Available online through
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ISSN 2321 - 6328

Research Article

PHARMACEUTICAL STUDY OF 'SHANKHA DRAAVAKA' AND THE HANDS-ON IMPEDIMENTS

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Article Received on: 10/03/18 Accepted on: 16/04/18

DOI:10.7897/2321-6328.06277

ABSTRACT

Introduction: Shankha draavaka is a unique classical formulation found in more than one classical books of Ayurveda. Among those the shanka draavaka (prathama) reference of Rasa tharangini was chosen for this study. Shankha draavaka is prominently indicated in 'annadravashoola' (gastritis) and 'udarashoola' (colic pains). These two types of abdominal ailments are usually co-related with 'gastric ulcers' and 'colic pains' respectively. Though these complaints are common in OPDs, this medicine 'shankha draavaka' rarely produced, marketed or prescribed. When we try to figure out the reasons for this, we find few of the significant hands-on impediments. The aim of this research work was to highlight those practical difficulties. **Methods:** Procurement of raw drugs and the step by step pharmaceutical procedures that included shodhana (physic-chemical purification) of selected ingredients, and the preparation of 'shankha draavaka' were done as per the classical guidelines in Rasashastra and Bhaishajya Kalpana Laboratory of S.D.M College of Ayurevda Kuthpady, Udupi. **Results**: After one hour of heating the drug mixture in distillation apparatus, there was no sign of draavaka getting collected in the receiver. Later by using sphatika (*potash alum*) and tankana (*borax*) in unpurified form, the draavaka preparation was possible, however the yield was only 8 – 10%. **Conclusion**: More number of ingredients, major diversion in the classical procedure i.e. use of two ingredients without specified purification methods, very less percent of total yield as final product; these factors keep this formulation away from the lists of pharmaceutical companies. Thus, its availability in *market* and consequently its use in clinical practice is very less.

Key words: Kshara, lavana, draavaka yantra, distillation apparatus.

INTRODUCTION

Shanka draavaka has more than one reference in classical books. In 'Rasa yoga saagara' (14 yogas)[1], in Bhaishajya ratnavali (3 yogas)[2], and in Rasa tarangini (3 yogas)[3]. The one which is selected here for the pharmaceutical study is shanka draavaka (prathama)[4] of the classical book Rasa tharangini. It contains eleven ingredients such as shuddha shankha (*conch shell*), tankana (*borax*), sphatika (*potash alum*), yava kshara (*potassium carbonate*), svarji kshara (*sodium bicarbonate*), navasaadara (*ammonium chloride*), saindhava lavana (*sodi chloridum*), samudra lavana (*sodi muras*), vida lavana (*black salt*), souvarchala lavana (*unaqua sodium chloride*), and romaka lavana (*lake salt*).

No doubt shanka draavaka is a unique preparation; not only in terms of its noticeable kshariya and lavaniya ingredients and also in terms of its special method of preparation employed i.e. distillation method. This formulation also has wide range of therapeutic indications. It is prominently indicated in shoola i.e. udara shola (abdominal pain), which includes all eight types of shoola as said in classics 'shoolam-ashtavidham-hanthi'. Practically term 'shoola' in this context can be further clarified as 'annadravashoola' and 'udarashoola'. These two types of 'shoola' are frequently co-related with 'gastric ulcers' and 'colic pains' in clinical practice. It is also indicated in 'agnimandya' (anorexia), 'visucika' (pricking pain in abdomen), 'grahani roga' (sprue), 'mutrakrchra' (dysuria), 'gulma roga (abdominal tumors)', 'plihodara' (splenic disorders), 'udararoga' (abdominal disorders), 'arsha roga' (hemorrhoids), 'udara krimi' (intestinal worms), and all types of 'chardi roga' (vomiting).

Though the above said ailments are common in clinics and OPDs, this medicine 'shankha draavaka' is generally not prescribed or advised for administration by an Ayurvedic physicians.

The most striking reason for the less use of this medicine by Ayurvedic physicians is because of its non-availability in the market. When we think about its non-availability in the market, we find few of the significant hands-on impediments or the practical difficulties that a pharmaceutical company faces to bring it into the market. The aim of this research work was to highlight those practical difficulties.

