Introduction

The early part of the 20th century brought a global flourishing of the pharmaceutical industry. With the progress in chemical techniques, crude drugs came to be replaced in the pharmaceutical industry by pure chemical drugs and the developed countries witnessed a decline in popularity of medicinal plant therapy. But the pendulum has swung again and there is a resurgence of interest in study and use of natural drugs. They are increasingly used as (1) source of direct therapeutic agents, (2) as a raw material base for the elaboration of more complex semi-synthetic chemical compounds and (3) as models for new synthetic compounds.

We have been surrounded by various known and unknown natural drugs. Many plants or natural drugs are known by only names. If the medicinal secretes of those plants or natural drugs are revealed and popularized, they can contribute a great deal towards more effective, less hazardous health care to the sufferings of the ill people. Ayurveda has identified and utilized the hidden treasure of natural drugs. Ayurveda has mentioned many formulations and dosage forms for a variety of ailments. Although there is massive wealth and knowledge available in Ayurveda, the lack of standardized products, Pharmacognostical and pharmacological data of the drugs and its formulations have hindered its fruitful utilization.
Nature has given medicinal value to every substance thus causing their minimal wastage. Unripe coconut husk, hen egg shell and banana peel are considered as waste materials. Ayurveda has identified the hidden potential of these waste materials and used these materials in the form mashi, bhasma and ash respectively for various human ailments.

Mashi a powder formulation is unknown to common man. Upon heating any material at a low temperature, it converts into a black colored substance which is called as mashi, which on further heating turns into ash. If the mashi is mixed with specified liquid (bhavana) then it converts into bhasma.

The selected natural drugs (Unripe coconut husk, hen egg shell and banana peel) and their formulations are not studied systematically. The lack of substantial scientific work and reports on the standardization parameters and various pharmacological activities encouraged us to conduct a systematic study of the drugs. We studied morphology, microscopy, proximate analysis and chemical study of drug materials with the following aims and objectives.

- To provide systematic/ Pharmacognostical data of selected crude drugs.
- To prepare and study the dosage form Mashi and its types systematically by applying modern parameters of evaluation to the raw material, its dosage forms and process involved.
• To study the effects of in process techniques which are commonly used in the preparation of bhasma viz shodhana, marana and bhavana.

• To study Composition of the authentic bhasma prepared by traditional method with Marketed bhasma.

• To study acute and sub acute toxicity of these materials

• To evaluate the role of bioinorganic constituents in the Mashi and Bhasma for Pharmacological action.

The work was divided into three parts

• Unripe coconut husk: Pharmacognostical and pharmacological study of unripe coconut husk. Preparation and evaluation of bahirdhum padhati and anterdhum padhati mashi.

• Hen egg shell (Modern and gavaran): Pharmacognostical and pharmacological study of both the hen egg shell. Preparation and evaluation of Kukkutandatvac Bhasma.

• Banana peel: Pharmacognostical and pharmacological study of banana peel. Preparation and evaluation of banana peel ash.

A) UNRIPE COCONUT HUSK

Pharmacognostical study

Morphological study: The coconut husk was found to be tough and smooth with a slightly curved shape.

Both mashi were different morphologically. Bahirdhum padhati mashi (BPM) was gray and salty in taste. The presence of potassium was found
responsible for salty test. Anterdhum padhati mashi (APM) was black in color and it was like charcoal. The texture of BPM was gritty and APM was smooth.

**Microscopical study:** Coconut fiber was found to contain sclerenchyma, xylem, phloem and parenchyma. The number, shape and arrangements of these cells vary from fiber to fiber. Since sclerenchymatous cells are greater and occupy the bulk they are responsible for the strength of the fibers. The high percentage of cellulose and lignin in the fibres makes them very difficult to powder.

