

PHARMACEUTICAL AND ANALYTICAL STUDY OF DADIMA TWAK ARKA

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ABSTRACT

Dadima is an easily available drug and its patra, phala, Dadaima phala twak are used in pharmaceutical preparations in Ayurveda pharmaceuticals. Arka is said as a potent formulation with longer shelf life compared to other primary preparations of Ayurveda pharmaceuticals. Dadima arka is a preparation that can be prepared easily. The analysis of Dadima arka carried such as pH, Specific gravity, Viscosity, Total Suspended Solids, Refractive Index were carried out as per Protocol of testing of Ayurveda Siddha and Unani drugs. Physico chemical analysis such as pH, Specific gravity, Viscosity, Total Suspended Solids, Refractive Index showed the following values 3.92, 1, 0.0078, 0.1, 0.34% respectively. The GCMS showed 12 peaks and these can be taken as preliminary standard of the arka.

KEYWORDS: Dadima, arka, GCMS, Ayurveda pharmaceuticals, analysis.**INTRODUCTION**

Arka Kalpana is a unique preparation where water soluble active principles and volatile oils are extracted from a drug through the method of distillation. 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.^[1] The first available reference of Arka Kalpana is from Arka Prakasha written by Ravana.^[2]

The word "Arka" is derived from the word "Agama" which means "that which comes", Arka is the product which comes through the process of distillation. It implies that the essence of the drug that is obtained after distillation. Samhita period didn't give much importance to Arka Kalpana as it was not much popular in those days. According to Ramayana, King Ravana's reign was during Dwapara Yuga and so Arka Kalpana had its popularity during that period.^[3]

METHODOLOGY**PHARMACEUTICAL STUDY****Collection of Drugs:** The raw drug for the preparation of Dadima Arka was procured from local vendor.**Preparation of Dadima Twak Arka****Equipments required:** Khalwa Yantra, weighing machine, distillation apparatus, measuring beakers, glass bottles.**Ingredients**

Sl. No.	Name of the Ingredient	Quantity
1	Dadima Twak (<i>Punica granatum</i>)	1 Part (100g)
2	Water	10 parts (1000ml)

METHOD

The preparation of Dadima Arka was done in SDMCAH, Hassan, under aseptic conditions. Dried drug of the Dadima twak was cleaned, coarsely powdered and used for Arka preparation. Initially the mentioned quantity of coarse powder of Dadima twak was taken in a round bottom flask and soaked with sufficient quantity of water just enough to soak the drug and kept overnight. Next day morning, remaining quantity of water was added and the Arka Yantra (Distillation apparatus) was set and heating was started. The heat given was 60⁰ initially; once it started boiling temperature gradient was maintained between 40⁰- 60⁰ during the procedure. Initial few drops of Arka were discarded as it may not contain therapeutically essential substance and the process of distillation of Dadima Twak Arka was continued till 60% of the distillate was collected. The Arka collected was stored in sterile glass bottle.

Precautions taken

- Sterile apparatus were used.
- Care was taken while handling the equipments.
- Continuous heat and water was supplied for condensation.

- Temperature was regulated (to avoid charring) . Receiver adjusted and kept properly to avoid spillage.
- Initial few drops of Arka was discarded.
- Arka stored in sterile glass bottles.

ANALYTICAL STUDY

Dadima Arka was analyzed for the following parameters as per the references available in CCRAS protocol

1. Morphological evaluation- Organoleptic characters.
2. Physico- chemical parameters- pH, Specific gravity, Viscosity, Total Suspended Solids, Refractive Index.

Place of Analytical study: This study was carried out in the Quality Control Laboratory of the Teaching Pharmacy of Department of Rasashastra & Bhaishajya Kalpana, Sri Dharmasthala Manjunatheshwara College of Ayurveda & Hospital, Hassan.

Organoleptic characters: Appearance, Color, Odor, Taste.

Determination of pH Materials: pH meter, distilled water, sample.

Method: Preparation of buffer solutions: Standard buffer solution; dissolved one tablet of pH 4, 7 and 9.2 in 100ml of distilled water.

