

THE PHARMACEUTICO ANALYTICAL STUDY OF VISHESHASHODHANA OF GANDHAKA W.S.R TO ITS NIRGANDHIKARANA

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ABSTRACT

RasaTarangini, the widely accepted authentic text book of medieval period mentions *visheshashodhana* of *Gandhaka* by *Shatavaradhalana* process to remove *dosha*, *visha* and to make *nirgandha*. At this point this method makes up to think critically that whether *visha* is in the form of odour or not. As we go through the synonyms of *Gandhaka* they are *putigandha*, *kruragandha*, *atigandha* etc. By which it clearly states it possesses foul smell. Therefore it may cause discomfort in the form of negative impact on the efficacy of final product. Perhaps this is why the author has made it mandatory to make *Gandhakanirgandhikarana*. **Aims and Objectives:** To carry out *visheshashodhana* of *gandhaka*, to perform its *nirgandhikarana* and to comparatively evaluate physico-chemical properties of *ashuddha* and *visheshashodhitagandhaka*. **Material and Method:** In this study the *dhalana* process is carried out i.e. melting in *goghrita* and pouring into *godugdha* for 100 times. **Result and Conclusion:** In the two samples of *ashuddha* and *visheshashodhitagandhaka* there was significant difference in the results of analysis hence indicative of a high purity and after completion of *visheshashodhana* the odour was reduced therefore by this objective of this work was achieved.

Keywords: *Visheshashodhana*, *Nirgandhikarana*, Sample analysis

INTRODUCTION

Gandhaka is a widely used drug in Ayurveda as well as other system of medicines. It has been given importance next to *Parada* and mentioned as having similar properties. It comes under *uparasavarga*, and is used as a chief drug in many formulations taken internally as well as externally for its efficacy in curing various diseases¹.

Before using *Gandhaka* a prior process of *Shodhana* has to be done because *Ashodhita Gandhaka* causes burning sensation, skin disease, giddiness, *pitta* related disorders and can also damage the strength and vigour of the body². *Shodhitagandhaka* is a good rejuvenator. It possesses *madhurarasa*, *katuvipaka*, and *ushnavirya*. It is indicated in *kandu*, *kushtha*, *visarpa*, and *dadru*. It improves the appetite and is a good di-

gestive; it also digests *amadasha* by the action of *shoshana*. It nullifies the influence of *garavisha*. It renders additional potency to 'Parada' and is a good *2. krimihara*³.

Shodhana means a process of not only purification but also involves the detoxification and enhancing the efficacy of the drugs. *Shodhana* is one type of *samskara* and Acharya Charaka has explained this term as '*Gunantaradhanam*'.

Most of the raw materials used in rasa shastra are obtained from the earth. So there is every chance of impurities, toxicity, heterogenous qualities, mixing of other substances and unwanted qualities to large extent. So *shodhana* is indicated to eliminate visible and invisible blemishes and to induce certain qualities which are essential for the metabolism of the material in the living body.

There are two types of *shodhana* *Samanya* and *Vishesha*. In *samanyashodhana* general impurities can be removed, where the method is common for the drugs of that *varga* (group) Ex. *Dhatushodhana*⁴. In *visheshashodhana* the method of purification differs from drugs to drugs even though the drugs classified under the same groups Ex. *Lohavisheshashodhana* (for *Giridosha*). In this study the *vishesha shodhana* of *gandhaka* was carried out as we see the synonyms of *gandhaka* are like *putigandha*, *kruragandha*, *atigandha* etc. which tells us that *gandhaka* possess bad and irritating odour and hence to minimize this the study was carried out at Muniyal Ayurvedic Research Center attached to the Muniyal Institute of Ayurveda Medical Sciences, Manipal.

Hence this study has been selected which is a unique procedure.

