

## REVIEW ARTICLE

## Study on Identification and drug standardization of fruit of Plant *Carum roxburghianum* (Benth and Hook), Ajmoda

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### ABSTRACT

Standard quality of drug was always emphasized as an essential requirement of treatment in Ayurveda. Dravya Sampanth was therefore held as one among the Dravya Chatushka. The word Dravya Sampath has been used by our ancient acharyas to describe what is the presently known by the term Standardization. Dravya Sampath or quality drug is the prerequisite for a successful and reliable treatment. It is basic for survival of the system and also a statutory requirement under Drug & Cosmetic Act. Standardization of raw materials is a precursor to the standardization of pharmaceutical preparations. Unfortunately former is the totally neglected side in comparison to the later.

Ajmoda, a crude drug mentioned by Maharshi Charaka in Shula parshmana and Dipaniya mahakshaya. It is the drug used in many formulations like Ajamodadi Churna, Hingwadi Churna, Vidangadi Taila, Phala Ghrita, Eladi sarpi, Yograj Guggulu etc. Authentic source of Ajmoda is *Carum roxburghianum*. (Syn. *Trachyspermum roxburghianum*). In spite of so much uses surprisingly in market of different areas different plant species are sold by the name of Ajmoda which causes variable efficacy, It is easy to identify these species from one another by simple procedures. Since crude drugs ultimately used singly or in formulations will affect the health of an individual.

**Keywords :** *Standardization, Carum roxburghianum*

### Introduction

Bhisag (Physician), dravya (Drug), upasthata (Nurse) and atur (Patient) are important pillars of Chikitsa Chatuspada. Drug being the integral part and prime tool of Chikitsa, its purity, genuinity and awareness towards its therapeutic properties are very necessary. Standard quality of drug was always emphasized as an essential requirement of treatment in Ayurveda. Dravya sampanth was therefore held as one among the Dravya Chatushka. Our ancient Acharyas incorporated these aspects by introducing Dravya parreksha under dashavidha parreksha. In Ayurveda texts there are references for

collection and storage of dravyas. Further the expiry period after which the raw drug loses its potency is also mentioned. Unfortunately in the present day practice the above standard guidelines have been totally neglected thus compromising the quality of the drug to serious proportions. Proper identification of the drugs mentioned in our texts, standardization and quality control of dravyas is indeed a very challenging task.

Back from the history as we see, The remarkable progress of Indian medicine was seen from Vedic period to period

of Compilation. During the latter period of compilation, the Ayurveda crossed the borders of India. Invasion of Greeks, the Mohammedans, in the early part of the medieval period gave way for deterioration of Indian Medicine. Then with the advent of Europeans after 16th cent. A.D. The decline in Indian medicine was still further marked.

During the medieval and succeeding periods Ayurvedic literary works flourished at regional levels mainly Nighantus came into existence. This created a new horizon of knowledge of medicinal plants, which in turn also triggered controversies in Identification of drugs. In every Nighantu while enumerating a drug 5-6 synonym were mentioned. In some cases a particular synonyms was accredited to more than one drug.

Due to excessive urbanization indiscriminate use, deforestation industrialization, increase of pollution at a greater pace, lust for being healthier, not only precious drugs but also common drugs were obliterated from source. In India after Independence many useful herbs become extinct. Due to Internationalization of herbal drug demand is increasing day by day.

The prime difficulty faced in Dravyaguna is Identification of drugs, which is possible when prominent characters of each drug are established. The therapeutic uniformity is secured and established by physical, morphological, biological and chemical assay of each drug. After proper identification then stress should be given on quality control of raw material. The quality of medicinal plant raw materials depends on multiple interrelated factors such as quality of genoplasm, habitat, climate, cultivation, harvesting and post harvesting processes, collection methods, and time of collection, primary processing methods, transport and storage methods, inadvertent contamination by microbes.

