Chinese Traditional Medicine Journal

ISSN : 2693 6356
2018 | Vol 1 | Issue 2

Pharmaceutico-analytical Standardization of *Devdarvyadi Churnakriya* (Processed powder)

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ABSTRACT

In order to increase the effectiveness of the treatment and decrease the necessary dosage, the powdered form of the drug is triturated with liquid preparations having the same components, a process called Churnakriya, which is described in Ayurvedic classics under the idea of Bhavana Samskara (process of trituration). When it comes to powdered drugs like Churna Kalpana, where the dosage is rather high, the Churnakriya idea is useful for lowering the dose while increasing the drug's acceptability. Devdarvyadi Churnakriya Pharmaco-Analytical Standardization is the Goal. Devdarvyadi Churna was made using traditional methods outlined in ancient texts. The Churna was ground using a mixture of the same elements used to make the decoction. There was a seven-day trituration process. Organoleptic and other Physico-chemical parameters, including moisture content, ash values, extractive values, etc., were analyzed in the traditional Devdarvyadi Churna and the Devdarvyadi Churnakriya. To further confirm the efficacy, purity, and security of these herbal preparations, thin layer chromatography was used. The average yield of Devdarvyadi Churnakriya from 500 gm was 666.66 gm, according to the observations and results. Devdarvyadi Churna had a weight increase of 32.66 percent and had analytical parameters such a loss of 6.3 percent of weight after drying, an ash value of 7 percent, an acid insoluble ash content of 3 percent, an extractive content of 34.8 percent in water and 4.8 percent in alcohol for a pH of 3.52. DECISION: Devdarvyadi Churnakriya was made in three separate batches. Daily trituration for each Bhavana lasted between seven and eight hours. Bhavana's ultimate result exhibited all the characteristics of Subhavita Lakshana (evidence of good trituration). Final product weight growth was 32.66 percent.

Keywords: *Bhavana, Churnakriya, Devdarvyadi, Standardization*

Introduction

R*asashastra* and *Bhaishjya Kalpana* is the part of Ayurveda which deals mainly with preparation of medicines. The process of transformation where the drug is changed or its properties enhanced is called *Samskara.* [1] In *Samhitas* there are various *Samskaras* described out of which *Bhavana Samskara* has a multi-dimensional action directly over the drug. It acts as a detoxifying agent in case of *Visha Dravya,* [2] it is also a *Poorvakarma* (prior process) for *Marana* process. [3] Under the context of *Bhavana, Acharya* Charaka states –*Bhavana* given with its own *Swarasa* enhances the efficacy of drug; Small quantity of drug produces maximum effect. This concept is known as *Churna Kriya;* where *Bhavya Dravya* is triturated with the liquid preparations like *Swarasa* (juices), *Kwatha* (decoction), *Hima* (cold infusion), *Phanta* (hot infusion), *Arka* (extract) etc. of the same ingredients.

[4] According to Dalhana, *Kwatha* is also called as *Swarasa*; therefore, it can be assumed that when *Swarasa* is not available for *Bhavana, Kwatha* of samedrug can be taken as substitute. [5]

Considering the above concept, it was decided to prepare *Devdarvyadi Churna Kriya* byconverting *Devdarvyadi Churna* described in *Bhaishjya Ratnavali* [6] under *Amavata Chikitsa* by giving *Bhavana* with the *Kwatha* of same ingredients.

Churna Kriya is described in *Samhita* but unfortunately very few works have been done over the concept, the present study is an attempt to Standardize *Devdarvyadi Churna Kriya* and to establish the quality standards forthe formulation.

Materials & Methods

The ingredients of *Devdarvyadi Churna* depicted in table no. 1 were collected from the Dattatraya Ayurveda Rasashala, Salod (H) Wardha, Maharashtra, India. All the drugs were identified

and authenticated by pharmacognostic study.

Pharmaceutical preparation of *Devdarvyadi Churna Kriya* was carried out in Dattatraya Ayurved Rasashala M.G.A.C.H. & R.C. The procedure was subdivided into the following steps:

1. Preparation of *Devdarvyadi Churna* (DC)
2. Preparation of *Devdarvyadi Kwatha*
3. Preparation of *Churna Kriya* (DCK) by seven times *Bhavana* with *Devdarvyadi Kwatha*
   Each formulation was prepared in 3 batches asper the protocol of drug standardization.

