



Plant Archives

Journal homepage: <http://www.plantarchives.org>
doi link : <https://doi.org/10.51470/PLANTARCHIVES.2021.v21.S1.416>

DETERMINATION ELEMENTAL COMPOSITION AND NUTRIENT VALUE OF *ZANTHOXYLUM OVALIFOLIUM*

Pavani P. and Raja Naika*

Department of Applied Botany, Kuvempu University, Shankaraghatta (Karnataka), India.

*Corresponding author

ABSTRACT

The present study explores elemental composition and nutritional value was carried out on the leaves and fruits of *Zanthoxylum ovalifolium* using standard methods. The result of the nutritional value of plant *Z. ovalifolium* showed significant nutrients in leaves it contained 3% moisture, 1.11% crude protein, 3.80% ash, 5.42% crude fiber, 1.0 % fat and 14.33% carbohydrate contents and in fruits 4.5% moisture, 1.58% crude protein, 4.60% ash, 7.50% crude fiber, 0.50 % fat and 17.68% carbohydrate contents respectively. The macro and micro elemental composition detected in leaves and fruits were Fe, Cu, Ca, N, Mg, Mn, Zn, K, and P. They are of nutritional, clinical and veterinary relevance considering the diverse ethno pharmacological uses of the plant in different parts of the world

Keywords: Micro and macro elements, nutritional value, *Zanthoxylum ovalifolium* Wight.

Introduction

The nutritional value takes the leading part of human life from the very first stage, i.e. fetus to adult and old age, for the wellbeing and development of the human life. To sustain fitness, growth and development, proper nutrient diet is essential for a healthy life. The human body is made-up of water, minerals, carbohydrates, proteins, fats and nucleic acids of chemical compounds. These sequentially consist of various types of elements, including oxygen, carbon, hydrogen, phosphorus, nitrogen, potassium, calcium, etc and also comprise some trace elements including metals such as iron, magnesium, cobalt and zinc (Katzmarzyk and waist, 2004)

Many people in developing tropical countries are facing problem such as food scarcity due to the rapid growth of population, climatic changes and insufficient in adequate land to farm crops, god's act and high prices of available staples and restrictions on the imports. This has resulted in a high incidence of starvation and people are suffering from malnutrition. (Uzoekwe and Mohammed, 2015). Nutritional deficiencies are commonly seen in some group of people, in particularly poor people. As a result, they do not get enough nutrients to the body; their health and well being would worsen.

Now a day's consumption of cultivated food is highly dangerous to health because many chemicals like fertilizers, pesticides, herbicide, plant growth regulator etc. were used to produce more yields. This leads to health hazards, lost of nutritional value, appearance and natural taste in the short term.

A perfect nutritional balance that included a significant proportion of calories, carbohydrates, fiber, amino acid, minerals, fatty acids and protein can be achieved with green vegetable, milk products, fruits and pulses. People around the

word show a great deal of interest in green leafy vegetables because of their high healthy benefits which contains large proportion of iron, β carotene, folic acid, pyridoxine, riboflavin, copper and protein. Vegetables are very cheap in cost and essential nutrients, filaments, amino acids and minerals are more readily accessible and much of these wild and local green vegetables and plants have been underexploited due to lack of science expertise and lack of logical knowledge of their nutritional potential (Banik *et al.*, 2018).

Healthy phyto nutrients that we need for a healthy life such as water, minerals, fatty acids, fibers were received from the fruits and vegetables. For example, pineapples containing vitamin A and B, citric acid, bromilin, malic acid etc.. Lycopene from tomato, Omega 3 Fatty Acids from *Linum usitatissimum* Lignan from rye, soybean and broccoli. Camphor from *Cinnamomum camphor*, Proanthocyanins from grapes, calcium, carbon, magnesium, manganese and iron from Blackberries, lychee, guava, Blackcurrants, Dates and Grapefruit (Pandey, 2011).

