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Original Article

Study of Preparation and Standardization of *'Maadhutailika Basti'* with special reference to Emulsion Stability

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Abstract

'Basti' is compared with conventional enema due to its similarity in procedure of administration. But in effect enema is a simple evacuation technique, whereas *'Basti'* is a therapeutic measure considered as *'Ardha Chikitsa'* i.e half therapy in the disease management. Constitution of *'Basti dravya'* formulation specifically *'Aasthaapana Basti'* has a direct impact on the end result of *'Basti'* therapy. A systematic step-wise procedure of preparation of *'Aasthaapana Basti'* is described in Ayurvedic Classics. The present study evaluates the significance of this procedure through standardization of *'Maadhutailika Basti'*, a type and standard of *'Aasthaapana Basti'*. Four samples of *'Aasthaapana Basti'* including the classical one were prepared for this study by replacement, exclusion and supplementation of honey in the formulation. A comparative study of physico-chemical characteristics of these samples was carried out. The stability of the constitution of *'Maadhutailika Basti'* was also studied to assess the role of honey as a natural emulsifying agent. The study underlines the significance of the procedure described in the classics emphasizing the role of honey as a natural emulsifying agent in standardization of *'Maadhutailika Basti'*.

Key words: Enema, *Aasthaapana Basti, Basti dravya,* Emulsion stability, Emulsifying agent.

Introduction

'Basti', one of the five therapeutic procedures in *'Panchakarma'* is an important *'Ayurvedic* therapy'. It is always compared with conventional evacuation and retention enema. According to *Ayurvedic* principles *'Basti'* plays a much more vital role in the disease management than conventional enema. *'Maadhutailika Basti'*, a type of *'Aasthaapana Basti'* also termed as *'Niruha Basti'* is a mixture of oil, honey, *'kwaatha'* (decoction) and *'Kalka'* (fine paste obtained after wet grinding of the plant material). These ingredients are immiscible with each other. A homogenous mixture is required for actual administration of *'Basti'*. The homogeneity needs to be sustained for a reasonable period through the procedure of administration of *'Basti'*. Considering the requirement a specific procedure of preparation of *'Aasthaapana Basti'* is prescribed by the classics.

पूर्वं ही दद्यान्मधु सैन्धवन्तु स्नेहं विनिर्मथ्य ततोऽनुकल्कम्।
विमथ्य संयोज्य पुनर्द्रवैस्तं बस्तौ निदध्यान्मथितं खजेन।।

च.सि. ३/२३[१]

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Serial order of mixing of ingredients as described by[1] *Charaka*, honey and rock salt are mixed together in the beginning followed by addition of oil. This mixture is then thoroughly mixed. The finely wet grinded paste of prescribed medicinal plants is then mixed in it. The mixture is then again mixed thoroughly. The prescribed liquids such as *kwaatha* (decoction), *kaanji* (vinegar) etc. are then added to it and the mixture is subjected to thorough churning to produce a homogeneous mixture. The mixture thus produced acquires a physical state of emulsion. An emulsion is a mixture of two or more immiscible (unblendable) liquids. One liquid (the dispersed phase) is dispersed in the other (the continuous phase).

An emulsifier (also known as an emulgent) is a substance which stabilizes an emulsion, frequently a surfactant. Examples of food emulsifiers are egg yolk (where the main emulsifying chemical is lecithin), honey, and mustard, where a variety of chemicals in the mucilage surrounding the seed hull act as emulsifiers; proteins and low-molecular weight emulsifiers are common as well. A wide variety of emulsifiers are used in pharmacy to prepare emulsions such as creams and lotions. Common examples include emulsifying wax, cetearyl alcohol, polysorbate 20, and ceteareth.[2]

Emulsifying agents are the substances added to an

emulsion to prevent the coalescence of the globules of the dispersed phase. They are also known as emulgents or emulsifiers. They act by reducing the interfacial tension between the two phases and forming a stable interfacial film. The choice of selection of emulsifying agent plays a very important role in the formulation of a stable emulsion. No single emulsifying agent possesses all the properties required for the formulation of a stable emulsion therefore sometimes blends of emulsifying agents have to be taken.

