Pharmacognostical Research

Identification of fruits of Tribulus terrestris Linn. and Pedalium murex Linn.: A pharmacognostical approach

Jignesh Kevalia1, Bhupesh Patel2

1Senior Lecturer, Institute of Ayurvedic Pharmaceutical Sciences, 2Assistant Professor, Institute for Post Graduate Teaching and Research in Ayurveda, Gujarat Ayurved University, Jamnagar, Gujarat, India

Abstract

Gokshura is a well-known Ayurvedic drug that is used in many preparations. Botonically it is identified as Tribulus terrestris Linn., especially the roots and fruits of the plant. But instead the fruits of another plant Pedalium murex Linn. are commonly used and the drug is frequently substituted. Pharmacognostical study has been carried out to identify the distinguishing features, both morphological and microscopic, of the fruits of Tribulus terrestris Linn. and Pedalium murex Linn. This knowledge should help reduce the problem of substitution of the genuine drug.

Key words: Gokshura, Pedalium murex, Tribulus terrestris

Introduction

Gokshura is one of the controversial drugs in Ayurveda,[1] and is a component of Dashamoola,[2] a reputed Ayurvedic formulation used in the treatment of various diseases. Decoction of Gokshura is useful in lower back pain, sciatica, inflammation of the pelvic and sacral region, dry cough, respiratory disorders. In all cases of Vata Prakopa, it can be used as a tonic to strengthen the system. Two species of plants are found to be available in the market under the name of Gokshura. A spreading plant belonging to family Zygophyllaceae, Tribulus terrestris Linn.,[3–5] which is known as Chhota Gokshura and the another erect herb belonging to family Pedaliaceae, Pedalium murex Linn.,[6–8] which is known as Bada Gokshura.

Ayurvedic pharmacopoeia refers Tribulus terrestris Linn. as Gokshura and it should be used in the preparation of various formulations. Only the fruits are available in the market. None of the samples examined contain roots of the plant. Besides this, fruits of bada Gokshura (Pedalium murex Linn.) also sold under the name of Gokshura.

None of the standard textbooks describe any method to differentiate the fruits of Pedalium murex Linn. from the fruits of Tribulus terrestris Linn., especially when it is in the powder form. Considering this, it is planned to study the characteristic features of both these fruits to find out the morphological and microscopic differences.

Address for correspondence: Dr. Jignesh Kevalia, Institute of Ayurvedic Pharmaceutical Sciences, A. K. Jamal Building, Gurunanak Road, Jamnagar – 361008, Gujarat, India. E-mail: vjyew@yahoo.com

Materials and Methods

Fully grown, whole plants of Tribulus terrestris Linn. were collected from the campus of Gujarat Ayurved University. Authentication of the herb was done by experts at university by comparing the characteristics of the plant mentioned in botanical texts[9] and other floras.[10,11]

The fruits were separated out from the plants, and then thoroughly washed in running water and dried, first in the shade and then in a hot-air oven at 50–60°C. After drying, 40–60# powder was prepared separately and stored in labeled bottles (40-60 #).

Dried samples of Gokshura available in the market were also collected from various regions of India, including Jamnagar (Gujarat), Mumbai (Maharashtra), Delhi, and Indore (Madhya Pradesh). The samples were identified to compose the fruits of Pedalium murex Linn. Pharmacognostical study[3,12] of both the fruits were carried out.

Fruits of both the plants were studied morphologically, with the naked eye and also under a dissecting microscope. Fruit powders of the two plants were made and studied under a simple compound monocular microscope. Specific characteristics were noted and drawn with the help of a camara lucida in the Pharmacognosy Laboratory, IPGT and RA, Gujarat Ayurved University, Jamnagar.

Observations

The morphological characteristics of the fruit of Tribulus terrestris Linn. [Figures 1 and 2] and Pedalium murex Linn. [Figure 3] are shown in Table 1.

The microscopic characteristics of the fruit of Tribulus terrestris Linn. [Figure 4] and Pedalium murex Linn. [Figure 5] are presented in Table 2.
Kevalia and Patel: Pharmacognosy of *T. terrestris* and *P. murex*.

Figure 1: *Tribulus terrestris* Linn. (1) Fruiting and flowering twig of plant, (2) Root of the plant

Figure 2: (1) Upper surface of leaflet, (2) Lower surface of leaflet, (3) An overview of flower, (4,5) Fruits from different view, (6) Diagrammatic TS of fruit, (7) Single coccus. End. – Endocarp S. – Seed Ep. – Epicarp S.Sp. – Small Spine L.Sp. – Large Spine Tr. – Trichome Mes. – Mesocarp V.B. – Vascular Bundle

Figure 3: *Pedalium murex* Linn. (1) Twig, (2) Fruit, (3) Diagrammatic TS of fruit, (4) Flower. End. – Endocarp S. – Seed Ep. – Epicarp Scl. – Sclerenchyma Mes. – Mesocarp V.B. – Vascular Bundle

Results and Discussion

*Tribulus terrestris* Linn., (Zygophyllaceae), one of the classical drugs in Ayurveda, is an ingredient in many formulations. The drug is often substituted with fruits of other plants, like *Pedalium murex* Linn. (Pedaliaceae).

