Research Article

www.ijrap.net

PHARMACEUTICO-ANALYTICAL COMPARISON OF DĀRUHARIDRĀ ARKA AND KVĀTHA AS ĀŚCOTANA DRUG

Aparna Sharma [1]*, K. Unnikrishna Pillai [2], Abhaya Kumar Mishra [3]
[1]PG Scholar, Department of Rasashastra and Bhaishajya Kalpana, Amrita School of Ayurveda, Amrita University, Kollam, Kerala, India
[2]Professor, Department of Rasashastra and Bhaishajya Kalpana, Amrita School of Ayurveda, Amrita University, Kollam, Kerala, India
[3]Associate Professor, Department of Rasashastra and Bhaishajya Kalpana, Amrita School of Ayurveda, Amrita University, Kollam, Kerala, India

Received on: 11/05/17 Accepted on: 10/06/17

***Corresponding author**
E-mail: aparnasharma1989@gmail.com

DOI: 10.7897/2277-4343.083186

ABSTRACT

Arka is a liquid preparation obtained from drugs by distillation using Arkayantra or any convenient modern distillation apparatus. In Arkaprakāśa, Arka Kalpanā is given specific importance and the author opines that it has more potency when compared to other Kalpanās. Kvātha is one among the Pañchavidha Kaṣāya Kalpanā. Boiling the drug in water for a definite period of time and reducing it to specified quantity is called Kvātha. The volatile contents of the drugs are extracted in Arka Kalpanā through condensation of vapour, which is destroyed in Kvātha Kalpanā. The present study was planned with the aim to compare the physico-chemical parameters of Arka and Kvātha Kalpanās of the drug Dāruharidrā.

Key words: Arka, Kvātha, Pañchavidha Kaṣāya Kalpanā, Dāruharidrā.

INTRODUCTION

Every dravya can be a medicine, but some pharmaceutical procedures are done to change or potentiate its original properties. The basic idea behind the processing of drug is to make it more suitable to the body elements. Arka is a liquid preparation obtained from drugs by distillation using Arkayantra or any convenient modern distillation apparatus. Even though Arka Kalpanā is included in one among Pañchavidha Kaṣāya Kalpanā by Arkaprakāśa, it is least used nowadays. In Arkaprakāśa, Arka Kalpanā is given specific importance and the author opines that it has more potency when compared to other Kalpanās. It has reduced dose and more shelf life. Kvātha is one among the Pañchavidha Kaṣāya Kalpanā. Boiling the drug in water for a definite period of time and reducing it to specified quantity is called Kvātha. In Samhita period, classification and method of preparation of different Kaṣāyas are mentioned in detail.

Aims & objectives

a. To prepare Dāruharidrā Arka and Kvātha.
b. To conduct physico - chemical comparison of Dāruharidrā Arka and Kvātha.
c. To analyse the active principles in both Kalpanās.

MATERIALS AND METHODS

Collection and Selection of Raw Materials

- The raw drug was collected from crude drug market of Thrissur.
- The genuinity of the drug was approved by Head of the Department, Department of Dravyaguṇa Vijnana, Amrita School of Ayurveda.
- They were properly cleaned for extraneous matter, if any.
- All the raw drugs were weighed before and after size reduction.

Pharmaceutical Study

Preparation of Dāruharidrā Arka

Name of the formulation: Dāruharidrā Arka
Place of practical: Amrita School of Āyurveda, Analytical Laboratory
Source of data: Arka Prakāśa, Āyurveda Formulary of India, Part III

Materials required

Equipments: Measuring jar, weighing balance, thermometer, rota mantle, round bottom flask, condenser, conical flask, funnel, stirrer
Ingredients: Dāruharidrā Cūrṇa-30 g, Distilled water- 600 ml

Procedure

For the preparation of Dāruharidrā Arka, Dāruharidrā Cūrṇa and water were taken in the ratio 1:20 i.e 30 gm of Dāruharidrā and 600 ml water. Dāruharidrā powder was kept soaked overnight in water. Next day powder along with water was transferred into the round bottom flask. The apparatus was arranged for distillation.

