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A Pharmaceutical and Analytical study of 'Gomutra Arka'

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ABSTRACT:

Ayurveda has achieved its proper position at international level & set up with weapons to solve many critical problems of human being. Different formulation methodologies prepared with various herbs & their administrations are collectively discussed in Bhaishajya Kalpana. Five basic methodologies called Panchavidh Kashay Kalpana are stated. Though these kalpanas are effective posses some limitations regarding taste, smell & shelf-life. So some derived formulations are designed by acharya based mainly on extraction of active ingredient. The term Arka used for the procedure indicates that it is the most applicable and potent formulation. While doing pharmaceutical preparations it is observed that some drugs having volatile constituents as active principles, loose their potency after boiling to obtain such volatile aromatic content, Arka Kalpana is developed. The Arka kalpana described in Vedas⁽¹⁾ can be traced in the form of liquors and named as 'Parisruta'. Parisruta is the alcoholic preparation made by the process of distillation. Arka Prakash the special text describing Arka stated isolation of arka not only from herbs & flowers but also from substances belonging to animal kingdom. In this thesis pharmaceutical preparation of Gomutra Arka is done by using domestic cooker as well as simple distillation apparatus. Open pan evaporation of Gomutra was also done to rule out the time required & temperature consumed. Cooker method arka preparation was done as pilot study. Based on the values obtained, groups of experiments changing initial quantity of raw material & keeping time & temperature constant & vice versa was done. Composition of Gomutra & it's utility is very well known today, but its dispersion has some limits due to smell, taste, availability of proper sources. So Gomutra Arka was prepared and studied analytically in terms of organoleptic test & chemical analysis was also done.

Keyword: Gomutra, Arka kalpana, Gomutra Arka

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INTRODUCTION

Review of research work done revealed that very less work is done on Arka kalpana⁽²⁾ hence it was decided to work on Arka Kalpana to study the preparation methodology in detail. Arka Prakasa the special text describing 'Arka' stated isolation of Arka not only from herbs & flowers but also from substances belonging to animal kingdom. Hence after selection of Arka Kalpana concentration was made on animal derivatives.

Gomutra is used in number of diseases⁽³⁻⁵⁾ & also administered in healthy person. Inspite of such important properties -Gomutra has strong smell & irritant taste. It is not easily available & proper sources are few. It becomes concentrated on keeping. Hence change in form of Gomutra keeping medicinal value intact is the need of time.

Hence dissertation topic was selected entitled as Pharmaceutical & Analytical study of Gomutra Arka Keeping its alms & objectives as-

1. To make conceptual study of Arka kalpana as well as Gomutra by reviewing the relevant literature.
2. To make Pharmaceutical preparation of Gomutra Arka (by following quality control norms of raw material as well as norms for process validation).
3. To correlate various samples of Gomora Arka analytically.
4. To make efforts to establish quantitative and qualitative standards to Gomutra Arka.

Importance of Arka kalpana

- It is used for extraction of aromatic, volatile substances in pharmaceutical industries.
- It is also used for preparation of distilled water which is required for medical purpose
- Aromatherapy is the most popular way for physical, psychological & spiritual problems in which Arkas of different herbs are used.
- Arka kalpana is also used in herbal cosmetics, perfumery, food products etc.
- By doing Arka of any drug it's shelf-life increases.
- Arkas are more concentrated than the original drug.
- Substances can be flavoured according to choice by doing its Arka.
- Administration of drug in Arka. form can reduce the dose.

Karma specification of Gomutra is indicated in Ashtang Sangraha as⁽⁶⁾

- Medhya Karma
- Deepan Karma
- Virechana Karma

Conceptual study of Arka Kalpana

Synonym of Arka

Word Derivation - The word 'Arka' is derived from root 'Arch' means to praise, fit to be worshipped Arka Kalpana is termed in different languages as -

- 1) Sanskrit - Arka kalpana, Pari stravana.
- 2) Marathi- Arka kalpana.
- 3) Hindi - Arka kalpana.
- 4) English – Distillation
- 5) Arabi – Takkir, Ta-arik
- 6) Urdu - Kashid karana, Arka Khichana, Arka chuana

