

## Verifying the Scientific Name of Costus [*Saussurea lappa* (Decne.)C.B.Clarke.) – Asteraceae]

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*Abstract.* Costus is the root of *Saussurea lappa*, ((Decne.)C.B.Clarke.) Asteraceae), an aromatic perennial plant growing in the open slopes of India and Kashmir, its essential oil is used as tonic, stimulant and antiseptic differs from *Costus spicatus* (Jacq.) S.w., (Costaceae) belong to order Zingiberales. There is a nomenclature confusion between *Saussurea lappa* and *Costus spicatus*, due to the uses of the same Arabic name "Costus". It was found that both species are really separated from each other through anatomical investigations where the former belong to dicotyledoneae group and the latter to monocotyledoneae.

### Introduction

The idea for this research was initiated by a query from a M.Sc. Biochemistry student who brought a number of unidentified roots to the Botanical Department in Faculty of Science, King Abdulaziz University for taxonomical identification. She mentioned that there are several medical applications for these roots which collectively bear the Arabic name Qust.

Upon reviewing the Guide to the global sources of beneficial plants<sup>[1]</sup>, which explains many species of Costus, and stressed the medicinal benefits of three types. First one is beautiful Qust *Costus speciosus* which is also called Arab Qust or *C. arabicus*, spreads naturally in South-East Asia' from the mountains and even Himalaya, the Philippines and Taiwan. Grown in India, Indonesia and the fresh roots

are eaten because it contains about 24% starch, and it is also used therapeutically in the chest, coughing and asthma. The second is African Qust *Costus afri*, the British call it Ginger lily easy widespread in tropical Africa and its roots are used to prepare pulp for paper-making, either root powder is used medically for coughing. The third type is *Costus villiosissimus* synonym *Costus spetimus* & *Costus spicatus* spreading in Colombia and tropical America, especially in Peru, Guyana, used medically to treat bronchial and intestinal fever, including in particular, Altthphus fever. These information supported the hypothesis of an existing misnames or mixed naming between the Qust expressed by Prophet Muhammad (PBUH) and the one described by the Guide to the global sources of beneficial plants. Therefore this research question was able to solve the misnomously of the two *Costus* plants. Furthermore, the great emphasis recently anticipated an alternative medicine which has been a motivating factor for this research.

### Materials and Methods

A scientific method of research was elicited by the observation of the two roots, similar in many characters, but differ in color (black and white). Both were named *Costus* plant (Qust). A research hypothesis developed, where it is a synonymous (two similar names of two different plants) or a misnomous (wrong naming to two different plants). Then a scientific method of inquiry was initiated:

1. The first method was the morphological identification of the whole plant related to its family.
2. The second method described the anatomical features of the roots provided of the two plants.

### Results

**A. *first result will be*** through the internet search and according to the Floras of India and Himalaya. It was possible to describe morphologically two types of plants named *Costus* related to two different families (Atkinson<sup>[2]</sup>, Murti<sup>[3]</sup> & Jose<sup>[4]</sup>):

### A.1 – Morphological Description of *Costus Spicatus* (Jacq.) S.w. Plant (Fig. 1&2)

The plant grows in Tropical America to about 6 to 7 feet tall. Leaves are about a foot long and about 4 inches wide. Plant produces a short cylindrical red cone with red-orange flowers emerging one at a time, long lasting and used as a cut flower, it grows in the sun if kept moist. These plants often have close interactions with ants. The plant makes sugary nectar which is attractive to many different kinds of ants. (Gilman,<sup>[5]</sup>) A new steroidal saponin has been isolated from the rhizomes of *Costus spicatus* and its structure was elucidated as (3 $\beta$ ,22 $\alpha$ ,25R)-26-( $\beta$ -D-glucopyranosyloxy)-2-methoxyfurost-5-en-3-yl-O-Dapio $\beta$ Dfuranosyl-(1 $\rightarrow$ 4)-O-[ $\alpha$ -L-rhamnopyranosyl-(1 $\rightarrow$ 2)]- $\beta$ -D-glucopyranoside by means of IR, MS NMR and chemical evidence (Bernadete *et al.*<sup>[6]</sup>). Two flavones diglycosides, tamarixetin 3-*O*-neohesperidoside, kaempferide 3-*O*-neohesperidoside and the known quercetin 3-*O*-neohesperidoside, together with six other known flavonoids were isolated from the leaves of *Costus spicatus* and their structures were elucidated by a combination of spectroscopic and chemical methods. The flavones diglycosides were evaluated for inhibitory activity of nitric oxide production by activated macrophages (Bernadete *et al.*<sup>[7]</sup>).



### A.2 Morphological Description of *Saussurea lappa* ((Decne.) C.B.Clarke.) Plant (Fig. 3, 4&5)

*Saussurea lappa* is found at elevations of 8000 to 13000 feet. It was used by the Romans as a culinary spice also as a perfume. Plant is a tall, perennial herb up to 2 m high. Leaves, heart-shaped, are very



large at the base born on the winged stalks and upper leaves are smaller, sometimes with two lobes at the, base of the leaves, almost clasping the stems.