Table1: Ingredients of *Devdarvyadi Churna Kriya*

Sr. no	*Sanskrit name*	Latin name	Parts used
1	*Devdara*	*Cedrus Devdara* (Roxb)Loud	Heart wood
2	*Vacha*	*Acorus calamus* Linn	Rhizomes
3	*Mustha*	*Cyprus rotundus* Linn	Rhizomes
4	*Sunthi*	*Zingiber oficinale* Rose	Rhizomes
5	*Ativisha*	*Aconitum Heterophyllum* wall ex Royle	Tuber
6	*Haritaki*	*Terminalia chebula* Reitz	Fruit

Preparation of *Devdarvyadi Churna* (DC) General method of preparation of *Churna* [7] is followed for the preparation of *Devdarvyadi Churna*. Raw drugs viz. *Devdara, Vacha, Musta, Sunthi, Ativisha, Haritaki* were collected and cleaned to avoid contamination of foreign material in final product.The ingredients taken in equal proportion and powdered separately with proper care to minimize the loss and sieved with mesh number 85 to obtain fine powder. The entire powdered drugs were in equal quantity mixed uniformly to obtain *Devdarvyadi Churna*(Table 2).

Preparation of *Devdarvyadi Kwatha*
The herbal drugs which were used for the *Churna* were taken in equal proportion and made into coarse powder. The coarse powder soaked overnight in water taken into stainless steel vessel for the preparation of *Kwatha*. Since the drugs were medium to hard 8 times of water was added and subjected to mild heating and reduced to 1/4th quantity. [8] The *Kwatha* obtained at the end was filtered through a piece of cotton cloth.

Preparation of *Devdarvyadi Churna Kriya* (DCK)
Half sample of prepared *Devdarvyadi Churna* was taken in a *Khalwa Yantra* into which the *Devdarvyadi Kwatha* was added in a quantity enough to appropriately wet whole *Churna* [9] and the trituration process was continued for 7-8 hours a day. After the trituration period the mixture was spread in a steel tray andsubjected to dryer at 50^{0}C. After drying of the material, it was powdered and again *Bhavana* process was done with freshly prepared *Kwatha* followed by drying. *Bhavana* process was repeated for 7 times. After this the final product *Devdarvyadi Churna Kriya* was obtained. **(Fig no.1-15)**

Analytical Study
Analysis of DC and DCK were done to study the physical properties. Both the samples were analyzed under the Pharmacopoeia standards for *Churna* [10] like organoleptic characters, pH, loss on drying, water soluble extractive value, alcohol soluble extractive, total ash, Acid insoluble ash, Water soluble ash, etc. Microbial specifications were tested to validate its safety for internal as well as external use.

Observation & Results
The *Devdarvyadi Churna* obtained was yellowish brown in colour; smooth in touch with the mixed aroma of all the herbal ingredients with prominent fragrance of *Devdaru,* and bitter –astringent in taste. All the ingredients were of medium to hard in texture which required efforts during the powdering process. After every *Bhavana* followed by drying weight gain was observed. After 7 *Bhavana* average 32.66 % weight gain was observed in final product (table3). Obtained *Devdarvyadi Churna Kriya* was comparatively smoother in touch, dark brown coloured, with pleasant odour and bitter in taste. Samples of *Devdarvyadi Churna* and *Devdarvyadi Churna Kriya* were tested for quality parameters of *Churna*. Results of analytical study depicted in table no 4, 5, and 6,7,8,9.