The most diagnostic morphological characters of *chhota Gokshura* fruits are globose or nearly globose with five coccii, ribbed, pubescent, woody, warty consisting two spreading spines at each cocci and attached pedicel with greenish yellow color, slightly aromatic odor and slightly bitter and astringent in taste; microscopically fruits can be easily differentiated by simple, straight, unicellular with bulbous base, very few are short narrow, usually bent at the base forming U curvature and sickle

Figure 4: Histological characters of fruit of *Tribulus terrestris* Linn. (1) Trichomes – wooly and glandular, (2) Epicarp cells showing anomocytic stomata, (3) Simple, circular starch grains, (4) Clusters of calcium oxalate crystals, (5) Endosperm cells containing oil globules, (6) Endosperm cells containing starch grains, (7) Xylem vessels with spiral thickening, (8) Endocarp cells with striated cuticle of testa, (9) Group of thin walled sclerenchymatous fibres, (10) Group of stone cells of mesocarp

Figure 5: Histological characters of fruit of *Pedalium murex* Linn. (1) Glandular trichomes and striated epidermal cells with cicatrix, (2) Epicarp in surface view shows striated cuticle and anomocytic stomata, (3) Parenchyma of mesocarp shows vascular strands with pitted and spiral thickening, (4) Sclereids with various sizes and thickening of mesocarp, (5) Epidermal cells of calyx containing colouring matter, (6) Inner layer of testa, (7) Sclereids of testa
Cells filled with starch
Not observed

| Table 1: Morphological characteristics of fruits of *Tribulus terrestris* Linn. and *Pedalium murex* Linn. |
|---------------------------------------------------------------|
| **Tribulus terrestris** Linn. | **Pedalium murex** Linn. |
| **Shape** | Globose or nearly globose, with five coccii and an attached pedicle | Ovoid, globular, four-ridged, with four spreading spines at the base |
| **Size** | About 1.3 cm in diameter and 8.5 mm thick | 1.5 cm in length and 1 cm in diameter; attached with a short curved pedicle and having a terminal apex |
| **Surface** | Ribbed, pubescent, woody, and warty; two spreading spines in each coccii | Glabrous; but sometimes it is being attacked by some insect or pest, living a fibrous like skeleton seen on the surface |
| **Texture** | Hard | Hard, fibrous |
| **Colour** | Greenish-yellow | Light or dark brown |
| **Odor** | Slightly, aromatic | Odorless |
| **Taste** | Slightly bitter and astringent | Sweet, mucilaginous |

shaped and some are with huge convex bulging base; starch grains in endosperm cells; stone cells in mesocarp; and cluster crystals of calcium oxalate.

While the diagnostic characters of *Bada Gokshura* fruits are ovoid, globular, four-ridged with four spreading spines at the base, glabrous, sometimes found to get attacked by insects leaving fibrous skeleton of the fruit behind with fibrous and hard texture having light dark brown colour, odorless and sweet mucilaginous taste and microscopically it can be differentiated by presence of glandular trichomes sometimes sessile with 4 celled head; sclereids with different thickened lumen and cells of the calyx containing coloring matter.

The distinct characteristics of the fruits of the two plants shows that they can be easily distinguished from each other.

**Conclusion**

In the Ayurvedic pharmacopoeia the use of the root of *Tribulus terrestris* Linn. is mentioned but, in practice, it is the aerial parts, especially the fruit, that is commonly used. Very often, fruits of other species (like *Pedalium murex* Linn.) are also incorporated in the formulation.

On the basis of the morphological and microscopic characteristics one can easily distinguish the fruits of these two plants from each other. Knowledge of these distinguishing characteristics will be useful in identifying a genuine drug.

**References**

1. Vaidya Bapalal. Some Controversial Drugs in Indian Medicine. 12. Varanasi: Chaukhambha Orientalia; 1982.
2. Anonymous. Ayurvedic Formulary of India, II Edition, Govt. of India, Ministry of Health and Family Welfare, Dept. of Indian System of Medicine and Homoeopathy, New Delhi, 2003.
हिन्दी सारांश

ट्रिब्युलस टेरेसस्ट्रिस एवं पेडालियम म्युरेक्स के फलों का परिचय – एक औषध अभिज्ञानीय अध्ययन

जिग्रेश केवलिया, भुपेश पतेल

गोशुर आयुर्विदिक चिकित्सा पद्धति में प्रचलित अनेक औषध योगों का प्रसिद्ध घटक द्रष्य है। आयुर्विदिक फार्माकोपिया के अनुसार गोशुर का स्फोट ट्रिब्युलस टेरेसस्ट्रिस है, जिसका प्रयोज्यमांग मूल और फल है। व्यवहार में अन्य औषधीय पादप पेडालियम म्युरेक्स के फलों का अपमिश्रण गोशुर के फलों में देखा जाता है। अतः इन दोनों पादपों के फलों की लाभकारी मिश्रित जानने हेतु औषध अभिज्ञानीय अध्ययन रथ्य और सूक्ष्म परीक्षण से किया गया है। इस अध्ययन का परिणाम वास्तविक द्रष्य में अपमिश्रण आदि को सुनिश्चित करने में सहायक होगा।

Announcement

“QUICK RESPONSE CODE” LINK FOR FULL TEXT ARTICLES

The journal issue has a unique new feature for reaching to the journal’s website without typing a single letter. Each article on its first page has a “Quick Response Code”. Using any mobile or other hand-held device with camera and GPRS/other internet source, one can reach to the full text of that particular article on the journal’s website. Start a QR-code reading software (see list of free applications from http://tinyurl.com/yzlh2tc) and point the camera to the QR-code printed in the journal. It will automatically take you to the HTML full text of that article. One can also use a desktop or laptop with web camera for similar functionality. See http://tinyurl.com/2bw7fn3 or http://tinyurl.com/3ysr3me for the free applications.