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Research Article

PHYSICO CHEMICAL ANALYSIS OF THE FORMULATION *KANAKABINDHVARISHTAM*

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ABSTRACT

Kanakabindhvarishtam is a formulation included in *Arishta kalpana*. It is mentioned by Acharya *Charaka* in the context of *Kushta chikitsa*. The formulation is having *Khadira* (Acacia Catechu) as *Kashaya Dravya* (decoction) and *Triphala* (*Amalaki, Vibeetaki, Hareetaki), Trikadu (Maricham, Sundi, Pippali), Vidanga, Mustha, Indrayava, Guduchi, Haridra, Daruharidra* and *Vasa Moola* as *Prakshepa Dravyas*. Even though *Guda* and honey were not mentioned in the yoga, they were added in order to facilitate the fermentation process. *Dhataki* flowers which are commonly used to accelerate the fermentation process were not added in the preparation. The whole process were carried out in two stages- initial stage include the preparation of *Kanakabindhvarishta* according to the reference by Charaka Acharya, and in the 2nd stage Physico chemical analysis of the yoga were carried out. The Physico chemical parameters include pH value (5.28), total solid content (2.03%), specific gravity (1.0105), reducing sugar (2.8129%), total sugar (6.43%) and alcoholic content (8%). 35lt of *Arishta* was prepared by fermentation process. The *Sandhana patra* (fermentation vessel) in which the *Arishta* was prepared were kept for a period of 45 days and all the *Arishta siddha lakshanas* were obtained as per the reference.

INTRODUCTION

Ayurveda is a divine science having its origin from Lord Brahma and is considered as *Upaveda* of *Atharvaveda*. Ayurveda is science of health as it deals not only with the diseased ones but also deals with the healthy individuals. The main aim of the science is to maintain the health of the *Swastha* and to pacific the illness of the diseased. The word '*Swasthyam*' is defined as the maintenance of the state of equilibrium of seven *Dathus*, three *Doshas*, three *Malas* and the *Agni*. Ayurveda as the science of life utilizes the drugs from all the natural sources like minerals, plant and animal origin. In the view of Ayurveda there is not a single drug, which is devoid of any medicinal property. It is the physician who decides whether a drug become a medicine or act as poison. The drug advised in proper dose act as nectar while improper dose will kill the person like *Visha*.

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In Ayurveda, there are various dosage forms which are used for maintaining the equilibrium of the deranged *Dosha* and there by bringing it to normalcy. The various dosage forms include *Swarasa*, *Kalka*, *Kashaya, Churna Kalpana, Gulika* preparations etc. *Sandhana kalpana* is a unique formulation in the field of *Bhaishajya kalpana*, as various alcoholic or acidic products are produced finally and this alcoholic medium created act as a preservative for the product and increases the shelf life of the product and promotes the long term use. *Sandhana kalpana* is a formulation where liquid base drugs like juices or decoctions are subjected to fermentation process by the addition of *Guda, Kinva*, etc, and finally acidic or alcoholic fermented products are manufactured. Or the process by which the various *Ausadhies* are mixed with *Madhura dravyas* like *Sarkara*, *Sitha, Madhu* and the mouth of the vessels are sealed and kept undisturbed for a definite period of time. The heat produced by the combination of the drugs cause the *Paka* of the *Dravyas* and produce a change in taste, smell and colour of the formulation.

Arishta Asava Kalpana, included under the *Madya kalpana* is a sub division of *Sandhana kalpana*. *Arishta Asavas* are considered as a unique dosage form due to their superiority above the other dosages. These

are preparations which contain self-generated alcohol. They are considered superior due to easy palatability and increased therapeutic activity. There are descriptions about various *Arishta Asavas* in classical text. These formulation are having long shelf life, due to the presence of self-generated alcohol which itself act as a preservative to the formulation. They are having action on both body and mind. *Arishta kalpanas* are having properties like that of *Madya kalpana*. The properties include *Laghu, Ruksha, Teekshna, Vidahi, Sookshma, Vyavayi, Vikasi, and Yogavahi*. As it is having the *Sookshma* property it can penetrate the deeper *Dathus*, and by the *Yogavahi* property it can possess the property of the drugs which are used in its preparation.

