Int J Ayu Pharm Chem
ISSN 2350-0204
www.ijapc.com

ORIGINAL RESEARCH ARTICLE

Pharmaceutical Standardization of *Ela Arka*

Author: Rakshitha D[1]

Co Authors: Gazala Hussain[2]

[1,2]Department of Rasashastra and Bhaishajya Kalpana, Sri Dharmasthala Manjunatheshwara College of Ayurveda & Hospital, Hassan, Karnataka, India

ABSTRACT

Introduction: *Ela* (*Elettaria cardamomum* Maton) belongs to Zingiberaceae family and is rich source of volatile content. *Arka* is a liquid preparation obtained by distillation of certain liquids or of drugs soaked in water using *Arkayantra*. *Ela arka* possesses *tikta rasa*, *katu vipaka*, also it is *deepana* and *pitta- kaphahara* in action. Standardization plays an important role in deciding the quality and purity of a drug or formulation through different set parameters. Hence in this study an attempt was made to prepare *Ela arka* and to analyze its analytical parameters according to standard protocol and to put forth a monograph of *Ela arka*. **Materials and Methods:** *Ela arka* was prepared by taking 1:3 (drug: water) proportion under volume/ volume (v/v) measurement and 30% of the distillate was collected. It's organoleptic and physico- chemical parameters were tested and analyzed for further documentation. GCMS (Gas Chromatography and Mass Spectrometry) study was also done to know the different components present along with their concentration. **Observations and Results:** *Ela arka* obtained was a transparent liquid with aromatic characteristic odor consists of volatile oil contents. Physico- chemical parameters were performed and analyzed. GCMS report revealed the presence of eleven peaks in *Ela arka*. **Discussion:** pH of *Ela arka* suggested the highly acidic nature of it. It contains volatile matters in the form of essential oil as the drug is rich in volatile oil content. Other parameters were analyzed for better understanding. **Conclusion:** Preparation of *Ela arka* was easy and owing to its properties can be used in many disease conditions and also as natural preservative.

Key Words *Ela arka, Standardization, Volatile Oil*

Received 19th July 21 Accepted 15th August 21 Published 10th September 2021

INTRODUCTION

Ela (*Elettaria cardamomum* Maton) is one of the world's oldest spices. It's a native of high ranges of Western Ghats of India. *Ela* is one among the '*Trijataka'* known for its aromatic fragrance and being used in both modern and Ayurveda pharmaceutics for medicine preparations. It is popularly known as 'queen of spices'; the dried fruit of tall perennial herbaceous plant belongs to the Zingiberaceae family[1]. *Ela* is more in use that possess *katu* (pungent)- *madhura* (sweet) *rasa*, *laghu* (light)- *ruksha* (rough) *guna*, *sheeta veerya* (cold potency), *katu* (pungent) *vipaka* and it is *dipana* (digestive), *hridya* (cardio-tonic), *kapha-vatahara* (alleviates *kapha* and *vata*)[2]. Part used is seed and it is aromatic, cooling, diuretic, cardio-tonic, abortifacient, digestive, carminative, expectorant and useful in burning sensation,

ORIGINAL RESEARCH ARTICLE

dyspepsia, cardiac disorders, anorexia, vitiated conditions of *vata* conditions[3]. *Ela* is a proven drug for anti-microbial and anti-oxidant properties[4]. Therapeutically, it is useful in *timira* (cataract), *hridroga* (heart disease), *mutrakricchra* (dysuria) with the dose of 0.5-1 g in powder form[5]. Chemically contains D- Limonene, naphthalene, p-Coumaric acid, 1, 8 cineole (aromatherapy, antiseptic) alpha-terpinyl acetate, cyclohexene, nerol, linalool, menthone, sitosterol, etc.[6]

Arka is a unique preparation where through distillation method, essential oils from herbal drugs are extracted[7]. It is a liquid preparation obtained by distillation of certain liquids or of drugs soaked in water using *Arkayantra* or any other convenient modern distillation apparatus[8]. Aims at extraction of active constituents from the content for the more benefit for therapeutic usage. Description of *Ela arka* is mentioned in the text of Arka Prakasha written by Ravana. *Ela arka* possess *tikta* (bitter) *rasa*, *katu* (pungent) *vipaka*, *pitta- kaphahara* (alleviates *pitta* and *kapha*) and *deepana* (digestive) action, indicated in *mutrakricchra*[9].

