unani and Yoga, Naturopathy and Homoeopathy. Ayurveda is made of two words ayus (life) and veda (science) means the "Science of life". In India, Ayurveda is considered as most of the oldest system of Indian traditional medicine systems accepted worldwide. Ayurveda is a complete medical system that takes in to deliberation of physical, psychological, philosophical, ethical and spiritual well being of mankind. It plays great importance on living in harmony with the Universe and harmony of nature and science. This system focuses on the importance of maintenance of proper life style for keeping positive health and adopting all the healthy activities to enhance the quality of life. Ayurveda's drug formulation field known as 'Bhaishajya Kalpana', which gives great deal of information about methods of drug preparation, use of adjuvant,

collection and processing drugs in a particular manner. The junction of voluminous knowledge rich in herbal medicines from different traditional systems of medicines can lead to new heights in discovery process of universe of medicine. Extensively used in Ayurvedic medicine, Guduchi is often called the "root of immortality". The amrita herb has countless health benefits. It is also known as a powerhouse of antioxidants, which fights with free radicals and thus reducing the risk of deadly diseases like cancer. In Ancient history, its name is also mentioned as Amrita (Nectar of Life). It is said that during Samundra Manthan, when the pot full of Amrita, came out of sea; the demons took it and ran away. So while running few drops of Amrita fell on earth which took the form of a climbing herb known as Giloy. Thus for the betterment of human life, Giloy can be used in composition with other nectar in any form like bhasma of metals etc. for the scrapping of hazardous diseases from all over the world. It was used as internal medicine. The development of Aushadhiya Rasavigyan has brought a revolutionary step in Ayurvedic medicines by developing new techniques like shodhana, jarana, and marana for converting metals and minerals to very fine, absorbable, therapeutically most effective and least toxic medicinal form called bhasmas. Bhasma are defined as powder form of a substance obtained by Calcinations^[3]. Natural products with medicinal value are gradually gaining importance in clinical research due to their well-known property of no side effects as compared to drugs. Mukta shukti nanoparticles are a calcium containing bhasma which is synthesized through special calcinations of the mother of pearls. It is commonly used as an acid neutralizer, rich source of calcium, anti- pyretic, asthma, dysmennorrhoea, cough, rheumatism, conjunctivitis, tuberculosis and other diseases.^[4] Present study intended to synthesize the mukta shukti nanoparticles and evaluate the quality parameters including the structure and particle size for characterization of using X-ray diffraction (XRD), Scanning electron microscope (SEM).

2. MATERIALS AND METHODS

2.1 Material Synthesis and Experimental Methods

The raw material for the preparation of mineral-based was taken as raw material. The Bhasma nanoparticles is prepared for mukta sukta by special process which is providing heat in closed crucibles in pits with cow dung cakes (putpak vidhi).^[5] and then Swedan of Mukta with jayanti patra swaras in dola yantra for 3 hr so that mukta is purified and wash it with clear water and store it . Marana is process of calcinations.^[6] The purified mukta was kept into mortar pestle and mardana was done with rose water and shape was given to the paste in to tablet and dried them. After that, Heat was provided in closed crucibles in pits with cow dung cakes for three consecutive times and the final product is mukta shukti nanocrystal. For the preparation of Guduchi Satva, Guduchi sized of thumb are collected and then cut into small pieces, washed well and then crushed. Ratio of water to Guduchi is 4:1 and then macerated/rubbed manually in the water. Then the mixture is filtered through a clean cloth and the filtrate is kept aside for the whole night. Next day, with the help of siphon method, Satva settled at the bottom of the container is collected^[7].

2.1.1 Ingredient specification-

Mukta sukta bhasma-It is calcium containing bhasma [8]. this bhasma is prepared from pearl oyster and is grounded and triturated with aloe vera and vinegar in adequate quantity to make a paste like texture.[9] In transmission electron microscopy study particles are appear irregular rod shaped and act like antacid antipyretic and as a source of calcium.[10] It is also beneficial in tuberculosis, cough ,asthma, arthritis, rheumatism and conjunctivitis. Recent studies have shown that better result in increased the bone mineral density of the lumbar spine through adding heated oyster shells to the diet of elderly patient [11].

Guduchi Satva-Ability to balance blood sugar, relieve fever and spasms, fight inflammation, carry out antioxidant functions, promote joint health, calm allergic reactions, reduce stress, protect the kidney,

support the immune system are the branches of Guduchi to act as a amrita in the field of diseased world.