OBSERVATIONS

1. Bubbling started in the Round Bottom flask at 40^0 C.
2. After 60% distillate was collected, the smell of remaining distillate gradually decreased.
3. Pilot studies were conducted with 1:12 ratio and 1:25 ratio (Dāruharidrā powder: Water). But the Arka obtained from 1:20 ratio was better in terms of organoleptic as well as analytical parameters.

Table 1: Preparation of Dāruharidrā Arka

Ingredients	Quantity	Process	Quantity of Distillate
Dāruharidrā Cūrṇa Water	30 g 600 ml	Distillation	450 ml

Arka was dispensed to patients in 10 ml dropper bottles for ease of application.

Preparation of Dāruharidrā Kvātha

Name of the formulation: Dāruharidrā Kvātha
Place of practical: Department laboratory, Amrita School of Āyurveda.
Source of data: Bhoja Tantra

Materials required
Equipments: Vessels, stove, stirrer, cloth, cotton.

Ingredients: Dāruharidrā powder- 20 g, Water- 320 ml

Procedure

20 g Dāruharidrā powder was taken in a steel vessel. 160 ml of water was poured into it. Water level was marked on a wooden rod and then the remaining quantity of water i.e. 160 ml also poured into the vessel. Then it was boiled in Mandāgni and reduced up to 160 ml. The obtained Kvātha was first filtered through a double folded cloth. Then it was again filtered using a cotton pad twice for complete removal of powder material if any.

Table 2: Preparation of Dāruharidrā Kvātha

Ingredients	Quantity	Process	Quantity of Kvātha
Dāruharidrā Cūrṇa Water	20 g 320 ml	Water extraction	160 ml

Analytical Study

Analytical study was done for all the 3 samples
1. Raw Dāruharidrā Cūrṇa
2. Dāruharidrā Arka
3. Dāruharidrā Kvātha

Raw Dāruharidrā Cūrṇa

Table 3: Organoleptic parameters of raw Dāruharidrā Cūrṇa

Parameters	Observations
Color	Pale yellow
Odour	Characteristic pleasant
Taste	Slight bitter
State	Coarse powder

Table 4: Physico- Chemical parameters of raw Dāruharidrā Cūrṇa

Parameters	Observations
pH (5% solution)	3.68
Loss on drying (LOD)	6.26 %
Bulk density	0.3051
Total ash	5.615 %
Acid insoluble ash	0.98 %
Acid soluble ash	4.635 %
Water soluble extractive	22.09 %
Alcohol soluble extractive	15.406 %

Dāruharidrā Arka & Kvātha

Table 5: Organoleptic parameters of Dāruharidrā Arka and Kvātha

Parameters	Arka	Kvātha
Colour	Colourless	Light brown
Odour	Characteristic pleasant	Characteristic pleasant
Taste	Slightly bitter	Bitter
State	Liquid	Liquid

Table 6: Physico- Chemical parameters of Dāruharidrā Arka and Kvātha

Parameters	Arka	Kvātha
pH	6.76	5.95
Refractive index (at 40^0 C)	1.3325	1.3356
Specific gravity	1.00013	1.0078

Results of Thin Layer Chromatography (TLC)

TLC of Arka and Kvātha
To compare the chemical constituents, present in Arka and Kvātha, TLC of the two formulations were done. The mobile phase used was Toluene: Diethyl ether in the ratio 7:3. After developing the TLC plate, it was visualized under both short and long UV in UV cabinet.
Under UV short,
For Kvātha, one spot was observed corresponding to the Rf value of 0.95. For Arka two spots were observed corresponding to Rf values of 0.81 and 0.95.
Under UV long,
For Kvātha, 3 spots were visible corresponding to Rf values of 0.16, 0.26 and 0.37. For Arka there was only 1 spot under UV long corresponding to the Rf value of 0.37.
After derivatizing the TLC plate with p- Anisaldehyde sulphuric acid, 2 common spots were developed each for both Kvātha and Arka corresponding to the Rf values of 0.81 and 0.95.

Results of Gas Chromatography Mass Spectroscopy (GC-MS) Study

GC-MS analysis was carried out on a Varian India Pvt Ltd Saturn 2200 model instrument and gas chromatograph interfaced to a mass spectrometer (GC-MS).