The Ayurvedic Pharmacopeia of India has ensured its fundamental object as to provide standards of drug, which are therapeutically useful. In the year 1964, the Govt of India amended the Drug and Cosmetic Act, 1940 and brought Ayurvedic drugs in Preview hence there is extra awareness about the standardization of Indigenous

drugs. But still some drugs are not properly identified in Ayurvedic Pharmacopeia of India. Considering above factors, Identification and drug standardization of Carum roxburghianum (Syn. Trachyspermum roxburghianum), (Ajmoda) research work is done.

### NEED OF STUDY

In old times Vaidyas used to treat patients on individual basis, and prepare drug according to the requirement of the patients. They people knew the proper identification, their characters, morphology, actions. But today due to life style, industrialization, lack of knowledge even vaidyas do not go upto the source and most of them are not able to identify the proper drug. So what the companies are supplying, patients are using that drug. Moreover in Pharmaceutical companies due to lack of proper knowledge of identification of drugs, or due to some other reason e.g. sometimes drug source away just for their own benefits companies start use of substitute easily available which will ultimately affect the potency of the drug or formulation. It is important to properly identify a drug. After proper identification of that drug it is essential to maintain proper quality of crude drug or formulations.

In fact former is the totally neglected side. So identification and drug standardization is chosen as topic of research. Present day researches are going on experimental and clinical aspect but no one is caring about quality, standardization of the drug used. So in today life this is a great necessity to do work on standardization.

Ajmoda drug happens to be very useful drug in cure of many diseases of G.I.T., arthritis, cardiac diseases, urinary disorders etc. Maharshi Charaka has mentioned the drug in Shula parshmana and Dipaniya mahakshaya. It is the drug used in many formulations like Ajamodadi Churna, Hingwadi Churna, Vidangadi Taila, Phala Ghrita, Eladi sarpi, Yograj Guggulu and many more.

Therefore, it is pertinent to determine correct botanical source of Ajmoda and its quality assurance values through standardization. Authentic botanical source of Ajmoda is Carum roxburghianum (Syn. Trachyspermum

roxburghianum). Further, it is essential to know the botanical sources of the drugs sold in market in the name of Ajmoda. Ajmoda is selected as the trial drug because, in spite of so much uses surprisingly in market of different areas different plant species are sold which causes variable efficacy, Since crude drugs ultimately used singly or in formulations will affect the health of an individual. But there is no research work yet done on its standardization.

### AIMS AND OBJECTIVES OF STUDIES

- ◆ To collect, compile and analyze the currently available literature with regard to standardization and quality control of medicinal plant raw materials.
- ◆ Study about literature of plant samples coming in market by the name of Ajmoda.
- ◆ To make a market and field survey for collection, comparison.
- ◆ Standardization of the authentic sample.
- ◆ Organoleptic analysis in order to establish identity and quality of crude drugs traded in the market.
- ◆ Detail study of literature, morphology, phytochemistry, macroscopic and microscopic characters of the drug.
- ◆ Comparing different market sample drugs with genuine sample.

### PLAN OF STUDY:

The work was carried out in the following phases-

1. **Literary review:** Literature Ayurvedic as well as modern was studied in detail.

#### 2. Collection of Samples and Photography:

Samples are collected from different areas field and market. Authentic 3 samples were collected from Kolkata in the month of April, 2010. (By Dr. N. D. Paria, Taxonomist, Professor, Botany department, Kolkata University, West Bengal). Then market samples were collected from crude drug markets like Ahmedabad, Jammu, Karnataka, and U.P., sold by the name of Ajmoda. One market sample

was collected by my colleague from Bangladesh. U.P. sample as told was two years old at the time of research was taken in consideration to see changes happened with time. Samples were collected and photographed. The attempt was made during survey of markets to collect information regarding trade name, local name, origin, time of collection of the sample drugs to the extent possible in addition to procurement of samples of crude drugs. Relevance of local names in establishing identity of a particular plant is discussed. (Naamép}an )

### 3. Conservation of germplasm and in situ cultivation for herbarium of the authentic drug plant:

Samples collected were packed in air tight containers because they absorb moisture or to avoid any infection by insects. They are grown in the garden of NIA, Jaipur. Authentic sample as well as market samples as much as possible tried to cultivate them. Then photography of plants was done. Herbarium was prepared of authentic sample.