Standardization means confirming of a drug identity and determination of its quality and purity. The subject of herbal drug standardization is production of standardized, therapeutically effective Ayurveda formulations for further usage[10]. CCRAS has given guidelines regarding the same for different dosage forms[11]. So in this study, an attempt was made to prepare *Ela arka* and to carry out its analytical study for further documentation.

MATERIALS AND METHODS

Ela drug for the preparation of *arka* was ordered and procured from C K Kumaran Memorial (CKKM) Pharmacy, Tripunithura, Kerala and authentication was also done from the same.

Method of preparation of Ela arka[12]:

Ela seed- 200ml (108.3g)

Water- 600ml

Ela arka was prepared by following 1:3 (drug: water) ratio under aseptic conditions. Dried drug of the specified species was cleaned, coarsely powdered (sieve number 44). Coarse powder of *ela* was taken in a round bottom flask and soaked with sufficient quantity of water (from 600ml of water) enough to soak the drug and kept overnight. Next day morning, remaining quantity of water was added at the time of distillation and the *Arkayantra* (distillation apparatus) was set and heating was started and controlled by temperature gradient during the procedure. Initial few drops of *ela arka* were discarded as it may not contain therapeutically essential substances and the process of distillation of *ela arka* was continued till 30% of the distillate was collected. The *arka* collected was stored in sterile airtight glass bottle. Organoleptic characters like appearance, taste, color, odor and physico- chemical parameters like pH, specific gravity, viscosity, total suspended solids, refractive index and volatile oil estimation were done for *ela arka* by following standard protocol as per CCRAS guidelines. GCMS (Gas Chromatography and Mass Spectrometry) study

ORIGINAL RESEARCH ARTICLE

for *ela arka* was done at CARe KERALAM Ltd, Thrissur, Kerala.

Determination of pH: pH value was noted using pH meter with the help of electrodes and buffer solutions. By introducing the electrodes into the sample solution, reading was noted. **Determination of Refractive index:** Using Abbe's Refractometer, refractive index was calculated for the sample. Using dropper on the measurement prism, sample was put and light focus was adjusted for proper illumination then reading was noted. **Determination of Viscosity:** 25ml of sample was poured into the bulb with a pipette. Liquid was released to flow back into the bulbs and time taken to flow from A to B was noted then the procedure was repeated for water and time was noted. With the help of pycnometer, density of water and sample was calculated and viscosity was determined. This procedure was performed using Viscometer. **Determination of Volatile oil estimation:** Volatile oil estimation was done using Clevenger's apparatus where volume of the oil collected on the surface of water in the graduated tube was measured and the volatile oil content expressed as a percentage v/w. **Determination of Specific gravity:** W1 (empty pycnometer), W2 (pycnometer with distilled water) and W3 (pycnometer with sample) values were calculated and specific gravity was determined by proper calculation. **Determination of Total suspended solids:** 30ml of the sample was taken in a pre-weighed dried china dish for the calculation of total suspended solids. Content was evaporated to dryness on a water bath and dried at 105^0 C for 3 hours in a hot air oven then the dish with residue was kept in desiccators for 30 minutes to cool and it was weighed. Final weight of residue should comply with the requirements stated under the individual monograph. All these procedures were repeated thrice and average value was calculated and noted.

Dose: 10 to 20 ml per day in divided dose

Anupana: Water

Indications: *Agnimandya, mutrakricchra, ajeerna, hridroga*

OBERVATIONS AND RESULTS

Observations noted during the preparation of *ela arka* are given in Table 1 and also the analytical test parameters are given in Table 2.