**Proximate analytical work:** Unripe coconut husk was found to contain high amount of moisture. A significant difference between total ash value and acid insoluble ash value indicated presence of major part of acid soluble inorganic radicals, potassium being a major one. Presence of potassium was confirmed by atomic absorption spectrometry. High water extractive value indicated the presence of water soluble constituents. Chemical test confirmed the presence of tannins, saponins and flavonoids. Fatty materials like sterols are present in very small amount which were confirmed by successive extraction. Crude fiber content determined by Dutch method was found to be very high (up to 81%), indicating high amount of acid and alkali resisting tissues. Fluorescence study is one of the powerful tools for identification of crude drugs. Study of unripe coconut husk with non polar solvents exhibited characteristic
color changes. Extracts with non polar solvents were colorless in ordinary light and faint blue in UV light.

Proximate analytical study of mashi revealed all the values higher than those in raw material. Yield of mashi was 1/3rd of the raw material. Reduction in weight affected the yield of organic and inorganic constituents present in the drug. As these two types of constituents were affected quantitatively, ash values and extractive values were also affected. BPM was found to contain high percentage of moisture compared to APM. Like coconut fiber, a significant difference between total ash value of BPM and acid insoluble ash value of BPM indicated presence of acid soluble material in the BPM. Water soluble constituents were more in BPM than APM.

**CHEMICAL STUDY:** Preliminary phytochemical screening of unripe coconut husk revealed presence of phenolic compounds, flavonoids, tannins, saponins, sterols and 3-5% of pectin. Organic chemical constituents were affected significantly due to thermal stress during formation of mashi, which was confirmed by absence of constituents like saponins sterols and pectin in the mashi. Both the mashi showed presence of phenolic constituents, flavonoids, tannins.

Total phenolic content was expressed as milligrams per grams of extract/mashi calculated as gallic acid. Aqueous extract showed 75mg/g, Alcoholic extract showed 68mg/g, BPM showed 15mg/g and APM showed 13mg/g phenolic content.
Due to thermal stress, decomposition, oxidative and thermal degradation of organic constituents may be taking place in mashi hence the amount of organic constituents found less in the mashi than the extracts. Identification of phenolic constituents in extract and mashi was carried out by HPLC which showed presence of 4 hydroxybenzoic acid, 4-hydroxybezaldehyde, 4-coumaric acid and ferulic acid.

Comparative study of the APM and BPM revealed major difference in yield. Yield of APM was more than the BPM. APM had poor flow ability, lower solubility compare to BPM. Inorganic content determination confirmed that there is only quantitative difference in the inorganic constituents and not qualitative. Comparison of the yield of the mashi and its inorganic content estimation confirms that quantitative difference found is dependent on the yield. More the yield, less the inorganic content and vice versa.. Hence inorganic content of BPM was more than APM. Potassium was found as 12.358 % in BPM and it was 1.651% in APM and 1.087%in fiber.

DSC thermogram of APM and BPM was reproducible. Therefore it may be considered as a promising tool for quality control. In the region of 80 to 120°C weakening of hydrogen bonds occur with the loss of physically bounded water. This is evident from the weakening of the endothermic peak in both the mashi. An endotherm at 210°C in BPM may be assigned to the condensation product of lignin. It is reported that lignin is devitrified by condensing and softening process in temperature 135-250°C.
PXRD study of the APM and BPM confirmed the crystalline form of potassium as potassium chloride sylvite, which is very common form of potassium salt occurring in various natural products.

APM and BPM showed similar pattern of the FTIR spectra. Peaks at 3647 cm\(^{-1}\) and 3456 cm\(^{-1}\) are assigned to Stretching vibration mode of the OH\(^-\), 2889 cm\(^{-1}\), 2857 cm\(^{-1}\) indicates the aliphatic C-H stretching. The bands between 1480 cm\(^{-1}\) and 1300 cm\(^{-1}\) may be due to the presence of the OH bending vibration which indicates the presence of phenolic group. The presence of bands around 2400 cm\(^{-1}\) denotes the presence of C=O stretching indicating that lignin might be rich of methoxy-O-CH\(_3\), C-O-C stretching and C=C stretching (aromatic ring) containing compounds.

**Pharmacological screening**

**Toxicological study:** No mortality and gross behavioral changes were observed except increase in urination in the test animals treated with the dosage forms of unripe coconut husk during acute and sub acute toxicity study. All the experiments confirmed the dosage form to be safe and non toxic. Increase in urination may be attributed to presence of potassium, which is an osmotic diuretic.