Criteria for selection of emulsifying agents[3]:

An ideal emulsifying agent should posses the following characteristics:

1. It should be able to reduce the interfacial tension between the two immiscible liquids.
2. It should be physically and chemically stable, inert and compatible with the other ingredients of the formulation.
3. It should be completely non irritant and non toxic in the concentrations used.
4. It should be organoleptically inert i.e. should not impart any colour, odour or taste to the preparation.
5. It should be able to form a coherent film around the globules of the dispersed phase and should prevent the coalescence of the droplets of the dispersed phase.
6. It should be able to produce and maintain the required viscosity of the preparation.

'Basti' is an emulsion by its physical state. *'Maadhutailika Basti'* an emulsion does not contain any such conventional emulsifying agent although it contains honey, a natural emulsifying agent. It is worthwhile to compare the utility of conventional emulsifying agents such as gum acacia in place of or in addition to honey for increasing the stability of *'Maadhutailika Basti'*. Such an achievement will increase the therapeutic efficacy of the *'Maadhutailika Basti'* and make it more and more user friendly. Considering the significance this study was undertaken. No such studies were found to be conducted in the past. The study is principally based on comparison of physico-chemical characteristics of the sample formulations along with testing of these samples for emulsion stability.

Aims and Objects:

1. To prepare *'Maadhutailika Basti'* in accordance with the prescribed classical method.
2. To standardize *'Maadhutailika Basti'* with reference to its physico-chemical characteristics.
3. To assess the role of honey as a natural emulsifying agent with reference to the constitutional stability of *'Maadhutailika Basti'*.

Material & Methods

The study was carried out on the formulation of *'Maadhutailika Basti'* prescribed by *'Sushruta'*.

मधुतैले समे स्यातां क्वाथश्चैरण्डमूलज:।
पलार्धं शतपुष्पायास्ततोऽर्धं सैन्धवस्य च।
फलेनैकेन संयुक्त: खजेन च विलोडित:।
देय: सुखोष्णो भिषजा माधुतैलिकसंज्ञित:।।[४]

सुश्रुत संहिता चि. ३८/१००-१०१

Raw material:

1. *Ricinus communis Linn.* (*Erand moola*) roots.
2. *Foenicum vulgare Mill.* (*Shatapushpa*) fruits (Fennel).
3. *Randia spinosa* poir *(Madanphal)* seeds (Emetic nut).
4. Honey.
5. Sesame Oil.
6. Rock Salt.
7. Potable water.

Equipments:

1. Pulverizer.
2. Mortar and Pastel.
3. S.S. container.
4. Gas stove.
5. Domestic mixer.
6. Spatula.
7. Measuring cylinder.
8. Laboratory glasswares like flasks, Soxlet extractor, Sp. Gravity bottle etc.

Method:

The study was carried out in two phases:

1. Preparation of *'Maadhutailika Basti'*.
2. Standardization of *'Maadhutiliaka Basti*.

Phase 1: Preparation of *'Maadhutailika Basti'*:

Ingredients in the formulation were taken in the measure as shown below:

1.	Decoction of roots of *Ricinus communis*	310 ml
2.	Sesame Oil	170 ml
3.	Honey	170 ml
4.	Rock Salt	10 gm
5.	Paste of fennel and seeds of emetic nut	30 gm
6.	Gum acacia	42.5 gm

Four samples of *'Aasthaapana Basti'* were prepared with ingredients as mentioned below:

Sample A - Decoction of roots of *Ricinus communis*, Sesame oil, Rock salt, Fennel and seeds of Emetic nut.

Sample B - Decoction of roots of *Ricinus communis*, Sesame oil, Rock salt, Fennel, seeds of Emetic nut and Gum acacia.

Sample C - Decoction of roots of *Ricinus communis*, Sesame oil, Rock salt, Fennel, seeds of Emetic nut, Gum acacia and Honey.

Sample D - Decoction of roots of *Ricinus communis*, Sesame oil, Rock salt, Fennel and seeds of Emetic nut and Honey. (Formulation as prescribed by *Sushruta)*.

Honey Agmark grade and Sesame oil I.P. grade and other raw material was collected from local market. The raw material was tested and authenticated in the drug testing laboratory of Govt. Ayurveda and Unani Pharmacy, Nanded, MA*hara*shtra.

To start with the decoction of *Ricinus communis* was prepared by standard method by taking the powder (60 BSSmesh) of *Ricinus communis* roots and water in the proportion of 1:16 and retaining 1/8th part after boiling. The contents were then filtered through a four layered muslin cloth. The filtrate so obtained was used as a decoction of *Ricinus communis* for preparation of all the four samples.