Kanakabindhvarishta is a formulation included in the *Arishta kalpana*. It is mentioned by Acharya Charaka in the context of *Kushta chikitsa*. The word '*Kanaka*' in the yoga stands for the colour it imparts to be body. The usage of *Arishta* makes the individual shine like gold. Most people doubt from the name *Kanakabindhvarishta*, to have the presence of *Datura*, which is not present in this formulation. It is having *Khadira* as *Kashaya Dravya* and *Triphala*, *Trikadu, Vidanga, Indrayava, Mustha, Guduchi, Haridra, Daruharidra* and *Vasa Moola* as *Prakshepa Dravyas*. *Guda* and honey are added to it for facilitating the fermentation process as they are acting as a source of energy for the microbes. Most of the drugs mentioned here in this *Yoga* is having *Rasayana* property.

METHODOLOGY

Preparation of *Arishta*

Prior to the preparation the drugs were collected. The drugs in the *Arishta* include

Khadira- for *Kashaya* preparation

Prakshepa dravyas include

Triphala - Hareetaki, Amalaki, Vibeetaki

Trikadu- Nagara, Maricha, Pippali

Mustha

Indrayava

Daruharidra Twak

Guduchi

Vasa Moola

Vidanga

Gudam and *Madhu*

Even though *Guda* and *Madhu* are not mentioned in the Yoga, in the commentary they were asked to be added as per the Yogas mentioned previous to *Kanakabindhvarishta.*

In the Yoga as per reference the quantity of the ingredients are mentioned as

Khadira kashaya - 64 *Pala*

Prakshepa dravyas - 6 *Pala* each

Madhu and *Gudam* - 1 *Prastham*

With a view of preparing 45lt of *Arishta* the ingredients were taken.

Preparation of *Khadira kashayam*

Khadira- 17.5kg

Water- 140lt (8 times)

Raw *Khadira* is taken, washed and cleaned properly and crushed to smaller pieces. 17.5kg of the crushed *Khadira* was taken in a vessel and 140L of water was added to it and kept over medium fire. The process of cooking was continued till the entire content was reduced to quarter. It took around 1 complete day for the contents to get reduced to 1/4th. The flame was put off and the *Kashaya* vessel was kept aside for complete cooling. The vessel was closed with a mesh like lid to prevent the *Kashaya* from getting contaminated by any creatures. Next day the *Kashaya* which was completely cooled was filtered.

Preparation of *Kanakabindhvarishtam*

1. *Khadira kashayam* – 35 L
2. *Triphala churnam*
   a. *Amalaki*
   b. *Vibeethaki* – 262.5 gm each
   c. *Hareethaki*
3. *Trikadu churnam*
   a. *Nagara*
   b. *Pippali* – 262.5 gm each
   c. *Maricha*
4. *Mustha churna* - 787.5gm
5. *Vidanga churna*- 787.5gm
6. *Indrayava churna*- 787.5gm
7. *Guduchi churna*- 787.5gm
8. *Haridra churna*- 787.5gm
9. *Gudam*- 2.240kg
10. Honey- 2.240 l

Preparation

Khadira kashaya was taken and kept aside.

A mud pot was taken and was washed with hot water as a part of getting it disinfected and kill any microbes present. It was then dried well and fumigated using *Guggulu dhupana*. To this mud pot half the quantity of *Kashaya* was poured. To this *Kashaya Prakshepa Churnas* from 2 to 8 were added. Then *Guda* and *Madhu* were added and the remaining *Kashaya* was poured in order to facilitate the mixing of the *Prakshepa churna*.

The mouth of the pot was then covered with a lid and sealed properly with mud smeared cloth. Seven layers of cloth were smeared with mud which was used for sealing. And it was kept undisturbed without aerobic intervention. This is kept undisturbed for a period of 45 days. On the 46th day the outer mud covering was removed and the signs of completion of fermentation are checked. The scum on the upper most part of the *Arishta* was removed and the clear layer of

fermented product below the scum was collected and transferred to another container. The *Arishta* was kept undisturbed for sedimentation of the *Prakshepa dravyas*. After 2 days the clear liquid portion was collected. The supernatant clear fluid obtained was then shifted to an air tight container for storage.

