



The identification, etymology and uses of *Bombax ceiba* (semal) sold by street vendors as *Semarkanda*: a review

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Abstract

The paper deals with the identification of a taproot sold by the street vendors under the name ‘semar-kanda,’ ‘semar-musalī’ or ‘Ram-kanda’ as *Bombax ceiba* (*semala*). The nomenclatural history, botanical description, chemical composition and uses of the plant parts of *Bombax ceiba* (*semala*) along with folk-uses and a report of Yellow flower by Charles McCann is also been reviewed. The Sanskrit names given in *Amarakośa* and their etymology are discussed. The formation of gum (*moca-rasa*) and its chemical analysis and the myths associated with the plant by the tribals are discussed. It is concluded that ‘semar-musalī’ or ‘semar-kanda’ and ‘moca-rasa’ sold in the bazaar are the products of *Bombax ceiba*. The mystery of the formation of the gum *moca-rasa* has also been discussed as to whether it is of fungal or insect origin?

Keywords *Moca-rasa* · Mythical & tribal folk story · Pharmacology · *Ram-kanda* · *Semar-musalī* · *Semur-kanda*

1 Introduction

Long back in Madhya Pradesh near Pachmarhi I came across a plant, not in flowering. My guide had identified the plant as ‘semar-kanda’ and told me that its root is very valuable and sold in the market. The plant was dug to see how the root looks like. It was only 1 m high, a young tree of *Bombax ceiba* syn. *Salamalia malabarica* (*Semala* or *Semara*). It was a very laborious and time taking job and even in 4 h of labour we were able to dig out a portion of a thin taproot, not more than a foot. Then, I remembered a person selling peace of thick root cut into slices near Hazrat Ganj in Lucknow about 10 years ago. After retirement, I visited the famous shrine of Punyagiri (Tanakpur) for *darśana* with my wife and saw a small shop selling the same tuberous root on way to the temple uphill. The tired pilgrims, who were approaching the temple for *darśana* were relishing the slices of the tuberous root. The root being sold were about a meter high and about 8–10 cm in diameter (thick) and fleshy. I tasted and found it as was sweet, cold, and very refreshing. The roots were sold in form of fresh transversely cut slices at Rs.5/- per full slice or Rs.2/- per one-fourth of the slice in

2015. In Hazrat Ganj, Lucknow, these were sold at Rs.1/- per slice in 1970.

In the present article, the description of the genera *Bombax* and the species *ceiba* of family *Bombacaceae* found in India is discussed. The nomenclatural history of the medicinal taxa of *Bombax ceiba* and *Ceiba pentandra* L. along with their Sanskrit names mentioned in *Amarakośa* are given. The botanical description of the plant parts used and chemical composition of various parts, mainly the taproot of *Bombax ceiba* (*semala*) known as ‘semur-kanda’ has been reviewed along with its uses. The formation of gum (*moca-rasa*) is a mystery and its chemistry is reviewed. Finally, the Indian and tribal myths associated with the tree are dealt with.

2 *Bombax ceiba* (*Bombacaceae*)

Bombax a small genus with 10 species is an African Indo-Malayan genera distributed in tropical Asia and Africa. However, the species *B. ceiba* is an important taxon distributed mainly in India, Ceylon, S.E. Asia, Queensland (Australia), and Yunan (China). In the year 1824, De Candolle named the species as *Bombax malabaricum* not knowing that it had already been designated by Linnaeus in 1753 and named it as *Malabaricum* on account of the species being first reported from Malabar in Rheede’s ‘*Hortus*

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Malabaricus'. This binomial was used by many leading botanists of the past like Hooker's Flora, Brandis, Talbott, and Cooke, Duthie, Parker, Osmaston, etc. Then, in 1827 Buchanan & Hamilton kept it under the genera '*Gossampinus*', i.e., *Gossampinus rubra* Buch.Ham meaning the 'cotton-pine tree' and '*rubra*' meaning the red flowers. He was also not aware of the earlier naming of the plant by Linnaeus and De Candolle, however, later Merril in 1927–28 also named it as *G. malabaricus* which was used by McCann (1966). It is interesting to note that a yellow-flowered form has been reported to exist and is called the *varma-druma* or the tree of the infernal regions or the god of death, because it makes a great show of flowers, and produce no edible fruits. The cut branches exude mucilage in water. The flowers open at night and are visited by fruit-bats for the nectar (McCann, 1966, p. 129). Xiang and Ren (2019) has also reported yellow flowers from China. It has also been reported from Himachal Pradesh and Chandigarh.