Table 2: Showing observations during preparation of *Devdarvyadi Churna in* each batch

Batch	Weight of individual ingredients (g)						Total weight (g)	% loss
	Devdar Churna	*Vacha Churna*	*Musta Churna*	*Sunthi Churna*	*Ativisha Chuna*	*Haritaki Churna*		
A	100	100	100	100	100	100	594.62	0.88
B	100	100	100	100	100	100	593.29	1.11
C	100	100	100	100	100	100	596.19	0.63
Total	300	300	300	300	300	300	1,784.10	2.62

Table 3: Organoleptic Characters of DC and DCK

Parameters	*Devdarvyadi Churna*	*Devdarvyadi Churna Kriya*
Touch	Smooth	Smooth
Colour	Yellowish brown	Dark brown
Odour	Pleasant	Pleasant
Taste	Bitter-astringent	Bitter

Table- 4 Comparative Physico-chemical parameters of the *Devdarvyadi Churna* and *Devdarvyadi Churna Kriya*

Parameters	DC	DCK
Loss on drying (% W/W)	7	6.3
Ash Value (%w/w)	5	7
Acid insoluble ash(%w/w)	3	3
Water soluble extract (%w/w)	17.2	34.8
Alcohol soluble extract (%w/w)	4.8	4.8
pH (%w/v)	4.1	3.52
Total sugar	27.77	25

Table 5: Microbial Load in DC and DCK

Parameters	DC	DCK
Total bacterial count	No growth	No growth
Total microbial count	No growth	No growth

Table 6: Particle size of DC and DCK

Mesh no.	DC (%)	DCK (%)

a) Above 60 mesh	**100**	**100**
b) Between 60- 80 (250 -177 microns)	**72**	**95**
c) Between 80 – 120 (177-125 microns)	**2**	**69**
d) Below 120 mesh	**-**	**4**

Table 7: Assays for *Devdarvyadi Churna* and *Devdarvyadi Churnakriya*

Assays	Tests	DC	DCK
Tannins	**5% $Fecl_3$ test**	**+**	**+**
Alkaloids	**Hager's test** **Wagner's test**	**+** **+**	**+** **+**
Phenols	**5% $Fecl_3$ test**	**+**	**+**
Glycosides	**Baljet test**	**+**	**+**

Table 8: Bulk Density & Tapped density of the DC& DCK

Sr.No	Parameters	DC	DCK
1	**Bulk density**	**0.390**	**0.84**
2	**Tapped density**	**0.406**	**0.84**

Discussion

Devdarvyadi Churna mentioned in *Bhaishjya Ratnavali* is composed of six ingredients (*Devdara, Vacha, Musta, Sunthi, Ativisha, Haritaki*). The ingredients were dried inthe hot air oven to remove moisture present in the ingredients which facilitates proper grinding of material. Temperature was maintained at 50^0 C for 8 hours. After appropriate drying the ingredients were separately powdered. All the ingredients were powdered in 3 batches each of 200 gm. The ingredients were powdered in mixer grinder for 3 times followed by sieving to obtain fine powder. The spillage during the grinding, sieving were the reasons behind the loss observed in the yield of *Churna.*

Kwatha prepared for the *Bhavana* process with the similar ingredients taken in equal proportion were soaked overnight to ensure the maximum extraction of active constituents from drugs. The obtained *Kwatha* when poured into the dry powder i.e. *Devdarvyadi Churna* the maximum quantity got absorbed into the powder. Quantity of *Kwatha* required for the first *Bhavana* in all the 3 batches was almost double, the quantity got enhanced when compared to the classical *Devdarvyadi Churna. The* quantity of *Kwatha* required during each *Bhavana* has been depicted in the table 3.

In classics, *Bhavana* to the material was given with the help of mortar and pestle. Now, with the advancement of techniques, different methods and machines were introduced for various pharmaceutical procedures. These progressions not only help in minimizing the manual power but also help in applying constant pressure & friction till expected duration which is suitable for maintaining standard data in more scientific way. Therefore, table top wet grinder with 2 roller stone was used for present study. Wet grinder works on three principles i.e., kneading, smearing and spatulation, which ultimately results in uniform mixing and quashing down particle size.Amount of liquid used in *Bhavana* and the process may be understood by capillary properties, which describes the processes of interaction of porous powder materials with the liquid. Capillary attraction or capillarity is the ability of a liquid to flow in narrow spaces without the assistance and in opposition to external forces like gravity. It occurs because of inter-molecular attractive forces between the liquid and solid surrounding surfaces. When a dry porous medium, such as a brick or a wick is brought into contact

with a liquid, it will start absorbing the liquid at a rate which decreases over time. The average *Kwatha* required for the initial *Bhavana* was more (1866.66 ml) than the subsequent *Bhavana*(1033.33 ml) in 5th *Bhavana*). This is further reduced to 826.66 ml in 7th *Bhavana*. Reason behind the decreased amount of liquid required for subsequent *Bhavana* can be elicited by reduced porosity of powder by process of trituration. Other reason for this may bedecreased particle size which will lower the permeability. The porosity or pore volume of a material has been defined as the total proportion ofair spaces contained between the solid particles of which the body is composed while permeability is restricted to interconnecting spaces. [11]

