

A COMPARATIVE PHARMACEUTICO-ANALYTICAL STUDY OF DHANANJAYADI VATI AND ITS MODIFIED LOZENGES

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ABSTRACT

Vati Kalpana is one of the secondary preparations in Ayurvedic pharmaceuticals. According to acharya *Vagbhata*, it is considered as an outcome of *Kalka Kalpana*¹. *Dhananjayadi Vati* is a formulation mentioned in *Yogaratanakara* under *Kasa Chikitsa*. Modification of classical and development of new dosage forms is current-day trend to fulfil needs like palatability, cost effectiveness and global acceptance of the product. Lozenges are one of the popular palatable solid dosage forms containing one or more medicaments in a flavored and sweetened base. In the present study an attempt was made to modify *Vati* into lozenges form and comparative pharmaceutico analytical study was carried out for understanding of each dosage was discussed.

Keywords: *Dhananjayadi Vati*, Lozenges, *Yogaratanakara*, Pharmaceutico-analytical study.

INTRODUCTION

Bhaishajya Kalpana is specialized branch in Ayurveda which deals with different fundamental principles of Ayurvedic pharmaceuticals right from the collection of drugs of the finished product and developing new dosage forms as per present requirement. Ayurveda growing global acceptance now is also raising concern regarding its safety profile as now peoples are more health conscious with more focus on the quality towards drug selection too, to meet this and to be sustainable in future it requires proper research, well documentation, clear explanation of concept and in-depth about therapeutic efficacy with pharmaceutico-analytical study of the formulations.

*Vati Kalpana*² is one of the secondary preparations in Ayurvedic pharmaceuticals. *Dhananjayadi Vati*³ is a formulation mentioned in *Yogaratanakara* under *Kasa Chikitsa* having eight ingredients in equal proportion with *Ardraka Swarasa* as *Bhavana Dravya* and is prepared by *Niragni* method. Lozenges are one among the popular palatable means of unit solid dosage form containing one or more medicaments in a flavoured and sweetened base. These preparations have several advantages like patient compliance, reduced gastric irritation, increased retention time of medicament etc. Lozenges are intended to dissolve and treat local irritation or infections of mouth and pharynx; these can be effectively used as antitussive or cough suppressant for providing symptomatic relief. By considering these factors in the present study an attempt was made to modify *Vati* into lozenges form and comparative pharmaceutico-analytical study was carried out for better understanding of both dosage forms.

AIMS AND OBJECTIVES

To prepare *Dhananjayadi Vati* as per classical reference

To modify *Dhananjayadi Vati* (D.V) into *Dhananjayadi Vati* lozenges (D.V.L)

To study organoleptic characters and physico-chemical parameters

MATERIALS AND METHODS

Pharmaceutical study

Equipment: Weighing machine, Measuring jar, Utensils, Fire source, Kore cloth, Porcelain jar, Candy mould, Mortar and pestle. Water bath.

Ingredients: Ingredients of *Dhananjayadi Vati* and its lozenges were mentioned in table no.1

Method of Preparation

Practical number - 1

Preparation of *Dhananjayadi Vati*

Reference: *Yogaratanakara*, *Kasa Chikitsa* (Sloke number – 98)

1) Converting into fine powder and extraction of *Ardraka Swarasa*

Each drug was pounded well separately into coarse powder form in a *Khalwa Yantra*. Further processing was done in a mixer and sieved to get a fine powder. Fresh *Ardraka* washed to overcome mud and other impurities. The outer skin of *Ardraka* peeled and pounded well, paste was squeezed in a clean vessel through a kora cloth and *Swarasa* was collected.

2) Process of *Bhavana Vidhi* and assessment of *Subhavita Lakshana*

Fine powder of *Arjuna Tvak*, *Pippalimoola*, *Trikatu* and *Trijata* are added successively and properly mixed. Later *Ardraka Swarasa* was added into *Khalwa Yantra* till the fine powder was completely immersed. In the first day trituration was carried out for 2½ hour and on the second day, for 45 min with freshly prepared *Swarasa*. After the trituration (*Subhavita*), paste was soft in touch and non-sticky consistency.

3) Procedure of rolling *Vati*, drying, package and storage⁴

Triturated mixture was taken out, rolled in between the fingers to get uniform shape and size of 2g *Vatis* and dried under sunshade for about 3 days with proper care. After completion each *Vati* was weighed (approximately 500 mg). The final product was packed in clean dry and food grade plastic bottles.