At present, the genus *Gossampinus* is invalid and in the year 1832 Schott and Endlicher named it as *Salmalia malabaricum* (DC) from its Sanskrit name *sālmali* and many botanists also used this name like Stewart (1972), who had worked on the vascular plants of Pakistan & Kashmir. Now, it is realized that *Salmalia* created by Schott & Endlicher is a new genus and has presently 10 species. *Bombax ceiba* L. was another name given to the same species by Linnaeus, which is also taken to be a valid name.

Sanskrit names No reference to *sālmali* has been found in the Vedic texts (Sharma, 1969). It was first mentioned by Amarasingha in his treatises *Amarakośa*, which contains plant names and homonyms, and synonyms. It has around ten thousand words in it. In other words, it is a Sanskrit Dictionary, which gives all Sanskrit names, their synonyms with its etymology of the important plants, animals, Gods, rivers, mountains, etc. Later Amarasingha's work was collected and compiled in 1600 CE under the name *Nāmlingānusāsana Amarakośa*. Amarasingha was one of the nine courtiers of king Vikramaditya Chandra Gupta II, the a great emperor of ancient India. Often characterized as a legendary king, he is known for his generosity, courage, and patronage to scholars. The other eight courtiers were Dhanvantri (great physician); Harisena (who composed the *Prayāg Praśasti* or Allahabad Pillar Inscription); Kalidasa (a writer and a peerless genius, whose works became famous worldwide in the modern world); Kahapanka (an astrologer); Sanku (an Architect); Varahamihira (a grammarian and a Sanskrit scholar); Vararuchi (a grammarian of the Prākrit language); and Vetalbhatta (a magician). According to morphology, uses etc. in *Amarakośa* the Sanskrit names along with their meanings for *semara* (*Bombax ceiba*) are given as *picchilā* (soft, smooth and greasy nature of the exudation), *pūrnī* (complete and fully grown stout tree), *moca* (the gum exudates), *sthirāyu* (which lives live for hundred years or long-living)

and *sālmali* (a tree with thorns) (Sastri, 2011, p. 184). Similarly, its gum is known as *moca-rasa* meaning soft, smooth and greasy nature. Later on other names given to *Bombax ceiba* are *rakta-puṣpa*, *tula-vrkṣa*, *kantaka-nkādhyāya*. Sanskrit names were also given to *Ceiba pentandra* L. the other medicinal taxon of family *Bombacaceae* as *rocana* meaning majestic, tall, and beautiful; and *kūṭa-sālmali* meaning false and black *semala* tree (Sastri, 2011, p. 185).

3 Features of *Bombax ceiba* tree and uses

It is a lofty, deciduous tree up to 30–40 m tall and 4–6 m or more in girth and buttressed at the base and in aged plants up to 2–3 m with horizontally spreading branches. Barks are pale ash to silver grey. The young stem and branches are covered with sharp, straight, stout prickles up to 1–2 cm long with woody conical bases. The numerous large red cup-like flowers reaches up to 10–13 cm in diameter, filled with copious nectar and fall off after fertilization. The sepals and petals are fleshy and sour to sweet. It is stated that vegetable is also prepared of the shed sepal, petals, and the stamens. The tree has a thick taproot but to further support, it is invariably buttressed at the base and goes up to 5–6 m in height (Fig. 1).

Fruit The fruit is a black-brown capsule roughly egg-shaped in structure. It is 10–15 cm long, 3–5 cm thick, and consists of five stout woody valves, filled with numerous