Method of determination of pH: 1 ml of sample was taken and made up to 10 ml with distilled water, stirred well and filtered. The filtrate was used for the experiment. Instrument was switched on. 30 minutes time was given for warming pH meter. The pH 4 solution was first introduced and the pH adjusted by using the knob to 4.02 for room temperature 30° C. pH 7 solution was introduced and pH meter was adjusted to 7 by using the knob. Introduced the pH 9.2 solution and checked the pH reading without adjusting the knob. Then the sample solution was introduced and reading was noted.^[4]

Determination of Specific Gravity

Materials: Pyknometer, weighing machine, sample

Method: A Specific Gravity bottle (pyknometer) was cleaned by shaking with acetone and ether. The pyknometer was dried and the weight of empty pyknometer was noted. The pyknometer was then filled with distilled water and the weight and temperature were recorded. The pyknometer was again cleaned and the interior was dried with a current of dry air. The bottle was then carefully filled with the test liquid, the stopper was inserted and the surplus liquid was removed, then the weight was noted and the temperature was recorded. Finally, the weight of the test liquid was divided by the weight of water to calculate the specific gravity.^[5]

Determination of Viscosity

Materials: Ostwald viscometer, stopwatch, pyknometer, sample.

Method: A definite volume of test liquid (25ml) was poured into the bulb C with a pipette. The test liquid was sucked up near to the top of the left limb with the help of rubber tubing attached to it. The test liquid was then released to flow back into the bulb C. The time (t1) to flow from A to B was noted with a stopwatch. Then the apparatus was cleaned and the experiment was repeated with water, taking about the same volume. The time of flow of water (t2) from A to B was recorded. The density of the test liquid (d) and water (dw) were determined with the help of a pyknometer. The relative viscosity coefficient was calculated and by knowing the value of the viscosity coefficient of water (nw) at the temperature of the experiment, the absolute viscosity coefficient (n) of the given test liquid was calculated.^[6]

Determination of TSS (Total Suspended Solids)

Materials: China dish, water bath, hot air oven, desiccator, weighing machine, sample.

Method: 50ml of the sample was taken accurately for testing in a dried and pre-weighed china dish. The content was evaporated to dryness on a water bath and then dried at 105° C for three hours in a hot air oven. For cooling, the dish with the residue was kept in desiccator for 30 minutes, later weighed immediately.^[7]

Determination of Refractive Index

Materials: Abbe's Refractometer, sample.

Method: Sample to be tested was taken. The prism of Abbe's Refractometer was opened and cleaned with soft cotton. A drop of the sample to be tested was placed on the lower part of the prism and the refractometer was closed. Observation was done through the eyepiece and the dispersion correction compensator knob was turned until the colored indistinct boundary seen between the light and dark field becomes a sharp line. Then until the sharp line exactly intersects the midpoint of the cross wires in the image the knurled knob was adjusted. The refractive index was read from the magnifier in the pointer and the reading was recorded.^[8]

Gas Chromatography and Mass Spectroscopy (GCMS) of Dadima Arka

The Gas Chromatography and Mass Spectroscopy are tests applied to identify different components in a given sample. Complex substances can be separated, identified and quantified at the molecular level with the help of GCMS. The working principle of Gas chromatography is based on the boiling point of the compounds and the compounds will be separated at different temperature on heating. This is then transferred into the Mass spectroscopy, where the compounds are analyzed based on the mass to charge ratio and further compared with the data library of known spectra and the report is generated.^[9]

OBSERVATIONS AND RESULTS**Pharmaceutical study observation**

While pounding Dadima twak, the characteristic odour of Dadima twak was appreciated.

During the distillation

- The powdered drug of Dadima twak possessed respective characteristic fragrance.
- After 10- 20 minutes of starting the distillation, vapor was seen over the neck of round bottom flask.
- Initial temperature was set to 60⁰ and after first few drops, the temperature gradient was maintained between 40⁰- 60⁰ throughout the procedure.
- The process of condensation of vapor was continuous and the liquid formed was collected in a conical flask.

