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Biochemical Evaluation of Ash Value of Some Medicinal Plants of Genus *Terminalia* (Combretaceae) of Marathwada Region in Maharashtra

¹Kadam V.B, ¹Salve S.B, ¹Deore S.V, ²Medhane V. J and ³Gaikwad V.B

¹P. G. Dept. of Botany & Research Centre, K.T.H.M. College, Nasik-422 002

²P. G. Dept. of Chemistry & Research Centre, K.T.H.M. College, Nasik – 422 002

³Director, B.C.U.D., Savitribai Phule Pune University, Pune, India

ABSTRACT

The seasonal variation of total ash, water soluble ash and water insoluble ash have been investigated in leaves, wood and bark of *Terminalia cuneata* Roth., *Terminalia bellirica* Roxb., *Terminalia chebula* Retz. and *Terminalia catappa* Linn., which are medicinally important plants. Comparative account of total ash, water soluble ash and water insoluble ash content of wood of *Terminalia chebula* showed high level of total ash in summer (12.75 %) and low level of total ash of leaves in winter of *Terminalia cuneata* (6.3 %). Comparative account of acid soluble ash of wood of *Terminalia chebula* in summer showed higher (6.75 %) and lower in the leaves of *Terminalia chebula* in monsoon (3.4 %). The acid insoluble ash showed higher level of wood in winter of *Terminalia chebula* (6.25 %) and lower in bark of *Terminalia bellirica* in monsoon (2.7 %).

Keywords: Total ash, acid soluble ash, acid insoluble ash, medicinal plant, *Terminalia*

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*Corresponding Author

Kadam V.B

P. G. Dept. of Botany & Research Centre,

K.T.H.M. College, Nasik-422 002, India

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1. Introduction

Nature has been a source of medicinal agent for thousands of years and an impressive number of modern drugs have been isolated from natural sources, many based on their use

in traditional medicines. Various medicinal plants have been used for years in daily life to treat diseases all over the world. The use of traditional plants extract as well as other

alternatives forms of medicinal use of plants species outnumbered (~10%) its use as food and feed (Moerman, D.E., 1996). Archana Sharma et.al. (2011) carried out biochemical evaluation of primary metabolites (total sugar, starch, lipids, proteins and phenols) from *Terminalia chebula* Retz. from various plant parts viz. the leaves, seeds and fruits. They found that, various parts of *Terminalia chebula* varied in composition of primary metabolites. *Terminalia cuneata* Roth. popularly known as Arjuna, Arjan, White mudra, Sadada, Orjun etc. have great medicinal properties, the bark of the trees contain calcium salts, magnesium salts and glucosides, B-Sitosterol, anthraquinone, glycoside, terchebin tanic acid, oleic, linoleic etc., its mature and immature fruits and bark is useful in diseases like wounds, ulcers, inflammation and so on. It has some cultural importance also. Arjuna is one of the sacred trees of India Kirtikar, K.R and Basu. B.D., (1988). *Terminalia bellirica* (Roxb.) Behada, Bahura is one of the oldest medicinal herbs of India have an anti-inflammatory, dyne, styptic acid thermo genic properties Indrayan et.al., (2005). It is also an ingredient of Triphala churn; the principal chemical constituents are tri-terpenoids, cardiac glycoside, saponins, bellericoside, bellericanin, tannin, ellagic acid etc. It also contains galloyl glucose and number of free sugars. The seeds contain proteins and oxalic acid, while bark contains tannin and its oil contain

plasmatic, oleic and linoleic acids as a major fatty acids. *Terminalia chebula* Retz. Haritak, is an active ingredient of a Hirda formulation Triphala churn, chebulin, ellagic acid, 2, 4-Chebulyl-B-D-glucopyranosc, chebolic acid, gallic acid, ethyl gallate, bunicalin, terflavin A, tanic acid, chebolic acid etc. are the major chemical constituents of this plant. It is an astringent, anthelmintic vine, expectorant toxic, carminative, laxative, rejunanative. *Terminalia catappa* Linn. an Indian almond or umbrella tree is an ornamental tree or cultivated tree, having anti carcinogenic properties, antioxidant as well as anticastogenic characteristics. It contains hydrolysable tannins, flavonoids, triterpenoids etc. The seed is very rich in proteins (19-22%) and oil (50-52) (Muhammad and Oloyede o-b, 2004). The bark contains Catappanin A, novel complex tannin, seven ellagic tannins (Lin Tc and Hsu. F.L., 1999). Ash values were determined with a purpose to find out the total amount and inorganic solutes present in the plant material (Kadam et.al. 2014). Some herbal therapies make use of ash. It is very obvious that ash of any plant does not contain any organic material and therefore inorganic salts are used medicinally. It is also interesting to know about the different solubility of the components of ash, therefore the solubility of ash in water and hydrochloric acid was studied in the present investigation.

2. Materials and Methods

Attempt was also taken to study the behavior of powder of plant material with certain chemical reagent as describe by Resenthalar (1930). Method recommended in Pharmacopoeia of India (Anonymous, 1966), and British Pharmacopoeia (Anonymous, 1973) were followed for determining Ash value percentage.

