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Research Article

A PRELIMINARY PHARMACOGNOSTICAL AND PHYSICOCHEMICAL ASSAY OF SHUNTHI KHANDA GRANULES

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ABSTRACT
Shunthi (*Zingiber officinale* Roscoe) is a drug with multi-dimensional activities mentioned in Ayurvedic classics for different disease conditions. Ayurvedic pharmacopeia also holds a number of formulations where Shunthi is one of the active components. Shunthi Khanda avaleha of Bhaisajya Ratnavali is one amongst them. Though Shunthi Khanda avaleha has significant therapeutic effect in case of Amlapitta, etc, it has few difficulties during pharmaceutical procedure like climatic influences, chance of bacterial or fungal growth, etc. Considering these inconveniencies, an attempt was made to change the form of Shunthi Khanda avaleha into Shunthi Khanda granules and assessed for its pharmacognostical and pharmaceutical characters. Samsakara is a tool mentioned in Ayurveda which refers to modification or processing of drug to potentiate it, or to get desired action or to change its form. The present study provides the details of Shunthi Khanda granules preparation, its pharmacognostical and physicochemical characters which may help in laying down a standard protocol for future research works.
Keywords: *Zingiber officinale* Roscoe, Shunthi, Granules, Pharmacognosy, Physicochemical Analysis, Standard Operative Procedure.

INTRODUCTION

The drug Shunthi Khanda avaleha[1] is one of the classical Ayurvedic medicines where Shunthi (*Zingiber officinale* Roscoe) is the main ingredient, commonly known as Ginger which is the rhizome of the plant belongs to Zingiberaceae family. The characteristic odor and flavor of ginger is caused by a mixture of zingerone, shogaols and gingerols, volatile oils that compose one to three percent of the weight of fresh ginger. When ginger is dried or cooked, Zingerone is produced from gingerols {[6]-gingerol (1-[4'-hydroxy-3'-methoxyphenyl]-5-hydroxy-3-decanone) is the major pungent principle of ginger}. Zingerone is less pungent and has a spicy-sweet aroma[2].

The traditional medical form of ginger historically was called *Jamaica ginger*; it was classified as a stimulant and carminative and used frequently for dyspepsia, gastroparesis, slow motility symptoms, constipation, and colic. It was also frequently employed to disguise the taste of medicines[3]. Ginger has been found effective in treating nausea[4] caused by seasickness, morning sickness and chemotherapy, enterotoxigenic *Escherichia coli* heat-labile enterotoxin-induced diarrhea[5], arthritis, hyperlipidaemia[6] & heart disease[7]. In Ayurvedic classics Shunthi has been reported to possess Shulaprashamana[8] (analgesic), Dipaniya[9] (appetizer), Triptighna[10](anti sated), Arshoghna[11] (anti hemorrhoidal), Stanyashodhana[12](galactodepurant), Trishnanigrahana[13](thirst suppressant), Shitaprashamana[14](califacient) and Grahi[15] (absorbent) properties.

Proper identification and standardization of a drug is very essential because each and every drug has its own physical and chemical characteristics that help for separating it from other closely related drugs. Hence physicochemical studies of a particular drug by making use of various parameters help in standardizing the drug and validate it. Chromatographic techniques were adopted for the separation of active moieties present in the formulation. Therefore, an attempt has been made to standardize Shunthikhanda granules, an Ayurvedic medicine based on their HPTLC fingerprint profile.

Though Avaleha (confection) form of the medicine has merits, it possesses some demerits also like:

- Avaleha is sticky so it is difficult for maintaining proper dosage during administration and dispose.
- Due to its semi solidity, there is high chance of Bacterial or Fungal growth in it due to presence of moisture.

Considering these demerits, it has been decided to mould the formulation composition of Shunthi Khanda avaleha into Shunthi Khanda granules.

Aims & objectives

To formulate Shunthi Khanda granules and evaluate their pharmacognostical and physicochemical characteristics.