TYPES OF ARKAS**1 Stability Arkas**

Stable Arka (sthir) eg. Rose Arka

Volatile Arka, eg Menthol Arka

2 Odour Arkas

Nirgandhi Arka eg. Pippalimool Arka

Sugandhi Arka eg. Rose Arka

Durgandhi Arka eg. animal derivatives

Drugs available for Arka preparation

Arka Dravyas are divided into

1. Herbal origin
2. Marine origin
3. Animal origin

Herbal origin dravyas are again divided into ⁽⁷⁾

1. Kathin dravya. Eg. Chandan
2. Sadharan dravya eg. Ajamoda
3. Ardra dravya

Ardra dravya are further divided into ⁽⁸⁾

1. Saras dravya
2. Niras dravya

Saras dravya can be classified as ⁽⁹⁾

1. Mrudugdha dravya eg. Arka
2. Tikshna dugdha dravya eg. Vajra

Selection criteria for material of Arka ⁽¹⁰⁾

Following criteria's should be followed for using herbal raw material for Arka preparation (A-P2/6)

Herbs should be collected from good source at proper season & used in fresh state

1. If not possible it should not be older than one year
2. It should not be very hard.
3. It should not be infected
4. It should be having its original taste, smell.

Criteria's to be followed while using animal origin raw material. ⁽¹¹⁾

- Milk, dung & urine of animal which is in it's youth & in good health should be collected
- Tissues feathers etc. of animals & birds which are in their youth & in good strength should be collected.

Equipment (Yantra) for Arka Preparation

While preparing any medicament from raw material of any type there is a need of proper instrumentation. An instrument is a tool by which an ideal drug can be prepared.

Library review of yantra for Arka preparation

Word yantra is derived from root yatni - to restroom to control. Yantra for arka preparation is termed in different languages as

- Marathi - Arka Patan yantra
- Sanskrit - Patan yantra/Tiryak patan Yank
- English - Simple distillation apparatus
- Hindi - Bhapaka yantra/Deg/Degis
- Urdu - Kara-a-ambik.

In ancient days Arka Patan yantra made of special, soil texture termed as Jirnasthi mrittika ⁽¹²⁾.

Apparatus for arka preparation is also explained in all rasagranthas as "Tiryak Patan Yantra" ^(13,14)

Review of literature regarding yantra

Article written by Dr. Y.G. Joshi states one yantra made of stainless steel having mechanism similar to distillation apparatus. It gives final product with good quality having shelf-life 2 years. That requires no preservation

Visit to Dhanvantari Pharmaceutical was also done regarding yantra. Abstract - simple, distillation apparatus made of stainless steel run on L.P.G and having no record for temperature. Mainly it is used for preparing rose arka.

Proportion of water for Arka dravyas of various types^(15,16)

Type of material	Quantity of Water	Duration to keep
Kathin (Hard) dravya	2 times at Water	Overnight
Ardra (wet) dravya	1/2 times at Water	24 hrs
Sadugdha dravya	Lukewarm water upto the level of material	3 days
Phala (fruits)	No water	-
Pushpa (Flower)	1/16 times of water	-
Kashtha (Stem)	1/80 times of water	1½ hrs.

Reff (ASK 8 DYY)

Temperature for Arka Preparation⁽¹⁷⁾

Regarding Anka kalpana six types of different heat patterns are mentioned in Arka Prakash. Viz- Dhoom agni, Manda agni, (A.P1/80-81) Deep agni, Madhya agni, Khara agni, Bhada agni

Time duration for Procedure

- At the beginning, distillate is collected speedily but as the time increases speed decreases.
- Typical water sound due to vapour pressure is observed during the procedure, which diminishes at the end.
- Smell of Arka changes when active principles are depleted (at the end point)
- Giving heat to the material is stopped after getting near about 1/3 of distillate from raw material.
- Time duration can be also decided according to the potency of the yield.
- According to various time ranges, Arkas are described in different grades⁽¹⁸⁾

Selection criteria of standard Arka⁽¹⁹⁾

The prepared end product, Arka should be observed for colour, taste, smell to examine its standard It should be tested for following criteria's before its administration (A.P1/74)

- Smell of Arka should be more prominent than raw material
- Taste of Arka should be same as raw material taken
- Arka should be milky white in colour (like sea-shell)

Conceptual study of Gomutra

Word derivation of Gomorra Gomutra is derived as (गो-मूत्र) 'urine of cow' dictionary meaning

It is also known in-different languages as

Sanskrit- Gonishyand/ Gojal/Godrava/Goambh

Marathi - Gomurra

English – cow urine.