### 4. Lab investigations:

Then further evaluation of all the samples was done. Market samples as well authentic samples-

a. Pharmacognostic evaluation – All the samples were observed. Firstly macroscopic features. Then with the help of magnifying lens. After that organoleptic testing [pÁceiNÔy prI]a) was done. Then after section cutting(microscopic) was done. Their standard procedure was studied.

b. Phytochemical evaluation-Then all the samples market as well authentic was investigated in Lab for phytochemical testing. So, all the standard procedures were studied in detail and compiled.

### 5. Observations and results:

Then all the readings were noted down for value of phytochemical as pharmacognostical findings.

### 6. Preparation of comparative table:

Then macroscopic, microscopic, phytochemical as well

pharmacognostical features were compared of different samples. tables are prepared. Then matching with standard keys we identified samples.

## LITERARY REVIEW

Word 'Ajmoda' was firstly used in Samhitas .There are no references in Vedas about drug Ajmoda as well as in Puranas. Then from Samhita period onward in Charka Samhita, Sushruta Samhita, Astang Samgrha, Astang hridya references of Ajmoda are found. Acc. to Acharya P. V. Sharma it is an exotic plant, native of Europe. In Samhitas it is used in various formulations e.g. external or of internal use. Tikakaras in comm. of samhitas cleared the differences between Ajmoda and Yvani .e.g. in Dipika and Guda artha dipika for external use of Ajmoda is prescribed and for internal use we have to take Yvani. Coming in Nighantu period literature about Ajmoda is available e.g. in Amarkosha, Dhanvantri Nighantu, Shodal Nighantus etc. In many Rasa Grantha also references of Ajmoda are found.

In nighantus many synonyms of Ajmoda has been described according to its different characteristics e.g. because of its characteristic odour due to which animals are attracted to it (Markat, Khravha, Ajmoda, Ugragandha, Modha). Some due to its used part (Phalemukhya) etc., some acc. to actions like Dipyaka, Vahnidipika, and Hridyagandha etc.

Rasapanchak of Ajmoda

- Rasa - Katu
- Guna - Laghu, Ruksha, Ushna, Tikshna
- Virya - Ushna
- Vipaka- Katu
- Karma - Doshagantha- Kaphavata hara dravya, Dipaniya, vidahi, hridya, vrishya, pachni, mala avsthambkari dravya.

In Ayurveda literature substitute of Ajmoda is mentioned Khurasani Ajowain. Abhav Dravya of Ajmoda in some nighantus is called Yvani.

When market survey of Ajmoda was done then it was

found 4-5 different plant species (Trachyspermum roxburghianum=Carum roxburghianum Syn., Apium graveolens, Apium leptophyllum, Trachyspermum ammi etc.) are coming in market in same name of ajmoda all are in family Apiaceae. As in Today time authentic plant by the name of Ajmoda is considered Trachyspermum roxburghianum because having max closeness to the synonyms, properties, actions mentioned by our texts.

- ◆ Phalemukhya- Fruit is its main used part. In case of A. graveolens used part are its leaf, tuber like root, fruit.
- ◆ Yvanika- Differentiated from Yvani (T. ammi) by having broad fruit. But smaller in length than Yvani.
- ◆ Lochmastka- Resemblance of inflorescence with head feathers of peacock. As in case of A. leptophyllum flowers are sometime sessile.
- ◆ Markati- As the Nirukati of synonym "markatakhyo snigdhataven" but when literary survey was done in modern literature too Apium graveolens was having maximum concentration of water in it. (>80%). But singdhta (oil conc.) as observed from study was found after Yvani concentration was max in Trachyspermum roxburghianum. (But reported values for both are almost same.)