MATERIALS AND METHODS

Genuine and authenticated raw drugs shuddha shankha (*conch shell*), tankana (*borax*), sphatika (*potash alum*), yava kshara (*potassium carbonate*), svarji kshara (*sodium bicarbonate*), navasaadara (*ammonium chloride*), saindhava lavana (*sodi chloridum*), samudra lavana (*sodi muras*), vida lavana (*black salt*), souvarchala lavana (*unaqua sodium chloride*), and romaka lavana (*lake salt*) were obtained from the GMP certified S. D. M Ayurveda Pharmacy Udupi. Romaka lavana, which was not available locally was obtained from raw drug market of Jaipur,

Rajasthan and was authenticated in quality control section of above said pharmacy. Vida lavana, which is also an ingredients in 'shankah draavaka' was prepared as per the classical guidelines in practical laboratory of PG department of Rasashastra and Bhaishajya Kalpana. All the pharmaceutical procedures like shodhana of selected ingredients were done step by step as per the classical guidelines, with proper care in practical laboratory of PG department of Rasashastra and Bhaishajya Kalpana.

The pharmaceutical study stages adopted were: 1. Shankha shodhana 2. Tankana shodhana 3. Sphatika shodhana 4. Navasaadara shodhana 5. Preparation of Vida lavana; followed by the preparation of the main formulation i.e. 6. Preparation of shankha draavaka.

Shankha shodhana: To purify shankha (*conch shell*) the drug materials used were 'ashuddha shankha naabhi' (base part of conch shell; 500gms) and 'nimbu swarasa' (1 liter). As a part of procedure 'shankha naabhi' was soaked in nimbu swarasa for 24 hours in a stainless steel vessel. Later it was removed from the vessel, washed with warm water, dried well and stored in an air tight container as 'shuddha shankha'.

During this procedure, it was observed that within few minutes of soaking shankha naabhi in nimbu swarasa, chemical reaction sets in in the mixture resulting in the formation of froth and air bubbles that get raised till the brim of the vessel. The nimbu swarasa attains curd like consistency. After shodhana, the hard surfaced shankha naabhi with dirty brown appearance turned into smooth surfaced and pure white coloured.

The severe fizzing during the shodhana procedure is the result of reaction between an alkaline substance (shankha naabhi) and acidic media (nimbu swarasa) resulting in the corrosion of the outer layer of shanka, and leading to reduction in its weight, and hardness. The total weight of shanka naabhi got reduced to 465gms from the initial weight of 500gms.

Tankana shodhana: The drug material used for purification of 'tankana' (*borax*) was 'ashuddha tankana' (500 gms). As a part of procedure 'ashuddha tankana' was powdered and taken in an iron pan. Then it was heated over moderate flame until the entire water content was lost and also the hissing sound stopped.

During the procedure as a result of heating, evaporation of water content was observed and there was puffed appearance of the entire content. After shodhana the total weight of tankana got reduced to 485gms from the initial weight of 500gms.

Ashuddha tankana possesses 10 water molecules in crystalline form, which got converted into liquid form in the initial stage of heating. This can be inferred by the conversion of entire content into semi solid form, while heating. The reduction of total weight of tankana after shodhana is due to the loss of water molecules present in it.

Sphatika shodhana: The drug material used for purification is ashuddha sphatika (*potash alum*; 500 gms). As a part of procedure ashuddha sphatika was powdered and taken in an iron pan. Then it was heated over high flame till the entire drug becomes totally dry and devoid of water molecules. At last the sphatika in dry powder form was stored in an air tight container as 'shuddha sphatika'.

During the procedure as a result of heating, evaporation of water content was seen. After shodhana the total weight of tankana got reduced to 478gms from the initial weight of 500gms.

Unpurified sphatika possesses twenty water molecules in crystalline form, which get converted into liquid form. This can be inferred by the conversion of entire content into semi solid form, while heating it. The reduction of total weight of sphatika after shodhana is due to the loss of water molecules present in it.

Navasaadara shodhana: The drug material used for purification is ashuddha navasaadara (*ammonium chloride*; 500 gms). As a part of procedure ashuddha navasaadara was dissolved in three times of water and filtered through a clean cotton cloth. This filtrate was taken in a stainless steel vessel and boiled to evaporate all the water molecules. Later after complete drying the drug is stored in an air tight container.

