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Estimation of lipid and alkaloid content in some medicinal plants of genus *Terminalia* (Combretaceae) of Marathwada Region in Maharashtra

Kadam V. B, Salve S. B, Deore S. V, Khandare K. R* and Kadam U .B**

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

*Department of Botany, Arts & Science and Commerce College, Satana, Nashik

**P.G. Department of Chemistry and Research Centre, M.S.G. College, Malegaon, Nashik

ABSTRACT

The seasonal variation of lipid and alkaloid content have been investigated from leaves, wood and bark of *Terminalia cuneata* Roth, *Terminalia bellerica* Roxb., *Terminalia chebula* Retz and *Terminalia catappa* Linn. are the medicinally important plants of family Combretaceae of Marathwada region in Maharashtra(India). Comparative account of lipid contents of leaves, wood and bark of *Terminalia chebula* showed higher level (range 6.65 to 23.6 mg/g dry wt.) than *Terminalia cuneata* (range 9.0 to 21.1 mg/g dry wt.) *Terminalia bellerica* (range 5.6 to 19.45 mg/g dry wt.) and *Terminalia catappa* (range 5.3 to 16.7 mg/g dry wt.). Comparative account of alkaloid contents of leaves, wood and bark of *Terminalia chebula* showed higher level (range 1.2 to 3.55 mg/g dry wt.) than *Terminalia bellerica* (range 1.45 to 2.85 mg/g dry wt.) *Terminalia cuneata* (range 1.4 to 3.15 mg/g dry wt.) and *Terminalia catappa* (range 1.45 to 2.8 mg/g dry wt.).

Keywords: Lipid, Alkaloid, Medicinal plant and genus *Terminalia*

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*Corresponding Author

Kadam V. B
P. G. Dept. of Botany & Research Centre,
K.T.H.M. College, Nasik-422002
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1. Introduction

Nature has bestowed upon us a very rich botanical wealth and a large number of diverse type of plants grow wild in different parts of our country. In India, the use of different

parts of several medicinal plants to cure specific ailments has been vogue from ancient times. Though at present Indian health care delivery consists of both traditional and

modern systems of medicines, both organized traditional systems of medicine like Ayurveda, Siddha and Unani and unorganized systems like folk medicine have been flourishing well. These two systems of medicine use plants, minerals, metals and animals as source of drugs, plants being the major source. It is estimated that roughly 1500 plant species in Ayurveda and 1200 plant species in Siddha have been used for drug preparation (Jain, 1987). In Indian folk medicine use, about 7500 plant species are recorded as medicinal plants (Anonymous, 1996). A plant species grown in different geographical localities also show quantitative variation in their chemical constituent (Mallavarapuet, et al., 1995; Kadamet al., 2013). According to Patil, and Gaikawad, (2011), the bark of *Terminalia arjuna* is potent cardio tonic in the Ayurveda. The bark was analysed with respect to reducing sugars, total sugars, anylose, amylopectin, starch, crude fibres and crude protein, total ash value, total flavonoids, total alkaloids, nitrates and total oxalate. Rajeev Nema et al. (2012) did preliminary phytochemical evaluation and flavonoids quantification of *Terminalia arjuna* leaves extracts. Stem, bark and leaves possess glycosides, large quantities of flavonoids have been found to possess antioxidant, anti-inflammatory and lipid lowering off *Terminalia bellirica* the best single herb for controlling Kapha. It is a powerful rejuvenative herb that nourishes the lungs, throat, voice, eyes and hairs. It expels stones or other kapha- type accumulation in the digestive, urinary, and respiratory tracts. It is unique in being both laxative and astringent, so it purges the bowels, while simultaneously toning the tissues of the digestive tract. It provides strength to the tissues of the sense organs. It is widely used in treatment of headache, leucorrhoea, liver diseases and gastro- intestinal complaints. Its properties include anthelmintic, antiseptic, astringent, expectorant, laxative, lithotripter, rejuvenative and tonic. According to Naik, et al (2002). The presence of compounds such as ascorbant, gallic acid and ellagic in the aqueous extract of a natural herb, *Terminalia chebula* was tested for potential antioxidant activity by HPLC analysis. 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 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. According to Saidet al. (2012), lot of the population trust on traditional medicines in the treatment of ailment, especially rural population still believes on herbs due to their easy accessibility and cost effectiveness.

2. Materials and Methods

The plant material of *Terminalia cuneata* Roth., *Terminalia bellerica* Roxb., *Terminalia chebula* Retz. and *Terminalia catappa* Linn. collected from different part of Maharashtra during different season viz. summer, monsoon and winter.

The leaves, bark, and wood sample are collected and kept parately. Dried in sun light and make a powder with grinder.