After the distillation

- Arka obtained possessed characteristic odor.
- It was colorless liquid.

RESULTS

- Raw drug procured from the local vendor possessed respective characteristic odor and was devoid of foreign matter
- Arka obtained was colorless liquid with strong odor of respective drugs used
- The distillation process was stopped when it attained 60% of the total liquid.

OBSERVATIONS OF ANALYTICAL STUDY**Organoleptic characters of Dadima Arka**

Sl. No.	Particulars	Observation
1	Appearance	Transparent liquid
2	Color	Colorless liquid
3	Odor	Aromatic characteristic odor
4	Taste	Kashaya Rasa Pradhana
5	Touch	Watery, non- slimy

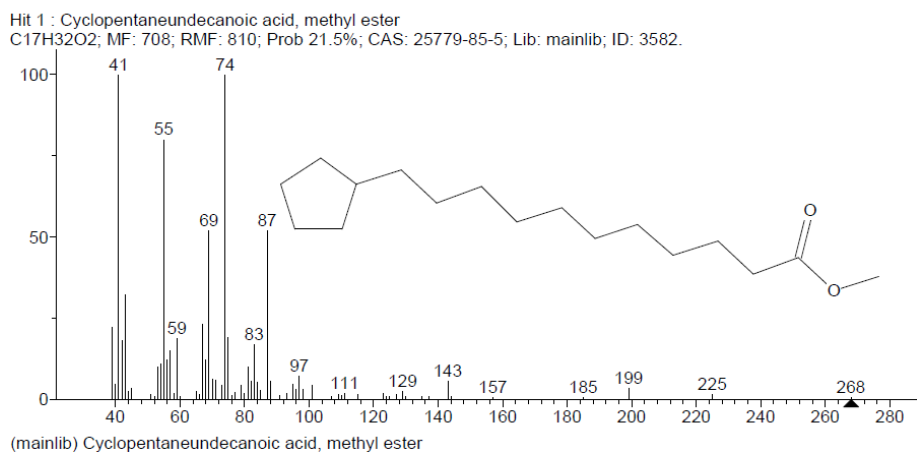
Physico- chemical parameters

Sl. No.	Particulars	Observation
1	pH	3.92
2	Specific gravity	1
3	Viscosity	0.0078
4	TSS (Total Suspended Solids) mg/l	0.1
5	Refractive Index	0.34%

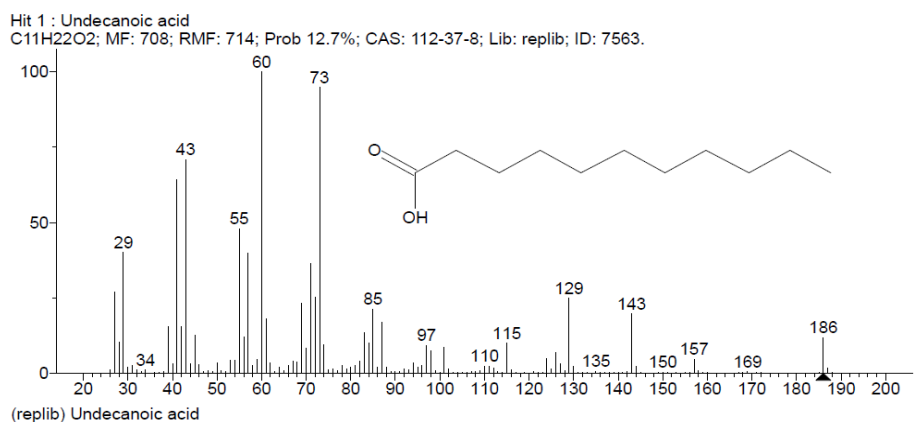
Observations and Results on Gas Chromatography and Mass Spectrometry of Dadima Arka