A fine paste of fennel fruits and seeds of emetic nut was prepared by wet grinding. The paste was used as a *'kalka'* for all the four samples. Rock salt and gum acacia were grinded independently to prepare fine powder.

Sample D was first prepared following the serial order of mixing the ingredients as prescribed by *'Charaka'* as indicated below:

Honey and rock salt were mixed together in the beginning followed by addition of Sesame oil. This mixture was then thoroughly mixed. The finely wet grinded paste of fennel and emetic nut was then mixed in it. The mixture was then again mixed thoroughly. The decoction of *Ricinus communis*, was then added to it and the mixture was subjected to thorough churning in a domestic mixer to produce a homogeneous mixture. The mixture thus produced acquires a physical state of emulsion.

In case of sample C same sequence of mixing as that of sample D except addition of gum acacia in the mixture of honey and rock salt.

In case sample B as honey is not present in the formulation Rock salt was mixed with gum acacia followed by the same sequence as that of sample D.

In case of sample A the formulation neither contains honey nor gum acacia. Hence-Rock salt was mixed in sesame oil followed by addition of the paste of fennel and emetic nut. Decoction of *Ricinus communis* was added in the added and the mixture was subjected to thorough churning in domestic mixer. Churning of all the samples was done in domestic mixer for one minute at 15000 rpm following addition of each ingredient.

Three batches of each sample were prepared. Sample was collected from each batch for carrying out analytical tests.

Phase 2: Standardization of *'Maadhutiliaka Basti':*

Standardization of *'Maadhutailika Basti'* was carried out by carrying out following tests on raw material and final product as per the requirement of the material.

Organoleptic characters, Water sol. extractives, Alcohol sol. Extractives, Total Ash, Acid Insoluble Ash, Moisture content., Sp. Gravity, Hardness, Refractive index, Relative viscosity, Acid value, Saponification value, Iodine value, pH and Total solids. Dilution, Conductivity and Dye test was carried out for testing the type of emulsion.

All the analytical tests were carried out in drug testing laboratory, Govt. Ayurved and Unani Pharmacy, Nanded.

Tests for Emulsion[3]:

Dilution test: In this test the emulsion is diluted either with oil or water. If the emulsion is o/w type and it is diluted with water, it will remain stable as water is the dispersion medium but if it is diluted with oil, the emulsion will break as oil and water are not miscible with each other. Oil in water emulsion can easily be diluted with an aqueous solvent whereas water in oil emulsion can be diluted with a oily liquid.

Conductivity Test:

This test is based on the basic principle that water is a good conductor of electricity. Therefore in case of

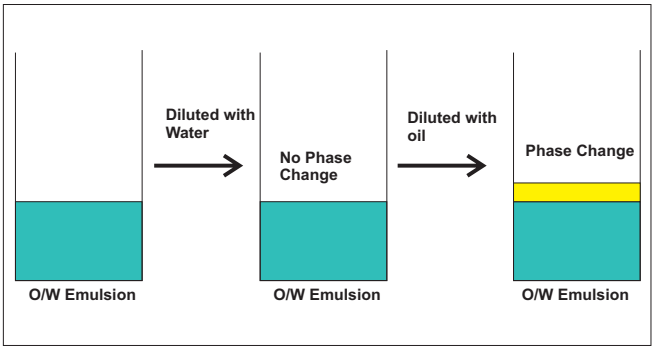

Figure 1:Tests for emulsion

o/w emulsion, this test will be positive as water is the external phase. In this test, an assembly consisting of a pair of electrodes connected to a lamp is dipped into an emulsion. If the emulsion is o/w type, the lamp glows.