Practical number 2:

Preparation of *Dhananjayadi Vati* lozenges

Reference - Modern principles of lozenges⁵.

1) Extraction of *Ardraka Swarasa*, converting raw drugs into coarse and fine powder form.

Ardraka peeled and pounded well, paste was squeezed in a clean vessel through a kora cloth and *Swarasa* was collected. Each drug was pounded well into coarse powder by using *Khalwa Yantra*. Again, coarse powder of *Trijata* were subjected in mixer and sieved to get in fine powder form.

2) Preparation of *Kwatha* and syrup consistency

Kwatha Dravya taken in stainless steel vessel containing eight parts of water. Heating was carried out in moderate flame. It was reduced into 1/8th part and filtered through kora cloth. The finely powdered sugar was taken in a stainless-steel vessel, required quantity of water was added and heated till attained into sugar solution.

3) Processing of Lozenges consistency, cooling and storage

The prepared decoction and *Ardraka Swarasa* were added to the sugar solution, heating continued till it attained 1-2 thread consistency (Syrup consistency), *Prakshepaka Dravya* were slowly added to the syrup followed by mixing of contents.

When the mixture attains lozenges consistency (Thready appearance) was poured into candy mould which was placed in a plate containing water. It was allowed to retain for 15-20 min. After cooling hard lozenges were wrapped in single layer square shaped aluminium foil and stored.

RESULTS

Results of pharmaceutical study:

1) *Dhananjayadi Vati*

Quantity of fine powder of drugs and *Ardraka Swarasa* - 400g + 860ml

Quantity of final product after drying and total number of *Vatis* - 457g and 695

2) *Dhananjayadi Vati lozenges*

Quantity of *Kwatha* & *Ardraka Swarasa* – 100+20ml

Quantity of *Prakshepaka Dravya* and weight of each lozenge – 30g+ 3g

Total number of lozenges – 69, Weight of final product - 218g

Results of organoleptic characters are mentioned in table no.2.

Analytical study results are given in table no.3.

DISCUSSION

DISCUSSION ON PHARMACEUTICAL STUDY

Pharmaceutical study refers to manufacturing of pharmaceutical dosage forms which involves a series of steps that can convert raw material into finished products. In the present *Dhananjayadi Vati* and its modified form *Dhananjayadi Vati* lozenges were prepared.

Discussion on preparation of *Dhananjayadi Vati*

In the preparation fine powder of each drug(50g) was added to *Khalwa Yantra* and mixed properly to get homogenous mixture. Freshly extracted *Ardraka Swarasa* (860ml) was added to mixture until it immersed completely. So that it sufficiently blended with every particle of the ingredients.

During the trituration consistency of the mixture assessed to know the exact stage of *Subhavita Lakshana*. It includes soft and fine consistency, can be rolled into pills of required size without any breakage. The paste was rolled appropriately in the fingers to get into round shape and 2g size of *Vatis*, it was dried under the sunshade so that volatile contents was retained⁶.

Complete dried *Vatis* were 500mg, light brown in color and 457 g was the net quantity of the final product. It is preserved in an airtight container to avoid the loss of its original color, taste and form.

Discussion on preparation of *Dhananjayadi Vati lozenges*

Kwatha was prepared out of *Arjuna Tvak*, *Pippalimoola* and *Trikatu* of 125g by adding eight parts of water. It was brick red in color and viscous form due to the influence of ingredients. In another vessel sugar (300g) boiled with required amount of water to attain syrup consistency and temperature maintained approximately 80-95°C. Attainment of 2-3 thread consistency of the mixture is necessary for proper binding of the medicaments and attainment of candy form⁷.

Ardraka Swarasa(30ml) and *Kwatha* (100ml) were added to the sugar syrup which has attained 2-3 thread consistency and contents were mixed thoroughly for proper blending. The color changed to dark chocolate brown. Finely powdered *Prakshepaka*

drugs were added to thick thready mixture and heated approximately 130-140°C to convert it into thick thready mass. Then poured into candy mould to get proper shape and size and allowed for cooling⁸.

Cooling technique facilitates solidification and stabilizes the mixture to ensure a good quality product. 218g was the net quantity of the final product and each lozenge weighed about 3g. Lozenges wrapped in aluminium foil and stored.