From the 35 L *Drava dravya* about 24 L of *Arishta* were only obtained.

Observations during *Arishta* preparation

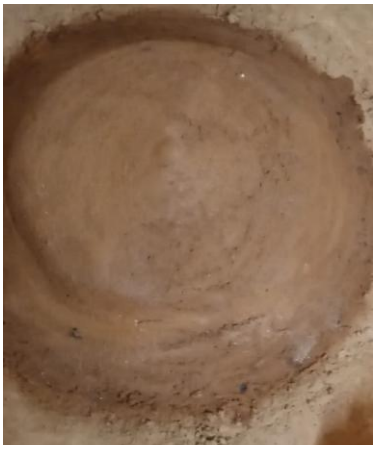
At the beginning of the process

The colour of the fermentation medium was that of the *Khadira Kashaya* i.e., reddish in colour. The *Prakshepa dravyas* that were added were seen floating on the surface. The honey poured form a supernatant layer above the *Prakshepa churnas* first and later sink down.

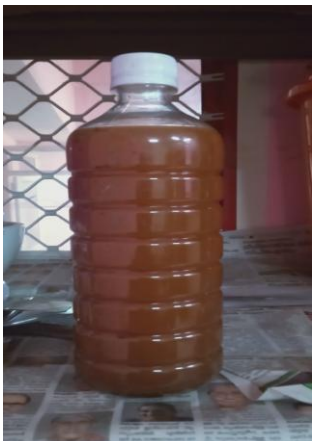
On completion of the fermentation, a supernatant layer of scum having the microbes was seen on opening the lid. Strong alcoholic smell was present. The *Prakshepa dravyas* has completely sunk to the bottom. The colour of the medium has changed from red to dark brown colour. Later, after the *Arishta* was kept for sedimentation the colour changes to light brown.

Arishta* on Breaking of *Sandhana Patra

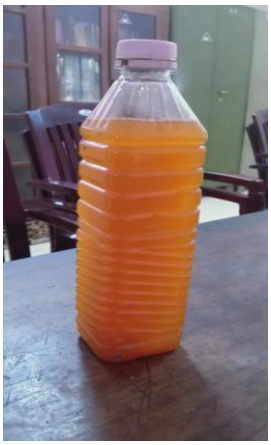
Arishta Sandhi Bandhana



***Arishta* Immediately After Fermentation**



***Arishta* on 3rd day After Fermentation**



Therapeutic indication: *Mahakushtam, Arsa, Svasa, Bagandhara, Kasa, Kilasa, Prameha, Sosa*

Dose: 30ml (As per AFI)

Organoleptic Characters of *Kanakabindhvarishta*

Organoleptic characters of *Kanakabindh-varishtam*	**Observation**
Colour	Light brown
Odour	Characteristic smell
Taste	*Madhura Tiktha*
Consistency	Slightly viscous

Determination of pH value

pH of *Kanakabindhvarishtam* was found to be 5.28

Determination of Specific Gravity

Specific gravity was calculated

Result

Specific gravity of *Arishta*= $\frac{wt\ of\ aris\ ta}{wt\ of\ distilled\ \ water}$

$= \frac{24.9551}{24.696}$

$= 1.0105$

Specific gravity of *Arishta* found to be 1.0105

Determination of Alcohol Content

Specific gravity of extract = $\frac{\text{weight of extract}}{weig\ t\ of\ water}$

= 25.4733 – 25.5521

= 0.9969

As per Alcoholometric table, alcohol content of *Kanakabindhvarishtam* with specific gravity 0.9969 is 2

Alcohol content in 100ml of *Kanakabindhvarishta*=2*4

= 8

The Alcohol content was found to be ~ 8%

Determination of Total Solids

Weight of empty beaker (w1)= 47.641

Weight of beaker after heating at 110 C (w2) = 47.844

Total solid content = w2 – w1

= 47.844 – 47.641

= 0.203

Percentage of total solids = $\frac{(w2-w1)*100}{10}$

= 0.203 *10

= 2.03 %

The Total Solid content was found to be 2.03%

Determination of Total Sugar Content

Sugar content= 1.1*0.505*79.84

= 44.3511

Total sugar content = 19.3079

% of total sugar = 6.43 %

The total sugar content found to be 19.3079 and % of sugar content found to be 6.43%