Peak Number	Name of the component	Formula	Probable %
1	Cyclopentaneundecanoic acid, methyl ester	C ₁₇ H ₃₂ O ₂	21.5
2	Undecanoic acid	C ₁₁ H ₂₂ O ₂	12.7
3	Methyl tetradecanoate	C ₁₅ H ₃₀ O ₂	22.6
4	Tetradecanoic acid	C ₁₄ H ₂₈ O ₂	21.0
5	Cyclopentaneundecanoic acid, methyl ester	C ₁₇ H ₃₂ O ₂	6.25
6	Phthalic acid, 3,5-difluorophenyl 2-isopropylphenyl ester	C ₂₃ H ₁₈ F ₂ O ₄	77.2
7	Benzamide, N-ethyl-N-(3-methylphenyl)-3-methoxy-	C ₁₇ H ₁₉ NO ₂	1.85
8	n-Hexadecanoic acid	C ₁₆ H ₃₂ O ₂	44.7
9	Cyclopentadecanone, 2-hydroxy-	C ₁₅ H ₂₈ O ₂	6.26
10	Retinal	C ₂₀ H ₂₈ O	81.3
11	Hexanedioic acid, mono(2-ethylhexyl)ester	C ₁₄ H ₂₆ O ₄	27.2
12	12-Methyl-E,E-2,13-octadecadien-1-ol	C ₁₉ H ₃₆ O	6.20