Physical Properties of Gomutra

Amount of daily cow urine excreted 8.8-22.6 Ltr/day

Colour cow's urine - Dark yellow reddish

Odour - Irritant bitter.

PH - 7.4-8.4

Specific gravity of cow's urine- 1.039 1.045.

(Elienberg & Schew nert Dairy cattle physiology)

Chemical Properties of Gomutra

Chemically Gomutra contain following compound's

Nitrogen - Sulphur - Ammonia - Copper

Uric acid - Phosphate - sodium-potassium

Carbolic acid – Vit A, B, C, D – Lactose – Enzyme

Other minerals – Creatinine – Steroid - Silicon

Iron - Urea

Magnesium - Hippuric and

Water - Gold salt

Chlorine

Description of gomutra from Ayurvedro texts

Ras of Gomutra - Katu Rasa

Virya of Gomutra - Ushna virya

Vipak of Gomutra - Katu vipaka

Guna of Gomutra - Tikshna, Ushna, Laghu, Deepan, Medhya

Action on tridosha - Kapha vata, shamak pitt vardhak

Formulation of Gomutra in ancient literature

Formulation	Disease	Reference Grantha
Arsha kuthar Rasa	Arsha	R.C. R.S.S.
Kushhadi Tail	Kustha	V.Bh.
Gomutro siddha manduram	Shool	C.d.
Punarnava Mandur	Pandu	B.R., C.S. GNAR, C.d
Punarnavadi Mandur	Parinamshool	VS. R.kd
Marichyadi tailam	Kustha	c.d, v.s
Raudra Rasa	Arbuda	B.R, B.P.
Vajrak tail	Kustha	R.V.S., R.kd
Mutrasyoga	Kamaroga	C.d. B.Y.T.
Haritaki Yoga	Arsha	Y.C

Haritakyadi choornam	Vruddhirog	C.S.
Gomutra Haritaki	Pandu	G.N, Y.R.
Gomutra Mandur	Shoth	BNR
Gomutro Yoga	Shoth Udar	C.S., Y.R., V.M.
Gomutra Arka	Medoroga	R.T.S.

MATERIALS AND METHOD

For conceptual study

All relevant literature regarding Arka Kalpana as well as Gomutra.

For Pharmaceutical study

Raw material- Gomutra was obtained following quality control norms ie 24 hrs collected fresh cow urine from well known & same source and utilised within 24 hrs.

Apparatus: For Pilot study domestic pressure cooker with rubber tube (8 lit.) was used. simple distillation apparatus assembled parallel to ancient Arka patan Yantra is used.

For Analytical study:

Necessary apparatus & chemicals for analysis

- PH papers
- Glass beaker
- Pycnometer along with balance.
- Oven
- Desiccator
- Analyser with reagent necessary for chemical analysis.

METHOD

Pilot study was done using pressure cooker with rubber tube.

- Based on pilot study observation Gomutra Arka is then prepared in laboratory using simple distillation apparatus.
- Process validation is done in terms of quantum of heat & time consumed
- Detailed record of observation is maintained which include qty of raw material time, temperature, yield, appearance of end product
- one parallel experiment was done in which Gomutra was subjected to distillation in apparatus as well as in pressure cooker

Total 6 samples were subjected for analysis

1. Raw material - Gomutra
2. Distillate obtained by apparatus - Gomutra, Arka

3. Distillate obtained by pressure cooker - Gomutra Arka
4. Remnant from apparatus method
5. Remnant from cooker method
6. Yield of open pan evaporation - Gomutra Ghana

Pharmaceutical study

Simple distillation apparatus was assembled in laboratory. Plan of work - Temperature & time are important factors regarding distillation process. Change in temperature as well as time ultimately changes the quality of final product. Hence work was planned on the basis of quantity of material, temperature given & time required for the procedure.