During this procedure, it was observed that there were blackish impurities found on the cloth after filtering. In spite of filtering the content through the cloth, some of the impurities remained and were initially un-identifiable. But later, when filtrate was heated, clear sedimentation of those impurities at the bottom of the vessel was seen. Those impurities were removed by decanting the supernatant clear solution carefully. Later on in another stainless steel vessel the clear solution was boiled and evaporated till the content attained semi solid consistency. Then it was spread on a plate and dried completely under shade. After shodhana there was a total loss of five grams in its weight and the navasaadara turned to white colour.

Table 1: Depicting the net loss of the drug materials after 'shodhana process'

S.no	Drug	Quantity taken	Weight after Shodhana	Net loss
1.	Shankha	500gms	465gms	35gms
2.	Tankana	500gms	485gms	15gms
3.	Sphatika	500gms	478gms	23gms
4.	Navasaadara	500gms	495gms	5gms

Preparation of vida lavana:[5] The drug materials used for preparation of vida lavana were amalaki churna (50 gms) and romaka lavana (250gms). As a part of procedure romaka lavana was taken in khalwa yantra and ground till it becomes fine powder. Later amalaki churna was added to it and ground further to get a fine mixture. Then the mixture was taken in a mud pot with narrow mouth and heated strongly for six hours to obtain vida lavana. During this procedure, it was observed that initially when romaka lavana was mixed with amalaki churna, the product was in yellowish white colour. During the heating process the entire material turned to dark black colour, followed by grey. And at last, it turned to grayish white colour.

As a result of heating process the organic matter present in amalaki churna converted into carbon form. This can be inferred as the entire material turns into black colour. The carbonized organic matter of amalaki becomes carbon-di-oxide by using the atmospheric oxygen. This can be inferred as the entire material turns from black colour to grayish white colour.

Preparation of Shakha Draavaka[6]: The drug materials used for preparation of shankha draavaka were 3 grams each of 1. Shuddha shankha (*conch shell*), 2. Shuddha tankana (*borax*), 3. Shuddha

sphatika (*potash alum*), 4. Yava kshara (*potassium carbonate*), 5. Svarji kshara (*sodium bicarbonate*), 6. Shuddha navasaadara (*ammonium chloride*), 7. Saindhava lavana (*sodi chloridum*), 8. Samudra lavana (*sodi muras*), 9. Vida lavana (*black salt*), 10. Souvarchala lavana (*unaqua sodium chloride*), and 11. Romaka lavana (*lake salt*)

Other requirements were 1. Distillation apparatus; 2. Heating mantle

All the ingredients were taken one by one in a clean khalva yantra and are triturated well to obtain a homogenous mixture. This mixture is meticulously transferred to the 'still' (round bottom flask -1) of a clean glass bodied distillation apparatus. When the apparatus is all set, mild heat was to be applied to the 'still' with the help of heating mantle. At this stage, even after heating for one hour, there was no sign of draavaka (distillate) getting collected in round bottom flask (2) i.e. the receiver.

To overcome this practical difficulty, after much deliberation, the ingredients tankana and sphatika, which possess ten and twenty water molecules respectively in its ashuddha form were used without purification. It can be noted that the use of ashuddha tankana and ashuddha sphatika can be substantiated by the cross reference of swetha parpati explained in Siddha yoga sangraha. Thus, by using ashuddha tankana and ashuddha sphatika with the remaining drugs as earlier the draavaka preparation was tried and was successfully obtained.

It can be noted that, when shuddha tankana and shuddha sphatika were added in purified form, because of no water medium (water molecules of ashuddha tankana and ashuddha sphatika) present in the mixture, there was reaction between the drugs in the mixture even after heating. Thus, distillate was not getting collected but when ashuddha tankana and ashuddha sphatika were used, the distillate gradually got collected in the receiver.

When ashuddha tankana and ashuddha sphatika were used and the process was carried out, after fifteen minutes of mild heat application, the appearance of steam was observed in the round bottom flask (1) i.e. the 'still'. Later on the steam getting distilled in the round bottom flask (2) i.e. the receiver was observed. Initially the distillation was quick and later on after one hour there was no features of distillation, so the process was stopped.