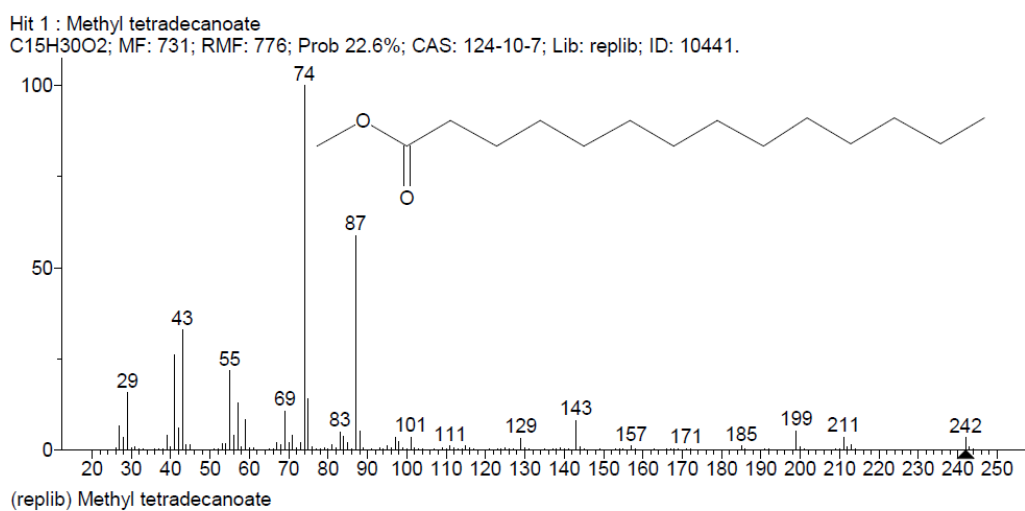
IMAGES



Peak 1

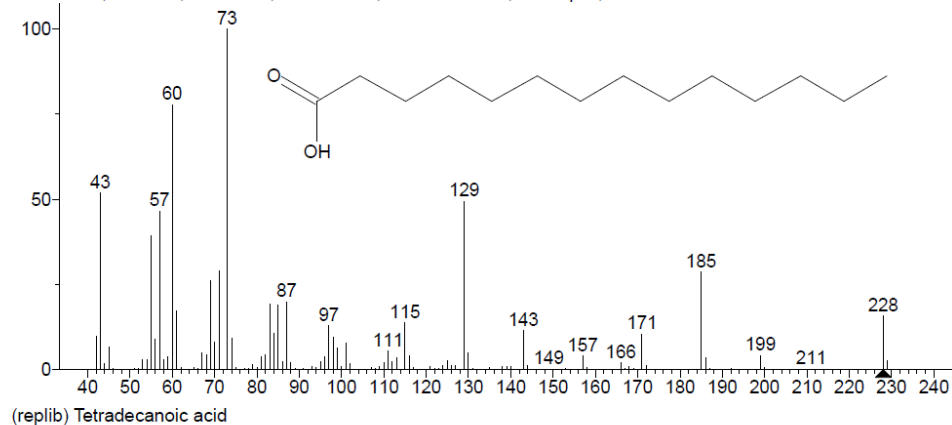


Peak 2

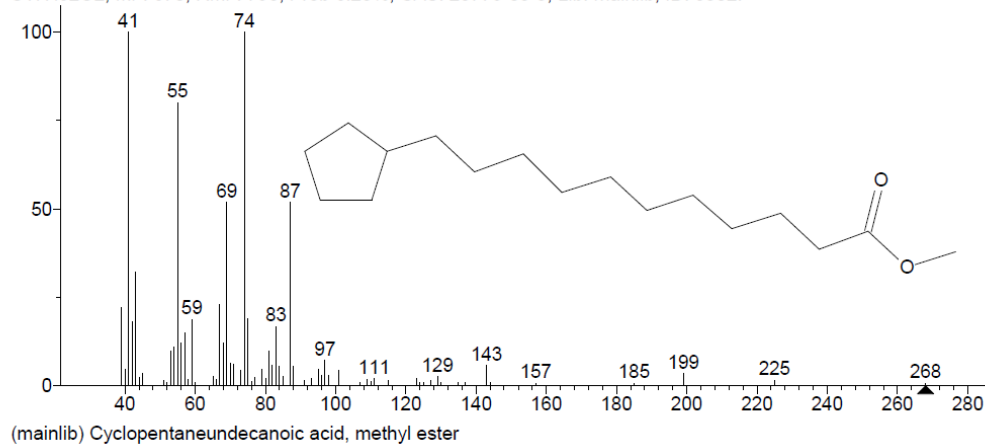


Peak 3

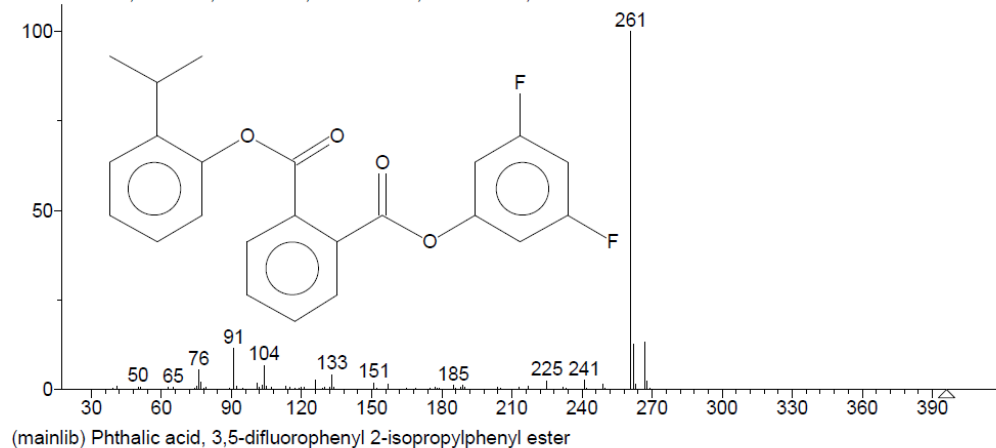
Hit 1 : Tetradecanoic acid

C₁₄H₂₈O₂; MF: 743; RMF: 781; Prob 21.0%; CAS: 544-63-8; Lib: replib; ID: 9631.**Peak 4**