Table 1 Observations of preparation of *ela arka*

Observations	***Ela arka***
Drug quantity (v/v)	200ml (108.3g)
Water	600ml
Proportion (drug: water)	1:3
Temperature gradient	Between 40^0- 60^0
Starting time	2:30pm
Ending time	4:45pm
Distillate obtained	150ml
% obtained	30%

Table 2 Observations and results of analytical parameters of *ela arka*

Particulars	***Ela arka***
Appearance	Liquid with a layer of volatile content which forms oily droplets above the surface
Taste	*Katu* (pungent) *rasa pradhana* with strong tingling sensation
Odor	Aromatic characteristic odor
Color	Colorless liquid
pH	2.75
Refractive index	1.34
Viscosity (Pasacl- second)	0.0053
Volatile oil estimation (%)	0.1%
Specific gravity	0.9787
TSS (Total Suspended Solids) mg/l	0.1

ORIGINAL RESEARCH ARTICLE

GCMS study of *ela arka* was done in which test method adopted was CKL/ANL/GC-001. Total 11 compound peaks were observed. Among them peak 6 was observed in the highest concentration. All observations of GCMS report are given in Table 3 and 4.

Table 3 Observations and results of Gas Chromatography and Mass Spectrometry of *ela arka*

Peak Number	Name of the component	Formula	Probable %
1	D-Limonene	$C_{10}H_{16}$	25.7%
2	3-Cyclohexen-1-ol, 4-methyl-1-(1-methylethyl)-	$C_{10}H_{18}O$	56.5%
3	3-Cyclohexene-1-methanol, α,α,4-trimethyl-	$C_{10}H_{18}O$	42.7%
4	1,6-Octadien-3-ol, 3,7-dimethyl-, 2-aminobenzoate	$C_{17}H_{23}NO_2$	26.3%
5	3-Cyclohexene-1-methanol, α,α,4-trimethyl-, acetate	$C_{12}H_{20}O_2$	30.2%
6	3-Cyclohexene-1-methanol, α,α,4-trimethyl-, acetate	$C_{12}H_{20}O_2$	59.3%
7	3-Cyclohexene-1-methanol, α,α,4-trimethyl-, propanoate	$C_{13}H_{22}O_2$	31.2%
8	Naphthalene, decahydro-4a-methyl-1-methylene-7-(1-methylethenyl)-	$C_{15}H_{24}$	16.1%
9	Naphthalene, 1,2,3,4,4a,5,6,8a-octahydro-7-methyl-4-methylene-1-(1-methylethyl-, (1α,4aβ,8aα)-	$C_{15}H_{24}$	29.0%
10	Naphthalene, 1,2,3,4,4a,5,6,8a-octahydro-4a,8-dimethyl-2-(1-methylethenyl)-, [2R-(2α,4aα,8aβ)]-	$C_{15}H_{24}$	16.0%
11	1,6,10-Dodecatrien-3-ol, 3,7,11-trimethyl-, [S-(Z)]-	$C_{15}H_{26}O$	32.6%

Table 4 Peaks observed in Gas Chromatography and Mass Spectrometry of *ela arka*

Peak Number	RT Min	First Scan	Max Scan	Last scan	Peak Height	Corr. % Max	% of total
1	14.583	1111	1118	1139	18521	0.25 %	0.229%
2	20.152	1753	1773	1817	121958	1.74%	1.609%
3	20.890	1848	1860	1897	155518	2.48%	2.288%
4	24.090	2221	2237	2254	23286	0.40%	0.370%
5	28.717	2769	2782	2809	19504	0.32%	0.296%
6	30.529	2969	2995	3041	6380857	100.00%	92.402%
7	33.550	3344	3350	3376	24158	0.26%	0.241%
8	35.097	3523	3533	3548	143420	1.31%	1.211%
9	35.317	3548	3559	3570	45466	0.42%	0.391%
10	35.871	3616	3624	3634	22093	0.22%	0.204%
11	37.677	3824	3836	3869	38005	0.82%	0.759%

DISCUSSION

Ela arka was prepared by taking 1:3 ratio of drug and water following v/v measurement for the better extraction of essential contents from the drug. *Ela* was easy to pound into coarse powder and soaking overnight made the drug softer and this helps in release of essential volatile principles while boiling as it is rich in volatile content. When the drug was soaked, the tissue swells up because of the cell wall of drug takes up the liquid hence it is advised to soak the powdered drugs for some time before boiling this increases the drug water contact time that facilitates the easy extraction of volatile principles on distillation[13]. Precaution has to be taken not to char the drugs as the amount of water used for the preparation was less and not to collect the distillate more than the calculated quantity as it may not contain therapeutically potent or essential substances. *Arka* obtained was a clear transparent liquid possessing characteristic aromatic odor with a layer of essential oil that fulfils the *Uttama arka lakshana* as explained in Arka Prakasha.