MATERIALS & METHODS

The study involved the following operating procedures:

Collection, identification and authentification of raw drugs - Test drug Shunthi Khanda granule is a pure herbal formulation consists of 18 ingredients (Table no.1). All of the herbs are collected from the Pharmacy, I.P.G.T & R.A, Gujarat Ayurved University, Jamnagar in the month of July, 2011. Surapunnaga (*Ochrocarpus longifolius* Benth and Hook) was used as a substitute[16] of Nagakeshara due to unavailability of Nagakeshara in pharmacy. Sharkara, Goghrta, Godugdha & Madhu were purchased from the local market of Jamnagar. All of the herbal components and sharkara were separated from physical impurities like small stones, sand particles etc. All herbs were authenticated and identified by the Pharmacognosy laboratory of I.P.G.T & R.A, Gujarat Ayurved University, Jamnagar followed by size reduction in a mixer grinder and passed through sieve number 85 to obtain fine powder.

Powder Microscopy – Powder microscopy of the ingredients of Shunthi Khanda granule was done and the observed characters regarding the herbs are tabulated in Table no.2, Plate no.1

Preparation of the drug at Pharmacy – At first Shunthi powder was taken into a stainless steel vessel and fried with ghee with mild heat over LPG stove till ghee gets separated from the paste form. Then vessel was taken out from the

stove and kept ready. In another vessel mentioned amount of milk was taken and subjected to heat over LPG stove. 7.2 kg. of sugar was added with the milk when boiling was started. The mixture was filtered through a clean cotton cloth to separate undissolved material, if any, in sugar. The filtrate was collected into another cleaned vessel, subjected to gentle boiling and stirred continuously with stainless steel ladle maintaining the temperature 95°C to 110°C throughout the process till it reduced to thicker consistency of leha confirmed by the formation of soft ball and appearing of Avaleha siddha lakshanas. When the classical characters of Avaleha were appeared i.e. Darvi pralepa (sticking to the ladle at 95°C), Apsu majjanam (sinking in water but did not disperse at 99°C), Patitastu na sheeryate (remain stable at 108°C), Rasa gandha varnotpatti (attaining pleasant odour, good colour and taste) the ready prepared fried Shunthi was added and mixed uniformly. After 15 minutes, vessel was taken out from the stove and allowed to cool. When the contents were at 60°C, the fine powders of prakshepa dravyas were added and stirred thoroughly to form a homogenous blend and further allowed it to cool to room temperature. When the mixture was almost dried and cooled, honey was added gently and passed the bolus through sieve number 10 to obtain granules. The average details are placed at Table no.3.

Phytochemical analysis of the compound drug - The research drug Shunthikhanda granules was subjected to organoleptic (Table no.4) and physicochemical study in order to develop analytical profile. The following parameters are carried out in this phase:

I) Organoleptic characteristics: Color, Odor, Touch and Taste.

II) Physicochemical analysis: Loss on drying at 110°C[17], p^H value[18], water soluble extractive[19], alcohol soluble extractive[20], determination of sugar contents[21] (Table no.5).

III) High Performance Thin Layer Chromatography[22] - Granules weighing 5 gm were taken with Petroleum ether and washed out. Then 100 ml Methanol was mixed with washed sample and the mixture had been left for 24 hours. Filtrate was prepared and evaporated till it gets dried in a flat-bottomed shallow dish and concentrated on water bath to volume of requirement (Methanol extract). Methanol extract of Shunthikhanda Granules were spotted on pre coated silica gel GF 60254 aluminium plate as 5mm bands, 5mm apart and 1cm from the edge of the plates, by means of a Camag Linomate V sample applicator fitted with a 100 µL Hamilton syringe. The slit dimensions were 6 mm x 0.45 mm and the scanning speed was 20 mm s-1. Then the plate was sprayed with Anisaldehyde Sulphuric acid followed by heating and then visualized in day light.

The methanol extract of the sample was analyzed qualitatively for different functional groups[23,24]. Details are placed at Table no.6.

Study of the compound drug Microscopically - Taking about 5 gm. of Shunthikhanda granules, a defatting solvent had been added to remove ghrita and the process was repeated till sample became free from greasiness. The defatted sample had been washed in warm water twice. Rejected the warm water, distilled water was added and stirred. The solution was allowed to stand and throw off the supernatant. Then a few mg of the sediment was taken in iodine solution and mounted in glycerin (50 per cent), cleared in chloral hydrate solution, washed in water and again mounted in glycerin. Microphotographs were taken by corl zeiss binocular microscope attached with camera.