MATERIAL AND METHODS

1. Procurement of ingredients

AshudhdhaGandhaka was procured from an authentic raw drug shop. In classics, *grahyalakshanas* of *Gandhaka* have been told by various acharyas and *Gandhaka* was collected confirming the presence of that characteristic features. *Godugdha* was procured from a dairy of government authorised. The procured milk was further tested for its purity. *Goghrita* was collected from

market from which homemade ghee were available. The procured ghee was further tested for purity.

GandhakaShodhana

Principle – Dhalana

Equipments – steel kadai, spoon, steel vessel, cloth, *khalwayantra*, heating system, measuring jar, weighing balance.

Ingredients-

Ingredients	Quantity
<i>AshuddhaGandhaka</i>	1parts (1630 g)
<i>Goghrita</i>	1 parts (1630 g)
<i>Godugdha</i>	Q.s (1800 ml)

Method of preparation

A vessel was taken in which warm *godugdha* was added and it was tied with a cloth. Then in a steel kadai *ghrita* was added and it was kept on mild fire, after *ghrita* melts equal quantity of *gandhaka* powder was added and heated on mild fire until it melts completely. As soon as *gandhaka* melts it is then filtered through a cloth containing warm *godugdha*. Later *gandhaka* is then removed and washed with hot water and dried. This procedure is repeated for 100 times.

Note- In the present study the methodology of *shodhana* could be repeated for 85 times only, where the resultant obtained quantity was 25gms which was the minimal quantity required for analysis purpose.

Precautions

- Mild heat was used during process, *gandhaka* was seen melting at around 116-125°C.
- Continuous stirring was done with iron ladle.
- After complete melting, it was immediately poured to the vessel containing milk with care.
- The unfiltered part was melted again and filtered through cloth to avoid greater loss.
- Washing with hot water was done till excess ghee was removed.
- Each time fresh Ghee & milk was taken.

OBSERVATIONS AND RESULTS

Observation-

It was observed that *gandhaka* solidifies at 68-95°C, when it is subjected to mild heat it starts melting at around 101-111°C, and it got completely melted at

around 116-125°C. Some physical impurities like stones, thread were observed on the cloth when molten *gandhaka* was poured into through it. *Gandhaka* solidifies after pouring into milk. Milk was found hot after *dhalana* process. When solidified *gandhaka* was subjected to *prakshalana* with hot water excess ghee was found floating on the surface. After *shodhana* process colour of *gandhaka* was seen to be dull yellow colour.

Results

- Total quantity of *AshuddhaGandhaka* taken – 1630 grams
- Total quantity of ghee – 65.39 kilograms

Total quantity of milk taken – 61.775 kilograms

ShuddhaGandhaka obtained – 25 grams

Total weight loss – 1605 grams.

The form and nature of *ashuddha* and *shodhita gandhaka* is shown in table 1.

Reason for Weight Loss

The loss was due to the physical impurities like stones etc. got separated. While pouring molten *gandhaka* through cloth some particles of *gandhaka* were seen adhering to the cloth. While washing with hot water, small particles of *gandhaka* flowed along with water. Loss was also due to oxidation process caused due to heat.

Table 1: Showing organoleptic characters of *Gandhaka*

Parameter	<i>Ashuddha</i> gandhaka	<i>Visheshashodhitagandhaka</i>
Colour	Yellow	Whitish yellow
Odour	Rotten egg smell, <i>Gandhakavishishtagandha</i>	No rotten egg smell, Slight smell of <i>gandhaka</i>
Touch	Rough	Soft
Consistency	Solid	Solid

Table 2: Showing Analytical study result of Milk and Ghee before and after *shodhana*

<i>Dhalana</i>	Milk				Ghee			
	Parameters				Parameters			
	Specific gravity		pH		Specific gravity		pH	
	Before <i>dhalana</i>	After <i>dhalana</i>	Before <i>dhalana</i>	After <i>dhalana</i>	Before <i>dhalana</i>	After <i>dhalana</i>	Before <i>dhalana</i>	After <i>dhalana</i>
1 st	1.00	0.975	6.68	5.21	0.90	0.84	6	6
3 rd	1.01	1.00	6.50	5.32	0.957	0.955	6	6
7 th	1.04	1.02	6.55	5.45	0.91	0.85	6	6
85 th	1.027	1.01	6.62	5.42	0.90	0.921	6	6