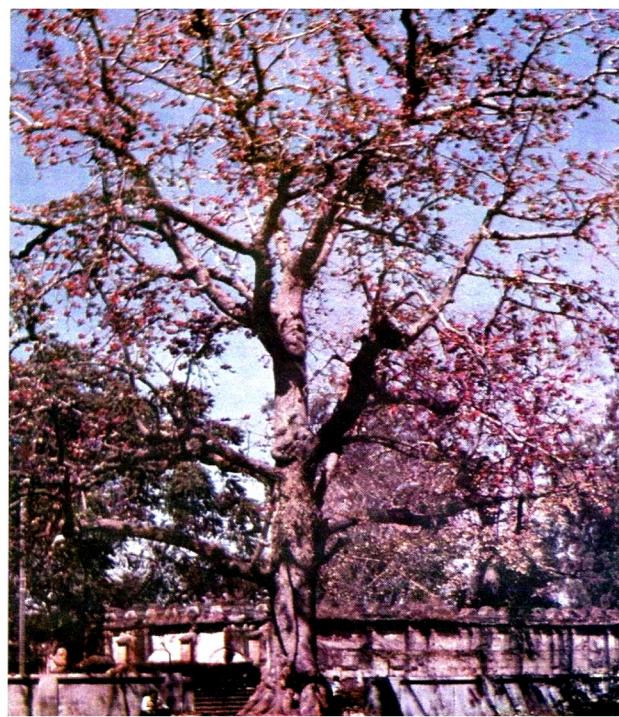


Fig. 1 The majestic tree of *Bombax ceiba* or *Semala* tree (Wikipedia)



black seeds irregular obovoid, smooth, oily with dense silky hair. The fruit pulp is sweet and edible. There are reports from India that immature fruits are eaten. At maturity, the valve opens out and the seeds with silky hairs fall away from the rest of the fruit. The seeds are small brown or black, obovoid, smooth, 6–9 mm long in size. The seeds are oily and surrounded by a thick mass of long silky hairs or called floss, hence easily blown by the wind and disseminated. All the five parts (*pancāṅga*) of *Bombax ceiba* (*semala*) root, stem, bark, flowers, leaves, are used in Ayurvedic formulations. The gum exudates (*moca-rasa*) is singularly used and its ayurvedic preparations are *laghugangādhara curṇa* and *abhayariṣṭa*. *Śālmali-ghṛta* and various other aphrodisiacs, restorative and expectorant preparations are made from the five parts (Dey, 1980; Garga, 1985).

The Gum (moca-rasa) According to Dey (1980) the stem exudates gum known as *moca-rasa*, which is stated to be a product of a diseased action like the Agarwood tree, which consists in a proliferation of the parenchyma cells of the bark. The diseased part contains a semi-transparent jelly-like substance, consisting of oblong cells containing a little granular matter and a small group of starch cells. At the margin of the cavity, the columns of healthy cells are seen breaking up and the cells separating to join jelly-like mass. This gradually increases in size and finds its way to the surface to be extracted as *moca-rasa*. When, first exuded it is a whitish fungus mass, which gradually turns red, and finally dries into brittle mahogany-colored tears like mass. The larger tears are hollow in the center, the cavity being produced during the gradual drying of the jelly-like mass. When soaked in water, it swells up and resembles very much as the appearance of the fresh exudation. The taste is purely like tannin. The gum contains, catechu-tannic acid and is aphrodisiac, demulcent hemostatic, astringent, tonic alternative, and used in diarrhea, dysentery, and menorrhagia (Chopra et al., 1956). The methylated gum on hydrolysis yielded 2,3,4,6-tetra-O-methyl-D-galactose; 2,6-di-O-methyl-D-galactose; 2,4-di-O-methyl-L-arabinose; 2,5-di-O-methyl-L-arabinose; 2,5-di-O-methyl-L-arabinose (Ikram & Hussain, 1978). According to Farooqi (2008), it is simply composed of L-arabinose, D-galactose, D-gluconic acid, and traces of L-rhamnose along with tannic and gallic acid and used in pulmonary tuberculosis, menorrhagia, acute dysentery, etc. in the Unani system of medicine. Rastogi and Mehrotra (1995) and Debarupa et al. (2010) have only reviewed the pharmacology of different parts of the plant. Recently, Shekkar (2016), Fatima et al. (2018) and Akhtar and Siddiqui (2019) have given a comprehensive review of other parts of plants and *moca-rasa*.

Root Ikram and Hussain (1978, p. 66) reviewed that roots yielded a mixture of polysaccharide containing varying proportions of D-glucose, D-galactose, D-xylose, and L-arabinose together with uronic acid and traces of r-rhamnose,

n-hexacosanol; palmitic acid, octa-decyl-palmitate, gallic acid, tannic acid, I-galloyl-β-glucose ethyl gallate, tocopherols, carotenoids, and unidentified terpenes. The root is rich in calcium and higher content of calcium (93 mg/100 g) makes it a calcium rich food for calcium deficient rural population (Rastogi & Mehrotra, 1995).