OBSERVATION AND RESULTS

In preparation of Shunthikhanda granules, cow milk was used particularly due to its efficacy in breaking pathological manifestation (dosha-dushya vighatana) of Amlapitta[25]. After mixed sugar in the milk, continuous stirring was done for proper extraction and to lessen the chances of degradation of some active constituents which may be decomposed due to hydrolysis[26]. Continuous stirring is also needed to facilitate the natural circulation evaporation[27]. Constant observation and continuous stirring[28] are essential in obtaining a good quality of Avaleha particularly during the initial stages of the procedure, otherwise sugar in the central part will be caramelized. Total sugar content in Shunthikhanda granules was found to be 39.14%, which may help in preserving the medicament for longer duration and make it palatable. The water-soluble extractive and methanol soluble extractive values were found to be 67.76% and 35.62% respectively, indicating considerable amount of polar compounds in the sample.

The High Performance Thin Layer Chromatography showed 3 prominent spots at hRf 66.10, 25.38, 8.51in short wave uv 254 nm and 4 prominent spots at hRf 57.46, 24.17, 8.04 and 10.33 in long wave uv 366 nm (Table no.7). After spraying with Anisaldehyde Sulphuric acid followed by heating the visualized solvent front was 7.5 and the solute run (Shunthikhanda granules) – 4.4/7.5 = 0.5866. Densitogram curve of HPTLC of Shunthi Khanda Granules is given in Fig. No.1.

In the present study a new pharmaceutical preparation of Shunthikhanda avaleha i.e. in the form of granules was tried which is economical in terms of time and machinery usage. As the formulation was tried for first time, the authenticity of drug used and its pharmaceutical properties had to be studied, hence the formulation was subjected to minimum Pharmacognostical and Pharmaceutical analysis. Pharmacognostical evaluation of Shunthikhanda granules showed the specific characters of *Zingiber officinale* Roscoe, *Ochrocarpus longifolius*, *Cyperus rotundus,* etc present in the preparation. Features found in Granules microscopy such as Parenchyma and vessels, Collenchyma filled with starch grains (stain), Pitted vessels, etc. confirm the same. The results obtained by conducting the preliminary qualitative analysis revealed the presence of tannins, saponins glycosides, flavonoids and alkaloids. The quantitative pharmaceutical analysis was in normal range and in accordance with those mentioned in reference books. As these reported analyses met the minimum standards the present work could be useful in the preparation of a standard protocol for future researches.

CONCLUSION

There is no previous record of concrete frame work for analysis of this traditionally much valued medicine in granules form, hence the present work had been taken up with a view to lay down the pharmacognostical and pharmaceutical standards. The method of preparation mentioned in the current study for Shunthikhanda granules may be considered as standard. On the basis of observations made and results of experimental studies, this study may be beneficial for future researchers and can be used as a reference standard in the further quality control researches. Auxiliary studies must be carried out on Shunthikhanda

granules based on identification and separation of active ingredients with the help of various Biomarkers.

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Table No.1 showing the ingredients of Shunthi Khanda:

Sl.No	Name	Botanical Name	Parts Used	Quantity		Amount taken in the current study
				Classical	Conversion*	
1	Shunthi	*Zingiber officinale*	Rhizome	1 Kurava	192 g.	1 part – 1.8 kg.
Praksepa Dravya (No.2 to No.14)						
2	Amalaki	*Emblica officinalis*	Fruit	3 Shana	9 g.	1/21 part – 87 g.
3	Dhanyaka	*Coriander sativum*	Fruit	3 Shana	9 g.	1/21 part – 87 g.
4	Mustaka	*Cyperus rotundus*	Tuber	3 Shana	9 g.	1/21 part – 87 g.
5	Sweta Jiraka	*Cuminum cyminum*	Seed	3 Shana	9 g.	1/21 part – 87 g.
6	Krishna Jiraka	*Carum bulbocastanum*	Seed	3 Shana	9 g.	1/21 part – 87 g.
7	Pippali	*Piper longum*	Seed	3 Shana	9 g.	1/21 part – 87 g.
8	Vansalochana	*Bambusa arundinaceae*	Exudates	3 Shana	9 g.	1/21 part – 87 g.
9	Twak	*Cinnamomum zeylanicum*	Bark	3 Shana	9 g.	1/21 part – 87 g.
10	Ela	*Elettaria cardamoum*	Seed	3 Shana	9 g.	1/21 part – 87 g.
11	Tejapatra	*Cinnamomum tamala*	Leaf	3 Shana	9 g.	1/21 part – 87 g.
12	Haritaki	*Terminalia chebula*	Fruit	3 Shana	9 g.	1/21 part – 87 g.
13	Krishna Marica	*Piper nigrum*	Fruit	6 Masa	6 g.	1/32 part – 56 g.
14	Surapunnaga	*Ochrocarpus longifolius*	Flower bud	6 Masa	6 g.	1/32 part – 56 g.
15	Sarkara	-	-	1 Prastha	768 g.	4 part – 7.2 kg.
16	Goghrta	*Butyrum departum*	-	2 Kurava	384 g.	2 part – 3.6 kg.
17	Godugdha	-	-	2 Prastha	1536 g.	8 part – 14.4 kg.
18	Madhu	-	-	3 Pala	144 g.	3/4th part – 1.35 kg.