Determination of lipid (oil): Agrawalet al., (1987) method was followed for the estimation of lipid. The material was dried for 12-17 hours at 60-70 °C and ground to a coarse powder. 5 g of weighed sample was taken in a cellulose thimble (The quantity of material would depend on oil content). The thimble was fixed in the sox let funnel and about 150 -200 ml of petroleum ether was taken in the flat bottom flask (FBF). The funnel over the flask was fixed and attached to the water condenser refluxed for at least 4 hours and the heater were switched off to let the apparatus cool (maintaining the water flow as such). Condenser and funnel were detached, petroleum ether was evaporated in FBF over hot platat 80 °C. When a small quantity (about 10ml) of ether was left in the flask, transferred it in weighed beaker (W_1) of 50 or 100 ml. Rinsed the FBF twice with small quantities of ether and transferred the washing in the beaker. The beaker was transferred in an oven at 70±10 °C till ether evaporated (presence of ether can be detected by its smell). The beaker was cooled in a dessicator and weight (W_2). Difference of ($W_1 - W_2$) would give the oil content. The oil percentage was calculated on the basis of the weight of plant material.

Total Alkaloids: Quantitative estimations of alkaloids were carried out following the method of Sairam and khanna (1971). Each sample was ground to fine powder. To each one gram powder, 0.75ml 25% ammonium hydroxide, 1ml 95% ethyl alcohol and 2 ml ethyl ether were added. The material was allowed to macerate for 12 hours and dried. The dried material was extracted with chloroform for 24 hours in a soxhlet apparatus, and the extract obtained was evaporated to dryness, and the residue was mixed with 2.5 ml 0.1 Methanol (90%) hydrochloric acid. The extracted, thus obtained was centrifuged to take supernatant and discard pellet. The solution was evaporated and the total alkaloids were weight after drying at 100 °C.

3. Results and Discussion

The estimation of lipid and alkaloid content was carried out in different plant parts like leaves bark and wood from four taxa of *Terminalia* (Combretaceae), during summer, monsoon and winter seasons for consecutive two years.

***Terminalia cuneata* Linn:** The lipid concentration of leaves in summer season (21.1mg/g) over that of winter (19.6 mg/g) and monsoon (18.5 mg/g). The lipid concentration of bark of the test plant was ranging from 15.6 mg/g to 17.35 mg/g and it was significantly higher in the season of summer (17.35 mg/g), the lipid content of wood was comparatively lower i.e. in the range of 9.0 mg/g to 9.95 mg/g Where, it was found lowest in the season of monsoon (9.0 mg/g). (Table No 1). The alkaloids content of leaves of the same plant showed in the range of 2.6 mg/gm. to 2.85 mg/g. and attained its peak concentration (3.15 mg/g.) during summer season. Alkaloid content range was found from 1.85 mg/gm to 2.5 mg/g in bark, in which highest concentration of alkaloid was found in summer season (2.5 mg/g) and lowest, was recorded in monsoon season (1.85 mg/g). The alkaloid content range in wood of the test plant

was found from 1.4 mg/gm to 2.0 mg/g, tested during different seasons, it was found highest concentration of alkaloids in summer season (2.0 mg/g). In winter it was recorded (1.55 mg/g) and 1.4 mg/g in monsoon season. The lipid and alkaloids content were in the increasing order from wood < bark < leaves. (Table No 1).

***Terminalia bellirica* Roxb:** The *Terminalia bellirica* Roxb., have stored more lipid in leaves i.e. in the range of (17.4 to 19.45 mg/g), where as in summer season it was recorded high (19.45 mg/g) compared to winter (18.5 mg/g) than in monsoon (17.4 mg/g). In bark of the test plant the concentration of lipid was observed highest in summer season (12.7 mg/g) and in winter season it was found (12.6 mg/g), which was slightly less than summer. It was found lowest in monsoon (11.3 mg/g). In the wood of same plant the percentage of concentration of lipid was found very low as compared to bark and leaves, it was found in the range of 5.6 mg/g to 6.45 mg/g, where as in the winter and summer season it was found highest (6.45 mg/g and 6.4 mg/g) respectively. In monsoon, very low concentration (5.6 mg/g) was found. (Table No. 1). The Alkaloid content of leaves was higher in summer (2.85 mg/g) than the monsoon and winter (2.45 mg/g and 2.5 mg/g) respectively. Similarly the alkaloid content of bark was higher in summer season (2.4 mg/g) over that of winter (2.25 mg/g) and monsoon season (2.1 mg/g). The wood of the same plant showed very low concentration of alkaloids as compared to leaves and bark, that was in the range of (1.45 % mg/g to 1.85 % mg/g), where it shows highest in summer season (1.85 % mg/g) than that of winter (1.65 % mg/g) and monsoon (1.45 % mg/g). The lipid and alkaloid contents were in the increasing order of wood < bark < leaves. (Table No. 1).