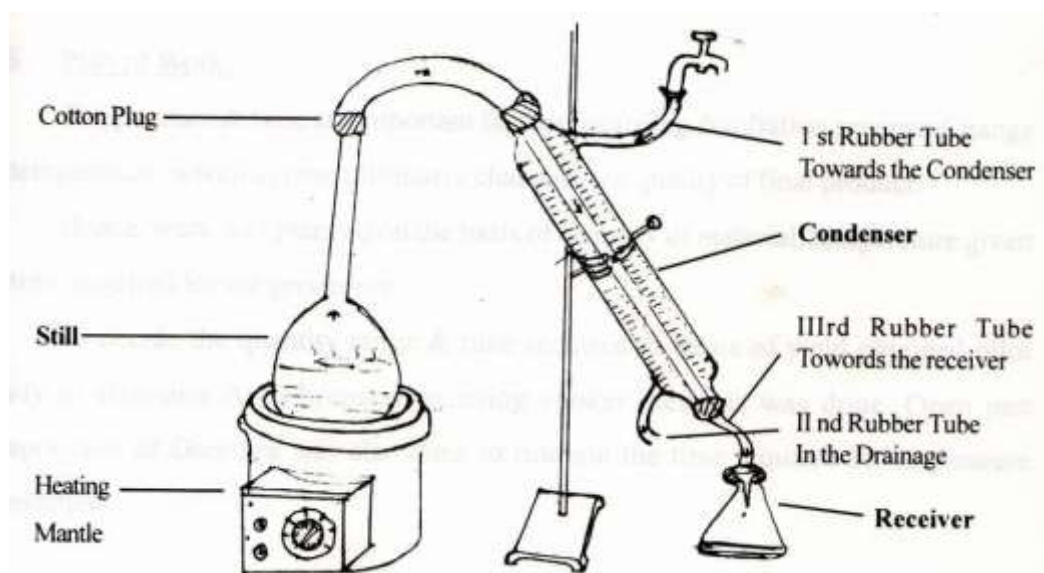


Figure 1: Simple distillation apparatus

To decide the quantity range and time required in terms of yield obtained pilot Study of Gomutra Arka preparation using cooker method was done. Open pan evaporation of gomutra was also done to rule out the time required & temperature consumed.

Total Nine experiments were done changing quantity of raw material & temperature given

Expt No.	Raw Mat (in ml)	Time(in min.)	Temp(°C)	Yield GA (in ml)	Remnant (in ml)
1	500 ml	30 min	90°C	55 ml	470 ml
2	600 ml	30 min	90°C	60 ml	475 ml
3	700 ml	30 min	90°C	75 ml	470 ml
4	700 ml	30 min	80°C	45 ml	470 ml
5	700 ml	30 min	85°C	50 ml	470 ml
6	700 ml	30 min	100°C	100 ml	470 ml
7	700 ml	15 min	100°C	60 ml	470 ml
8	700 ml	45 min	100°C	130 ml	470 ml
9	700 ml	60 min	100°C	180 ml	470 ml

Maximum yield was obtained at 100°C for 700ml initial quantity & after 60 minutes.

Final experiment was done based on these experiments. With these selected values three experiments here were conducted simultaneously. Similarity in quantity of raw material & time required for procedure was maintained.

Analytical study

Prior to production of any formulation, it's analytical examination is necessary. By analysis one can judge the product regarding its quality & efficacy. Samples obtained during pharmaceutical study were subjected to analysis. For analysts six (6) samples are labelled in following manner

Sample 1 - Raw material (Gumutra)

Sample 2 - Distillate by apparatus (Gomutra Arka)

Sample 3- Distillate by Cooker method (Gomutra Arka)

Sample – 4 - Remnant in distillation apparatus.

Sample-5 - Remnant in cooker

Sample - 6- Yield of open pan evaporation (Gomutra Ghan)

These are based on 'Pancha bhautik' constitution of dravyas –

Following chart shows organoleptic tests as well as few physical test viz pH, specific gravity

Sa. No.	Colour	Appearance	Taste	Smell	pH	Specific gravity
1	Dark yellow redish	Turbid	Bitter	Strong	8	1.0200
2	Milky white	Transparent	Bitter Irritant	Strong+1	9	1.0038
3	Milky white	Transparent	Bitter Irritant	Strong+1	8	1.0332
4	Dark red yellowish	Turbid	Bitter Salty	Strong+1	9	1.0022
5	Dark red yellowish	Turbid	Bitter Salty	Strong+1	8.5	1.0639
6	Dark brown	Solid	Salty bitter	Similar to cow dung	-	-

Chemical analysts of final experiment.