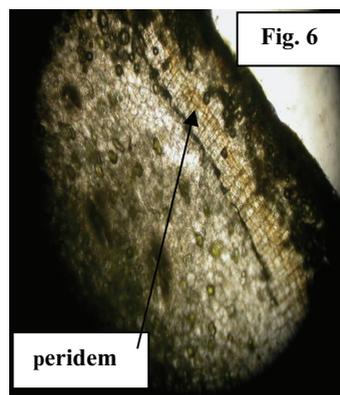
Flowers are about 2 centimeters long, bluish purple or almost black, borne on rounded flower heads; few flower heads are clustered together. Pappas is about 1.7 cm long, feathery, giving a curious, fluffy appearance to the fruiting flower heads. Fruits hairy, the dried roots of the plant constitute the drug. It was dug up and cut into small pieces and shipped to Rome and China. The root is generally of the size of a finger with a yellowish woody part and a dark bark. The Indian origin of Costus is evident from the fact that the word is derived from the Sanskrit term "Kustha" which means 'that which stands in the earth'. This word was perhaps used as Costus was a root. (Polunin and Stainton,<sup>[8]</sup>)



**B. Second results** will be through the anatomical investigation of the two provided roots.

Segments of the two adventitious roots (black and white roots) were fixed in preserved material in F.A.A. (Formalin - acetic acid - alcohol 5:5:90) – were free sectioned (T.S from 20-50  $\mu\text{m}$  thick) using table microtome were taken, after dehydration in alcohol xylol series; and mounted in Canada balsam. (Waly<sup>[9]</sup>) Photographs were taken using a Nikon Camera.

**B.1)** Cross section in white root show that a suberized thick wall cells periderm, (Fig. 6) as outer most layer. Cortex formed of reserved parenchyma cells full of reserved food materials, a large vascular cylinder in the center of the root with number of xylem vessels in its periphery



(Fig. 7), and small amounts of phloem cells in between, while large amount of parenchyma cells occupying the center of the root, pith, without any secondary growth, indicating a monocot root type.

**B.2)** Secondary growth occurs in black roots usually results in the thickening of the root diameter by the addition of vascular tissue.

Initiation of secondary growth occurs when cells in the residual procambium and parts of the pericycle begin to make periclinal divisions.

Only the pericycle cells opposite the xylem points start to make periclinal divisions. The inner layer of cells becomes the vascular cambium. The outer layer is retained as pericycle. The vascular cambium is continuous around the primary xylem.

The vascular cambium continues to divide periclinally.

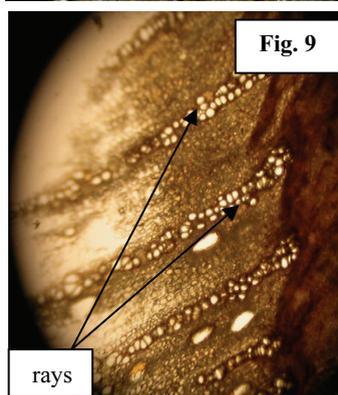
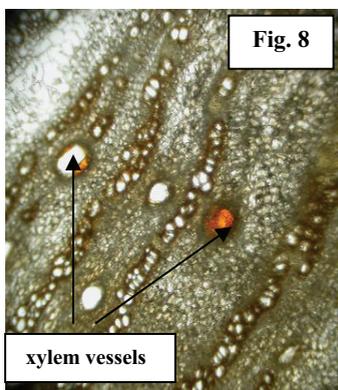
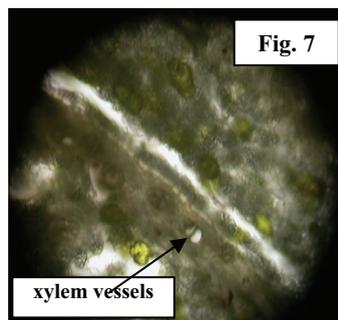
The daughter cells that result from these divisions differentiate into secondary xylem cells if they divide off towards the inside of the root or secondary phloem cells if they divide towards the outer surface of the root (Fig. 8).

After many cell divisions and cell differentiation, a root is exhibited.

Secondary growth might look like the one depicted in the diagram to the right. Also number of parenchyma rays appear between xylem vessels (Fig. 9).

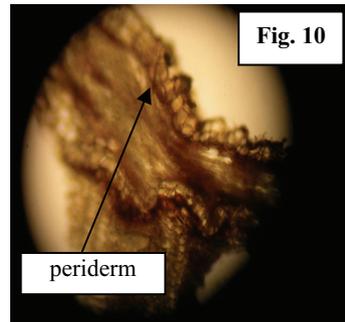
Black roots also form an outer protective layer called the periderm which originates from the pericycle and replaces the epidermis.

The pericycle resumes its meristematic character and begins to divide periclinally



again. At this point it is called the phellogen or the cork cambium (Fig. 10).