Identification of components: Chemical compounds detected from GC-MS spectrum of both Arka and Kwatha were compared using NIST database pattern. All the parameters including name, molecular weight and structure of the chemical compounds were ascertained from this comparison.

Kvātha

Table 7: Chemical compounds in Dāruharidrā Kvātha

Sl No	Chemical name	Chemical formula	Molecular weight(g/mol)	Retention time	Peak area
1	4- (3-hydroxy1propenyl) 2-methoxyphenol	$C_7H_8O_2$	124.14	11.471	104258
2	Quinoline- 7 propyl-	$C_{12}H_{13}N$	171.243	13.391	44880
3	2- Methylbenzaldehyde	C_8H_8O	120.15	14.084	77824
4	3- Methoxycatechol	$C_7H_8O_3$	140.14	14.680	12310
5	2- N-4,5- trimethylbenzene 1,2diamine	$C_9H_{14}N_2$	150.22	15.367	161532
6	2,6- Dimethoxyphenol	$C_8H_{10}O_3$	154.16	15.785	152522
7	Phenol 2-methoxy-3-(2-propenyl)-	$C_{10}H_{12}O_2$	164.204	15.844	7937
8	2- Benzothiazolamine 5,6- dimethyl(9 CI)	$C_9H_{10}N_2S$	178.25	16.091	546794
9	3Hydroxy- 4- methoxy mandelic acid	$C_9H_{10}O_5$	198.17	16.352	13046
10	Phenol 2-methoxy-4-(1-propenyl)-	$C_{10}H_{12}O_2$	164.20	16.406	5236
11	4- Hydroxyphenethyl alcohol	$C_8H_{10}O_2$	138.16	16.622	3025377
12	2- methoxy- 4- (prop1enyl) phenol	$C_{10}H_{12}O_2$	164.20	16.846	51499
13	6- Methoxy- 3- methylbenzofuran	$C_{10}H_{10}O_2$	162.18	17.176	9377
14	1,6-Anhydro-β-d talo pyranose	$C_6H_{10}O$	162.141	17.329	192922
15	Propan-2-one	$C_{13}H_{18}O_3$	222.28	17.560	39836
16	Homovanillyl alcohol	$C_9H_{12}O_3$	168.1898	17.601	134020
17	9-Aminofluorene	$C_{13}H_{11}N$	181.2331	17.853	114796
18	4Allyl- 2,6- Dimethoxy phenol	$C_{11}H_{14}O_3$	194.23	18.139	19174
19	4((1E)3Hydroxy1propenyl) 2methoxyphenol	$C_{10}H_{12}O_3$	180.2005	18.577	29033
20	1Butanone	$C_{11}H_{14}O_4$	210.22	19.453	73923
21	Pentadecanoic acid	$C_{17}H_{34}O_2$	270.45	20.507	6693

Arka

Table 8: Chemical compounds in Dāruharidrā Arka

Sl No	Chemical name	Chemical formula	Molecular weight(g/mol)	Retention time	Peak area
1	Oxime-, methoxy-phenyl-	$C_8H_9NO_2$	151.16	6.764	332692
2	3,3-Dichloro-1,1,1,5,5,5-hexamethyltrisiloxane	$C_6H_{18}Cl_2OSi$	261.37	10.984	12273
3	Benzaldehyde 2,5- bis (trimethyl silyl)oxy-	$C_{13}H_{22}O_3Si_2$	282.48	11.678	16511
4	(Z)- 3- Nonen- 1- ol	$C_9H_{18}O$	142.23	11.951	6044
5	1,3- Dihydro- 7- chloro- 5- phenyl- 1-trimethylsilyl- 2,1,4benzodiazepin- 2- one	$C_{18}H_{19}ClN_2OSi$	342.89	12.396	2856
6	(5a,6a)-4,5-Epoxy-17-methylmorphinan -3,6-diol	$C_{17}H_{21}NO_3$	287.35	13.667	1287
7	2Methyl- 5- (propan- 2- yl) -ol	$C_{10}H_{14}O$	150.21	15.103	385335
8	Nonanoic acid	$C_{10}H_{20}O_2$	172.26	15.449	6014
9	1,2,4- Trimethoxy-5-[(E)prop-1- enyl] benzene	$C_{12}H_{16}O_3$	208.26	18.224	129246
10	2- propenoicacid tridecyl ester	$C_{16}H_{30}O_2$	254.41	18.853	33823
11	1,2- methyltridecanoic acid methyl ester	$C_{15}H_{30}O_2$	242.39	19.090	26539
12	Eudesma- 5,11(13)- dien-8,12-olide	$C_{15}H_{20}O_2$	232.31	20.673	63515