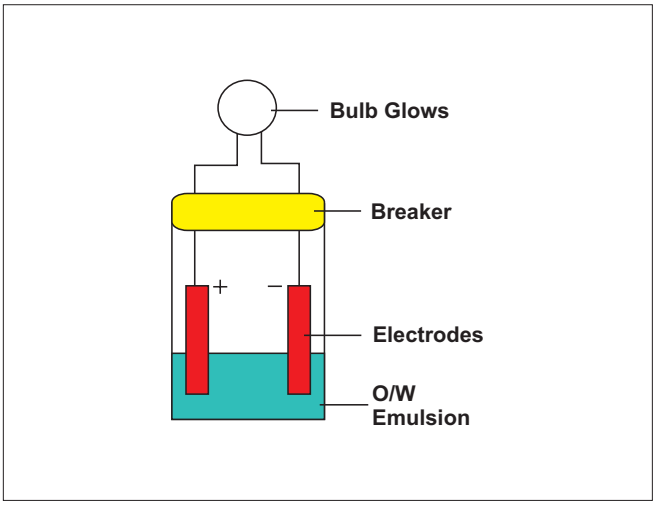

Figure 2: Conductivity test

Dye Solubility Test:

In this test, when an emulsion is mixed with a water soluble dye such as amaranth and observed under the microscope, if the continuous phase appears red, then it means that the emulsion is o/w type as water is the external phase and the dye will dissolve in it to give color, but if the scattered globules appear red and continuous phase colorless, then it is w/o type. Similarly if an oil soluble dye such as Scarlet red C or Sudan III is added to an emulsion and the continuous phase appears red, then it w/o emulsion.

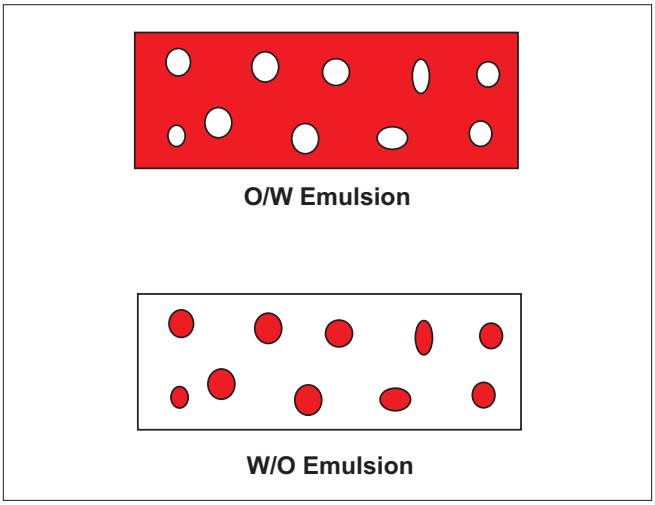

Figure 3: Dye solubility test

Discussion

'Basti' as described earlier is a very important therapeutic measure in the management of disease. The effect of *'Basti'* is not restricted to ano-rectal region locally as in conventional enema. The *'Basti'* is supposed to exert a systematic action. The ingredients of *'Basti'* reach up to small intestine. They are absorbed through gut wall distributed in the body and thus exert a systematic effect[5]. *Chakrapaani* in his commentary on action of *'Basti'* says

प्रकृतिस्थ च गुदे गुदस्य बस्तिना सम्यगुपश्लेषाद् व्याप्तिर्भवति,
तथा वलयश्च लीना भवति।
तेन सुखं बस्तिर्याति ग्रहणीर्गुदयो प्रकृतिस्थतया च बस्तिर्व्याप्त
सुखे ग्रहणीं भावयतीति बोद्धव्यम्।[५]

चक्रपाणी च. सि. ३/२४

It means the ingredients of *'Basti'* reach up to duodenum. This statement is supported by[6] Best and Taylor who state "Materials introduced by enema, may in some instances pass through the valve into the ileum. Such incompetence may permit the enema fluid to reach the duodenum." He further adds "The possibility of material from even lower bowel reaching the mouth is strongly

Table 1: Physico-chemical characteristics of raw materials

Raw material	Water sol. extrat	Alochol sol. extract	Total ash	Acid insol. ash	Moisture content	Sp. Gr.	Hardness
Ricinus Communis root	7.97%	2.8%	6.91%	0.57%	-	-	-
Foenicum vulgare	2.84%	6.21%	12.8%	2.52%	-	-	-
Randia spinosa	25.03%	18.914%	5.79%	0.9%	-	-	-
Rock salt	-	-	-	-	24.236%	2.132	3.5
Gum acacia	-	-	2.1%	0.4%	5.7%	-	-