ORIGINAL RESEARCH ARTICLE

Ela arka is predominant with *katu rasa* as the drug was endowed with *katu rasa* and also has strong tingling sensation at the end because of the higher concentration of constituents present in *ela* drug. *Arka* possess aromatic characteristic odor as the drug is known for its aromatic fragrance. It contained more amount of volatile content as the percentage of volatile matter present in a raw drug was more.

Ela arka possesses pH of 2.15 suggestive of highly acidic nature of the sample. Refractive index gives the idea about the viscosity and the density of the substance. The substance with low refractive index will be having low viscosity and density. The refractive index of 1.34 suggests the low viscosity and density of the sample. Viscosity of *ela arka* is 0.0053 which is similar to that of water as it is a distillate of water. Volatile matter percentage gives an idea about index of gaseous matter present in the substance and also suggests the volatile oil concentration in the drug. *Ela arka* contains volatile matters in the form of essential oil. Specific gravity suggests the presence of solutes in a solvent. Here solvent is water and volatile oil extracted forms the solute. Specific gravity of *ela arka* is near to the value one suggestive of the sample has specific gravity that is similar to water. Total suspended solids of *ela arka* is 0.1mg/l, the lesser value is because it is a water distillate and has only water soluble active principles along with volatile principles extracted from the raw drug. Gas Chromatography is a modified technique useful to analyze and also to separate the volatile compounds from an organic or inorganic substance. The report of GCMS study of *ela arka* conveyed that there are 11 multiple volatile compounds observed out of which Limonene, Cyclohexene methanol and Naphthalene are the compounds which covered maximum area of the graph which depict the highest concentration in the *ela arka* sample. 11 compounds were identified with equal or more than 70% quality in the graph, suggesting that *ela arka* is rich in volatile matters in its essential oil.

CONCLUSION

Preparation of *ela arka* is easy, can be done in minimum setup with required equipment's. Distillation was carried out by following 1:3 ratio of drug and water under v/v measurement and *arka* was colorless liquid with characteristic odor containing volatile matter. *Ela arka* is acidic in nature and showed total of 11 compounds from GCMS study. *Ela arka* owing to its properties can be used in many disease conditions and also can be used as natural preservative for many pharmaceutical preparations. This study extends the scope for taking up many research works on the same for further documentation. The following information can be put forth as ***Ela arka* monograph**

Definition:

Ela arka is a liquid preparation obtained by hydro-distillation of the seeds of *Elettaria cardamomum* Maton

Formulation composition:

ORIGINAL RESEARCH ARTICLE

Sl. No.	Drug	Part used	Quantity (v/v)
1	*Ela* (*Elettaria cardamomum* Maton)	Seed	200ml (108.3g)
2	Water	-	600ml

Method of preparation:

- Take *ela* seeds of Pharmacopeial quantity
- Powder the drug and pass through sieve number 44 to obtain coarse powder
- ake 200 ml (108.3g) of drug in a round bottom standard joint flask, add sufficient quantity of water (from 600 ml of water) enough to soak the drug and keep overnight
- Add the remaining quantity of water at the time of distillation taken in the ratio of 1:3 (drug: water)
- Set the distillation assembly with double surface condenser, receiving flask and enough circulating water to condense the distillate
- Place the flask on a heating mantle, adjust the temperature control and continue the process of distillation to collect about 30% distillate of *ela arka*
- Store *ela arka* in air-tight container to protect from light and moisture

Description:

Ela arka is a transparent liquid with an aromatic characteristic odor, pungent with tingling sensation and with a layer of volatile content.

Identification:

Gas Chromatography: The analysis procedure is done using 100ml sample extracted with dichloromethane and evaporated at room temperature and 0.1 ml of concentrated sample dissolved in 10 ml DCM + Injected to GCMS.