During *Bhavana* process, average 1245.23ml of *Devdarvyadi Churna Kwatha* was required for average 500 gm of *Devdarvyadi Churna*. Average 32.66% weight gain was observed after consecutive seven *Bhavana*. During the *Bhavana* process the *Bhavya Dravya* used was the *Kwatha* prepared with the same ingredients containing higher concentration of phyto-constituents which were deposited into the final product during the process of *Bhavana*, this caused weight gain in final product. Criteria for identifying the Subhavita Lakshana are, the Bhavit Dravya can be changed into desired shape. If pressed in between fingers, turns into flat shape, becomes smooth and soft in texture.
[12]

Mild heating with peak temperature maintenance of 95^{o}C-97^{o}C along with continuous stirring was appliedfor proper extraction and for reducing the chances of degradation of some of the active constituents which may decompose due to hydrolysis. Continuous mechanical stirring is needed to facilitate the natural circulation evaporation. On an average it took 3.68hrs to prepare 1571.42 ml of *Devdarvyadi Churna Kwatha*

The DCK and DC were tested for physicochemical parameters for *Churna*. There was considerable difference in loss on drying in DC 7 % w/w and DCK 6.3% w/w. This difference may be due to more stable nature of *Devdarvyadi Churnakriya* due to more number of *Bhavana*. This difference also suggests more shelf life of *Devdarvyadi Churnakriya* than *Devdarvyadi Churna*.

The total Ash value in DC was 5 % w/w and in DCK was 7% w/w. This may be possible due to the higher concentration of phyto-constituents of *Bhavana Dravya* in DCK which is loaded during *Bhavana* process carried out with the *Devdarvyadi Churna Kwatha*. Acid insoluble Ash of DC &DCK was found to be 3 % w/
w. This indicates that the proportion of acid insoluble inorganic material in both samples is same.

Water soluble extractive indicates the amount of active constituent of material when extracted with water. The comparative result was very encouraging. This value was greater in *Devdarvyadi Churna Kriya. Kwatha* used for levigation is a form of water soluble extractive and thus has contributed to the increment. Therefore, indicating the role of *Bhavana Samskara* (levigation with aqueous extract of drug) in extraction. Water soluble active principles in DCK were comparatively much more than DC. The values of extract are just double in DCK which indicates the potential part is much more in DCK as compared to DC. From this value it can be justified that DCK is more potent in same dose than DC. It can be also stated that in smaller dose DCK can give therapeutic action. This also shows that DCK contains double phytochemical concentration than DC.

DC (4.8% w/w) and DCK (4.8% w/w) have same ASE (alcohol soluble extractive) value. There is no any difference in both the samples. In *Churna Kriya,* the *Bhavana* of *Devdarvyadi Churna Kwatha* was given which contains the water soluble active principles, potentiating the water soluble extract but, the fatty material was not fortified, which resulted in constant value of ASE in both the samples. There was no addition of any alcohol soluble active principle which caused constant ASE value for both samples. pH value of DC was 4.1 and that of DCK was 3.52 shows the acidic nature of both the samples. The total sugar observed in DC was 27.77 & DCK was 25 indicating presence of starch.

Bulk densities for DC were 0.390 gm/ml and tap density for DC 0.406gm/ml for DC whereas for DCK Bulk density was 0.84 gm/ml, &tap density 0.84gm/ml for DCK. Bulk density and tap density affected by the inter-particle spaces in the powder. In case of DCK tap density and bulk density are same it may be due to process of trituration, the particles become finer and the inter-particular space decreases

resulting in compactness of the material. The volume occupied by the DC is more as compared to DCK (taken equal in weight).

Microbial load in both samples was observed and found no growth. Proper precautions were taken throughout the processes to avoid any microbial contamination.

