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AUTOMATED BASTI BLENDER

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Abstract - *Honey, Salt, Sneha which is Oil/Ghee, Kalka also called as a Herbal Paste, and Kwatha, known as herbal decoction make up Niruha Basti which is mostly preferred to be called as Medicated Enema. To make the ideal basti dravya, the components must be blended in a certain sequence. Honey and rock salt are combined first, followed by the addition of sesame oil. After then, the mixture is well blended. The finely ground paste of herbal medications is then completely blended in. The herbal medication decoction is added, and the combination is thoroughly churned in a household mixer to make a homogenous mixture. The resulting combination takes on an emulsion-like physical condition. We are developing an AUTOMATIC BASTI BLENDER for crushing and blending basti or enema components, with a base/bowl made of wood, metal, ceramic, or granite, and a hefty pestle attached to a machine that revolves automatically around the base at a set pace. The five primary components, honey, salt, oil, medicine paste, and drug decoction, each have their own area. With the use of a set self-timer linked to it, the automated blender is pre-programmed to inject each component into the bowl/mortar in a certain measured quantity (as per the proportion of each ingredient necessary for the final result) automatically at a specified interval. This will not only make it easier to make Basti/Enema, but it will also eliminate individual variances in the final Basti by creating a standard final produced Basti.*

Key Words: Basti, Ayurvedic, Automated, blender, Decoction, Niruha.

1. INTRODUCTION

In today's environment, maintaining one's health has become a demanding and time-consuming task. Years of poor eating habits, nutrition, and lifestyle may lead to a buildup of toxins in the stomach, which are then taken into the circulation and appear as illnesses. Any ailment in the human body, such as inflammation or arthritis, has been demonstrated to be caused by toxins that stay in our bodies. The key to restoring an individual's health is to eliminate these pollutants. It's also critical to preserve the body's normal metabolic activity while doing so. This may be performed by giving the person an Ayurvedic enema or Basti. Basti Karma is one of the Panchakarma treatment's five branches. It is a process in which a person's rectum is pumped with a combination of herbal oils or decoctions. This aids in the removal of all toxins from the colon and promotes the individual's health and well-being. We generate a natural strategy using Basti Karma in order to cleanse and nurture the land. It nourishes and feeds the flora in the colon. It also strengthens an individual's immune system by cleaning and nourishing the gut by replenishing the body's basic prana, which is created in the colon, it brings the body into entire equilibrium. Although Basti is delivered in the colon, its effects are far-reaching and profound. It helps with bowel regularity, joint support, gastrointestinal issue treatment, nervous system support, and good sleep patterns. As a result, Basti contributes to an individual's general well-being.

2. CONVENTIONAL METHOD OF PREPARATION OF BASTI

The basic ingredients used in the basti preparation are Honey, Salt, Oil, Ghee, gomutra, alkali, kalkam paste and decoction, *(fig.1)*. First, the honey is mixed with rock salt and grinded in a mortar until they mix up properly. Later the oil or ghee or both is added to the mixture and thoroughly mixed. Later kalka is added and mixed and finally Kashaya is added to the mixture and grinded well until they form a homogenous mixture. The whole mixture should be put in a transparent container and left for few minutes. The contents should not be settled in different layers. This is the test for homogeneity. Now the basti dravya is ready to be administered, *(fig.2).*

Fig -1: Basic Ingredients

3. PROBLEM STATEMENT AND SOLUTION

The root cause of our project goes back to the fact that even in this advancing science field we exist in, we are still dependent on the manual labor work for creating ayurvedic

medicines that not only take a longer time but also make it less available for the consumers. Hence, with meticulous research and study, the team of four of us came out with a solution to this by deciding to automate the process, in a way that it has never been done before. The base design for our project takes reference from the technology of an automated liquid dispenser *(fig.2.1)*. Not only can it produce all the different types of basti but can also produce two different types of Basti at once. The base idea of the automated basti blender roots back to the mechanism of a liquid dispenser coupled with an electric motor which is set to run at a particular RPM using an electric circuit. The basic ingredients of the basti medicine are subjected to the blender with the help of the dispenser mechanism. These raw ingredients are then mixed with other elements in the blender where heat is introduced to it. This process forms the emulsion called Basti.

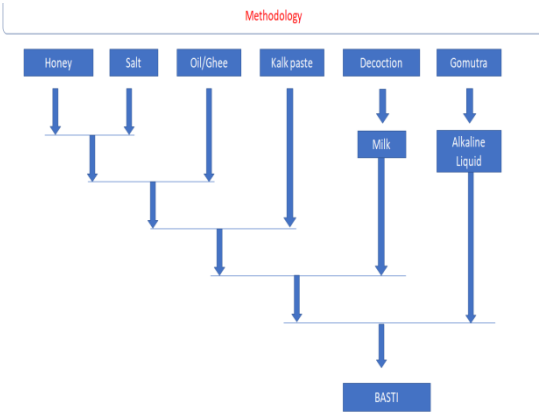

Fig -2: Methodology

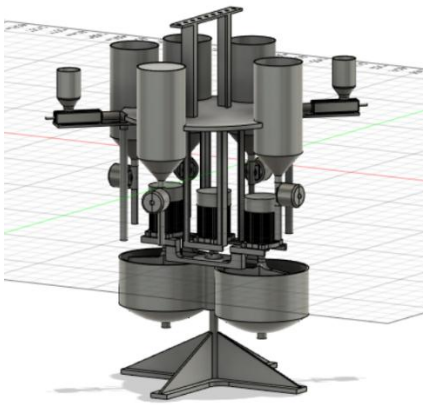

Fig -2.1

3.1 Manufacturing process and material used

The manufacturing process chosen for the prototype of the automated basti blender was 3-D printing.