Chemically Gomutra contains various substances (24) & all the values can be traced analytically.

Few tests are done within the limited scope of present study.

- Nitrogen Compound - Urea, Uric acid, creatinine
- Minerals - Calcium, Sodium, Potassium chloride Magnesium.
- Traced Elements Protein, Iron

Gradation for the values obtained during study can to be presented as follows.

	Arka	Remnant	Ghana
Creatinine	↔	↑	↑
Urea	↓	↓	↓
Uric acid	↑	↑	↑
Calcium	↓	↓	↓
Protein	↑	↑	↑
Sodium	↓	↑	↓

Potassium	↓	↓	↑
Chlorides	↓	↓	↓
Iron	↑	↑	↑
Magnesium	↓	↑	↑

↔Indicates value remains same

↑indicates value increases

↓indicates value decreases.

That means. —

Values for Nitrogenous material (urea, uric acid creatinine) decreases in distillate & increases in remnant & Ghana.

Values for minerals (calcium, sodium, potassium magnesium) decreases in distillate & increases in remnant & Ghana Values for protein increases in distillate remnant as well as Ghana. Values for Iron increases in distillate.

CONCLUSION

The total study can be concluded as-

1. Arka Kalpana is one of the potent Ayurvedic formulations.
2. Gomutra (Cow's urine) is well known for its wide range of therapeutic action. By preparing Arka, efficacy of Gomutra can be increased (in Gomutra Arka form).
3. Collection of distillate increases with increase in the quantity of the raw material.
4. Distillate collected during first half hour of the experiment observed to be stronger than that collected in the second half.
5. Collection of the vapours start when the raw material reaches it's boiling point. After Condensing those vapours, Gomutra Arka can be collected. It suggests that Arka kalpana can be studied for different temperature ranges. For various substances this range will vary for process validation temperature range of that particular raw substances will be important
6. In case of present study. Gomutra Arka was obtained on boiling 700ml of Gomutra at 100°C for 60 min.
7. Gomutra Arka obtained is irritant, more stronger than initial Gomutra, milky white & transparent,
8. Gomutra Arka can be administered in reduced dose after capsulization.
9. Gomutra, Gomutra Arka, Remnant during Arka preparation & Gomutra Ghang are tested analytically for their values of creatinine, Urea, uric acid, Calcium, Magnesium potassium, sodium chlorides. Iron & protein.

10. Further analysis of Gomutra Arka regarding type & structure of protein present in it will be fruitful.
11. For effective external application as well as for internal administration of Gomutra Arka, pharmacological screening, as well as well planned phase wise clinical trials are necessary. After such research work therapeutic indication for Gomutra & Gomutra Arka can be differentiated.

Abbreviations

B.R. - Bhaishajya Ratnavali

B.B. R. - Bharat Bhaishajya Ratnakar

C.S. - Charak samhita

D.G - Dravyaguna

G.N- Gadanigraha

N.R. - Nighantu Ratnakar

R .C. - Rasachandanshu.

R.V. - Rasavagbhatta.

R.R.S. – Rasa Samucchaya

R.T.S - Rasa tantrasara

R.Kd - Rasa kaumudi

S.B.M. - Siddha Bhashay Manimal

S.S - Sushrut samhita

R.Y.S. Rasa yogsagar

V.Bh. - Vagbhatta

Y.R - Yoga ratnakar.