Later, Chakraborty and Chakraborty (2010), further reviewed the chemical constituents of the roots and reported nine cadinene sesquiterpenoids, including five new compounds bombamalones A–D; bombamaloside, and four known compounds (isohemigossypol-1-methyl ester; 2-O-methylisohemigossylic acid lactone; bombax quinone B; and lacinilene C). Further, a sesquiterpene lactone has also been reported from the root which was previously identified as hemigossylic acid lactone-7-methyl ether. Two-dimensional nuclear magnetic resonance experiments have shown it as a new compound, isohemigossylic acid lactone-2-methyl ether acid, I-galloyl-β-glucose ethyl gallate, tocopherols, carotenoids, and unidentified terpenes. Root tubers from a young plant with a height of 0.5–1.0 m are generally used in the form of transversely cut thin slices as a refrigerant, cooling and as a tonic, however, it is known that it contains many sugars which act as energy giving and invigorating (Fig. 2).

However, Chopra et al. (1956) reported that young plant root contain protein 1.2%, fatty matter 0.9%, phosphatides (cephaeline) 0.3%, semal red 0.5%, tannins 0.4%, arabinose and galactose 8.2%, pectous matter 6.0%, starch 71.2% and mucilage consists of salicophosphoric ester of mannogalactan. However, the taproots of the tree are edible and known as '*semara-kanda* or *semala-musalī*'. They are rich in calcium, protein, and phenolic content (Chadha, 1972). It is reported that various parts are used as an anti-inflammatory, hepatoprotective, hypotensive, anti-angiogenic, antioxidant,



Fig. 2 The tubers are sold in form of cut slices near the temple in Punyagiri in Tanakpur (Uttarakhand) and occasionally in U.P., Orissa and Madhya Pradesh. (Note This is the first-ever published photograph of the tap-root or tuberous-root, known as *semara-kanda*)



Fig. 3 Left: a transversely cut root-tuber; right: thin fleshy cut slices and sold either full or half or quarter



Fig. 4 A branch of *Bombax ceiba* laden with flowers (Wikipedia)

and analgesic agent and important phytoconstituents such as naphthol, naphthoquinones, polysaccharides, anthocyanins, shamimin, and lupeol. Jain et al. (2007), for the first time, investigated that the plants need conservation as during the Holi festival several plants are uprooted and burnt during *Holikādahana* in most places of Rajasthan. The dry root powder of this plant was investigated for its antioxidant potential for the first time in a clinical trial and the preliminary phytochemical screening of the roots showed the presence of phenolics, tannins, flavonoids, steroids, saponins, and cardiac glycosides and validated its uses in diabetes mellitus and heart disease as described in the traditional medicine (Jain et al., 2011a, 2011b) (Fig. 3).

Flowers The flower are found to contain three new compounds, bombasin, a colorless gum with molecular formula ($C_{19}H_{20}O_6$); bombasin 4-O-*b*-glucoside, a white amorphous powder, with molecular formula $C_{25}H_{30}O_{11}$, and bombalin, white amorphous powder with molecular formula ($C_{16}H_{18}O_8$) (Fig. 4). These were isolated by 70% (v/v) aq. Et OH at room temperature for three days which was then further extracted with BuOH five times and then the compounds were separated by Column Chromatography



Fig. 5 A complete flower showing pedicel, fleshy—calyx, red corolla, stamens, and pistil in the center (Wikipedia)

(Chakraborty & Chakraborty, 2010). The stem bark has been reported to have anti-angiogenic and hypo-tensive activity. The leaf has been reported with analgesic, anticancer and anti-HIV, antioxidant, and hypoglycaemic activity (Chakraborty & Chakraborty, 2010). The calyx contain moisture up to 85.66%, crude protein 1.38% and carbohydrate 11.9% (Ikram & Hussain, 1978, p. 66) (Fig. 5).

Fresh petals The petals contain aromatic oil (still not analyzed), hentriacontane, hentriacontanol, quercetin, kaempferol, β -sitosterol, and its glycosides, pelargonidin and cynadin glycosides (Asolkar et al., 1992). The flowers are cooked and used as a vegetable in many places (Fig. 6).

