



A Comparative study on Proximate Analysis conducted on Medicinal Plants of Chhattisgarh, CG, India

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Abstract

The medicinal plants have become important in the global context today as it offer solutions to the major concerns of human mankind. This review gives a bird eye view on the proximate analysis of some medicinal plants of Chhattisgarh India. The leaves of tulsi (oscimum sanctum), neem (azadirachta indica), karanj (milletia pinnata) and the leaves, stem, flowers and fruits of kalmeg (andrographis paniculata) were collected and taxonomically authenticated. These samples were dried in the sun, dried in the shade for a week and then subjected to proximate analysis such as extractive values, total ash, acid insoluble ash, sulphated ash, water soluble ash and loss on drying. The results were tabulated to show their difference in their qualities.

Keywords: Oscimum, azadirachta, milletia, andrographis, proximate analysis.

Introduction

Medicinal plants find application in pharmaceutical, cosmetic, agricultural and food industry¹. The earliest mention of medicinal use of plants in Hindu culture is found in "Rigveda" which is said to have written between 4500-1600 BC. It is Ayurveda, the foundation of medicinal science of Hindu culture in its eight division deals with specific properties of drugs and various aspects of science of life and art of healing. Medicinal plants are a source of great economic value all over the world. Nature has bestowed on us a very rich botanical wealth and a large number of diverse types of plants grown in different parts of the country². In view of extremely rich bio cultural diversity in the state and dependence of forest dwellers for their health requirement on medicinal plants, the government has declared CG (Chhattisgarh) in India as the herbal state in July 2001. The herbal state of CG is situated in Deccan bio geographical area. The state is significantly rich in endemism with respect to many plants having medicinal importance.

Tulsi (oscimum sanctum) have significant anti stress properties. Its leaf infusion improves apatite. It is carminative, antipyretic, diaphoretic, expectorant and vermifugal and it is applicable to all types of fever, cough, cold, bronchitis, catarrh, dysentery, diarrhea etc. Oil extracted from the leaves is used as a pest repellent, antibacterial and insecticide³. Antibacterial agents contain phenolic, saponins, alkaloids and flavonoids. These substances were active against many infectious human pathogenic bacteria that cause many dangerous diseases such as vomiting, diarrhea, urinary infections, gastroenteritis etc⁴. Neem (azadirachta indica) has been extensively used in India for the treatment of various diseases like leprosy, respiratory disorder in children, intestinal helminthiasis. Azadirachta indica offers another option for a safer and effective antiulcer drug. Neem is

also used to treat viral diseases such as small pox and chicken pox. It protects the liver from damage which in turn helps to clean the blood. It shows hypoglycemic effect⁵. Neem may help in the search for prevention or cure for AIDS which may possibly be treated by ingesting neem leaf extracts or the whole leaf or by drinking a neem tea⁶. All parts of Azadirachta indica tree possess insecticidal activity but seed Kernal is the most effective. It has a multitude of pesticidal active ingredients which are together called "triterpeni" more specifically "limnoids". The four best limnoid compounds are azadirachtin, salannin, meliantriol and nimbin⁷. The natives and traditional healers of CG use different parts of karanj (milletia pinnata) as medicine very frequently. According to Ayurveda, Karanj is antihelmintic, alexipharmic and useful in the diseases of eyes, vagina, skin tumours, wound, ulcers, itching, enlargement of spleen, abdomen urinary discharges etc. In case of joint pains, they use karanj roots and barks externally. Karanj seeds help in the production of the fuel that can serve purpose of alternative fuels. Government of India has in recent times provided major emphasis to bio fuels in particular jatropha derived bio diesel. A detailed project report recently prepared under the ministry of rural development identified various end uses for non edible SVO (strait vegetable oils) produced from plants such as jatropha including their direct use for transport applications and power generation on a decentralized basis apart from conversion of the SVO's to bio diesel for purpose of blending with petro diesel⁸. The fuel properties of karanj oil methyl ester was compared with simarouba oil methyl ester and it was found that the tree borne oil like simarouba glauca is the most potential species to produce bio diesel in India which could offer the opportunity to the generation of rural employment⁹. Kalmeg (andrographis paniculata) extract exhibits anti typhoid and antifungal activities. It is also reported to possess anti hepatotoxic, antibiotic, anti malarial, anti hepatic,