Even after the completion of procedure, the smoke like appearance remained in round bottom flask (1) for another half an hour. Once this smoke was cleared, there was a whitish puffed layer, superficially covering the entire surface of still. Below this surface the entire material of still was in grey colour. As the angle of bent tube initially maintained was acute, due to it, the distillate got reversed to the round bottom flash (1). This resulted in the sudden cooling of lower round surface of round bottom flask (1) leading to crack in the same. The total yield of draavaka obtained out of 33 gms of raw material was 3.1 ml (8%).

Here it can be noted that above process was repeated for several times with same quantity of raw material. This was done in order to calculate the average yield of draavaka. During the subsequent trials of shankha draavaka preparation, the angle of round bottom flask was tilted down to maximum, thus the cracking of round bottom flask(1) due to the back flow of distillate was prevented.

The twenty and ten water molecules present in sphatika (*potash alum*) and tankana (*borax*) respectively acting as a media for the reaction of entire material lead to the successful distillation. The superficial white coating to the entire still's surfaces may be due to the presence of tankana in the drug mixture. On repeating the procedure the average yield was 8 – 10%. Thus it can be inferred that the average yield doesn't exceeds 10%.

RESULTS AND DISCUSSION

The different steps followed for the preparation of 'shankha draavaka' were shankha shodhana (purification of *conch shell*), tankana shodhana (purification of *borax*), sphatika shodhana (purification of *potash alum*), navasaadara shodhana (purification of *ammonium chloride*), preparation of vida lavana (*black salt*), and finally the preparation of shankha draavaka.

The first and foremost impediment we face here is the identification and authentication of raw drugs used. When many samples of same drug are available in the market, it becomes difficult to choose the genuine sample. The bottlenecks in the process of drug identification and authentication were overcome through classical literature support, opinion of different pharmacies (in particular SDM Ayurveda pharmacy, Udupi), raw drug traders, traditional vaidyas and the experienced senior teaching faculty of Rasa shastra and Bhaishajya Kalpana.

During the procedure of 'shankha shodhana' the reaction between shankha naabhi (alkaline) and nimbu swarasa (acidic media) in the form of froth and air bubbles will be fierce than ones expectation. Thus, it is better use a wider and bigger stainless steel vessel to prevent the frothy material from overflowing. The fierce reaction between acidic medium (nimbu swarasa) and the alkaline drug material (shankha naabhi), resulted in the corrosion of the outer layer of shankha naabhi, leading to reduction in its weight and hardness. After shodhana procedure the loss in the drug was of 35 gms i.e. from the total quantity (500gms) of shanka naabhi.

During the process of 'tankana shodhana', there was a reduction of 15 gms from the total weight (500gms) of ashuddha tankana. The loss is due to the evaporation of water molecules present in it. Similarly during the process of 'sphatika shodhana', the total weight of sphatika got reduced to 478gms from the initial weight of 500gms making a total loss of 23gms. The reduction of weight is also due to the loss of water molecules present in it.

During 'navasaadara shodhana', there were blackish impurities found on the cloth after filtering. After shodhana there was a total loss of five grams in its weight. The removal of physical impurities made the drug shuddha white in colour. During 'preparation of 'vida lavana', consequential changes in the colour of vida lavana material from yellowish to black, grey and grayish white was observed. As a result of heating the organic matter present in amalaki churna converted into carbon form turning the entire material into black colour. The carbonized organic matter of amalaki becomes carbon-di-oxide by using the atmospheric oxygen, resulting a further change from black colour to grayish white colour.