Table 3: Showing Physico-chemical result of *Gandhaka* before and after *shodhana*

Sr. No.	Parameters	<i>AshuddhaGandhaka</i>	<i>VisheshashodhitaGandhaka</i>
1.	LOD	0.5%	0.29%
2.	Total Ash value	4%	2.2%
3.	Acid Insoluble value	1%	1.3%

XRD

X-Ray diffraction study of *Ashuddha* and *visheshashodhita* samples show well crystalline rhombic sulphur having 2θ peaks 23.060 and 23.160 respec-

tively in *ashuddha* and *shodhitagandhaka* samples with 100% relative intensity. Other minor peaks observed also correspond to the standard peaks of a rhombic sulphur.

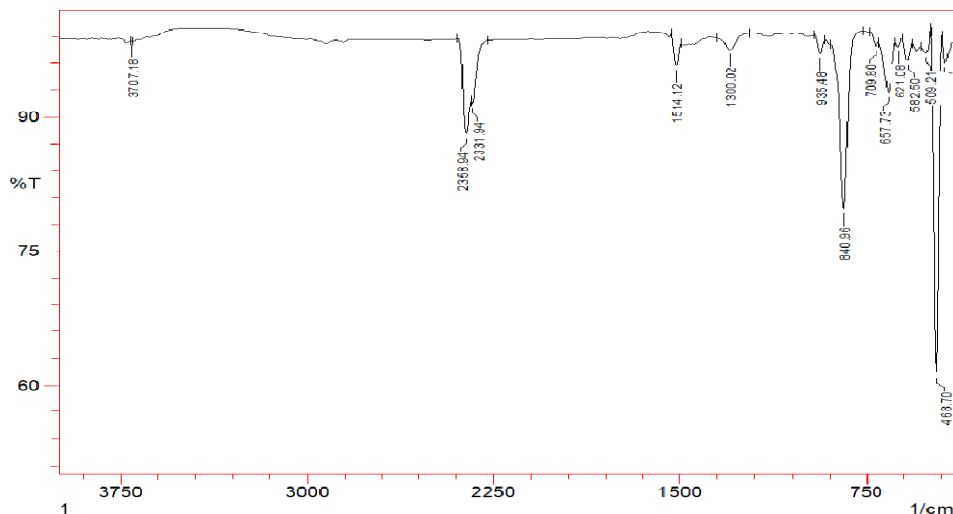
ICP-AES

Table 4: Showing result of ICP-OES of *Ashuddha* and *Visheshashodhitagandhaka*

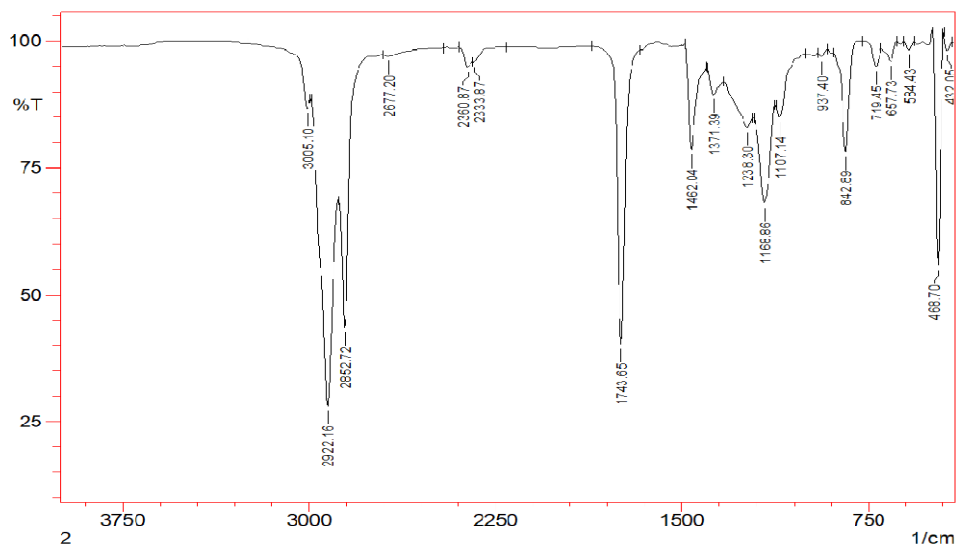
<i>AshuddhaGandhaka</i>	78.19 ppm
<i>VisheshashodhitaGandhaka</i>	158.10 ppm