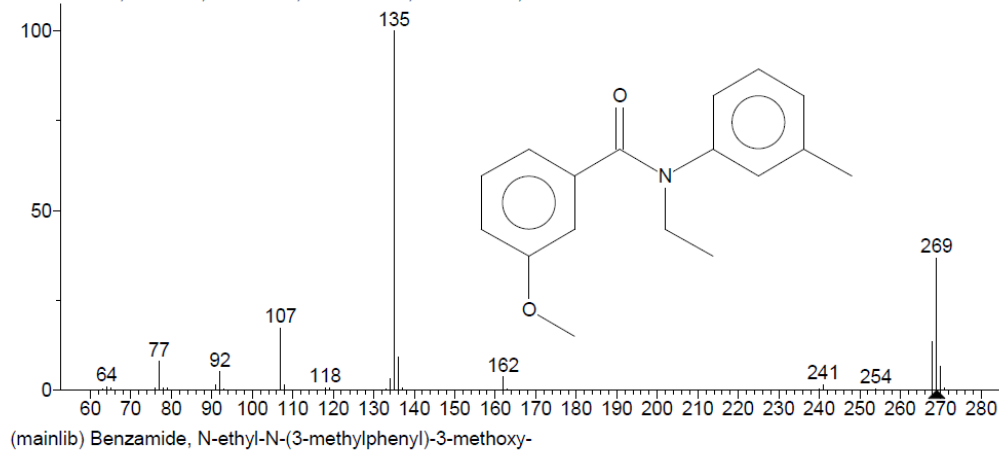
Hit 1 : Cyclopentaneundecanoic acid, methyl ester

C₁₇H₃₂O₂; MF: 678; RMF: 795; Prob 6.25%; CAS: 25779-85-5; Lib: mainlib; ID: 3582.**Peak 5**

Hit 1 : Phthalic acid, 3,5-difluorophenyl 2-isopropylphenyl ester

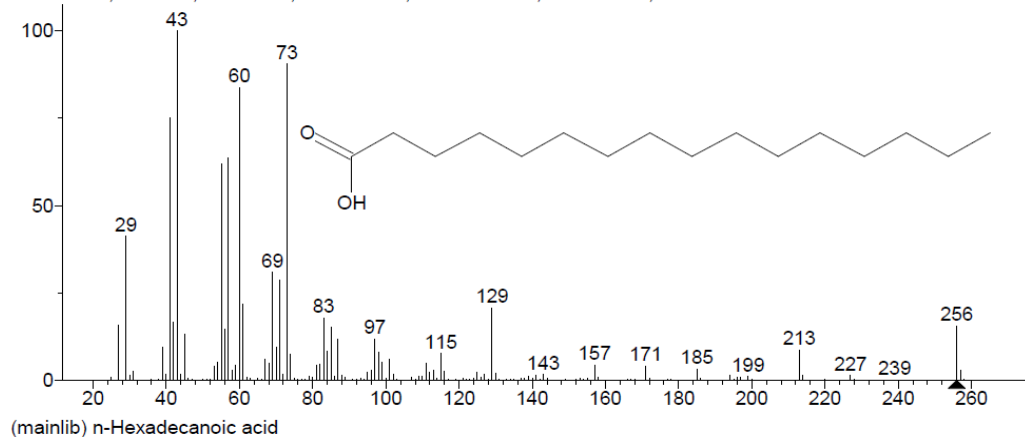
C₂₃H₁₈F₂O₄; MF: 827; RMF: 827; Prob 77.2%; Lib: mainlib; ID: 213830.**Peak 6**

Hit 1 : Benzamide, N-ethyl-N-(3-methylphenyl)-3-methoxy-
C₁₇H₁₉NO₂; MF: 999; RMF: 999; Prob 1.85%; Lib: mainlib; ID: 121918.