Particle size of the drug affects its absorption. The rate of absorption can be assessed by determining the particle size of the drug. Less particle size leads to more surface area, more absorption thus enhancing the therapeutic efficacy of the drug. Determining the particle size of material, before and after processing, helps to draw the conclusion regarding the significance of that particular pharmaceutical procedure. The difference in size is due to continuous trituration which results into particle size reduction. Less particle size leads to more surface area results in more absorption thus enhancing the therapeutic efficacy of the drug. It can be stated that DCK in less dose will be more therapeutically potent due to maximum absorption as it is having less particle size as compared to DC.

The chemical analysis for the qualitative estimation of tannins, alkaloids, phenols & glycosides in the DC & DCK revealed presence of tannins, alkaloids, phenols & glycosides (table no. 8).

In HPTLC, number of bands observed on same R*f* values in DC &DCK. In short UV-254 nm, maximum 2 bands (R*f* value 0.9, 0.76) were observed in DC & DCK. Similarly, in long UV-366nm, maximum no. of bands observed in both sample were 5 bands. Alteration in total number of components was observed after spraying with methanolic H_2SO_4 was 10 bands for DC &DCK. Throughout HPTLC process same bands were observed for DC &DCK, indicating the presence of same constituents in both the samples.

The present formulation *Devdarvyadi Churna Kriya* has been standardized by intervention of modern scientific quality control measures described in the classical texts of Ayurveda. Hence the physicochemical parameters and quantitative analysis together may be used for quality evaluation and the standardization of compound formulation. *Churnakriya* could be better substitution for dosage reduction without altering its classical form with expected action of drug.

Conclusion

Average 666.66 gm of *Devdarvyadi Churnakriya* can be obtained from 500 gm of *Devdarvyadi Churna* with 32.66 % weight gain. Analytical specifications observed for DC and DCK were within the acceptable limits. *Churnakriya* could be the better substitution for drug dosage reduction.

Images of raw drugs & preparation methods:

Fig no. 1: *Devdaru* 	**Fig no. 2: *Vacha*** 	**Fig no. 3: *Musta*** 
Fig no. 4: *Sunthi* 	**Fig no.5: *Ativisha*** 	**Fig no.6: *Haritaki*** 
Fig no. 7: Mixing of powders 	**Fig no.8: *Devdarvyadi Churna*** 	**Fig no.9: *Kwatha* preparation** 
Fig no. 10: *Devdarvyadi Churna Kwatha* 	**Fig no. 11: *Bhavana* process** 	**Fig no. 12: First *Bhavana*** 
Fig no .13: Fifth *Bhavana* 	**Fig no. 14: Drying** 	**Fig no. 15: Final Product (DCK)** 

Images of HPTLC:

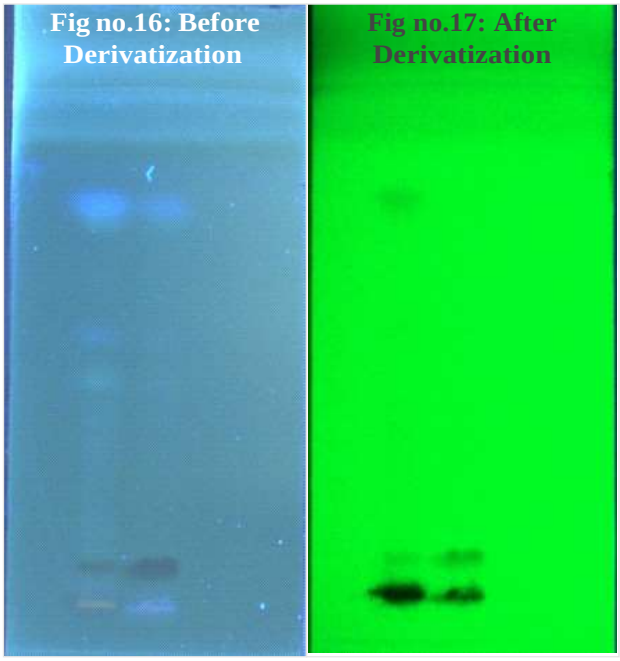

Fig no.16: Before Derivatization

Fig no.17: After Derivatization

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