Taking into account the value of dietary awareness and nutritious importance of herbal plants, the *Zanthoxylum ovalifolium* were picked and evaluated for analysis of nutritional value and identification of heavy metals. The purpose of this research was to collect underexploited plants and determine their pharmaceutical and nutritional value.

Materials and Methods

Preparation of plant sample:

The Fresh plant material leaves and fruits of *Z. ovalifolium* were collected from study area and washed separately with running water for about 2-3 times and allowed for 20- 30 days of shade dried. These dried plant samples were pulverized to the coarse powder of about 1mm

in diameter using a mechanical grinder. The powdered materials were kept for 4°C and used to evaluate the proximate analysis, minerals and nutrient 41 compositions.

Proximate Analysis:

The powdered samples of *Z.ovalifolium* were analyzed for protein, fat, crude fiber, Moisture, ash, carbohydrate was estimated on the basis of then standard guidelines of AOAC methods, 1990.

Determination of Moisture Content of plant Z. ovalifolium:

Moisture content of plant was analyzed by oven drying method, where 2g of plant material was introduced into a clean and dry crucible which is weighted (W₁) carefully, then the crucible was placed in a ventilated electronically heated oven at 105° C for about 24 hr. After cooling, crucible reweighed (W₂). At last, the percentage of water content of plant was calculated by using the following equation.

$$\text{Moisture (\% weight)} = \frac{\text{Loss of weight on drying} \times 100}{\text{Initial sample} \times 1}$$

W₁ = Initial weight crucible with sample

W₂ = final weight crucible with sample after drying

Determined of total ash content of plant Z. ovalifolium:

About 2gm of plant sample was precisely weighed into silica crucible and placed in a muffle furnace at 6000°c for 3hr until it turns into complete ash. At the last stage of ashing period, the ash which is formed is removed from the furnace and allowed to cool it in room temperature by placing in desiccators and reweighed again.

$$\text{Ash content (\% weight)} = \frac{\text{weight of residue sample} \times 100}{\text{initial weight of sample} \times 1}$$

Determination of crude protein:

Total protein concentration was determined by using Macro Kjeldahl method (%Nx6.25).The Kjeldahl method can conveniently be divided into three steps: digestion, neutralization and titration.

Digestion: One gram of dried powdered plant materials were took into a digestion Kjeldahl flask and digested by heating it in the presence of digestion mixture such as sulfuric acid, anhydrous sodium sulfate and copper for about 5 to 6 hours.

Neutralization: The digestion flask was connected to a receiving flask by a tube and later the solution was made as alkaline by adding 40% sodium hydroxide, by which ammonia gas is formed from the solution is liberated from digestion flask to the receiving flask.

Titration: Receiving flask was augmented with 10 ml of 2% boric acid solution and few drops of mixed indicator solution. Then, the distillate was subjected to titration against 0.01 N HCl solution until pale pink was formed. Finally, crude protein of *Z. ovalifolium* was calculated as:

Determination of fat:

About 5gm of dried powder test was gauged and filled in a permeable what's man channel paper and kept in thimble. The thimble was set inside the soxhlet apparatus and dry pre weighed dissolvable flask was associated underneath the apparatus. Required amount of solvent was added and connected with the water condenser. The solvent petroleum

ether has been heated, vaporized and condensed which is passed to the reflux flask filled up and siphoned over, collecting its oil extract into the boiling flask. This cycle was permitted to go on consistently for 4 hours before the defatted test was taken out, the dissolvable recuperated and the oil separate was left in the dissolvable flask. The dissolvable recuperated and the oil separate was left in the flask. The flask (containing the oil extricate) was dried in the oven at 60°C for 30 min to eliminate any remaining dissolvable. The flask was cooled in desiccator and gauged (Talreja *et al.*, 2015)

$$\text{Crude fat (\% of Dry matter)} = \frac{\text{weight of fat}}{\text{Weight of sample}} \times 100$$

Determination of fiber content:

Crude fiber content of plant materials were determined by extracting 2 gm of moisture and fat free plant sample was treated with 100ml of N H₂SO₄, the mixture was boiled for 30 min. After filtration and washing the residue was treated and boiled with 100ml of N NaOH solution. The filtrate was washed with hot H₂SO₄, water and alcohol. The residue was ignited and the ash is weighed. Crude fiber weight was determined from the lost weight of total ash residue.

$$\text{Crude fiber (\%)} = \frac{W_1 - W_2}{W_3} \times 100$$

Determination of carbohydrates (Nitrogen free extract):

Carbohydrates of each sample was measured by subtracting percentage of moisture content, ash, content, crude protein, crude fat and crude fibers from 100 as follows;

$$\text{NFE (\%)} = 100 - (\text{moisture \%} + \text{Crude protein \%} + \text{crude fat \%} + \text{crude fiber \%} + \text{ash \%})$$

Result and Discussion

Proximate composition of the *Zanthoxylum ovalifolium* leaf and fruit sample

The plant *Zanthoxylum ovalifolium* leaf and fruits were analyzed for the study of phytochemical composition such as moisture content, carbohydrate, crude protein, dietary fiber, fat and total ash content. The outcome of the analysis revealed that, both leaf and fruit part of *Z. ovalifolium* has an excellent number of phytoconstituents.

Table 1: Physicochemical analysis of leaf and fruit powdered sample of *Zanthoxylum ovalifolium*.

Sl. No	Parameters (%)	Plant sample of <i>Zanthoxylum ovalifolium</i> .	
		Leaf	Fruit
1	Moisture	3	4.5
2	Carbohydrate	14.33	17.68
3	Crude protein	1.11	1.58
4	Fiber	5.42	7.50
5	Fat	1.0	0.50
6	Ash	3.80	4.60

In *Z. ovalifolium* leaf part the parameters were carbohydrate> fiber> ash> moisture>protein>fat and the same fruit portion was carbohydrate > fiber > ash > moisture > protein > fat. Based on the result, there is a substantial variation in physicochemical parameters which were found in leaves and fruits.

The Carbohydrate content of leaves and fruit of *Z. ovalifolium* found to be 14.33% and 17.68%. Fruits showed highest percentage of carbohydrate than leaves. However, based on result the carbohydrate content of *Z. ovalifolium* less than that of cassia tora seed (27%) by Shaikh and Syed (2016), *A. tetra-cantha*. Leaves found to be (58.40 ± 4.56) and reported by Gayathri G *et al.* (2012), *M. nigra* seeds (62.483%) by shukla *et al.* (2015) But it is higher than the seeds of *F. benghalensis* (12.95 %) reported by Govindan and Shoba (2015). Carbohydrates are known to be energy source for all organisms and playing both nutritional and structural functions by Barkatullah *et al.* (2015). This indicates that leaves and fruits of *Z. ovalifolium* are to be a good source of carbohydrates.

Based on our research protein content in leaves and fruits of *Z. ovalifolium* is reported as 6.11% and 6.58% but higher than *C. tora* leaves (4.8%) reported by Shaikh and Syed (2016), Joshi *et al.* (2019) reported timber, seed and seed coat of *Z. alatum* (2.9 ± 0.14, 2.1 ± 0.24 and 2.6 ± 0.43%). (3.33 ± 0.07 %) in *Ocimum gratissimum* by S. Idriset *al.*, (2011). In this research, detailed examining of plant leaves and fruits revealed a moderate proportion of crude protein and fiber. This indicates that the plant is a modest source for crude proteins and fiber content in leaves and fruits. *Z. ovalifolium* helps to protect the health of gastrointestinal tract.