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7. गव्यं समधुरं किञ्चिद् दोषघ्नं क्रिमिकुष्ठनुत् । कण्डूं च शमयेत् पीतं सम्यग्दोषोदरे हितम् ॥ (च. सू. १/१०२)
8. गोमूत्रं कटू तीक्ष्णोष्णं सक्षारत्वान्नवातलम् लघ्वाग्निदीपनं मेध्यं पित्तलं कफवातजित् शूलगुल्मोदरानाह विरेकास्थापनादिषु मूत्रप्रयोगसाध्येषु गव्यं मूत्रं प्रयोजयेत् । (सु.सू.-४५/२२०-२१)
9. कृमिशोफोदराहशूल पाण्डुकफानिलान् गुल्मारुचिविषशिवत्र कुष्ठांशसि जयेल्लघु । (अ.ह.सू. ७/१३८)
10. दीपनं पाचनं भेदि तेषु गोमूत्रमुत्तमम् तिक्तं पामाहरं मूत्रं मानुषं तु विषापहम् (अ. सं. सू. ६ / १३९)
11. अत्यन्त कठिनं चाद्यं कठिनं च द्वितीयकम् । आर्द्र तृतीयमुद्दिष्टं चतुर्थं पल्वलं भवेत् ॥ अ.प्र. २/२
12. आर्द्र द्रव्यं द्विधा प्रोक्तं सरसं नीरसं तथा । अ.प्र. २/१२
13. सदुग्धं तु द्विधा प्रोक्तं मृदुतीक्ष्णमिती क्रमात् । अ.प्र. २/१८
14. वर्षाधिकं तु यदद्रव्यमत्यन्तकठिनं च यत । चन्दनादीनि सर्वाणि हात्यन्तकठिना नि हि कीटै भुक्तं पुणैर्भुक्तं यच्च गन्धविवर्जितम् रहितं च रसानापि नार्ककर्मणि योजयेत् । अ.प्र. २/६
15. पयो बाष्कयणं विण्मूत्रं तद्यनीरुजम् । अ.क. ८.
16. लोहचूर्णं सस्फटिका च गैरिका भ्रष्टमृत्तिका मृत्तिकास्थिभवं चूर्णं काचं कीकसजं रजः एतानि समभागानि सर्वतुल्या च मृत्तिका भ्रंशनीया पंचमूत्रैवाश्रमहिषोद्भवैः गजाजसम्भवाभ्यां च सहितं तद्विशोषयेत् यावद्गन्धविनाशः स्यात् तावत्सम्मर्दयेच्च तः । अ.प्र. १/५२/५४
17. क्षिपेदसंघटे दिर्घनताधोनालसंयुते । तत्रालं निक्षिपेदन्यघटकुश्यन्तरे खतुतत्र रुध्वा मृदा सम्यग्वदने घट्योरथ अधस्ताद्रसकुम्भस्य ज्वालेतीव्रपावकम् इतरस्मिन्पटे तोयं प्रक्षिपेत्स्वादुशीतलम् तिर्यक्पातनमेताद्धि वार्तिकैरभिधीयते । र.र.स. ९/१०-१२
18. नतनालघटे दीर्घं रसेद्रं तु विनिक्षिपेत् तन्त्रालं भेलयेदन्यभाण्डगर्भेऽतियन्ततः शोधयेदथ यत्नेन पारदगर्भघटीमुखम् ततोसूतघटस्याध अग्निं प्रज्वालेत् भृशम् पूरयेच्च भाण्डं त्वन्यं निर्मलैः शीतलैर्जलैः यन्त्रमेतत् समाख्यातम् तिर्यक्पातनसंज्ञकम् । र.स. वा.

19. मृदौ चतुर्गुणं देयं मध्यमेऽष्टगुणं तथा । द्रव्ये तु कठिने देयं बुधै षोडशिकं जलम् । द्र. गु. यादवजी
20. कर्षादितः पलं यावत् क्षिपेत् षोडशिकं जलम् । तदूर्ध्वं कुडवं यावत्तोयमाष्टगुणम् भवेत् । तदूर्ध्वं
प्रक्षिपेन्नीरं खारी यावच्चतुर्गुणम् । अ.सं.क / ८
21. अर्कनिष्कासनार्थाय क्रमाद्देयाः षडग्नयः धूमाग्निश्चैव मन्दाग्निर्दीपाग्निर्मध्यमस्तथा
खराग्निश्च भटाग्निः अ.प्र. १/८०-८१
22. कुत्सितार्कस्तुयामे स्याद्वियामाभ्यां तु मध्यमं । त्रिभियमैर्भवेच्छ्रेष्ठ अर्कोऽमितगुणप्रदः ॥ अ. प्र.
१/७३
23. द्रव्यादधिकसौगध्यं यस्मिन्नर्के प्रदृश्यते । जीर्णास्थिपात्रे संक्षिप्तो द्रव्यवर्णो न दृश्यते ॥
शंखकुन्देदुधवलोऽन्यथा पात्रांतरे स्थितः । जिह्वेपरिगतः स्वादं दद्यादद्रव्यभवं तु च ॥ तमेवार्क
विज्ञानीदन्यथायं रसादिवत् ॥ अ. प्र. १/७४

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