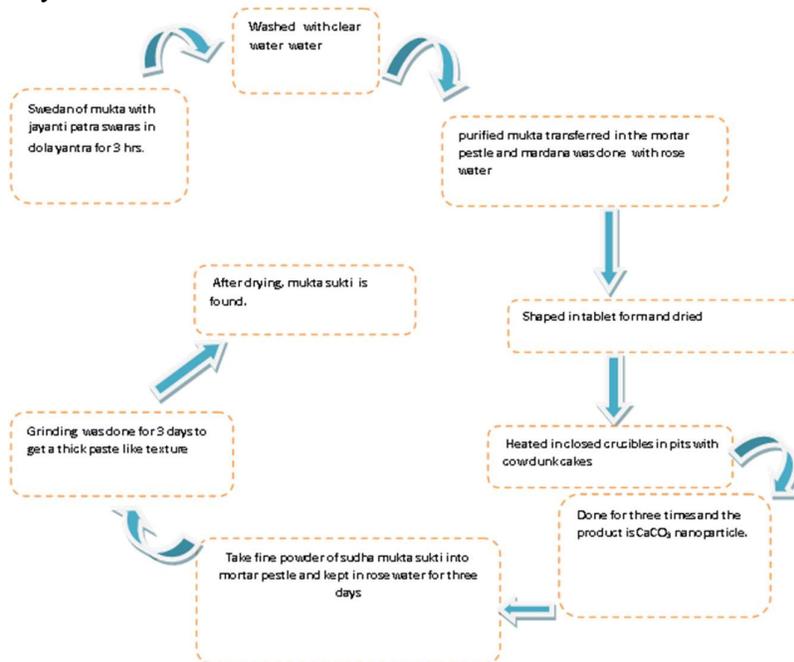
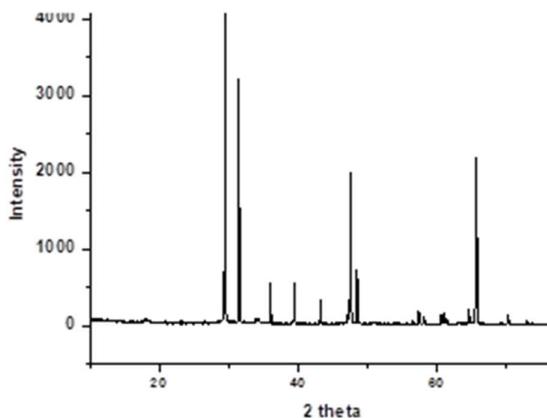


Figure 1 CaCO₃ nanoparticles using traditional Indian method.

2.2 X-ray Diffraction-

X-ray diffraction images of were recorded using powder x-ray diffraction analysis. The pattern of mukta shukti bhasma shows that the raw material of Muktashukti is in the aragonite form of calcium carbonate.



2.3 Morphological Examination by Scanning Electron Microscope

The morphological examination of the Ayurvedic Herbo- mineral drug was studied with the help of a scanning electron microscope JSM-5600. The drug Guduchi or Amrita consists of dried pieces of mature stem of *Tinospora cordifolia*. It is a large, deciduous extensively spreading climbing shrub with several elongated twinning branches.

3. RESULTS AND DISCUSSION

3.1 X-ray Diffraction-

Nanoparticles were characterized by X-ray diffraction. The observed diffraction patterns of the drug sample have been shown in Fig. 1. The X- Ray diffraction spectra recorded for nanoparticles were

marked by most prominent peaks centered at 29.36 & 32.14.

Fig 2: X-ray Diffraction of CaCO₃ nanoparticles.

3.2 Scanning Electron Microscope-

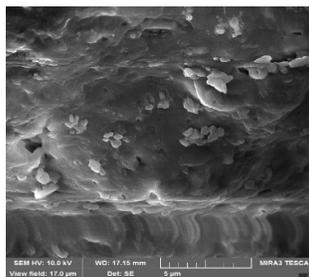


Fig: 3- SEM image of CaCO₃ nanoparticles.

Figure no.3 is showing the Scanning Electron microscopy of CaCO₃ based nanocrystals. By different methods the SEM images are collected for Mukta-Shukti sample. In this figure the smallest size of the nanoparticle cluster of sample is 200 nm.

Antimicrobial Activity

Test Micro-organisms

The micro-organism used for the test was Escherichia coli and Candida albicans were procured from NCL (Pune, India).

Preparation of Disc

The sterile 8 mm discs were loaded with 20µl samples of 45% concentration and Streptomycin was used as positive control with concentration of 100µg/disc while for the negative control distilled water was used. The studies indicated that guduchi extract as well as synthesized nanoparticles lack anti-microbial activity. These will interesting if it is ingested as a drug as it will not harm microbial flora of the gut. Water extract and nanoparticles of CaCO₃ were analyzed for anti-microbial activity using different fungal and bacterial strains. However, no clear zone of inhibition was observed in either case. This suggests that extract lacks anti-microbial activity (Table a & b). Results obtained were in good agreement with MIC/MBC tests, where clear zone of inhibition was observed for nanoparticles up to 60 nm size but not for larger nanoparticles. Moreover, the release of Ca from large nanoparticles is stated to be lower in solid culture media [12]

Table a & b CaCO₃ nanoparticle activity for Escherichia coli and Candida albicans

a.

Microorganism	10	+ve	-ve	30	+ve	-ve	60	+ve	-ve	100	+ve	-ve
	mg/ml	(mm)	(mm)									
<i>E.coli</i>	-ve	31.85	+ve	-ve	22.92	+ve	-ve	25.95	+ve	-ve	21.43	+ve
<i>C. albicans</i>	-ve	16.55	+ve	-ve	11.95	+ve	-ve	9.21	+ve	-ve	10.96	+ve

b.

Microorganism	10	+ve	-ve	30	+ve	-ve	60	+ve	-ve	100	+ve	-ve
	mg/ml	(nm)	(nm)									
<i>E. coli</i>	-ve	39.51	+ve	-ve	35.03	+ve	-ve	36.97	+ve	-ve	38.45	+ve
<i>C. albicans</i>	-ve	9.54	+ve	-ve	11.45	+ve	-ve	8.87	+ve	-ve	8.87	+ve

4. CONCLUSION

In this research work, the synthesis of CaCO₃ nanoparticles were successfully designed on ZnSe and PbSe core quantum dots using chemical deposition technique. The XRD patterns confirm the presence of CaCO₃ nanoparticles. The average crystalline size was calculated using Scherrer's formula and found to be 208 nm for CaCO₃ nanoparticles. It can be concluded that the CaCO₃ nanoparticles may be suitable for biological application in cancer, TB etc.

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