During the study five samples from different areas (U.P., Bangladesh, Jammu, Karnataka, and Ahmedabad) were taken to know about what is supplied in market by the name of Ajmoda. Then detailed pharmacognostic as well phytochemical study was done.

## Pharmacognostical Evaluation:

Firstly pharmacognostical evaluation of all the samples was done which include organoleptic, macroscopic as well as microscopic.

- ◆ Shape of Kolkata sample fruits elongated laterally flattened, Ahmadabad ovoid, U.P. partially spherical, Bangladesh elongated, South partially spherical and Jammu also partially spherical in shape.
- ◆ Average Size-Kolkata sample in size 2.8 mm long, 2.5 mm broad, 0.5 mm thick. Ahmadabad 2.5-1.5-1 mm,

U.P. 1.5-2.5-1, Bangladesh sample 2 mm long, 1.5 mm broad, 0.5 thick, South 2-2.5-1mm, Jammu 2-2.5-1mm.

- ◆ Colour was darkest (Brown) of the fruit of Bangladesh, then from Kolkata, other samples were yellowish brown or yellowish in colour.
- ◆ Taste-In Kolkata and Bangladesh samples Katu Rasa is felt not just after taking in mouth but as we chew katu rasa increases, but in Jammu, South and U.P. katu rasa diminishes as we chew the drug. At first we feel katu but latter it diminishes.
- ◆ Bangladesh and Kolkata samples having pleasant spicy smell, Jammu and South sharp smell different from Kolkata, Sharp smelling Ahmadabad like that of thymol.
- ◆ Sound-No significant difference found.
- ◆ Touch-All samples are rough, Max Ahmadabad, then U.P. sample.
- ◆ Magnifying lens-5 ribs in all samples, ribs least prominent in Kolkata and Bangladesh .Corky in U.P. sample.
- ◆ Microscopy-Bangladesh and Kolkata-Trivittate condition, Kidney shaped cross section; Trichomes present very densely hirsutus, 6 vittae 4 on dorsal side 2 on commissural side. (Characteristic -T. roxburghianum).In Ahmadabad sample T.S. hexagonal in outline, having tubercular surface(characteristic of T. ammi),6 vittae 4 on dorsal two in commissural surface, mesocarp cells barrel shaped. In case of Jammu and South samples .Jammu and South fruit surface devoid of hairs (trichomes) as well as protuberances. Dorsal channels with single vittae lateral 2-3, vittae broad occupying whole breadth. Mesocarp cell max. round from all samples (A. graveolens). In case of U.P. samples from macroscopy ribs are prominent and thick corky than Jammu sample. All other features almost same as that of Jammu. (A. leptophyllum) .
- ◆ As the plants were cultivated in the garden it was

clear demarcation between leaves too. Kolkata leaves-trifoliate dark green in colour, leaflet not coarsely toothed, and In Jammu sample leaves tripartite but coarsely toothed leaflet was present. In case of U.P. very minute leaves needle like was present characteristic of A. leptophyllum.