(*Reference for metric equivalents: Ayurvedic Formulatory of India, Part – I, Second Revised English Edition, Appendix 5, Page no. 483, Govt. of India, Ministry of Health and Family Welfare, New Delhi)

Table No.2 showing the caharacters of ingredients of Shunthi Khanda granules under powder microscopy:

Sl.No	Name	Characters of powder microscopy
1	Shunthi	Parenchyma and vessels, Starch and oilresin
2	Amalaki	Crystals, Crystals with Tannins
3	Dhanyaka	Epiderrmal Cells, Oil Globules
4	Mustaka	Oleo resin, Scalriform vessles
5	Sweta Jiraka	Oil Globules, Mesocarp
6	Krishna Jiraka	Beaded parenchyma, Vitte Cells
7	Pippali	Fiber, Starch grain, prismatic crystals & Epidermal cells
8	Surapunnaga	Simple fibre with prismatic crystal, Pollen grains with three portuberance
9	Twak	Schelerides with stain , Collenchyma filled with starch grains (stain)
10	Ela	Oil content cells with aleurone grains, Perisperm cells
11	Tejapatra	Fibre, Stone cells in group with stain
12	Haritaki	Pitted vessels, Scleroids
13	Krishna Marica	Fiber, Stone

Table No.3 showing practical details of Shunthikhanda granules

Partameters	Shunthikhanda granules
Total solid contents in %	3.42
Total liquid contents in %	53.55
Total duration (h)	4.15
Total yield (kg)	12.8

Table no.4 showing Organoleptic character

Parameters	*Shunthi Khanda* Granules
Rupa (Colour)	Light brown
Rasa (Taste)	Madhura, Katu
Gandha (Odour)	Spicy-sweet aroma
Sparsha (Consistency)	Solid

Table no.5 showing Physicochemical Analysis

S. No.	Physicochemical Parameters	Shunthikhanda granules
1.	Loss on drying	0.6.33% w/w
2.	Water soluble Extract	67.76% w/w
3.	Alcohol soluble Extract	35.62% w/w
4.	Total Ash	2.16% w/w
5.	$_{P}$H Value	5.5
6.	Reducing sugar	17.634% w/w
7.	Total sugar	39.14% w/w
8.	Dextrose value	21.506% w/w