DISCUSSION

On Analytical study

While analyzing the organoleptic parameters, the color of Kvātha was found to be light brownish while that of Arka was colourless and clear. When a preparation is used as eyedrops, the clarity of the liquid is an essential parameter, and for removing the grittiness of Kvātha, the medicine had to filter through cotton piece at least twice. So Arka is the better choice than Kvātha when used as Āścotana drug.

pH is a very important parameter in case of eye drops. To determine the acidity and alkalinity of both the liquids, pH was tested. For Arka, it was 6.76 and for Kvātha it was 5.95. pH range of tear film is 7.3-7.6. pH of the drug which is nearer to the pH of tear film provides better bioavailability[1]. So Arka may give be more bioavailable than Kvātha when used as Āścotana drug. Specific gravity of Arka was found to be 1.00013 and that of Kvātha was 1.0078. High specific gravity of Kvātha may be due to the presence of more dissolved solid particles. Refractive index of Arka was 1.3325 and that of Kvātha was 1.3356. Refractive index of water is 1.33 which means light travels 1.33 times slower in water than in vacuum. Increased value of refractive index may be due to the presence of more dissolved solid particles in Kvātha.

On Thin Layer Chromatography

When the developed TLC plate was visualized under UV short, for Arka, 2 spots were developed corresponding to Rf values of 0.81 and 0.95. For Kvātha, the spot corresponding to Rf value 0.95 was visible, and spot corresponding to Rf value 0.81 was

missing. Under UV long, Kvātha and Arka showed a common spot corresponding to Rf value of 0.37. Kvātha showed additional 2 spots corresponding to Rf values of 0.16 and 0.26.

After derivatization with p- Anisaldehyde sulphuric acid, both Kvātha and Arka showed 2 common spots corresponding to Rf values of 0.812 and 0.95.

On GC-MS study
Kvātha

Even though twenty one chemical compounds were identified from the Chromatogram plot of Dāruharidrā Kvātha, only few of them were found to be present in high concentrations. 4-Hydroxyphenethyl alcohol, 2- Benzothiazolamine 5,6- dimethyl (9 CI), 1,6-Anhydro- β- d talo pyranose, 2- N-4,5-trimethylbenzene 1,2diamine, 2,6- Dimethoxyphenol, Homovanillyl alcohol and 4- (3-hydroxy1propenyl) 2-methoxyphenol were found to be in maximum concentrations.

Among these compounds, 4(3-hydroxy1propenyl) - 2-methoxyphenol, which is also known as Coniferyl alcohol is a proven anti inflammatory agent[2]. This property may be helpful in reducing the symptoms like Lohita netrata and Dāha of Netra Abhiṣyanda when used as Āścotana drug. 2, 6-Ditertbutylphenol- and 4- Hydroxyphenethylalcohol (thyrosol) are known to be potent antioxidants[3] which promote healing of conjunctival epithelial cells. 2-methoxy-4-(prop-1-en-1-yl)phenol and 4- hydroxyl- 3- methoxyphenethanol (homovanillyl alcohol) which are aromatic compounds provide fragrance to the medicine and also these compounds are known for antioxidant properties[4].

Arka

The GC-MS spectrum profile of Dāruharidrā Arka confirmed the presence of twelve chemical compounds. Among these 2-Methyl- 5- (propan- 2- yl) phenol, Oxime-, methoxy-phenyl-, 1,2,4- Trimethoxy-5-[(E)prop-1- enyl] benzene and Eudesma-5,11(13)- dien-8,12-olide were found to be present in higher concentrations.