antithrombogenic, anti inflammatory¹⁰, anti snake venom and antipyretic properties. Besides these, it is generally used as immune stimulant agent¹¹. The Phytoconstituents like phenols, anthraquinone, alkaloids, glycosides, flavanoids and saponins are antibiotic principles of plants. From these phytoconstituents, saponins have been reported to exhibit hemolytic and foaming activity, antifungal, anti inflammatory, fungistatic, molluscidal properties¹². Kalmeg is known for its exceptional ability to protect liver, brain and heart¹³. Apart from these medicinal applications, the medicinal plants act as a useful tool for establishing the extent of absorption of toxic substances by plants such as remains of pesticides and the possible effects of atmospheric soil or water pollution. The biomass was successfully used for removal of surfactant from waste water which is technically applicable and viable¹⁴. Similarly medicinal plant like *Moringa oleifera* act as natural coagulant, flocculent absorbent for the treatment of ground water. It reduces the total hardness, turbidity, acidity, alkalinity and chloride¹⁵. Also it was found that the use of almond tree biomass as a bio sorbent for trace metals Al^{3+} and Cr^{6+} in water and waste effluents is expected to solve environmental problems¹⁶.

Proximate analysis in plants gives valuable information and help to access the quality of the sample. It provide information on moisture content, ash content, volatile matter content, ash, fixed carbon etc. Ash is the inorganic residue remaining after water and organic matter have been removed by heating, which provides a measure of total amount of minerals with in the food. Minerals are not destroyed by heating and they have a low volatility as compared to other food components. Total ash may vary with in wide limits for specimen of genuine drugs due to variable natural or physiological ash. Ashes give us an idea of the mineral matter contained in a plant. Measuring it is important, because mineral matter may be the cause of a pharmacological effect¹⁷.

About 1500 plants are systematically used in indigenous system of medicine like ayurveda, unani and siddha. However the ethno pharmacologists, botanist, microbiologists and natural product chemists in the world over today is constantly still in search of medicinal efficiency of plants and their phytochemicals, since the reported data so far available on plants are comparatively meager before the vast number of plant population. So the approach of this paper involved is to explore the proximate analysis of medicinal plants and study their qualities.

Material and Methods

Collection of samples: The studies were undertaken on four medicinal plants tulsi (*osimum sanctum*) of family lamiaceae, neem (*azadirachta indica*) of family meliaceae, karanj (*milletia pinnata*) of family fabaceae and kalmeg (*andrographis paniculata*) of family acanthaceae. The choice of plant parts were leaves of tulsi, neem, karanj and leaves, stems, flowers and fruits of kalmeg which were collected from Chhattisgarh and were taxonomically authenticated. A care was taken to select

healthy plants and the plant parts for the study were collected fresh and dried for a week to be involved in the proximate analysis.

Proximate analysis: As per reference¹⁸⁻²³.

Extractive values: About 5g of the dried and finely coursed powder is mixed with 100 ml of 90 % ethanol in a closed flask. The flask was frequently shaken during the first 6 hours and allowed to stand for 18 hrs. Then the mixture was rapidly filtered to minimize the loss of ethanol and 25 ml of the filtrate was evaporated to dryness in a tarred flat bottomed shallow dish. The residue was dried at 105°C for minutes and then weighed. The procedure was performed twice more from the filtrate.

Ash values: Total ash and sulphated ash values: A silica crucible was heated for about 30 min to red hot and cooled in a desicator to note down its weight. About 3 g of the powdered sample were weighed and then dried at 100-105°C for 1 hr and ignited to constant weight in a muffle furnace at 600-625°C, until a carbon free ash is formed. The crucible was allowed to cool in desicator after each ignition and care was taken to avoid catching fire. The weight of the carbon free ash was determined. The procedure was repeated to obtain a standard deviation to ensure consistency and then tabulated. The same procedure was carried out adding dilute sulphuric acid to determine the yield of sulphated ash.

Acid Insoluble ash: About 1g of the total ash (from total ash) was boiled with 25 ml of 2M hydrochloric acid for 5 min. The acid insoluble was separated by filtration on an ash less filter paper in Gooch crucible. The content on the ash less filter paper was washed with hot water and ignited and then weighed to obtain the percentage of ash with reference to the air dried samples.

Water soluble ash: About 1g of the total ash was boiled with 25 ml of water for 5 min and then filtrated to retain the insoluble matter on ash less filter paper. The content was ignited for 15 min at a temperature not exceeding 450°C then weighed. The difference between the amount of ash subjected and weight of insoluble ash was accounted as the water soluble ash value.

Loss on drying: About 10 g of each specimen under study were accurately weighed and transferred to a charred china dish which was known for its weight and kept in a hot oven at 100-105°C for an hour. Then the sample was weighed along with china dish to deduct the actual weight of tarred china dish. The weight of the powder was noted to calculate the percentage loss on drying with reference to air dried specimen.

Results and Discussion

The results obtained were recorded and tabulated.

Proximate analysis on leaves of tulsi (*osimum sanctum*), neem (*azadirachta indica*), karanj (*milletia pinnata*) and kalmeg (*andrographis paniculata*).