Material used: ABS plastic

Table -1: INGREDIENTS

INGREDIENTS	QUANTITY (gm)	VOLUME (cm^3)
SALT	10	10
HONEY	120	120
OIL	20	120
GHEE	120	120
GOMUTRA	120	120
ALKALINE	120	120
KALKAM	80	80
DECOCTION	640	640

3.2 Design and numerical solution

1) Total flow through the cylindrical section *(fig.3)*

- honey, oil, ghee, gomutra and alkaline liquids = 120 x 14 = 1680 cm^3
- Salt = 10 x 14 = 141 cm^3
- Kalkam paste = 80 x 14 = 1120 cm^3
- Mandanaphalam = 320 x 14 = 4480 cm^3
- Kyatha Dravya = 120 x 14 = 1680 cm^3

Fig.3

2) Upper cylinder volume (V) = $\pi r^2 h$ *(fig.4)*
Taken, r = 50 mm = 5 cm
h = 195mm = 19.5 cm
(V)= 3.14 × (5 cm) ^{2} × 19.5 cm
(V) = 1530.75 cm^2

3) Volume of small cylinder attached to frustum = $\pi r^2 h$
*(fig.5)*Taken, r = 83 mm = 0.83 cm
h = 15mm = 1.5 cm
Volume (V) = 3.14 × (0.83cm) ^{2} × 1.5 cm
(V) = 3.24 cm^3

4) Volume of Frustum of cylinder (V); *(fig.6)*

(V)= H/3 × (S1+S2+$\sqrt{S1S2}$), where,

- H = Height of the frustum (the distance between the centers of two bases of the frustum)
- S1 = Area of one base of the frustum
- S2 = Area of the other base of the frustum

Taken, h = 5cm, r = 5cm, R = 0.835cm
S1 = πr2 = 3.14 × 5cm × 5cm = 78.5 cm^2
S2 = πR2 = 3.14 ×0.835 cm ×0.835 = 2.18 cm^2

Applying it in the above mentioned formula,
(V) = 5/3 × (78.5+ 2.18 + √78.5+ 2.18)
(V) = 149.43 cm^3

5) Volume of pipe attached to valve (V) = $\pi r^2 h$
*(fig.7)*Taken, r = 83 mm = 0.83 cm
h = 15mm = 1.5 cm
(V)= 3.14 × (0.83cm) ^{2} × 1.5 cm
(V) = 3.24 cm^3

6) Volume of cylindrical part of grinder (V) = $\pi r^2 h$
*(fig.8)*Taken, r = 95 mm = 9.5 cm
h = 100mm = 10 cm
(V) = 3.14 × (9.5) ^{2} × 10 cm
(V) = 2833.85 cm^3

7) Volume of Frustum of grinder (V), *(fig.9)*
(V) = H/3 × (S1+S2+√S1S2), where,

H = Height of the frustum (the distance between the centers of two bases of the frustum)
S1 = Area of one base of the frustum
S2 = Area of the other base of the frustum

Taken, h = 4cm , r = 9.5cm , R = 0.8cm
S1 = πr2 = 3.14 × 9.5cm × 9.5cm = 283 cm^2
S2 = πR2 = 3.14 ×0.8 cm ×0.8 = 2 cm^2

Applying it in the above mentioned formula,
(V) = 4/3 × (283+ 2 + √283+ 2)
(V) = 4041.1 cm^3

8) Volume of cylinder attached to lower frustum,
(V) = $\pi r^2 h$, *(fig.10)*
Taken, r = 8 mm = 0.8 cm
h = 12.2mm = 1.22 cm
(V) = 3.14 × (0.8) ^{2} × 1.22 cm
(V) = 2.45 cm^3

9) Volume of dispenser cylinder (V) = $\pi r^2 h$
(fig.11) Taken, r = 23 mm = 2.3 cm
h = 58.3mm = 5.8 cm
(V) = 3.14 × (2.3) ^{2} × 5.8 cm
(V) = 87.8 cm^3