#### Phytochemical observations:

- ◆ Foreign matter -Hence average value of Kolkata sample 0.623%, Bangladesh 0.466%, Jammu 2.23%, Gujrat 1.00%, U.p.3.45%, South 6.02 %
- ◆ Moisture content was 5.04% in Kolkata, 6.5% in Bangladesh, 7.7% in U.P. Sample, 9.5% in Jammu, 7.6% in South, 4.5% in Gujrat sample.
- ◆ Ash value (in %) Kolkata 4.7, Jammu 8.3, South 6.6, U.P.6.5%, Ahmadabad 10.8, Bangladesh 4.7%.
- ◆ Acid insoluble ash was Kolkata 0.249%, Jammu 0.49%, South 0.25%, U.P. 0.38%, Ahmadabad 0.26%, and Bangladesh 0.22%.
- ◆ Colour of ash was Kolkata White, Jammu Black white, South Blackish white, U.P. Red white, Ahmadabad white black, and Bangladesh Reddish.
- ◆ Inorganic matters calcium, iron, potassium was positive in all. Magnese only in Kolkata and Bangladesh. Phosphorus negative in South. Sulphur in U.P. was negative. Sodium negative in South. Only Zn heavy metal positive in all samples.
- ◆ Extractive value-By hot method of Kolkata sample Max was in ethyl acetate, then ethanol and least in acetone.
- ◆ By cold method extractive value-Max of Kolkata (15.1%), Least in U.P.(Alcoholic extractive value)
- ◆ By cold method aq. Extractive value max south, least U.P.
- ◆ Tests of Carbohydrates, proteins, alkaloids, phenol (negative in south), terpenoids were positive in all samples. Steroid was negative in U.P., Phenol in South negative.
- ◆ Volatile oil 3.7% in Kolkata, 3% in Bangladesh,

- 0.4% in U.P., 2.5 and 2.8% in Jammu and South respectively, 4% in Ahmadabad.
- ◆ HPTLC results-Kolkata and Bangladesh both samples shows similar Rf values, peaks, graphic patterns for Kolkata sample 1 major Rf points (254 nm)-0.49, 0.61, 0.7 (Blue in colour), Sample 1b 0.50, 0.61, 0.72 (Sample 1b and 1c almost same as 1a), in case of Bangladesh 0.52, 0.61, 0.74 (Blue in colour) copy of Kolkata, in case of Gujrat major spots 0.14, 0.38, 0.45, 0.53 (blue in colour), 0.63, 0.73, in case of Jammu and south again carbon cory spots at 0.67, 0.67 respectively. In case of U. P. spots were at 0.38, 0.46.
  - ◆ At 366 nm Kolkata 0.06, 0.16, 0.43, 0.51, 0.66, 0.71 same in Bangladesh at 0.06, 0.16, 0.44, 0.52, 0.67, 0.74 respectively. In Gujrat 0.02, 0.06, 0.09, 0.32, 0.40, 0.46, 0.52. In U.P. 0.02, 0.06, 0.13, 0.20, 0.39, 0.46, 0.56, 0.73 were major spots. In Jammu and South 0.18, 0.54, 0.73.
  - ◆ After derivitization spots were at Kolkata Rf 0.18, 0.24, 0.30, 0.7 and 0.9, Bangladesh 0.18, 0.25, 0.32, 0.62, 0.75, 0.93, U.P. 0.2, 0.46, 0.6, 0.83, 0.92, Ahmadabad 0.19, 0.31, 0.41, 0.48, 0.53, 0.63, 0.73 Jammu and South 0.18, 0.32, 0.46, 0.65, 0.91 and 0.19, 0.30, 0.42, 0.49, 0.65, 0.91.
  - ◆ Blue colour spot thymol was in Kolkata, Bangladesh and Ahmedabad samples showing presence of thymol (Characteristic) but at lower length in Ahmedabad showing max. concentration in that sample
  - ◆ Moreover of graphs of Kolkata and Bangladesh; Jammu and South are again same. Which show same species of sample.