In case of karanj (*milletia pinnata*), the alcoholic extractive values was higher than that of tulsi and neem. In kalmeg (*andrographis paniculata*), the dried powdered mixture of leaves, stems, flowers and fruits were subjected to proximate analysis and it was observed that the aqueous extractive values of mixture was found to be higher than that of alcoholic extractive values.

Table-1

Proximate analysis of Karanj (*Millettia pinnata*), Neem (*Azadirachta indica*) and Tulsi (*Oscimum sanctum*)

Extractive values	Specimen	Colour of the residue	Extractive % w/w
Alcoholic extractives	<i>Millettia pinnata</i> -leaves	Green	5.41
Alcoholic extractives	<i>Azadirachta indica</i> -leaves	Dark brown	3.05
Alcoholic extractives	<i>Oscimum sanctum</i> -leaves	Light brown	4.04

Table – 2

Proximate analysis of Kalmeg (*Andrographis paniculata*)

Extractive values	Specimen	Colour of the residue	Extractive % w/w
Alcoholic extractives	<i>Andrographis paniculata</i> -dried powdered mixture of leaves, stems, flowers and fruits	Dark green	1.722
Aqueous extractives	<i>Andrographis paniculata</i> - dried powdered mixture of leaves, stems, flowers and fruits.	Light brown	3.025

Ash figures and loss on drying: The leaves of tulsi (*oscimum sanctum*) showed about 15.21%w/w of total ash as compared to the percentage ash value of leaves of neem (*azadirachta indica*) and karanj (*milletia pinnata*) which lied between 6 – 13 %w/w. However sulphated ash values of leaves of tulsi and karanj showed proximity with that of the total ash values. It is highly controversial and unusual that the water soluble ash value assumed more than 80% of the total ash value (for an unknown reason). Loss on drying for leaves of karanj, neem and tulsi lied between 4-16.5 % w/w. The leaves of tulsi were found to containing higher water soluble ash and so the acid insoluble ash value also showed a hike. Out of karanj, neem and tulsi, the percentage ash of tulsi (*oscimum sanctum*) was observed to be lower than the other two. The dried and powdered mixture of leaves, stems, flowers and fruits of kalmeg (*andrographis paniculata*) showed the percentage ash value range between 16.9 – 21.5 %w/w with higher value of water soluble ash 82.54%w/w and loss on drying 3.56%w/w.

Table – 3

Proximate analysis on leaves of Tulsi (*Oscimum sanctum*), Neem (*Azadirachta indica*) and Karanj (*Millettia pinnata*)

Experimental studies	Tulsi leaves % w/w	Neem leaves % w/w	Karanj leaves % w/w
Total ash value	15.21	12.81	6.97
Water soluble ash	46.72	55.3	45.92
Acid insoluble ash	17.6	9.66	10.08
Sulphated ash	15.6	10.86	6.86
Loss on drying	16.26	5.75	4

Table – 4

Proximate analysis on the dried and powdered mixture of leaves, stems, flowers and fruits of Kalmeg (*Andrographis paniculata*)

Experimental studies	Dried and powdered mixture of leaves, stems, flowers and fruits of Kalmeg (<i>Andrographis paniculata</i>) % w/w
Total Ash value	16.9
Water soluble ash	82.54
Acid insoluble ash	31.56
Sulphated ash	21.46
Loss on drying	3.56

Conclusion

The leaves of *oscimum sanctum*, *azadirachta indica* and *milletia pinnata* were collected, dried and powdered and the leaves, stems, flowers and fruits of *andrographis paniculata* were dried and powdered and the mixture were subjected to proximate analysis such as extractive values, total ash values, water soluble ash values, acid insoluble ash values, sulphated ash values and loss on drying and the results were tabulated to note down how far they differ in their qualities determination of proximate analysis of these samples will give a finger print of whether the species is adulterated or not. Ash value is useful in determining authenticity and purity of sample and also these values are important qualitative standards. Kalmeg shows higher total ash value which shows higher mineral content, higher value of aqueous extractive value shows that it is fully assimilated when taken with water which is an effective solvent. The total ash value of tulsi (*oscimum sanctum*) was found to be higher than neem (*azadirachta indica*) and karanj (*milletia pinnata*). This shows that it had higher mineral content than the other two. Higher value of acid insoluble ash indicates the higher digestibility when the plant is consumed. Tulsi shows higher value of acid insoluble ash which indicates the higher digestibility when the plant is consumed. Lower value of moisture content shows high calorific value in karanj. Also karanj (*milletia pinnata*) showed lower total ash value so its energy value is high so it is a good bio fuel. More research work is recommended on the plant leaves for isolation and characterization of bio active compounds that may be active against malarial parasites and other diseases.

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