***Terminalia chebula* Retz:** The lipid content of leaves of *Terminalia chebula* Retz. was higher in summer season (23.6 mg/g) over than winter (22.85 mg/g) and monsoon season (21.45 mg/g). The range of lipid content of bark of the plant was from (11.6 mg/g to 12.7 mg/g), highest level in bark was being observed during summer season (12.7 mg/g) and the lower lipid content was found in monsoon (11.6 mg/g) where as in the season of winter it was recorded (12.35 mg/g). (Table No.1A & B). *Terminalia bellirica* Roxb. accumulated highest level of alkaloids in its leaves over than bark and wood, and this trend of

observation were similar to *Terminalia liacuneata* Roth. and *Terminalia chebula* Roxb. Throughout the course of investigation. The alkaloid content of leaves in *Terminalia chebula* was found ranging from 2.25 mg/g to 3.55 mg/g, where it was found highest in summer season (3.55 mg/g) and lowest in season monsoon (2.25 mg/g) where as in winter it was found 3.3 mg/g. The alkaloid content of bark of the same plant was highest in summer season (2.6 mg/g) compared to winter (2.25 mg/g) and monsoon (1.8 mg/g). The wood of the same plant showed very low amount of alkaloid, that is in the range of (1.2 mg/g to 1.6 mg/g), it showed highest accumulation in summer and winter seasons (1.6 mg/g) the monsoon (1.2 mg/g). The lipids and alkaloids content were found in the increasing order from wood < bark < leave (Table No 1).

***Terminalia catappa* Linn:** The lipid concentration of leaves of *Terminalia catappa* Linn. was higher in summer and winter season (16.7 mg/g) over that of monsoon (15.5 mg/g). In bark, the concentration of lipid was found in the range of (9.7 mg/g to 10.7 mg/g), where the highest content was found in summer season (10.7 mg/g) over other seasons i.e. winter (10.2 mg/g) and monsoon (9.7 mg/g). The lipid content of wood was found very low as compared to leaves and bark, which was recorded in the range of (4.75 mg/g to 5.75 mg/g). In the season of monsoon it was very low i.e. 4.75 mg/g whereas, in the season summer and winter it was found (5.75 mg/g) and (5.3 mg/g) respectively. The alkaloid content of leaves of *Terminalia catappa* Linn. ranging from 2.25 mg/g to 2.8 mg/g, the highest content of alkaloid observed at summer season (2.8 mg/g) over than winter (2.6 mg/g) and monsoon (2.25 mg/g). In the bark of the same plant alkaloid content was found in the range of 1.75 mg/g to 2.4 mg/g where as in summer it was observed highest (2.4 mg/g) as compared to winter (2.15 mg/g) and monsoon (1.75 mg/g). The alkaloid content was found very low in wood of the same plant, as compared to leaves and bark. This was recorded in the range of 1.15 mg/g to 1.5 mg/g. In the monsoon season, it was recorded very low content of alkaloid i.e. (1.15 mg/g) in the season of summer (1.5 mg/g) and in winter (1.45 mg/g) alkaloid was recorded. The lipid and alkaloid content were found in the increasing order from wood < bark < leaves. (Table No. 1A).

Table 1A: Seasonal variation of organic constituents levels of *Terminalia cuneata* Roth., *Terminalia bellerica* Roxb., *Terminalia chebula* Retz and *Terminalia catappa* Linn.

Plant parts	Season	Lipids (mg/g dry wt.)			
		<i>T. cuneata</i>	<i>T. bellerica</i>	<i>T. chebula</i>	<i>T. catappa</i>
Leaves	Summer	21.1	19.45	23.6	16.7
	Monsoon	18.5	17.4	21.45	15.5
	Winter	19.6	18.5	22.85	16.7
Wood	Summer	9.95	6.4	7.55	5.75
	Monsoon	9.0	5.6	6.65	4.75
	Winter	9.2	6.45	7.0	5.3
Bark	Summer	17.35	12.7	12.7	10.7
	Monsoon	15.6	11.3	11.6	9.7
	Winter	16.4	12.6	12.35	10.2

Table 1B: Seasonal variation of organic constituents levels of *Terminalia cuneata* Roth., *Terminalia bellerica* Roxb., *Terminalia chebula* Retz and *Terminalia catappa* Linn.

Plant parts	Season	Alkaloids(mg/g dry wt.)			
		<i>T. cuneata</i>	<i>T.bellerica</i>	<i>T. chebula</i>	<i>T.catappa</i>
Leaves	Summer	3.15	2.85	3.55	2.8
	Monsoon	2.6	2.45	2.25	2.25
	Winter	2.85	2.4	3.3	2.6
Wood	Summer	2.0	1.85	1.6	1.5
	Monsoon	1.4	1.45	1.2	1.15
	Winter	1.55	1.65	1.6	1.45
Bark	Summer	2.5	2.4	2.6	2.4
	Monsoon	1.85	2.1	1.8	1.75
	Winter	2.25	2.25	2.25	2.15

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