FT-IR

Graph 1: Showing result of *AshuddhaGandhaka*



Graph 2: Showing result of *VisheshashodhitaGandhaka*



SEM-EDAX

Table 5: Showing result of SEM-EDAX of *AshuddhaGandhaka*

Element	Line Type	Wt%	Wt% sigma	Atomic %	Oxide	Oxide %	Oxide % sigma
O		59.95		75			
S	K series	40.05	0.22	25	SO3	100	0.56
Total		100		100		100	

Table 6: Showing result of SEM-EDAX of *VisheshaShodhitaGandhaka*

Element	Line Type	Wt%	Wt% sigma	Atomic %	Oxide	Oxide %	Oxide % sigma
C	K series	10.905	0.76	15.79	CO2	39.96	2.8
O		65.045		71.055			
S	K series	24.045	0.405	13.16	SO3	60.04	1.025
Total		100		100		100	

DISCUSSION

Comparative analysis of raw and *shodhitagandhaka*:

Organoleptic parameters: Bright yellow coloured raw sulphur got converted into a pale yellow or white yellow. Characteristic irritant rotten egg odour of sulphur got markedly reduced after *visheshashodhana* to partially achieve the objective of *nirgandhikarana*. *Shodhitagandhaka* was soft when compared to rough and hard consistency of *ashuddhagandhaka*.

Physico-chemical parameter

During and at the end of *shodhana* process basic physico-chemical characters of media used for *shodhana* i.e. *godugdha* and *goghrita* were tested. This test was performed after 1st, 3rd, 7th and 85th (last) *dhalana* process. In all the samples specific gravity and pH were tested it was observed that specific gravity and pH of *godugdha* got marginally reduced after *dhalana* process.

According to the study pH of milk decreases when it is heated up due to molten sulphur⁵. This is due to the function of CO₂ concentration. Also this is followed by drop in pH due to the Maillard reaction⁶.

A study also confirms that specific gravity of milk changes with temperature it tends to decrease when increase in temperature, probably the reason may be that the proteins gets hydrated at high temperature⁷.

A marginal reduction in specific gravity observed in samples may be partial hydrolysis due to effect of heat.

Physico-chemical parameters like Loss on drying, Ash value were adopted for *ashuddha* and *visheshashodhitagandhaka*. It was observed that loss on drying in *shodhita* sulphur was 0.29% which was lesser than raw sulphur which was 0.5% which indicates less moisture content. Total Ash value got reduced from

2.2% to 4%. However acid insoluble ash was marginally increased from 1-1.3%.

Sulphur was subjected to flame test there is slight different in colour of flame. Raw sulphur showed blue purplish flame and *visheshashodhitagandhaka* showed greenish blue flame.

X-Ray diffraction study of G1 and G2 samples i.e. *Ashuddha* and *visheshashodhita* samples show well crystalline rhombic sulphur having 2 θ peaks 23.060 and 23.160 respectively in *ashuddha* and *shodhitagandhaka* samples with 100% relative intensity. Other minor peaks observed also corresponds to the standard peaks of a rhombic sulphur (JCPDS 4-8-0240)⁸.