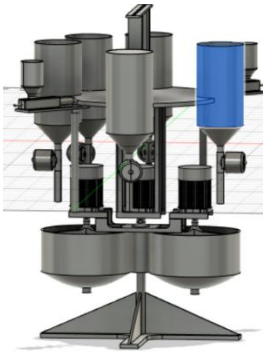

Fig.4

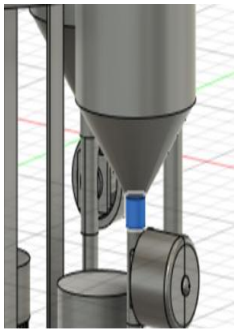

Fig.5

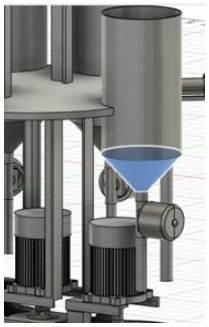

Fig.6 **Fig.7**

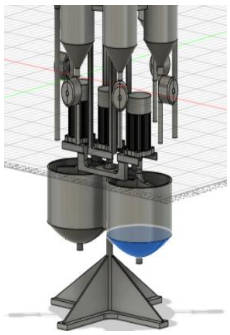

Fig.8 **Fig.9**

Fig.10

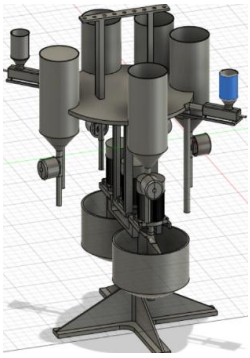

Fig.11

10) Volume of Frustum of dispenser (V); ***(fig.12)***
(V) = H/3 × (S1+S2+√S1S2), where,

H = Height of the frustum (the distance between the Centers of two bases of the frustum)
S1 = Area of one base of the frustum
S2 = Area of the other base of the frustum

Taken, h = 1.6 cm , r = 2.3 cm , R = 1.2 cm
S1 = πr2 = 3.14 × 2.3cm × 2.3cm = 16.61 cm^2
S2 = πR2 = 3.14 ×1.2 cm ×1.2 cm = 4.5 cm^2

Applying it in the above mentioned formula,
(V) = 1.6/3 × (16.61+ 4.5 + √16.61+4.5)
(V) = 13.7 cm3

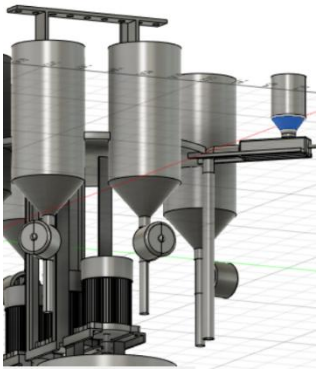

Fig.12

4. TESTING

The testing process was carried out for the preparation of Basti using the Automated Basti blender. The prototype of the Automated Basti blender was 3-D printed up to 1/4th of its original design (***fig.13***), to exhibit and accomplish the work. For the preparation of Basti, the basic ingredients were pre-mixed and were then administered to the Blender. The blender was powered with an electric motor which was circuited to run at a fixed rpm=200 (***fig.14***). Several trials were conducted wherein the blender was tested at different Rpm's for different durations of time to achieve the perfect the consistency of the Basti medicine. The partially done mixture (***fig.15***) was made under the supervision of Ayurvedic doctors. This mixture was then taken out and allowed to cool down for a few seconds before getting introduced to the blender. The mixture was poured into the blender and the motor rotated the blender fans at an rpm=200 for seven minutes to achieve the necessary consistency of the Basti.

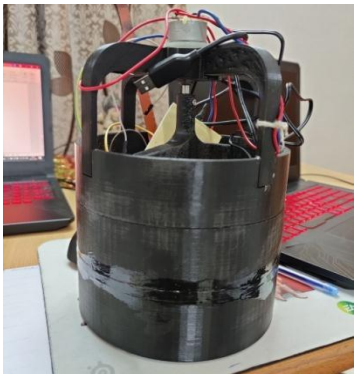

Fig.13

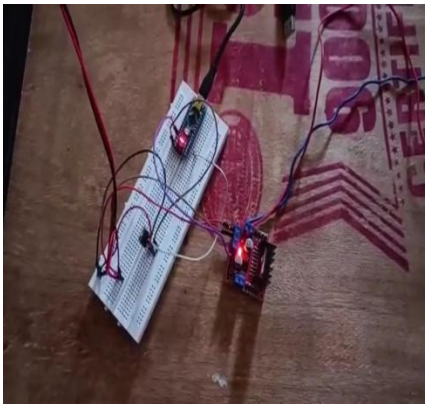

Fig.14

Fig.15

5. RESULT

As a result, the Niruha Basti produced using the Automated Basti Blender was found to have better chemical and physical properties compared to that of a handmade Basti. The estimated time taken to make the basti was 10 minutes, three times faster than that of the conventional method of preparation.

6. CONCLUSION

As you can see from the above, the traditional technique takes a long time and requires human labour. It makes no sense to use human labour for such a work in this day and age of technology, thus this project aims to automate the entire process, boosting efficiency and reducing labour requirements, making it easier and more comfortable for the general population to carry out this activity. Finally, we'd like to state that we envision our initiative as a one-stop solution to many of the challenges that hospitals confront when it comes to basti preparation. We also believe that this project will pave the way to many more advances in this field which would make human life much easier.

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