Instrument model: 7890 A GC with 5975C with triple axis detector

Injection volume: 3 µL, temperature at 280 ^{0}C and injection mode is split (1:100)

Sample was stored at -4 ^{0} C. Total 11 peaks were observed out of which peak 6 was observed to cover maximum concentration (92.402%) at RT 30.529/ min. First peak is observed at RT 14.583/ min followed by successive peaks. Initially, value at 40^{0}C/min with holding time 5 followed by ramp 1 at rate 5^{0}C/ min, value at 100 ^{0}C/ min with holding time 10 followed by ramp 2 at rate 7 ^{0}C/ min, value at 150 ^{0}C/ min with holding time 10 were observed.

Physico- chemical parameters:

- **Specific gravity**: 0.9787
- **pH**: 2.75
- **Refractive index**: 1.34
- **Total Suspended Solids**: 0.1
- **Viscosity**: 0.0053

Assay:

Ela arka contains 0.1 % v/v of essential oil

Storage:

Store in a cool place in tightly closed container, protected from light and moisture

Therapeutic uses:

Agnimandya, mutrakricchra, ajeerna

Dose: 10 to 20 ml per day in divided doses

ORIGINAL RESEARCH ARTICLE

ACKNOWLEDGEMENT

I am very much thankful to Dr Harini A, Associate Professor at Department of *Dravyaguna* from SDM College of Ayurveda and Hospital, Hassan for her crucial guidance in preparing this research article. Also I thank staff members of C K Kumaran Memorial (CKKM) Pharmacy, Tripunithura, Kerala for drug authentication and also staff members of CARe KERALAM Ltd, Thrissur, Kerala for GCMS study of *ela arka*.

REFERENCES

1. Korikanthimathm VS, Prashanth D, Rao Govardhana. (2000). Medicinal properties of cardamom *Elettaria cardamomum*. Journal of Medicine and Aromatic Plant Sciences, 22, 683-85.
2. Sastry J.L.N. (2012). Dravyaguna Vijnaana. Reprint edition; Varanasi: Chaukhambha Orientalia;: vol II. 527.
3. Indian Medicinal Plants. (2006). Arya Vaidya Sala, Kottakkal ed. Chennai: Orient Longman Private Limited, Vol 2. 360.
4. Ağaoğlu S, Dostbil N, Alemdar S. (2006). Antimicrobial effect of seed extract of cardamom (Elettarıa cardamomum Maton). YÜ Vet Fak Derg. 16(2), 99-101.
5. Rakshitha D, Devika Balagopalan, Hussain Gazala. (2020). A Review on Chaturjataka. IJRAR, 7(4): 510-19.
6. Sastry J.L.N. (2012). Dravyaguba Vijnaana. Reprint edition; Varanasi: Chaukhambha Orientalia, vol II: 528.
7. Rakshitha D, Hussain Gazala. (2020). Preliminary pharmaceutico analytical study of trisugandha arka. IJAAR, 4(11): 1331-36.
8. Government of India Ministry of Health & Family Welfare. (2000). The Ayurvedic Formulary of India. First English edition. New Delhi. The Controller of Publications Civil Lines, Delhi, Part II:41.
9. Ravana. (1990). Arka Prakasha with Mukunda Ram Pandit Hindi Commentary, Arka Prakasha, Mumbai, Ganga Vishnu Srikrishnadas Prakashana, 59.
10. Desai Drashti, et al. (2016). Standardization of Jeera vati: An Ayurvedic Polyherbal formulation. International Journal of Pharmaceutical Science and Research, 1(6): 33-6.
11. CCRAS. Laboratory Guide for the Analysis of Ayurveda and Siddha Formulations. (2000). First edition. New Delhi. CCRAS Department of AYUSH, Ministry of Health and Family Welfare.
12. Government of India Ministry of Health & Family Welfare. The Ayurvedic Formulary of India. Second edition. New Delhi. The Controller of Publications Civil Lines, Delhi: Part I. 27.
13. Devika Balagopalan. (2019). Pharmaceutico Analytical Evaluation of Chaturjataka Arka as a preservative for Triphala Kashaya, Sri Dharmasthala Manjunatheshwara College of Ayurveda and Hospital, Hassan, 60.