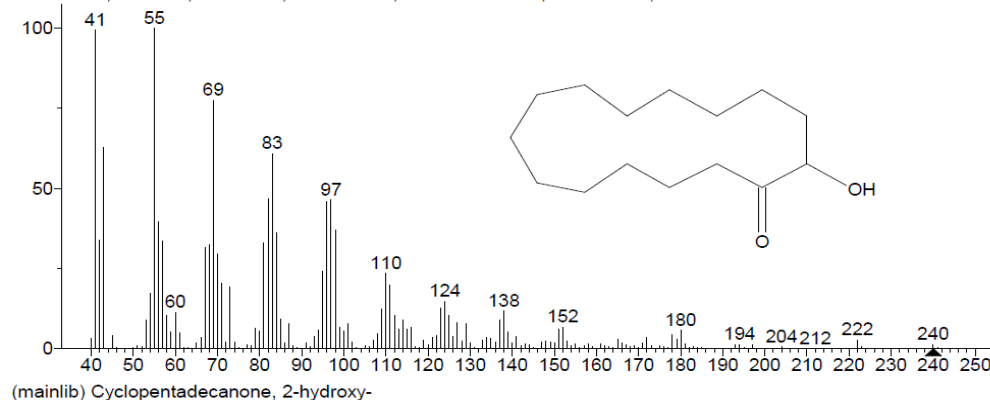
Peak 7

Hit 1 : n-Hexadecanoic acid
C₁₆H₃₂O₂; MF: 805; RMF: 816; Prob 44.7%; CAS: 57-10-3; Lib: mainlib; ID: 9208.



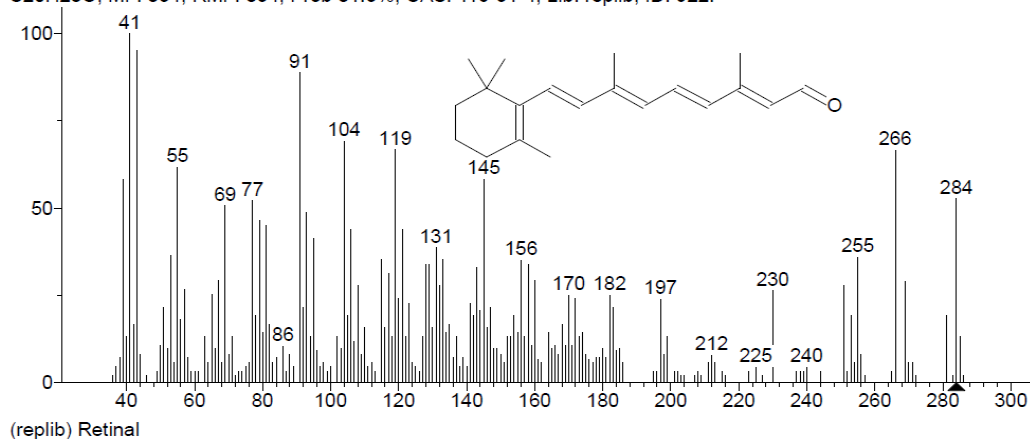
Peak 8

Hit 1 : Cyclopentadecanone, 2-hydroxy-
C₁₅H₂₈O₂; MF: 761; RMF: 764; Prob 6.26%; CAS: 4727-18-8; Lib: mainlib; ID: 19282.



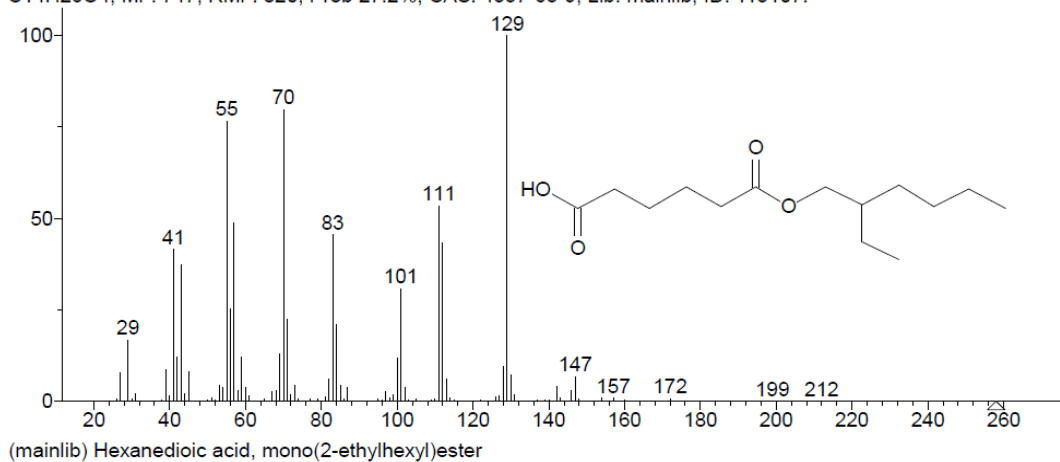
Peak 9

Hit 1 : Retinal
C₂₀H₂₈O; MF: 834; RMF: 834; Prob 81.3%; CAS: 116-31-4; Lib: replib; ID: 922.