Preparation of Ash

3gm of drug was incinerated in a silica crucible over the burner. The charred material was heated in muffle furnace for six hours at 600-650°C. The ash was found white and free from carbon. It was cooled and weighed on the ash less filter paper.

Determination of Water-Insoluble Ash

The acid was boiled for 5 minutes with 25ml of distilled water. Insoluble matter collected in crucible or an ash less

filter paper and washed with hot water, ignited and weighed. Weight of the insoluble matter was subtracted from the weight of ash. The difference in weight represents the water soluble ash. Percentage of water soluble ash was calculated with reference to the air dried drug.

Determination of Water-Soluble Extractive

1gm of air dried drug, coarsely powered was macerated with 100ml distilled water in a closed flask for 24 hours shaking frequently. Solution was filtered and 25ml of filtered was evaporated in a tarred flat bottom shallow dish, further dried at 100°C and weighed. The percentage of water soluble extractive was calculated with reference to the air dried drugs.

3. Results and Discussion

Terminalia cuneata Roth. The total ash content of leaves ranges from 6.3 % to 6.4% higher level during summer (6.4 %), than winter (6.3 %) and monsoon (6.35 %) was found. The total ash content of bark was higher level at summer (7.65 %) than winter (7.45 %) and monsoon (7.15 %). The total ash content of wood was found higher level at summer (8.8 %) than monsoon (8.35 %) and winter (8.05 %) respectively. The percentage of total ash was found to be in the increasing order Wood < Bark < leaves. (Table No.1). The range of water soluble ash content of leaves was ranging from 3.25% to 3.55 %, highest solubility observed at summer season (3.55 %) than winter (3.3 %) than monsoon (3.25 %). Bark of the plant showed higher level of water soluble ash at summer. 4.55 %, over than winter (4.4

%) and monsoon (4.15 %) but wood showed lower level of water soluble ash at both monsoon season (4.35 %) and winter season (4.25 %) than summer (4.7 %). The percentage of ash solubility in water to be in the increasing order of leaves < wood < bark. (Table No. 1).

The range of water insolubility of ash content was found highest in wood and bark than the leaves. In leaves water solubility of ash contain ranges from 2.85 % to 3.1%, monsoon and winter showed higher (3.1%) and summer showed 2.85%. In bark higher level of water insolubility was found in summer and monsoon (3.35%), than winter (3.05%). The wood showed higher water insolubility than leaves and bark. It ranges from 3.9% to 4.1%, summer

season has higher value, i.e. 4.1 % than other seasons that is, in monsoon it was recorded 4.0 % and in winter it was found 3.9 %. The percentage of water insolubility was found in increasing order of leaves < bark < wood. (Table No. 1). *Terminalia bellerica* Roxb. - Total ash content in the leaves of *Terminalia bellerica* Roxb. ranges from 7.05 % to 7.3 %, higher being observed in summer (7.4 %), than in winter (7.3 %) and in monsoon season (7.05 %), the bark had higher total content of ash, in summer season (11.5 %) than winter (11.3 %) and monsoon (11.1 %). was noted. In wood, total ash content was found higher in summer season that is 12.75%, than in winter (12.25 %) and in monsoon season it was found (11.7%).

The percentage of total ash were found to be in the increasing order of leaves < bark < wood. (Table No. 1). The water solubility of ash in leaves of the same plant ranges from 4.2 % to 4.65 % in the summer season (4.65 %) showed high ash solubility in water as compared to monsoon (4.35%) and winter (4.2%) respectively. Water solubility of ash content of bark of the same plant was ranging from 5.25 % to 5.75%, highest being observed in summer season (5.75 %), as compared to winter (5.45 %) and monsoon (5.25%). In wood, summer season exhibit more water solubility of ash (6.6 %) and remaining two seasons, that is winter and monsoon showed 6.5 % and 6.3 % of water solubility of ash respectively. The percentage of water solubility of ash were found to be in the increasing order of leaves < bark < wood (Table No 1).

The water insolubility of ash in leaves of test plant showed higher level in winter season (3.05 %) as compared to summer (2.75 %) and monsoon (2.7 %). The water insolubility of ash in bark, ranges from 5.75 % to 5.85 %, higher insolubility observed at monsoon and winter seasons (5.85 %) and at summer it was found 5.75 %, the wood showed highest water insolubility of ash in summer season (6.15%), then it was observed (5.75%) in winter and (5.4%) in monsoon season. The percentage of water insolubility of ash was found in increasing order of leaves < bark < wood. (Table No. 1).