Crystalline size was found to increase marginally after *visheshashodhana*. Hence XRD was indicated for both crystallography as well to estimate values of both *ashuddha* and *shodhita gandhaka*.

Sulphur exists in different crystal structure known as allotropes. The stable form at room temperature is called rhombic sulphur. When this is heated slowly about 95°C it transforms into monoclinic sulphur. Both forms are crystals made up of S8 molecules. The only difference between rhombic and monoclinic types is the arrangement of the molecules in space. Crystalline sulphur consists of puckered S8 rings in a shape of crowns. This can be packed together in two different ways to form rhombic crystal and to form needle shaped mono-clinic crystals. Inductively coupled plasma optical emission spectrometry study showed more amount of sulphur was found in *shodhitagandhaka* compared to *ashuddhagandhaka* indicating higher purity. Here FT-IR was performed to detect the presence of functional groups organic ligands in *ashuddha* and *shodhitagandhaka*. FT-IR spectrum was taken in region of 400-4000 cm⁻¹. General overview of sample indicates presence of large number of functional groups (2.1 to 2.2). *Ashodhitagandhaka*

sample showed total 13 peaks whereas *shodhitagandhaka* sample showed about 19 peaks. In G1 sample peak corresponding to 840.96 cm⁻¹ probably corresponding to C-Cl stretch with an medium bond having alkyl halide as the functional group a similar peak was found at 842.89 cm⁻¹ in sample G2. A peak with value 709.80 cm⁻¹ corresponds to CH-OOP a strong bond of aromatic functional group a similar peak was found in G2 sample at 719.45 cm⁻¹. A sample peak in G1 at 657.73 cm⁻¹ corresponds to a strong double bond CH- bend corresponding alkenes is observed in both the samples. A sample peak of 621.08 cm⁻¹ in G1 and a sample peak of 937.40 cm⁻¹. In sample G2 probably corresponds to strong NH-wag bond which is due to 1st and 2nd degree amylase. The peak with value 1514.12 cm⁻¹ in G1 sample is probably due 1st degree amines with bond of medium strength corresponds to N-H bend. In G1 sample a peak at 2358.4 cm⁻¹ is probably due to NH and OH group a similar peak was observed in G2 sample at 2677.0 cm⁻¹^{9,10}. 2 peaks 1107.14, 1168.86 were raised due to CH stretching vibration and esters groups¹¹.

Sharp peaks at 468.70 cm⁻¹ in both the samples, at 840.96 cm⁻¹ in G1 and 842.89 cm⁻¹ in G2 are due to α -sulphur¹². In SEM study both samples showed presence of rhombic sulphur crystallites. In *visheshashodhitagandhaka* crystallites were slightly large and there were non-crystalline material which may be due to presence of organic substances.

CONCLUSION

Gandhaka is mostly used therapeutically in Ayurveda but after its proper *shodhana* only it can show its best result and after its *nirgandhikarana* it becomes easy for intake without its strong odour which can cause discomfort, the number of *shodhanasamskara* exerted to *gandhaka* will increase its properties which can show magical results with small dose also. The various analysis like organoleptic characteristics, physico-chemical analysis, and instrumental analysis showed high purity level of *visheshashodhitagandhaka*.

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IMAGES OF SHODHANA OF GANDHAKA

Figure 1: AshuddhaGandhaka **Figure 2- Churna of AshuddhaGandhaka** **Figure 3- Melted ghee**



Figure 4- Gandhaka heated **Figure 5- Gandhaka starts melting** **Figure 6- Melted gandhaka**



Figure 7-Pouring of gandhaka **Figure 8- Gandhaka in warm milk** **Figure 9- Prakshalana**