The seeds The seed oil contains saturated fatty acids, 32.94%; oleic acid, 48.38% and Linolenic acid 18.86% (Ikram & Hussain, 1978, p. 66). It also contains, gallic acid and ethyl gallate (Oliver-Bever, 1986, p. 144). The oil is reported to be used in the treatment of enteritis, dysentery, lymphoedema, menorrhagia, hepatitis, etc. (Ikram & Hussain, 1978, p. 66). In West Africa, *Bombax buonopozense* P. Beuv. immature fruit is used to prepare a beverage. The young tender leaves are dried and pulverized and used as a pot-herb. Women use pounded bark to increase lactation (Andoh, 1986, p. 153).



Fig. 6 The shed flowers from the tree containing calyx, corolla and androecium, and pistil remain on the tree to form fruit



Fig. 7 The thorns on the stem as the teeth of Kalo Dānava: a myth

4 The mythical and folk stories

There are many interesting mythical and tribal-folk stories related to *semala* plant.

Why the stem bears the spiny thorns? It is stated that that once Bhima wanted to tease Draupadi and cut a joke on her, so he sent a message to her in the evening that he is having pain in his leg and she should come immediately into his room and massage the leg. He kept a log of *śālmali* covered with a bed-sheet. As it was dark in the room, Draupadi put her hand inside the bed-sheet and began to massage. The log was hard and after some time, she realized that she has been fooled, and in place of the leg of Bhima, it was a log of *śālmali* tree. She cursed the log that thorny spines may grow on it so that in future such acts could not be repeated. It is said that since then the *śālmali* tree has spiny thorns (Gandhi, 1989; Gupta, 1971).

In an Oriya tribal folklore it is stated that the Oriyan king of Judagarh had two wives but there was no issue. Someone told the king that there is a holy devil name Kalo Dānava, who was black and had many teeth in his mouth, and possibly he could help the king. Kalo Dānava was approached and he said the king to send the queens to him. The queens were sent to him and many days passed and there was no information about them. The king again sent his men. When they reached the place of Kalo Dānava they only found the left-out bones and the jewelry of the queens which they were wearing. And Dānava had fled away. He was followed by the king's army but he climbed up to a *śālmali* tree and the tree at that time did not bear any thorny spines. It was a tall tree and Kalo Dānava while climbing up pricked his tooth into the trunk so that the king's men could not follow him up. Thus, Kalo Dānava escaped and since then the tree bears thorny spines (Elwin, 1954; Gandhi, 1989) (Fig. 7).

Why the tree sheds its leaves and flowers? The *śālmali* tree like other used to bear leaves and flowers and looked majestic, gracious, and beautiful. Therefore, it became proudy and arrogant with the notion that no one can stand before him. One day, the tree was describing its beauty to *devarṣi Nārada*, who heard it and then told that there are many powerful Gods, like *Pavana* and no one can stand before him. In arrogance, *śālmali* tree challenged the God *Pavana* through *Nārada* but, realized that it could not stand before the mighty *Pavana* and became nervous. So, before *Pavana* could reach, the tree had shed all its flowers and leaves and some branches. When *Pavana* arrived, he looked at the tree and knew, what had happened? So, he cursed him that in the future, it would stand as bare tree. But, knowing that while Brahma was creating the world and became tired, he had rested under this tree. So *Pavana* became lenient and withdrew his curse and told the tree that at one time, it would lose all its flowers and leaves and but soon it would regain these (Elwin, 1954; Gandhi, 1989). Thus, the sheding cycle of the *śālmali* tree goes on.

The tree is also known as *yamadruma* i.e. the tree of God of death. It is said that in hell people are beaten with its spiny club. Further, the wood is also used in a pyre in burning the corpses. As per a Oriyan tribal story, the tree is a shelter of *bhuta ambe* (a female ghost), which always attacks young men in their dream and robs them of their virility.

5 Discussion and conclusion

No doubt a lot of work has been conducted on *Bombax ceiba* like pharmacognostic and chemical studies on the plant's parts. The information about *semara-musalī*, *semara-kanda*, the tuberous roots is presented here with photographs. The

naturally gum-like exuded material is whether a whitish fungus, or insect from the stem requires serious attention to identify its causal factor. Futher studies are required to access whether it is fungus or insect or both.

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