Table 2: Phyico-chemical characteristics of liquid raw materials

Raw material	Sp. Gr.	R.I.	Rel viscosity sec.	Acid value	Sap. value	Iodine value	Most. content	pH	Total solids
Sesame Oil	0.918	1.4713	56.5	4.439	187.935	102.315	0.174%	-	-
Honey	1.3913	1.4907	1530	-	-	-	17.7%	4.97	-
Decoction of *Ricinus communis* root	1.0162	1.3383	1.1	-	-	-	-	4.28	0.758%

Table 3: Organoleptic characteristics of samples of *'Maadhutailika Basti'*

Sr. no.	Test	Sample A	Sample B	Sample C	Sample D
1	Colour	White	White	Reddish White	Reddish White
2	Taste	Salty	Salty	Salty sweet	Salty sweet
3	Odour	Oily	Oily	Oily sweet	Oily sweet
4	Touch	Soft	Soft & sticky	Soft & sticky	Soft

Table 4: Tests for emulsion

Sr. no.	Test	Observation
1	Dilution	Miscible with water
2	Conductivity	Conducts electricity
3	Dye test	Water soluble dye colors the emulsion

Table 5: Physico-chemical characteristics of Sample D *'Maadhutailika Basti'*

Sp. gravity	1.0913
Iodine value	100.8158
Sap. value	189.8707
% acidity	103.3333
Rel. viscosity	19.9833
Stability in hrs.	24.5333

Table 6: Stability period of emulsions in all the Samples

Sr. no	Sample	Stability in hrs.
1	without honey or gum acacia	9.7166
2	with gum acacia	29.7666
3	with honey & Gum acacia	6.4833
4	with honey	24.5333

suggested by the fact that lycopodium spores, introduced into the colon by enema, have been recovered some hours later from washings of the stomach, alimentary canal movements"

In this reference *Sushruta* also says that if *'Basti'* is properly administered the ingredients of *'Basti'* circulate in all the body just like a plant watered at its root circulates the water through out its branches. if *'Basti'* is properly administered.

सम्यग् प्रणिहतो बस्तिः स्थानेष्वेतेषु तिष्ठति।
पक्वाशयात् बस्तिवीर्यं खैर्देहमनुसर्पति।
वृक्षमुले निषिक्तानामपां वीर्यमिव द्रुमम्।।[४]

सु. चि. ३५/२४-२५

पक्वाशयाद्बस्तिवीर्य खैः स्रोतोभिरनुसर्पति कृत्स्नदेहे, वीर्य शक्ति, प्रभाव इस्यनर्थान्तरम्। [७] डल्हण

Kaashyapa states that administration of *'Basti'* proves to be an elixir for children as well as adults. शिशुनामाशिशुनां च बस्तिकर्मामृतं यथा।[८] का. सि. १/९

Whereas *Charaka* and *Sushruta* both say that *'Aasthaapana Basti'* has multiple therapeutic actions such as

बस्तिर्वयः स्थापयिता सुखायुर्बलाग्निमेधास्वर्णकृच्च।
सर्वार्थकारी शिशुवृद्धयूनां निरत्ययः सर्वगदापहश्च।।
विट्श्लेष्मपित्तानिलमूत्रकर्षी दाढ्यावहः शुक्रबलप्रदश्च।
विश्वक्स्थितं दोषचयं निरस्य सर्वान् विकारान् शमयेन्निरुहः।।[९]

च. सि. १/२७-२८

तत्रास्थापनानुवासनं तु खलु सर्वत्रोपक्रमेभ्यो वाते प्रधानतमं मन्यन्ते भिषजः तद्वयादित एवं पक्वाशयमनुप्रविश्य केवलं वैकारिकं वातमूलं छिनत्ति, तत्रावजितेऽपि वाते शरीरान्तर्गता वातविकाराः प्रशान्तिमापद्यन्ते, यथा वनस्पतेर्मूले छिन्ने स्कंधशाखाप्ररोहकुसुमफलपलाशादीनां नियतो विनाशस्तद्वत्।[१]

च. सू. २०/१२

वीर्येण बस्तिरादत्ते दोषानापादमस्तकान्।
पक्वाशयस्थोऽम्बरगो भूमेरेर्को रसानिव।।
स कटीपृष्ठकोष्ठस्थान् वीर्येणालोड्य संचयान्।
उत्खातमूलान् हरति दोषाणां साधुयोजितः।।[४]

सु. चि. ३५/२७-२८

सकलावयवगतदोषहरणं बस्तेरेकस्थानस्थितस्योपमानेन दर्शयन्नाह-वीर्येणेत्यादि। डल्हण

शरीरोपचयं वर्णं बलमारोग्यमायुषः।
कुरुते परिवृद्धिं च बस्तिः सम्यगुपासितः।।[४]

सु. चि. ३५/३१

To summarize[9] Kasture H S states "Action of the *'Basti'* is not limited to extraction only but it acts all over the body. *Basti* does not retain itself in the ano-rectal region but by crossing large and small intestine and can reach even duodenum. The active ingredients of *'Basti'* are thus absorbed in the duodenum."