Sr. no.	Plant	Main Chemical constituent
1.	<i>Carum roxburghianum</i>	Limonene (15%), Cadinene (24%), $\beta$ -cyclolavandulal/ acid is 15-25%, Seselin (~12-15%)
2.	<i>Apium graveolens</i>	Limonene (85%), pentyl benzene, 3-n-butyl phthalide & other phthalides
3.	<i>Apium leptophyllum</i>	1-2% Monoterpenes, coumarins
4.	<i>Trachyspermum ammi</i>	2-5% p-cymene, $\gamma$ -terpinene, thymol (35-60%)

- ◆ As there is no available fix key for Carum roxburghianum, so from the literature (Wealth of India, Flora of British India, Flora of China, Encyclopedia of Word Medicinal Plants a key is developed for comparing our findings.
  - ◆ name of Ajmoda which are Carum roxburghianum, Trachyspermum ammi, Apium graveolens, Apium leptophyllum.
  - ◆ Phytochemistry and pharmacological findings of All the 4 samples are different.
  - ◆ Since all the 4 samples are botanically and phytochemically different, it is not possible without clinical verification to suggest whether any of 3 (Trachyspermum ammi, Apium graveolens, Apium leptophyllum) can be substituted for Ajmoda.
- Conclusion of the study work-**
- ◆ Ajmoda is concluded as based on literature, morphological, chemical correlation as Caum roxburghianum
  - ◆ In market 4 different plants are seen on the same

- ◆ There for *Trachyspermum roxburghianum* should be used in the name of Ajmoda. source of the traded drugs in the name of Ajmoda.

#### Key of Identification

- ◆ A key has been devised to recognise the botanical

Feature	<i>T.roxburghianum</i>	<i>A.graveolens</i>	<i>T.ammi</i>	
Leaf	Tripartite, leaflet not coarsely toothed	Tripartite, leaflet coarsely toothed	Small feathery leaf	
Fruit	Elongated to somewhat ovoid, hispid fruit, minutely puberopunctate	Ovoid, Glabrous fruit	Ovoid, Rough fruit, Presence of Pappilae and tubercles	
Taste	Firstly not so much bitter latter aromatic and numbness to tongue	pungent	pungent (most)	
Odour	Pleasant	Sharp smelling	Smell of thymol	
Ridges	5, faint (Flora of British India)	5, much prominent, broad	5, much prominent	
Transverse section	Kidney shaped, smallest vittae, trivittae, 6 in number, trichomes present	No trichomes, thick cuticle, Vittae 6-12, (lateral commissure 2 vittae sometimes), pentagonal in shape	Protuberances on surface, thick cuticle, Vittae 6, hexagonal in shape	
Essential oil	2.5% (2-4%)	2-3%	2-4%	

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## सारांश:

उच्च स्तर के गुणयुक्त द्रव्यों का प्रयोग चिकित्सा की सफलता के लिये नितांत आवश्यक है। आयुर्वेद मे द्रव्यसंपत् नाम से द्रव्यों की गुणवत्ता का विवेचन किया है। द्रव्यसंपत् न केवल आयुर्वेद चिकित्सा पद्धति की परंपरा की रक्षा हेतु आवश्यक है परन्तु औषध एवं रूपसंसाधन अदि नियम के अन्तर्गत वैधानिक जिम्मेदारी है। महर्षि आत्रेय द्वारा सूचित द्रव्यपरीक्षा की प्रणाली अत्यन्त प्राचीनतम एवं अबतक की प्रस्तुत द्रव्यसंपत् नियमावली मे सर्वोत्कृष्ट माना जायेगा। अजमोदा महर्षि चरक द्वारा दीपनीय और शूलप्रशमन महाकषाय में वर्णित अतिमहत्वपूर्ण द्रव्य है। देश के विभिन्न भागों में अजमोदा के नाम पर विभिन्न द्रव्य मिल रहे हैं। असली अजमोदा उत्तरीपूर्वी भारत में ही मिल रहा है। अन्य भागों में मिलने वाला अजमोदा असली से गुणों व रसायनिक संगठन में पूर्णतरु भिन्न है। असली अजमोदा की पहचान बहुत सरल है। एकल द्रव्य या योगों में प्रयुक्त होने वाले द्रव्यों का व्यक्ति के स्वास्थ्य प्रभाव होता है। अतरु द्रव्य परीक्षण नितांत आवश्यक है।