Shankha naabhi (bases of conch shell)

Shankha naabhi + nimbu swarasa

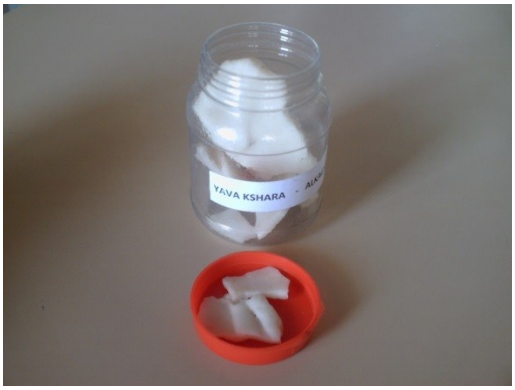
Chemical reaction

Chemical reaction

Suddha Shankha (Purified conch shell),

Tankana (*borax*)

Sphatika (*potash alum*)



Yavakshara (*potassium carbonate*)

Sarja kshara (*sodium bicarbonate*)

Navasadhara (*ammonium chloride*)

Saindhava lavana (*sodi chloridum*)

Samudra lavana (*sodi muras*)

Vida lavana vida lavana (*black salt*)

souvarchala lavana (*unaqua sodium chloride*)

Romaka / Audbhida lavana (*lake salt*)

During 'preparation of shankha draavaka', all the eleven ingredients were ground to fine powder form one after other, they were mixed and triturated again to obtain homogenous drug material. It is taken in round bottomed still; and heated over mild heat to obtain draavaka. After one hour of heating, there was no sign of draavaka getting collected in the receiver; as there is no media (water) present in the mixture, for reaction between the drugs to get distilled - the draavaka was not obtained. So in order to obtain the draavaka, the drugs - tankana and sphatika which possess ten and twenty water molecules respectively in its ashuddha form were used. Thus by using the sphatika and tankana in ashuddha form with the remaining drugs in shuddha form, the draavaka preparation was successfully obtained. But the draavaka prepared failed to dissolve a small piece of shankha when soaked in it (as this is the parameter explained in rasa tarangini for shankha draavaka). On repeating the procedure the yield was 8 – 10%. Thus it can be inferred that the average yield doesn't exceeds 10%.

CONCLUSION

The hands-on impediments that were evident during the above pharmaceutical study were quite a few. First and the foremost one was related to raw drug source, their genuineness and their authentication. This hurdle was overcome with the support of different classical literature, opinion of different pharmacies (in particular S. D. M. Ayurveda pharmacy, Udupi), raw drug venders and traders, traditional vaidyas and the experienced senior teaching faculty in the field.

Second biggest impediment is the use of 'shuddha tankana' (purified *borax*) and 'shuddha sphatika' (purified *potash alum*), in the preparation as mentioned classical reference. If done so, one cannot get the 'draavaka' (distillate). Instead use of 'ashuddha tankana' (raw *borax*) and 'ashuddha sphatika' (raw *potash alum*) along with other ingredients will yield the distillate. The reason behind this is the absence of 20 and 10 molecules of water present in 'ashuddha tankana' and 'ashuddha sphatika', which will be lost completely during their purification process. When used in unpurified form, these water molecules will facilitate the chemical reaction in between the nimbu rasa (acidic) and the shankha naabhi (alkaline) and as a result, the distillate can be obtained.

Third impediment that pharmaceutical companies face in producing and marketing this formulation 'shankha draavaka' is very less quantity of yield. As per above study, only a maximum of 10% of yield (of total drug mixture taken) can be obtained as 'draavaka'. Perhaps because of this less percentage of yield, majority of the pharmaceutical companies are not inclined towards production and marketing of this product named 'shankha draavaka'. However, taking into account the therapeutic utility and wide range of indications, this medicine needs to produced, marketed and made as a frequently prescribed medicine in the field of Ayurveda clinical practice.

ACKNOWLEDGEMENT

Authors are grateful to revered President, Dr. D. Veerendra Heggade and Dr B Yashovarma, Secretary, SDM Educational Society for encouragement. Dr. Ravishankar B, and Mr. Ravi are gratefully acknowledged for support in animal experiments, data

analysis, manuscript review and adding intellectual content of study design.

CONTRIBUTERS: Dr. N. K. Parthipan and Dr. Ravindra Angadi contributed to study design, literature study, data acquisition and study conduction. Dr. Ravindra Angadi contributed to the conceptualization of the topic and manuscript editing.

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Cite this article as:

N. K. Parthipan and Ravindra Angadi. Pharmaceutical study of 'Shankha draavaka' and the hands-on impediments. J Biol Sci Opin 2018;6(2):23-29.
http://dx.doi.org/10.7897/2321-6328.06277

Source of support: Nil; Conflict of interest: None Declared