All this can be only achieved if the *'Basti'* is formulated and administered properly. Considering such an action apart from the actual method of preparation of *'Basti'* the Ayurvedic classics have prescribed a specific serial order of mixing the ingredients while preparing the formulation of *'Basti'*. This order has been specifically mentioned by *'Charaka'*[1].

In the present study it was observed that the order of mixing is very important as the ingredients like salt and grinded paste being do not get properly mixed in the emulsion if such an order of mixing is not followed. Especially honey a natural emulsifying agent has a great significance in this regard.

'Maadhutailika Basti' was proved to be oil in water o/w emulsion as proved by dilution, conductivity and dye test. It was observed in this test that the emulsion was diluted easily with water, the medium was conducting the electricity and the continuous phase acquired the colour of water soluble dye which all lead to the conclusion that *'Maadhutailika Basti'* is an o/w emulsion.

Regarding stability of emulsion state Sample B i.e. *'Basti'* prepared with gum acacia in place of Honey appears more stable as compared to other samples (Stability period 29.76666 hrs.). The stability of Sample D with honey is 24.53333 hrs. It proves that *'Basti'* prepared without use of emulsifying agents honey or gum acacia do not have good stability. Honey although little less effective serves the purpose of emulsifying agent. Apart of its action as an emulsifying agent has specific clinical activity. Honey moreover

gains over gum acacia with its properties like *'Yogavaahitwa'* and *'Kaphaghnata'*. These properties are very much essential considering the therapeutic action of *'Aasthaapana Basti'*. Addition of honey also results in homogenization of the formulation, which is required for formulation stability. It remains to be studied whether Gum acacia gives formulation stability along with emulsion stability.

An interesting observation in this study also needs attention. Honey and Gum acacia both appear to be very good in giving emulsion stability when used independently. But their combination leads to reduction in emulsion stability as observed in sample C. It indicates that both have an antagonistic action over each other and are not compatible as emulsifying agents. How this happens is a subject of further study. However it has been noted by *Ayurvedic* classics that honey although very good when used independently its combination with ghee particularly in equal quantity is harmful to the body. It suggests that a serious thought should be given before using honey in combination with other substances. All this discussion leads to the conclusion that in preparation of *'Basti'* honey should be preferred over gum acacia.

It is also observed that the specific serial order of mixing the ingredients in preparation of *'Basti'* mentioned by the classics is also very important. It makes the *'Basti'* more and more homogeneous.

Conclusion

'Basti' is oil in water o/w emulsion. Honey should be preferred as an emulsifying agent over others on account of its stability yielding and specific therapeutic effect. The serial order of mixing the ingredients mentioned by classics should be maintained to get a homogenized emulsion.

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हिन्दी सारांश

इमल्शन स्टॅबिलीटी के संदर्भ में माधुतैलिक बस्ति का प्रमाणीकरण/मानकीकरण

एस. एस. सावरिकर एवं सी. ई. लगड़

आयुर्वेद में बस्ति चिकित्सा को 'अर्ध-चिकित्सा' माना गया है। इसका प्रभाव बस्तिद्रव्यों पर निर्भर रहता है। प्रस्तुत शोधकार्य में माधुतैलिक बस्ति के मानकीकरण का अध्ययन किया गया है। इसमें शास्त्रोक्त बस्तिद्रव्य के साथ मधु के प्रमाण में बदलाव करके चार अलग नमूनों का भौतिक एवं रासायनिक परीक्षण किया गया। शास्त्रोक्त विधि से बनाई गयी बस्ति का महत्त्व और मधु का प्राकृतिक इमल्सीफायिंग द्रव्य के रूप में उपयोग इस शोधकार्य से सिद्ध होता है।