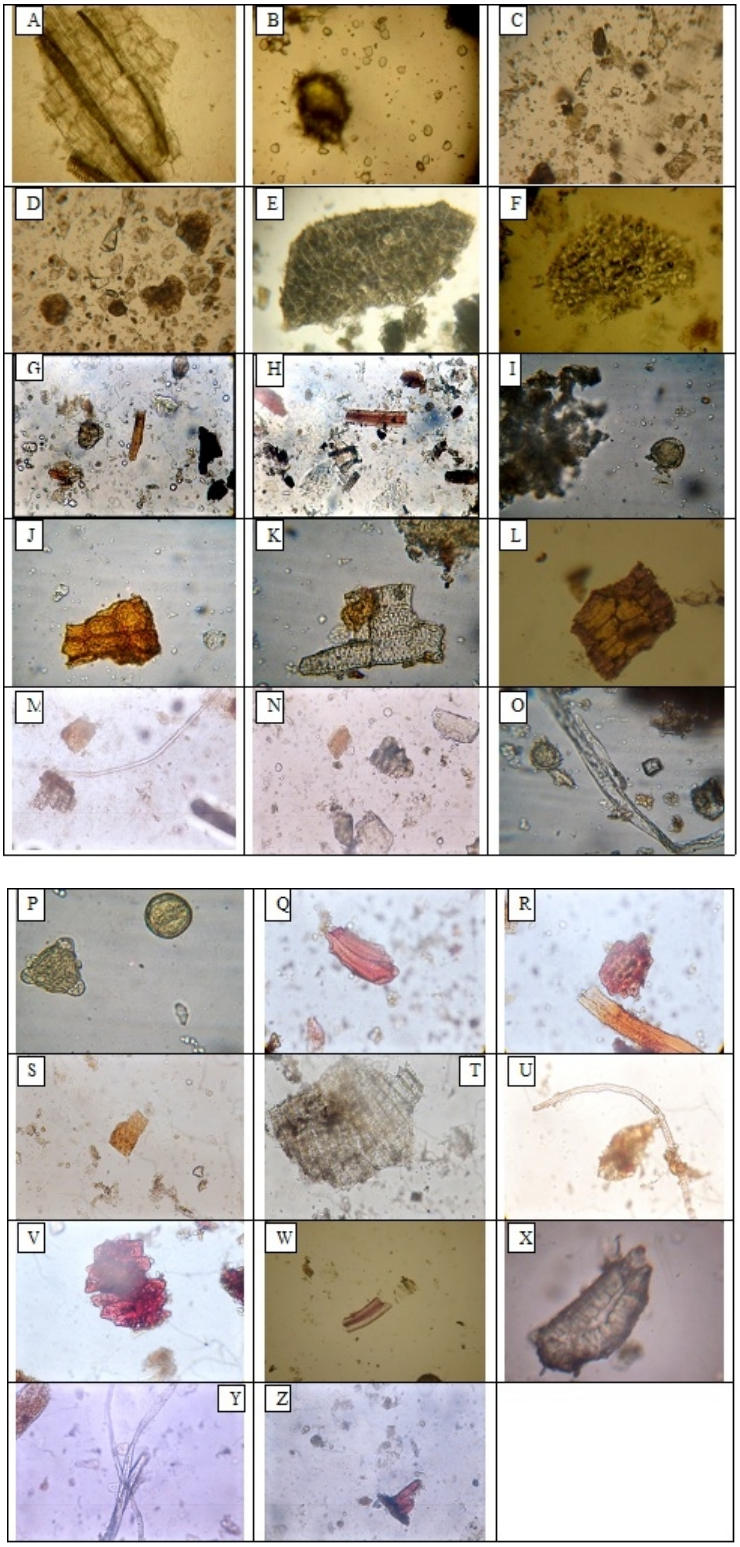
Table No. 6 showing Functional group of *Shunthi Khanda* granules

Sl No.	Functional group	*Shunthi Khanda* granules
1.	Alkaloid	+ve
2.	Glycosides – Saponins	+ve
3.	Tannins	+ve
4.	Flavonoids	+ve
5.	Triterpenoids & Steroids	+ve
6.	Carbohydrates	+ve
7.	Proteins	+ve
8.	Amino acid	+ve

Table No.7 showing the HPTLC profile of *Shunthi Khanda* grannules

Shunthikhanda granules		
Wavelength	**No.of Spots**	**R_f value**
Long wave (366 nm)	4	57.46 24.17 8.04 10.33
Short wave (254 nm)	3	66.10 25.38 8.51

Plate no. 1 showing microscopic characters of the ingredients of *Shunthi Khanda* granules



A - Parenchyma and vessels; B - Starch and oilresin; C - Crystals; D - Crystals with Tannins; E - Epiderrmal Cells; F - Oil Globules; G - Oleo resin; H - Scalriform vessles; I - Scalriform vessles; J – Mesocarp; K - Beaded parenchyma; L - Vitte Cells; M – Fiber; N - Starch grain, prismatic crystals & Epidermal cells; O - Simple fibre with prismatic crystal; P - Pollen grains with three protuberance; Q - Schelerides with stain; R - Collenchyma filled with starch grains (stain) ; S - 4.Oil content cells with aleurone grains; T - Perisperm cells; U – Fibre; V - Stone cells in group with stain; W - Pitted vessles; X – Scleroids; Y – Fiber; Z - Stone