The moisture content in fruit and leaves (4.80 and 6.50%) is lower than the moisture content obtained from Periwinkle leaves and Lemongrass leaves (8.71 and 8.56 %) reported by Radali D and Alka G (2018) and (11.04% ± 0.01%) *C. cujete* by Musbau B (2018). However, moisture content in plant sample is higher than the value obtained (2.90 ± 0.10 and 2.35 ± 0.05) *Z. armatum* leaves and fruit by Barkatullah *et al.* (2015). So the results of moisture content in leaves and fruits of *Z. ovalifolium* support the practice of storage of the leaves in dehydrated form. The low moisture content of these leaves will help to keep leaves and fruits from microbial attack and allows high storage capacity.

The crude fat content of leaves and fruits of *Z. ovalifolium* found to be (1.0 and 0.50 %) comparatively lower than the amount found in *C. tora* 56% Leaves by Shaikh and Syed (2016) and *Ocimum sanctum* (3.6 ± 0.07%) which is reported by (Sudeshna Biswas *et al.*, 2018). Excessive fat consumption results in metabolic disorders such as atherosclerosis, cancer and aging. A low-fat food decreases cholesterol and obesity. In our study we found *Z. ovalifolium* leaves and fruits shows respectable amount of crude fat.

In present study the ash content of leaves and fruits of *Z. ovalifolium* (3.11 and 4.60 %) are comparatively lower than the plants *Deterium microcarpium*, *Flueggea virosa*, *Piliostigma thonnigii*, *Entada africana* and *Prosopis africana* (4.91%, 7.01%, 7.01%, 13.3% and 5.92%) respectively reported by Olanrewaju, C. A and Ahmed. F (2014). Adamu *et al.* (2017) reported that possess more or equal proportion of ash content (4.03%). The higher ash content is a reflection of the level in inorganic minerals and organic matter elements present in the sample, therefore the result suggest that the plant samples also possess significant amount of mineral elements.

Table 2: Essential elements contents in leaf of *Zanthoxylum ovalifolium*

Sl.No	Elements name	Leaf
Major elements (%)		
1	Phosphorus	0.12 %
2	Potassium	1.22 %
3	Calcium	0.77 %
4	Magnesium	0.031%
5	Nitrogen	2.10 %
Trace elements (ppm)		
1	Iron	222.55
2	Manganese	561.00
3	Zinc	32.02
4	Copper	62.80

Table 3: Essential elements contents in fruit of *Zanthoxylum ovalifolium*

Sl. No	Elements name	Fruit
Major elements (%)		
1	Phosphorus	0.17 %
2	Potassium	1.78 %
3	Calcium	0.57 %
4	Magnesium	0.029 %
5	Nitrogen	3.5 %
Trace elements (ppm)		
1	Iron	74.50
2	Manganese	220.70
3	Zinc	33.30
4	Copper	36.40

Table 2 and Table 3 showed that the result of essential elements of leaves and fruits of *Z. ovalifolium* possess high proposition of major trace elements. Elements analyzed in that, result showed significant differences between leaves and fruit. Nitrogen (3.5%) was found to be high in fruits, followed by leaves (2.10%). The amount of phosphorus found to be highest in fruits (0.17%) compared to the leaf (0.12%). Potassium was found to be high in the fruits (1.78%) compared to the leaves (1.22%). Magnesium was found to be high in leaves (0.031%) and least percentage was found in fruits (0.029%). Nitrogen found to high in fruits (3.5%) when compared to the leaves (2.10%).

The amount of iron content in the leaves (222.55 ppm) was almost twice that of the iron found in leaves (74.50 ppm). Compared with fruits, Manganese is found to be high in leaf (561.00 ppm) (220.70 ppm). Compared to the leaf and fruits of the *Z. ovalifolium* plant, zinc was found to be significantly high in fruits (33.30 ppm) than in leaves (32.02). Percentage of copper found to be high in leaves (62.80 ppm) compared with the fruits (36.40 ppm).

