Pharmacognostical Evaluation of *Trachyspermum roxburghianum* (DC) Craib Fruits

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Abstract – Sophisticated modern research tools for evaluation of medicinal plants are available but microscopic methods are one of the simplest and cheapest methods to establish the identity of the source materials. Pharmacognostical investigation of the dried, powdered and anatomical sections of the fruits of *Trachyspermum roxburghianum* (DC) Craib was carried out to determine its macro and microscopical characteristics along with its physical constants. Externally, the fruits, yellowish or greenish brown in colour are elongated, elliptical, slightly curved, prominently ridged and longitudinal. As seen in transsectional views of the fruits from *Trachyspermum roxburghianum*, the mericarp has concave sides called commissural surfaces and a convex outer side called the dorsal surface. The mericarp has three primary ridges alternating with two secondary ridges on the dorsal side. On the commissural side, there are two primary ridges which are lateral in position and two secondary ridges in the commissural side. The seed is attached to the pericarp by a short stalk called a raphe. Circular, four-lobed calcium oxalate crystals are fairly abundant in the endosperm. Phytochemical studies revealed the presence of phenolic compounds, terpenoids, proteins and sugars. The pharmacognostical profile of the fruits will assist in standardization for quality, purity and sample identification.

Keywords – *Trachyspermum roxburghianum*, pharmacognostical standardization, morphology

Introduction

*Trachyspermum roxburghianum* (DC) Craib (Umbelliferae), commonly known as Ajmoda or Ajmod is a reputed drug in the Indian system of medicine. It is a well-branched annual reaching up to 90 cm in height and cultivated throughout most of India. Ajmod is one of the ingredients in carminative and stimulant preparations and is used for in dyspepsia, as a cardiotonic, an emmenagogue, in bronchitis and asthma. It induced hyperactivity of the central nervous system in mice and also exhibited activity against *Entamoeba histolytica*. The Fruits yield an essential oil (up to 2.5%), a fixed oil (4.5%) and a crystalline ketonic compound (0.1%). The oil contains *d*-limonene (35.1%), *α*-terpinene (19.4%), *d*-limatol (4.7%), *dl*-terpineol (5.7%), thymohydroquinone (0.2%), thymol (1.7%), *dl*-pipertone (13.6%), cumicic acid (0.4%), cumminsdehyde, traces, an unidentified ketone (C₁₀H₁₉O₃) 1, an unidentified ester (5.9%), and dipentene mixture (2.5%) (Kritikar and Basu, II, 2005; Wealth of India 2005).

*Trachyspermum roxburghianum* (DC) is very closely resembles and is probably a cultivated form of *T. stictocarpum* (C. B. Clarke) Wolff Syn. *Carum stictocarpum* which is found wild from the lower Himalayas to South India. There are however minute differences in the fruits due to cultivation (Wealth of India, 2005). In view of its diverse medicinal applications and no pharmacognostical work reported so far, the present investigation was carried out in order to ensure the quality of its supply, especially in case of adulteration and substitution by existing crude drug markets. The study includes morphological and anatomical evaluation, determination of physic-chemical constants and preliminary phytochemical screening.

Experimental

Plant material – Fruits of *Trachyspermum roxburghianum* were collected from Jawaharlal Nehru Krishi Vishwa Vidyalaya, Krishi Nagar and M. P. Jabalpur. It was identified and authenticated by the taxonomic division, National Herbarium of Cultivated Plants, National Bureau
of Plant Genetic and Resources (NBPGR), New Delhi. The specimen voucher no. NHCP/NBPGR/2007/96/32/1479, dated 06/07/2007 was preserved in the department for future references.

Macrosopic and microscopic analysis – The macroscopy and microscopy of the fruits were studied according to the method of Brain and Turner (1975a). For the microscopic studies, cross sections were prepared and stained as per the procedure of Johansen (1940). The micropowder analysis was done according to the method of Brain and Turner (1975b).

Physicochemical analysis – Physicochemical analyses were performed according to the official methods prescribed (Indian Pharmacopoeia 1996) and the WHO guidelines on quality control methods for medicinal plant materials (WHO-QCMMPM guidelines, 1992). Fluorescence analysis was carried according to the method of Chase and Pratt (1949) and Kokoski (1958).

Preliminary phytochemical screening – Preliminary phytochemical screening was carried out using standard procedures described by Harborne (1998).

Results

Macromorphography of fruits of *Trachyspermum roxburghianum* – The fruits called Cremocarp are elongated, longitudinal, elliptical, slightly curved, prominently ridged and coloured yellowish or greenish brown (Fig. 1 and 2).

Microscopic Studies – Transactional views of the cremocarp reveal two reniform mericarps. The concavity of the mericarp is 1 mm in the vertical plane and 750 µm in the transverse plane. As seen in transactional views, the mericarp has a concave side called a commissural surface and a convex outer side called a dorsal surface. The seed is firmly attached to the pericarp by its thick testa or seed coat. The seed has copious and dense endosperms (Fig. 3) with a central cavity in which the embryo is situated.

Anatomy of the pericarp and mericarp – The mericarp has three primary ridges alternating with two secondary ridges on the dorsal side. On the commissural side, there are two primary ridges which are lateral in position and two secondary ridges in the commissural side. The seed is attached to the pericarp by a short stalk called a raphe (Fig. 3 and 4). Within each primary ridge occurs a prominent vascular bundle which consists of densely packed, small thick-walled cells.

The pericarp has a thin continuous layer of epidermis with two or three layers of large oblong cells of mesocarp. There are two secondary cavities called vitæ beneath the secondary ridges of the dorsal side and two vitæ in the...