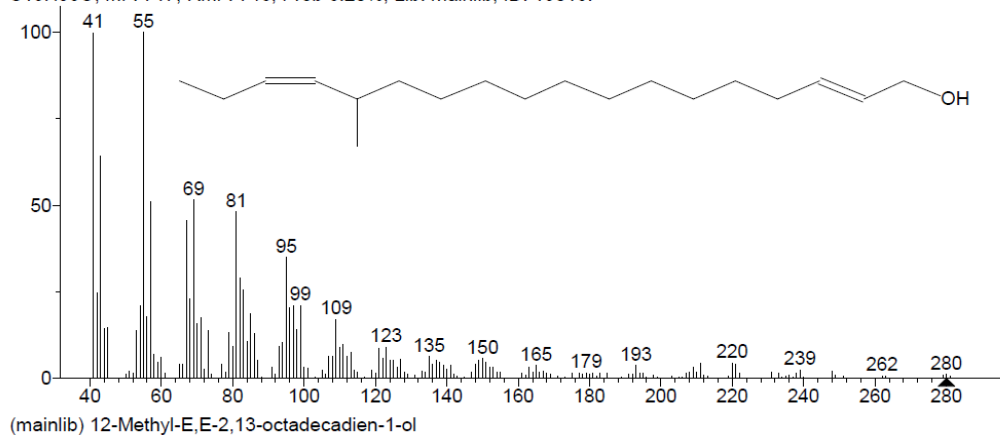
Peak 10

Hit 1 : Hexanedioic acid, mono(2-ethylhexyl)ester
C₁₄H₂₆O₄; MF: 747; RMF: 820; Prob 27.2%; CAS: 4337-65-9; Lib: mainlib; ID: 113107.



Peak 11

Hit 1 : 12-Methyl-E,E-2,13-octadecadien-1-ol
C₁₉H₃₆O; MF: 717; RMF: 746; Prob 6.20%; Lib: mainlib; ID: 19016.



Peak 12

DISCUSSION

Pharmaceutical Study

Size reduction of drug was done by making coarse powder of the drugs which helps to increase the surface area of the drug for the active principles to be dissociated into water and those are used for the preparation of Arka and soaking was done overnight to make the drug soft.

When the drug is soaked, the tissue swells up because of the cell wall of drug takes up the liquid. So it is advised to soak the powdered drugs for sometime before boiling. Next day remaining amount of water was added and kept for distillation process.

Odor: Arka possessed respective aromatic characteristic odor indicating the feature of the drug.

Appearance: Arka obtained was a colorless liquid which indicates the prashasta arka lakshana.

Taste: Twak Arka possessed Kashaya Rasa in predominance as the Twak has Kashaya Rasa.

Physico- chemical parameters

pH: pH of Arka was acidic suggestive of highly acidic nature; the efficacy, absorption, irritability depends on pH of a drug. It also influences on the rate of oxidation. More acidic pH results in lesser oxidation suggestive of acidic nature reduce the growth of micro-organisms.

Specific gravity: Specific gravity suggests the presence of solutes in a solvent. In this, solvent was water and volatile oil extracted forms the solute. Specific gravity of Arka was near to the value one suggestive of these had specific gravity that was similar to water as it is a water soluble extract preparation.

Viscosity: Viscosity measures the resistance of a solution to flow when stress is applied. Viscosity of Arka was 0.0078 which was similar to that of water as it was a distillate of water.

TSS (Total Suspended Solids): Total suspended solids for all Arka was 0.1mg/l as it was a distillate it would only have water soluble active principles along with volatile principles extracted from the raw drugs.

CONCLUSION

Physico chemical analysis such as pH, Specific gravity, Viscosity, Total Suspended Solids, Refractive Index showed the following values 3.92, 1, 0.0078, 0.1, 0.34% respectively. The GCMS showed 12 peaks and these can be taken as preliminary standard of the yoga.

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