Determination of Reducing Sugar

Sugar content= 0.8 * 0.505 * 79.84

= 32.2554

Reducing sugar content= 14.0649

% of reducing sugar= 2.8129

The amount of reducing sugar found to be 14.0649 and % of reducing sugar is 2.81%

The table showing the Physico chemical analysis are shown below

pH value	5.28
Specific gravity	1.0105
Alcohol content	8
Total solid content	2.03%
Total sugar content	19.3079
Reducing sugar	14.0649

DISCUSSION

Preparation of *Kanakabindhvarishta*

At most care has to be maintained throughout the *Arishta* preparation. The entire vessels used in the *Arishta* preparation are to be sterilized by fumigating with drugs like *Guggulu* which have antimicrobial action. The vessels should be devoid of moisture content. Because moisture content at any stage of preparation can cause the *Arishta* to get easily spoiled. The moisture content will favour the growth of microbes and affect the quality of *Arishta*. The mud vessel in which *Arishta* has to be kept are fumigated before preparation. Crushed *Khadira* was taken and 8 times water was added and subjected to *Paka* till the *Kashaya* get reduced to 1/4th. The *Kashaya* is made to cool before pouring. The *Arishta* was prepared next day. Half the amount of *Khadhira Kashaya* was added and to it *Prakshepa Churna*, honey and *Guda* are added. The remaining *Kashayas* are poured and the mouth is covered with a lid. The mouth of the vessel was then covered with seven layers of cloth which was smeared with clay. The crack which appeared on this covering was plastered for a period of two weeks for preventing the entry of air. The vessel was kept immersed in a pit to maintain the temperature of the fermentation medium in uniform pattern. Optimum temperature has to be maintained for the effective and maximum yield of products.

On the 45th day the seal of the vessel was removed. Supernatent layer was observed with white sponge like fungal colonies. A lighted cloth wick was brought to the vessel mouth and the lid was covered partially to prevent the contact with external air. The cloth wick continued to burn which indicates the completion of fermentation. On the removal of supernatant layer, clear light brown liquid solution was observed. The *Prakshepa Dravyas* have all sunk to the bottom. The thickness of the liquid solution was found to be more as we do deeper the vessel. There was considerable loss of final product as too much quantity of *Arishta* was mixed with slurry. The *Prakshepa Dravyas*, as they were added as *Churna* the amount of slurry formed was more. Finer the particle the wastage will be more. In the industries to reduce the wastage of the *Arishta* the *Prakshepa Dravyas* are

only crushed and made coarse. 25L of *Arishta* was only obtained from 35L of *Kashaya*.

Discussion on Analytical Study

Determination of pH: The pH of *Kanakabindh-varishta* was found to be 5.28, which indicates that the *Arishta* is weakly acidic. The pH is the indicator of the acidity and alkalinity of the solution.

Determination of Total Solids

The Total Solid Content of *Kanakabindhvarishta* was found to be 2.03%.

Determination of Specific gravity: The specific gravity of *Arishta* was found to be 1.0105.

Total Sugar: The Total Sugar Content was found to be 19.307, and % of the total sugar was found to be 6.43%.

Reducing sugar: The total amount of reducing sugar was found to be 8.439, and Percentage of reducing sugar was found to be 2.8129%.

Alcohol content: The alcohol content of the *Arishta* was found to be 8%, which is within the standards.

The amount of total solids, reducing sugars and total sugar was found to be slightly less. It may be due to the time lag occurred between the productions and testing of the sample. It has been experimentally proved that with the passage of time the total solid content, total sugar and reducing sugar content percentage get reduced.

CONCLUSION

Arishtas are unique dosage forms as they produce self generated alcohol and they have long shelf life. *Kanakabindhvarishta* is *Arishta kalpana* mentioned by Charaka Acharya in the context of *Kushta chikitsa* and having action in diseases like *Maha Kushta, Switra* etc. *Switra* (vitiligo) is considered to be a disease having worst prognosis and the mental tension the patient experience is more than the physical impairments caused. *Arishta* as it is having longer shelf life and easy palatability and increased therapeutic activity can be prescribed for the indicated conditions.

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