Table no. 1 Ingredients and their quantity of Dhananjayadi Vati⁹ and its lozenges¹⁰

Sl. No	Ingredients	Botanical name	Part used	Proportion	D.V-Quantity taken(g)	D.V.L-Quantity taken(g)
1	Arjuna	<i>Terminalia arjuna</i> (Roxb)W&A.	Stem bark	1 part	50	10
2	Tvak	<i>Cinnamomum zylanicum</i> Blume.	Stem bark	1 part	50	5
3	Patra	<i>Cinnamomum tamala</i> Nees and Eberm.	Leaf	1 part	50	5
4	Ela	<i>Elettaria cardamomum</i> (Linn.) Maton.	Seed	1 part	50	5
5	Pippali moola	<i>Piper longum</i> Linn.	Root	1 part	50	10
6	Shunti	<i>Zingiber officinale</i> Roxb.	Rhizome	1 part	50	10
7	Pippali	<i>Piper longum</i> Linn.	Fruit	1 part	50	10
8	Maricha	<i>Piper nigrum</i> Linn.	Fruit	1 part	50	10
9	Ardraka	<i>Zingiber officinale</i> Roscoe.	Rhizome	Quantity sufficient	860ml	4ml
10	Sugar	-	-	60%	-	60

Table no.2: Showing organoleptic characters Dhananjayadi Vati and its lozenges.

Characters	Dhananjayadi Vati	Dhananjayadi Vati Lozenges
Colour	Brown	Light brown
Taste	<i>Katu, Kashaya,</i>	<i>Madhura, Katu</i>
Odour	Characteristic	characteristic
Consistency	Hard	Hard
Texture	Smooth	Smooth

Table no.3: Showing physico-chemical parameters Dhananjayadi Vati and its Lozenges¹¹.

Parameters	D.V - Result (%w/w)	D.V.L – Result (%w/w)
pH	6.0	6.0
Loss on drying	6.56±0.01	5.95±0.00
Friability	< 1.0	< 1.0
Hardness	2.0	1.0
Uniformity of weight	Tablet fails uniformity of weight because its handmade range should be 0.615-0.679	Tablet fails uniformity of weight because its handmade range should be 3.55-3.93
Disintegration time (min)	20	7.0
Total ash	8.39±0.1	0.39±0.01
Acid insoluble ash	0.07±0.00	0.0±0.0

Alcohol soluble extractive	5.46±0.02	2.85±0.01
Water soluble extractive	64.51±0.02	92.51±0.01
Microbial contamination	>300 CFU	50 CFU
Total sugar	-	91.30
Reducing sugar	-	12.0
Non-reducing sugar	-	79.30

PHOTOGRAPHS OF DHANANJAYADI VATI



Fig.1 Ingredients



Fig.2. Extraction Swarasa



Fig.3. Adding Ingredients



Fig.3 Adding of Swarasa



Fig.4 Rolling into Vati



Fig.5 Final product

PHOTOGRAPHS OF DHANANJAYADI VATI LOZENGES



Fig.6 Adding water



Fig.7 Adding of Kwatha



Fig.8 Thready appearance.



Fig.9 Pouring into mould



Fig.10 Process of preservation



Fig.11 Final product.

DISCUSSION ON ANALYTICAL STUDY¹²

Analytical research study is the process of gathering, analysing and interpreting information to make inferences and reach conclusions; analytical tools are used to check the authenticity of the final product in terms of stability, quality and proper pharmaceutical procedures. *Dhananjayadi Vati* and its modified lozenges were sent for analytical study, and its results were discussed.

The hardness of the sample *Dhananjayadi Vati* and its lozenges were 2 and 1 kg/cm² respectively. The hardness of the tablets plays a vital role in determining the quality of formulation as well as the absorption and action of the drug. The disintegration time of sample *Dhananjayadi Vati* and its lozenges were 20 and 7 minutes, respectively. So, it indicates that the lozenge starts disintegrating in the oral mucosa when compared with *Vati*. It dissolves fast in the saliva while in the oral cavity during the chewing process. Loss on drying of *Dhananjayadi Vati* and its lozenges were 6.56 % and 5.95 % w/w, respectively. It indicates lozenges have less moisture content compared with *Dhananjayadi Vati*. The preparation process of lozenges involves the preparation of sugar syrup and mixing of finely powdered drugs under regulated temperature at a proper stage, which facilitates evaporation of the moisture contents to a greater extent this may be the probable reason for the lower moisture contents in lozenges. On the contrary, *Vati* preparation involves trituration of finely powdered drugs with ginger juice as liquid media and rolled in hand where pills were dried at room temperature, in this procedure, effective evaporation of moisture content won't be there.

