

Inorganic Elemental Composition of Wood of *Ficus Religiosa* L. (Peepal)

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Abstract

The total ash content and inorganic elemental compositions of the wood of Ficus religiosa L. from Nepal had been studied. The percentage of total ash content were found highest in comparison to other Ficus species. Different eight inorganic elements were detected from wet ash analysis by atomic absorption spectroscopic (AAS) method. The remarkably high concentrations of K, Ca and Mg were also reported.

Key words: *Ash, Elemental composition, Ficus religiosa, Sacred.*

Introduction

Ficus religiosa L., commonly known as, sacred fig. (Peepal)¹, belongs to the family Maraceae and is widely distributed in Nepal, India, Bangladesh, Pakistan, Srilanka, Southwest China and Indochina, all along tropical and sub-tropical regions up to elevations of 1,524m, (Neal 1965)². It is a large dry season deciduous or semi evergreen tree of 10 to 30 m tall and with a trunk diameter up to 3 m. The leaves are cordate in shape with distinctive extended tip. The flowers are unisexual, male flower very few and female flower sessile. The fruit is a small fig, 1-15cm diameter and green ripening purple. Types of root are tap root, prop root and branched. The bark is astringent sweet, cooling and aphrodisiac. The plant is considered sacred by the followers of Hinduism, Jainism and Buddhism. Hence the plant was also named as sacred fig or Bo tree. *F. religiosa* is used in traditional medicine for about 50 types of disorders including asthma, diabetes, diarrhea, epilepsy, gastric problems, inflammatory disorders, infections and sexual disorders^{3, 4}

The detail chemical composition of this sacred tree is not investigated yet. The chemical compositions of only four *Ficus* species, *F. lapathifolis* Liebm of Mexico, *F. conora* king, *F. malunuensis* Warb and *F. nota* (Blanco) Merr. of Philippines were reported in the literature (Pettersen et al.)⁵. Here, we report the determination of total ash content and Inorganic elements compositions of wood (stem) of *F. religiosa*.

The inorganic composition of wood is usually referred to as its, total ash content which is an approximate measure of the mineral salt and other inorganic materials in the fiber after combustion at temperature of 575 ± 25 °C. The total ash content is usually high in woods of tropical climate than woods from temperate zones. The inorganic content can be quite high in woods containing large amounts of silica, but in most cases it is less than 0.5% (Browning

1967)⁶. This small amount of inorganic material contains a wide variety of elements (Ellis 1965, young and Guinn 1966)⁷. Ca, Mg and K make up 80 % of the ash in wood. These elements probably exist in the wood as oxalates, carbonates and sulfate or bound to carboxyl groups in pectin materials (Hon and Shiraishi 1991)⁷. Other elements present are Na, Si, B, Mn, Fe, Mo, Cu, Zn, Ag, Al, Ba, Co, Cr, Ni, Pb, Rh, Sr, Ti, Au, Ga, In, La, Li, Sn, V and Zr (Ellis 1965)⁷. Some of these are essential for wood growth. Inorganic ions are absorbed into the tree through the roots and transported throughout the tree.

Young and Guinn (1966) determined distribution of 12 inorganic elements in various parts of a tree (roots, barks, wood and leaves) and calculated that both the total inorganic content and concentration of each elements varied widely both within and between species.⁷ The Inorganic content varies depending on the environmental conditions in which the tree lives. Petterson et. . al had given a partial list of the Inorganic content of some woods.⁷ The analysis of the cations is usually made directly after weight ashing of the wood sample, using atomic absorption spectroscopy(AAS)⁸.

Materials and Methods

Sample Preparation and Ash Content (T 211 om -93)

The plant *F. religiosa* L. were collected from Chobhar Hills at altitude of 1300 m, latitude of 27°40', 13km southwest of Kathmandu, Nepal. The collected wood (stem) samples were shade dried and ground to fine particles (40-60 mm) and oven dried. The oven dried samples were taken for analysis.

The percentage of ash content was calculated on the basis of dry weight of original sample, after the sample was ignited at muffle furnace at 575±25°C. Carefully cleaned empty crucible with cover, and ignited them to constant weight in a muffle furnace at 575±25°C. After ignition, cooled in desiccators and weighted the crucible with cover on the analytical balance. 5 gm of samples was taken on the crucible, burned sample directly over a low flame a Bunsen burner until it was well carbonized, taking care not to blow portions of the ash from the crucible. Continued heating with the burner only as long as the residue burns with of flame. Placed the crucible in furnace at 575±25°C for period of at least 3 hours a longer to burn off all the carbon. When ignition was completed as indicated by the absence of black particles, removed the crucible from the furnace, replaced the cover and allowed the crucible to cool some what. Them placed in desiccators and cooled to room temperature. Reweighted the crucible with ash and calculated the percentage of ash based on the moisture free (oven dried) weight of test specimen. Ash content was calculated by using following formula.

$$\text{Ash content \%} = (A/B) \times 100$$

Where, A = weight of ash, g and B = weight of oven dried test specimen.

Inorganic elemental Composition by Atomic Absorption Spectroscopy (AAS)

The ash was dissolved with 10-20 ml of 5N HCl, boiled the solution and made the required volume for the analysis of various elemental compositions by AAS. The series of composition of inorganic elements Mn, Cu, Fe, Zn, K, Mg, P and Ca were analyzed.

Results and Discussion

The results of findings are tabulated in the Table 1 and Table 2. The Table 1 shows percentage of the ash content of *F. religiosa* compared with the other reported species. *F. religiosa* from Nepal has shown the higher percentage of total ash (4.3%) content than *Ficus* species from Philippines and from Mexico but it is slightly lower than *Michelia* species (highest ash content in Pittersen et al) of Kalimantan, Bornea. Eight trace elements were (Table 2) found in wet ash analysis of wood samples using Atomic Absorption Spectroscopy. The compositions are given in ppm in the decreasing order as Potassium> Calcium> Magnesium> Phosphorus> Iron> Manganese> Copper> Zinc. The highest contents of Potassium and Calcium resembles *F. religiosa* wood with the tropical woods but high content of Calcium than that of temperate wood is remarkable.

Table 1: The percentage of ash content of *F. religiosa* L. (wood) with other reported species

Sample name	Country name	Total ash content (%)	Remark
<i>Ficus religiosa</i> L.	Nepal	4.3	This study
<i>Ficus conora</i> King.	Philippines	2.6	Table-IX (Petterson et al.)
<i>Ficus malunuensis</i> Warb.	Philippines	3.0	Table-IX (Petterson et al.)
<i>Ficus nota</i> (Blanco) Merr.	Philippines	4.0	Table- IX (Petterson et al.)
<i>Ficus lapathifolis</i> Liebm.	Mexico	1.7	Table-IV (Petterson et al.)
<i>Michelia</i> sp./Champaka	Kalimantan (Bornea)	4.6	Table-VIII (Petterson et al.)

Table 2: Inorganic elemental compositions of the wood of *F. religiosa* L

SN	Elements	Symbol	Composition in ppm
1	Potassium	K	1.4×10^4
2	Calcium	Ca	2.7×10^3
3	Magnesium	Mg	5.9×10^2
4	Phosphorus	P	1.9×10^2
5	Iron	Fe	79.3
6	Manganese	Mn	5.2
7	Copper	Cu	3.7
8	Zinc	Zn	3.0

Conclusion

The wood of *F. religiosa* L. contains high percentage of total ash content as that of tropical woods. The main inorganic elemental contents are K, Ca, Mg, P, Fe, Mn, Cu and Zn. These elemental compositions are reported first time from this wood species.

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