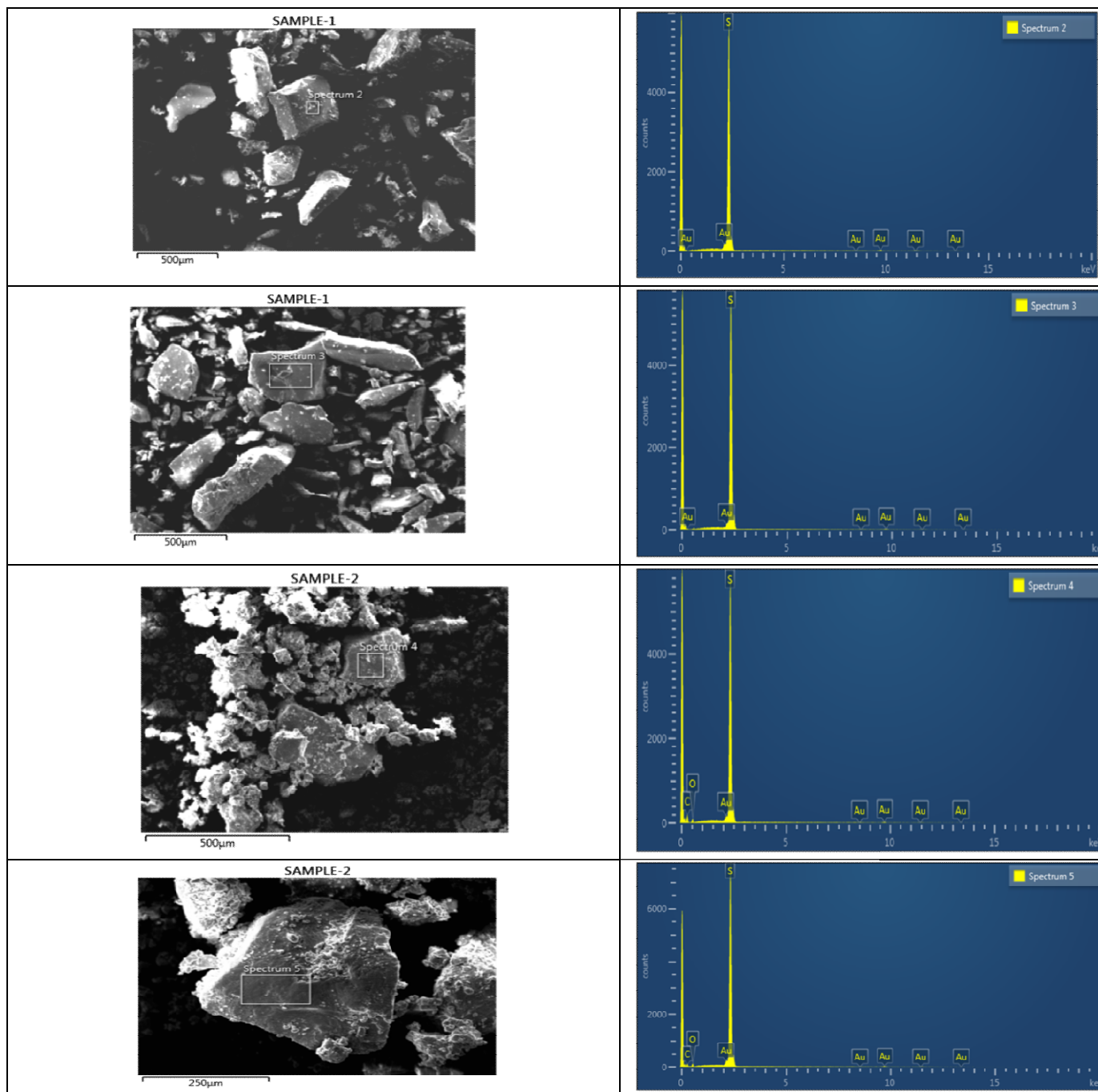
Figure 10- ShodhitaGandhaka

FLAME TEST



Figure 11- AshodhitaGandhaka **Figure 12- ShodhitaGandhaka**

SEM-EDAX



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