Both samples of *Dhananjayadi Vati* and its lozenges were complying, which means both formulations fall <1.0 % w/w. It infers both formulations were withstanding the stress. Uniformity of weight in *Dhananjayadi Vati* and its lozenges were failed in the result because its handmade range was 0.615 – 0.679 and 3.55 – 3.93 % w/w respectively and helps to understand the degree of uniformity in the amount of drug substance among the dosage units.

The total ash value of the *Dhananjayadi Vati* and its lozenges were 8.39 and 0.39 % w/w respectively. It determines the amount of inorganic compound was more in *Vati* compared to lozenges. In the *Dhananjayadi Vati* finely powdered ingredients triturated with ginger juice followed by shade drying. Whereas in lozenges preparation caramel syrup was blended with decoction and finely powdered ingredients. *Dhananjayadi Vati* and its lozenges were 0.07 and 0 % w/w respective results of acid insoluble ash. High value indicates may be the presence of acid insoluble substance in the products. pH is main analytic tool which influence on the drug solubility, stability and absorption. pH of both the *Dhananjayadi Vati* and its lozenges were 6.0 and it confirms the weak acidic nature. *Dhananjayadi Vati* and its lozenges were 64.5 % and 92.5 % w/w result of water-soluble extractive respectively. High value may be the presence of more active principles which were soluble in water compared to *Vati*. The alcohol soluble extractive value of *Dhananjayadi Vati* and its lozenges was 5.46 and 2.28 % w/w respectively. High value in *Dhananjayadi Vati* indicates a greater number of phytochemical constituents were soluble in alcohol media compared to lozenge. Presence of reducing sugar in *Dhananjayadi Vati* lozenges were 12 % w/w shows the presence of mono or disaccharides and presence of non-

reducing sugar were 79.30 % w/w shows presence of di or oligosaccharides. The existence of sugar in the *Dhananjayadi Vati* lozenges was due to the base i.e., sugar of the formulation. The presence of total sugar in the *Dhananjayadi Vati* lozenges were 91.20 % w/w which shows the presence of monosaccharide or polysaccharide sugars. On analysing the HPTLC results, under the TLC plate documentation of ethanol extract of *Dhananjayadi Vati* and its lozenges, under the 254 nm eight spots were seen in *Dhananjayadi Vati* and three spots were identified in *Dhananjayadi Vati* lozenges. At 381 nm there was five spots and Rf value 0.43 could be ellagic acid in *Dhananjayadi Vati* and one spot of *Dhananjayadi Vati* lozenges. At 620 nm six spots were seen in *Dhananjayadi Vati* and one spot in *Dhananjayadi Vati* lozenges. From this it can be assessed that more active principles were observed in *Dhananjayadi Vati* when compared with *Dhananjayadi Vati* lozenges.

The microbial contamination of *Dhananjayadi Vati* and its lozenges were TNTC (too numerous to count) and 50 respectively. As the preparation of lozenges includes boiling and heating the contents under regulated temperature to attain lozenge consistency and some extents storage of lozenges in aluminium foil which prevents the microbial contamination while compared to *Dhananjayadi Vati*.

DISCUSSION ON PHYTOCHEMICAL ANALYSIS¹³

Preliminary phytochemical screening study of *Dhananjayadi Vati* and *Dhananjayadi Vati* lozenges reveals that, presence of Alkaloids, resin, carbohydrates, tannin in both formulations. Presence of steroid, coumarins in *Dhananjayadi Vati* and flavonoid, terpenoid found in *Dhananjayadi Vati* lozenges.

CONCLUSION

Vati Kalpana plays a vital role in Ayurvedic pharmaceuticals due to various advantages. *Dhananjayadi Vati* is one among the formulations mentioned in *Yogaratanakara Kasa Chikitsa Adhyaya*. The lozenges are convenient dosage mode of oral dosage form with higher retention in the oral cavity and provide effective relief of cough and upper respiratory tract infec-

tions. In the present study classical formulation *Dhananjayadi Vati* was modified into convenient *Dhananjayadi Vati* lozenges.

Dhananjayadi Vati has been prepared by following classical *Vati* preparation methods and modification of *Vati* into lozenges done using base substance as sugar along with herbal ingredients and method adopted was non-crystallisation process. As standards for *Dhananjayadi Vati* and its lozenges were not available, the present study findings serve as guide for further evaluation of the product.

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