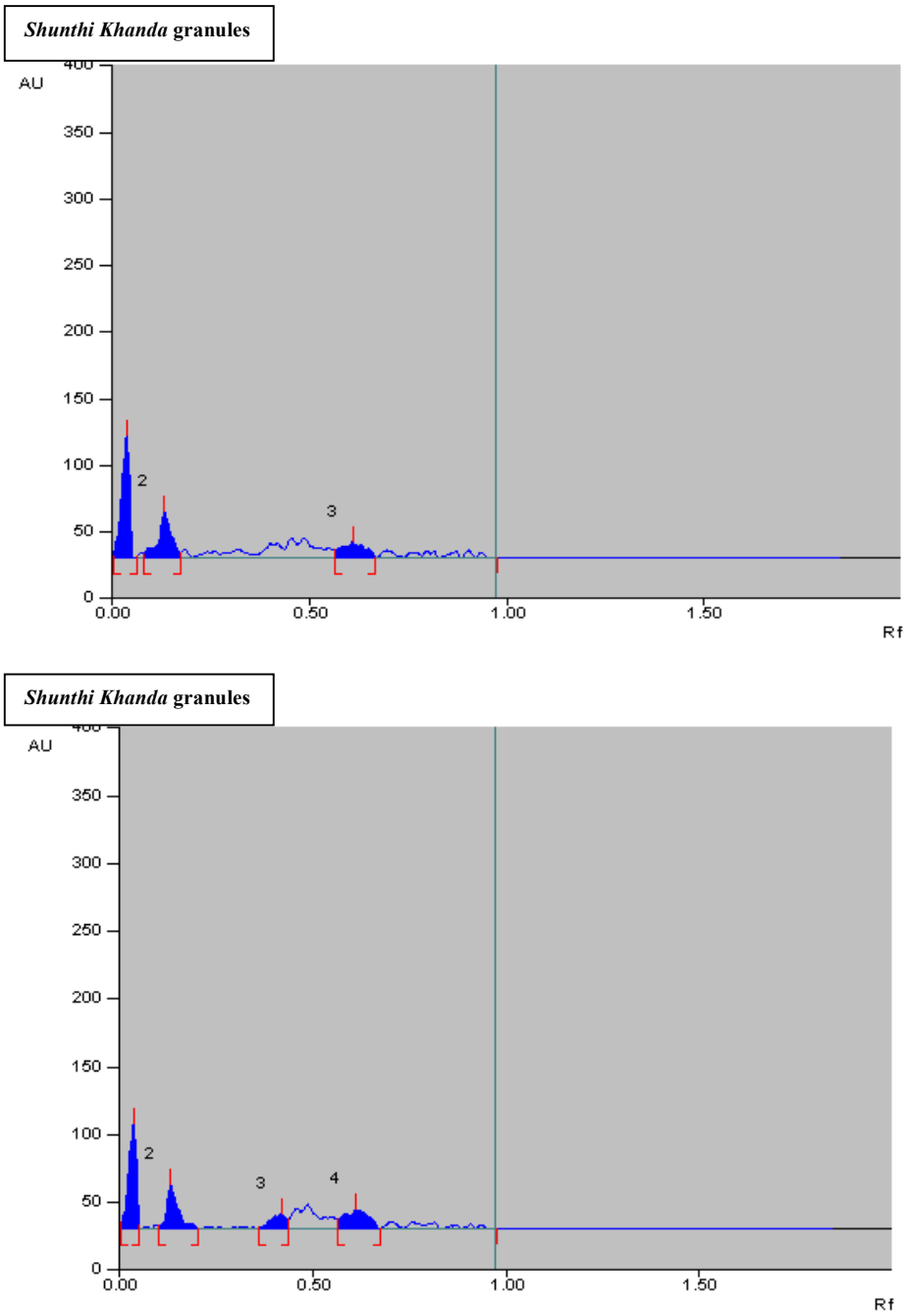


Figure No.1 Densitogram curve of *Shunthi Khanda* Granules Extract in 254nm & 366nm

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