Conclusion

The analysis of elemental composition and nutrient value of *Zanthoxylum ovalifolium* leaves and fruits of our study showed significant amount of biological nutrients and trace elements. Hence, it might supply as nutrition in the body. The concentration of nutrition in fruits are more when compared to leaves, even though leaves found to be moderate compound of nutrition (Table 1) but overall the study plant *Z. ovalifolium* showed the presence concentrated nutrients to full fill the daily nutrition elemental dose of individual

person which contains nutrients such as, Crude protein, carbohydrates, crude fat, fiber and ash

References

- Adamu, A.U.; Paul, E.D.; Gimba, C.E. and Ndukwe, I.G. (2017). Phytochemical and proximate analysis of *Aspilia kotschy* (sch. bipex, hochst) oliv. Nigerian Journal of Technology (Nijotech) 36(4): 1135 – 1137.
- Bapan, B.; Kakoti, S.; Saikia, M.; Das, J. (2018). Evaluation of nutritional parameters in medicinal plants of assam. Current trends in Pharmaceutical Research, 5(1): 34-43.
- Barkatullah, Muhammad Ibrar, Naveed Muhammad, Abdur Rauf, Nasruddin, Haroon khan, Jawad Al. Evaluation of *Zanthoxylum armatum* its toxic metal contents and proximate analysis The Journal of Phytopharmacology 2015; 4(3): 157-163
- Gayathri, G.I., Bindu, R.N. and Babu, V. (2012). Analysis of proximate and nutritional composition in the leaves of *Azima tetracantha* Lam. Journal of Pharmacy Research, 5(3): 1568-1570.
- Idris, S.; Iyaka, Y.A.; Ndamitso, M.M. and Paiko, Y.B. Nutritional Composition of the Leaves and Stems of *Ocimum Gratissimum*. Journal of Emerging Trends in Engineering and Applied Sciences (JETEAS) 2 (5): 801-805.
- Idris, S.; Iyaka, Y.A.; Ndamitso, M.M. and Paiko, Y.B. Nutritional Composition of the Leaves and Stems of *Ocimum Gratissimum*. Journal of Emerging Trends in Engineering and Applied Sciences (JETEAS) 2 (5): 801-805.
- Katzmarzyk, J.L. and Waist, R.R. (2004). Circumference and not body mass index explains obesity related health risk. Am. J. Clin. Nutr. 79(3): 379-384.
- Neha, P.; Meena, R.P.; Rai, S.K. and Rai S.P. (2011). Medicinal plants derived nutraceutical : A re-emerging health aid. International journal of pharma and bio science. Vol2, issue 4,.
- Olanrewaju, C.A. and Ahmed, F. (2014). Proximate analysis and phytochemical screening of some medicinal plants commonly used by Guaris of FCT, Nigeria. International Journal of Current Research, 6(06): 6964-6967.
- Rahimullah, S. and Syed, I.Z. (2016). Phytochemical, Proximate and Nutrient Analysis of Cassia Tora Seeds. International Journal of Pharmaceutical Science Invention. 5(6): 04-06.
- Rishi, K.S.; Deepak, P.; Shukla, A.; Kumar, V.; Singh, J.; Porval, A. and Vats, S. (2015). Physical evaluation, proximate analysis and antimicrobial activity of *Morus nigea* seeds. International journal of pharmacy and pharmaceutical sciences. Vol 7, Issue 1.
- Sudeshna, B.; Sufia, Z. and Abhijit, M. Nutritional Value of *Ocimum Sanctum*. International Journal of Green and Herbal Chemistry. ; 7(2): 200-203.
- Tamana, T.; Sirohi, P. and Sharma, T. (2015). Proximate composition analysis of two medicinally important plants *Achyranthes aspera* and *Cissus quarangularis*. International journal of Pharmacy and Pharmaceutical Sciences ISSN- 0975-1491 Vol 7, Issue 4.
- Uzoekwe, N.M. and Mohammed, J.J. (2015). Phytochemical, proximate and mineral contents of leaves and bark of *Ficus capensis*. Journal of Applied Science and Environmental Management, 8(4): 125–129.