The cork cambium forms phellen cells (cork cells) towards the outside of the plant. These cells are dead at maturity. They are suberized, which makes the cells impermeable to water. The cork cambium also produces the phelloderm, a tissue consisting of cells that are living at maturity, indicating a dicot, root type with normal secondary growth.



### Discussion

Plant taxonomic studies were initiated and developed to provide comprehensive descriptions and classify the enormous species of plants in the world, into different phyla and families. These classifications help those interested in botany and all other various sciences derived from, and related to it, to understand the morphological characters in relation to the anatomical features, as well as the various extracts which are used in the medicinal, pharmaceutical and therapeutic fields.

After the scientific query of the postgraduate student who brought the types of *Costus* roots, the author of this paper was motivated to conduct this research based on scientific evidence, going on scientific methodologies and inspired by the statements of Prophet Muhammad (PBUH) on the benefits and therapeutic effects of using this plant as a remedy for illnesses of different body symptoms. Results of this search showed that the morphological of the plants indicates two different species the white root was *Costus spicatus*, related to family Costaceae belong to order Zingiberales of Monocot type and the black roots was *Saussurea lappa*, related to family Asteraceae belong to order Cucurbitales of Dicot type. However this morphological description did not put the final touches as this classification is supported by anatomical root investigation indicating the taxonomical difference between the two plants. Finally the *Costus* described by Prophet Muhammad (PBUH), is *Saussurea lappa* ((Decne.)C.B.Clarke.).

## Recommendations

Based on the previous research it is recommended that:

1. Both morphological and anatomical characters can be used for plant identification.

2. Inspiration from prophetic medicine can be leading for scientists to throw light on many unknown plants which when studied would provide therapeutic and medicinal benefits.

3. According to the benefit of Qust (*Saussurea lappa*) it might be used in all types of phlegmatic diseases. It is effective in general weakness after diarrhea and cholera. From olden days, even the days of Prophet Muhammad (PBUH), it was used to wash the internal organs by the females after the menses. Oil prepared by Qust and olive oil is effective against Alopecia and tones up the body. It is a good remedy for freckles and chloasma if applied on face; with vinegar it is effective in Ringworm. The modern researches suggest that it is a blood purifier, Antiseptic and increases the cetaceous circulation. It is a good insect repellent. Hence, might be used to keep off the insects from the clothes. Internally it is a good expectorant, anti-spasmodic and Neurotoxin, hence, might be used for cough, Bronchitis, Bronchial Asthma, Paralysis, facial Palsy and Neurasthenia.

## References

- [1] **Foul and Mafif**, *Guide to the Global Sources of Beneficial Plants*, Moscow, Russia (1952).
- [2] **Atkinson, J.E.T.**, *Flora of Himalayas – with Special Reference to Kumaon, Nepal and Tibet* (1998).
- [3] **Murti, S.K.**, *Flora of Cold Deserts of Western Himalaya*, Vol. I. Monocotyledons Calcutta (2001).
- [4] **Jose, J. and Rajalakshmi, R.**, *Medicinal and Aromatic Plants: Essential Oils and Pharmaceutical Uses*, New Delhi (2005).
- [5] **Edward F.G.**, Fact Sheet FPS-152. Series of the Environmental Horticulture Department, Florida Cooperative Extension Service, *Institute of Food and Agricultural Sciences, University of Florida* (1999).
- [6] **Bernadete P. da Silva, Robson R.B. and José P.P.**, A furostanol glycoside from rhizomes of *Costus spicatus*, *Photochemistry*, **51(7)**: 931-935 (1999).
- [7] **Bernadete P. da Silva, Robson R.B. and José P.P.**, Flavonol glycosides from *Costus spicatus*, *Photochemistry*, **53(1)**: 87-92 (2000).
- [8] **Polunin, O. and Stainton, A.**, *Flowers of the Himalayas*, Oxford University (1984).
- [9] **Waly, N.M.**, Wood anatomy of some Egyptian woody perennials and its adaptation to Environmental conditions, *Taekholmia*, **13**: 43-52 (1991).

## تحقيق الاسم العلمي لنبات القسط *Saussurea lappa* (العائلة المركبة)

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المستخلص. القسط وهو جذور نبات *Saussurea lappa* الذي ينتمي للعائلة المركبة، وهو نبات موسمي ينمو في مرتفعات الهند وكشمير. يستخدم الزيت المستخلص منه طبياً كقابض، ومطهر، ومضاد للالتهابات المختلفة، وهو يختلف عن نبات *Costus spicatus* الذي ينتمي لعائلة Costaceae، وهناك خلط بين النباتين *Saussurea lappa* و *Costus spicatus* بسبب استخدام نفس الاسم العربي "القسط".

بدراسة التركيب التشريحي لجذور النباتين موضع الدراسة أمكن حل هذه المشكلة موضعاً الفروق التشريحية و التصنيفية بينهما، حيث ينتمي النبات الأول إلى النباتات ذات الفلقتين والثاني إلى النباتات ذات الفلقة الواحدة.