Among this 2- Methyl- 5- (propan- 2- yl) phenol or Carvacrol possess multiple biological properties such as anti inflammatory, anti-leishmanial, antioxidant, hepatoprotective and anti- tumoral activities[5]. It also possesses antibacterial properties against different bacterial species including Streptococcus and Staphylococcus. The underlying mechanism of Carvacrol is the inhibition of growth of both gram positive and gram negative bacteria by similar to that of other phenolic compounds and happens by membrane damage resulting in an increase in membrane permeability and disruption of cell wall. Its antioxidant property helps in healing the damage caused by the inflammation to the conjunctival epithelium. 1, 2, 4-Trimethoxy-5-[(E) prop-1- enyl] benzene, also known as Asarone is an anti allergic compound[6] which may be helpful in reducing the symptoms like Kaṇḍu, Aśru and srāva. Oxime-methoxy-phenyl is having antioxidant[7] and anti microbial activity which may be beneficial in fast healing of the epithelial cells.

CONCLUSION

Dāruharidrā is a well-known Chakshushya drug. So it was a subject of interest to compare the Physico-chemical parameters of two preparations of the drug; Arka and Kvātha and to evaluate the efficacy of these preparations as Āścotana drug on the basis of analytical parameters. After analysing the chemical components of both the preparations, it has been found that there are no chemical components in common between these preparations. But on the basis of organoleptic as well as other analytical parameters, it can be said that Arka is better than Kvātha when used as Āścotana drug. Also Arka needs a single time preparation which can be used even upto one year. So on the basis of pharmaceutical and analytical parameters, it can be concluded that Daruharidra Arka is the better choice than Kvātha in ocular ailments. Further clinical studies can be done to evaluate the clinical efficacy of both the drugs in different ocular manifestations.

REFERENCES

1. Baranowski P, Karolewicz B, Gajda M, Pluta J, "Ophthalmic Drug Dosage Forms: Characterisation and Research Methods", The Scientific World Journal 2014, Article ID 861904, doi:10.1155/2014/861904.
2. Anza M, Haile E, Tadesse S, Mammo F, Endale M, A coniferyl alcohol derivative from the roots of *Zanthoxylum chalybeum*, Journal of Coastal Life Medicine 2014, doi: 10.12980/JCLM.2.201414J56
3. Milaeva E R, Filimonova S I, Meleshonkova N N, "Antioxidative Activity of Ferrocenes Bearing 2,6-Di-Tert-Butylphenol Moieties," Bioinorganic Chemistry and Applications 2010, Article ID 165482, doi:10.1155/2010/165482
4. Dawidar A M, Abou- Elzahab M M, Abdel- Migib M, Hussien, Mostafa M, Photo oxygenation of Trans Anethole, International Journal of Science and Engineering Applications 2015, Volume 4 Issue 5, ISSN-2319-7560.
5. Robledo, S., Osorio, E., Munoz, D., Jaramillo, L.M., Resterepo, A., Arango, G. and Velez I, In vitro and in vivo cytotoxicities and antilashmanial activities of thymol and hemisynthetic derivatives, Antimicrob Agents Chemother., 2005, 49: 1652-1655.
6. Lim, H., Lee, S. Y., Lee, K. R., Kim, Y. S., & Kim, H. P, The Rhizomes of Acorus gramineus and the Constituents Inhibit Allergic Response In vitro and In vivo, Biomolecules & Therapeutics 2012, 20(5), 477–481.
7. Harini S.T., Kumar H.V., Peethambar S.K., Rangaswamy j, Naik N., Novel 2,6-bis (4-methoxyphenyl)-1-methylpiperidin-4-one oxime esters: Synthesis and a new insight into their antioxidant and antimicrobial potential, Med Chem Res 2014, 23: 1887. doi:10.1007/s00044-013-0793-z

Cite this article as:

Aparna Sharma *et al*. Pharmaceutico-analytical comparison of Dāruharidrā arka and kvātha as āścotana drug. Int. J. Res. Ayurveda Pharm. 2017;8(Suppl 3):141-144 http://dx.doi.org/10.7897/2277-4343.083186

Source of support: Nil, Conflict of interest: None Declared