Terminalia chebula Retz.- Total ash content of leaves in *Terminalia chebula* Retz. ranging from (7.2 % to 7.7 %) among different seasons tested, while in summer season leaves showed high level of total ash (7.7 %) as compared to monsoon (7.4 %) and winter season (7.2 %), while in bark of the same plant, total ash ranges from 11.2 % to 11.6 %. Highest level of total ash was observed in summer season (11.6 %) than in winter season (11.4 %) and monsoon (11.2 %). In the wood, total ash was found ranging from 12.35 % to 12.75 %, higher level of total ash was observed in summer season (12.75%), than winter (12.65 %) and monsoon (12.35 %). The percentage of total ash were found in the increasing order like leaves < bark < wood.(Table No. 1). The range of water solubility of ash content of leaves in the *Terminalia chebula* Retz. ranging from 3.4 % to 3.65 %, highest level of water solubility was

observed in the season of summer (3.65 %) as compared to winter (3.5 %) and monsoon (3.4 %). Ash of wood of the same plant showed range of water solubility of ash content was 6.3 % to 6.75 %, in which summer season showed higher level of water solubility (6.75 %) while winter (6.4 %) and monsoon (6.3 %). In the bark, the level of water solubility of ash content was found in the range of 5.35% to 5.75%. Higher ash water solubility was observed in summer season (5.75 %), than monsoon (5.4 %) and winter (5.35 %), the percentage of water solubility of ash were found to be in the increasing order of, leaves < bark < wood. (Table No. 1).

The water insolubility of ash of leaves ranging from 4.0 % to 4.2 %, winter season showed higher water insolubility of ash (4.2 %), than monsoon (4.0 %) and winter (4.05 %). Bark showed highest level of water insolubility of ash in winter (6.1 %), than summer (5.85 %) and monsoon (5.8 %). Wood ash water insolubility show ranges from 6.0 % to 6.25 %, higher level observed at winter season (6.25 %) than monsoon (6.05 %) and summer (6.0 %). The percentage of water insolubility of ash were found in the increasing order of leaves < bark < wood (Table No.1).

Terminalia catappa Linn. - Total ash content in leaves of *Terminalia catappa* Linn. ranges from 8.3 % to 8.7 %, highest being observed in the season of summer (8.7 %) than winter (8.45 %) and monsoon (8.3 %), the bark had higher amount of ash content at summer season (10.95 %) as compared to winter (10.7) and monsoon (10.3 %). In wood, total ash content was higher at summer season (11.65 %) than winter (11.2 %) and monsoon (10.8 %), the percentage of total ash were found to be in the increasing order of leaves < bark < wood. (Table No. 1).

The water solubility of ash in leaves of the same plant ranges from 4.4 % to 4.8 %, where summer season showed highest ash solubility in water (4.8 %), than that of winter (4.6 %) and in monsoon (4.4 %). Water solubility of ash content of bark was ranging from 5.5 % to 5.15 %, highest being observed at summer season (5.5 %) as compared to winter (5.15%) and monsoon (4.9 %). In wood, summer showed water solubility of ash at high level (5.75 %) as compared to winter (5.65 %) and monsoon (5.5 %), the percentage of water solubility of ash were found to be in the increasing order of leaves < bark < wood. (Table No. 1).

The water insolubility of ash in leaves of the test plant showed highest level in the season of summer and monsoon (3.9 %), and it was found lowest in the season of winter (3.85 %). The bark water insolubility of ash ranges from 5.55 % to 5.5 %, higher insolubility observed at winter season (5.55 %) than monsoon (5.5 %) and summer (5.45 %), the wood show higher water insolubility in summer season (5.9 %) than monsoon (5.7 %) and winter (5.55 %). The percentage of water insolubility of ash was found in the increasing order of leaves < bark < wood (Table No.1).

Table 1: Determination of Ash values of *Terminalia cuneata* Roth., *Terminalia bellerica* Roxb, *Terminalia chebula* Retz. and *Terminalia catappa* Linn

Plant parts	Season	Total ash (%)			
		Plant 1	Plant 2	Plant 3	Plant 4
Leaves	Summer	6.4	7.4	7.7	8.7
	Monsoon	6.35	7.05	7.4	8.3
	Winter	6.3	7.3	7.2	8.45
Wood	Summer	8.8	12.65	12.75	11.65
	Monsoon	8.35	11.7	12.35	10.8
	Winter	8.05	12.25	12.65	11.2
Bark	Summer	7.65	11.5	11.6	10.95
	Monsoon	7.15	11.1	11.2	10.3

Table 2

Plant parts	Season	Water soluble (%)			
		Plant 1	Plant 2	Plant 3	Plant 4
Leaves	Summer	3.55	4.65	3.65	4.8
	Monsoon	3.25	4.35	3.4	4.4
	Winter	3.3	4.2	3.5	4.6
Wood	Summer	4.7	6.6	6.75	5.75
	Monsoon	4.35	6.3	6.3	5.3
	Winter	4.25	6.5	6.4	5.65
Bark	Summer	4.55	5.75	5.75	5.5
	Monsoon	4.15	5.25	5.4	4.9

Table 3

Plant parts	Season	Water insoluble (%)			
		Plant 1	Plant 2	Plant 3	Plant 4
Leaves	Summer	2.85	2.75	4.05	3.9
	Monsoon	3.1	2.7	4.0	3.9
	Winter	3.1	3.05	4.2	3.85
Wood	Summer	4.1	6.15	6.0	5.9
	Monsoon	4.0	5.4	6.05	5.7
	Winter	3.9	5.75	6.25	5.55
Bark	Summer	3.35	5.75	5.85	5.45
	Monsoon	3.35	5.85	5.8	5.5

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