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Estimation of Proximate Composition, Nutritional Attributes and Minerals Composition of *Abutilon pannosum* (Forst.f) and *Grewiatenax* (Forssk) Leaves of Kachchh Region

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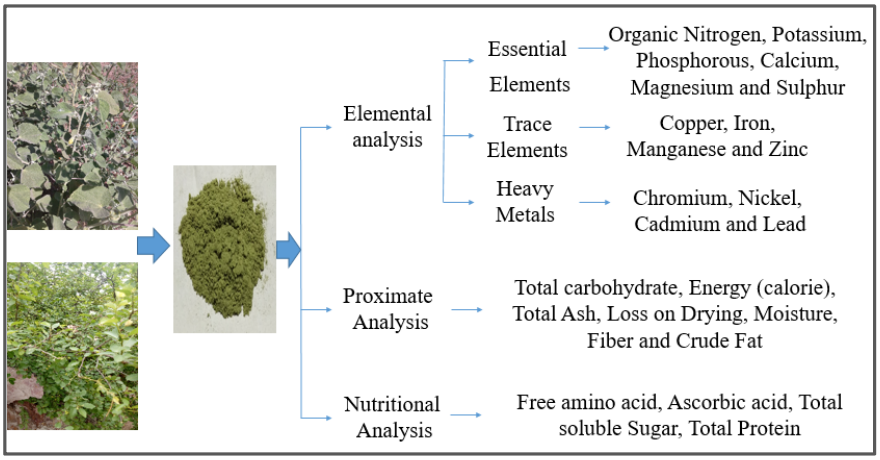
ABSTRACT

In the present part of the study, nutritional, proximate and elemental (essential, trace and heavy metals) analysis have been conducted by using various analytical techniques for Abutilon pannosum leaves (APL) and Grewia tenax leaves (GTL). Both plants contain the significant amount of nutrition like free amino acid, ascorbic acid, total sugar and total protein, proximate like total carbohydrate, calorie, fiber, ash, and crude fat, essential elements such as K, P, Ca, Mg, and S and trace elements like Cu, Fe, Mn, Zn etc. The results of the nutritional and proximate analysis indicate that the leaves of the GTL have greater nutritional value compared to APL. The elemental analysis of both plant samples was found below the Recommended Dietary Allowance (RDA) and World Health Organization (WHO) limits, except Cr and Ni in plant samples.

Graphical Abstract



Keywords: *Abutilon pannosum* leaves *(APL), Grewia tenax* leaves *(GTL)*, Proximate, Nutritional, Elemental Analysis.

INTRODUCTION

Abutilon pannosum (Forst.f) generally recognized as khapat is a significant therapeutic plant used in an ethnic medicinal system. The leaves were used as an adjunct to medicines used for relieving dehydration, diarrhoea, treating bronchitis, for pile grumbles, gonorrhoea, in reducing fever, diabetics, haemorrhoids and anemia, treating a vaginal infection and in impatience of the bladder and it is also used in cleaning wound and ulcer [**1**]. *Grewia tenax* (Forssk.) Fiori (GT) is the mutual name of Guddaim or Gangeti, a treasured plant species in Kachchh region. *Grewia tenax* is used as a remedy for luxury several diseases, including jaundice and hepatic disorders. The *G. tenax* leaves are useful against of tonsillitis infections, trachoma and as a poultice to treat inflammation [**2**].

The proteins, fats, carbohydrates, fiber, vitamins, lipids etc., are primary nutritional or metabolites, which are essential for plants as well as the human being to live and reproduce. Estimation of nutritive value delivers valuable data as it specifies the ability of any plant or plant part for being used as a drug. The proximate analysis of nutritive elements gives a good perception, especially when presented with further data about their phytochemical contents as well as their biological activities [**3**]. Elements have important biological functions in plants and in the human metabolic reactions. In the human body, the elements play a vigorous role in many physiological reactions and its deficit or surplus amount can affect the human health [**4**]. The elements were analyzed by Microwave Plasma Atomic Emission Spectroscopy (MP-AES), and Inductively coupled plasma mass spectrometry (ICP-MS) which have slowly been emerging as one of the most powerful and popular analytical tools for the analysis of elemental composition in different materials. The concentration of a sample can be determined through calibration with certified reference material such as single or multi element reference standards [**5**].

MATERIALS AND METHODS

Nutrient and Proximate analysis: The procedures of nutrient and proximate analysis were followed for the determination of free amino acid, ascorbic acid, total soluble sugar, total carbohydrate, total protein, energy (calorie), total ash, water-soluble ash, acid-insoluble ash, loss on drying, moisture, fiber and crude fat etc [**6, 7**].

Free amino acid: Ninhydrin reagent was prepared by mixing solutions A, B and C in the ratio of 5:12:2. (A-1% of ninhydrin reagent in 0.5 M citrate buffer, pH 5.5, B-Glycerol, C-0.5M citrate buffer). 2.0 g sample was homogenized in mortar and pestle with 10 mL of 80 % methanol for extraction of amino acids. The extract was transferred in 15 mL glass centrifuge tube. The tube was centrifuged for 10 min at 2000 rpm. The supernatant was collected in a 25 mL volumetric flask. This was repeated 2-3 times and the combined supernatant was made 25 mL with 80 % methanol. The suitable aliquot (0.2 mL) was taken in a glass tube and prepared up to 1.0 mL with the distilled water, 5.0 mL of Ninhydrin reagent was poured and content was thoroughly mixed. Tubes were kept in boiling water bath for 10 min to develop color. At the end of the incubation period, the tubes were removed from the water bath and allowed it to cool and reading was taken at 530 nm in the spectrophotometer. The reference curve was prepared using glycine as standard.

Ascorbic acid: Ascorbate was taken out from 1g of the sample using 4% Trichloroacetic acid (TCA) and the amount was prepared up to 10 mL. The supernatant achieved by centrifugation at 2000 rpm for 10 min was treated with a pinch of actuated charcoal, mixed energetically by a cyclomixer and reserved for 5 min. The charcoal particles were detached by centrifugation and aliquots were used for the assessment. Standard ascorbate running between 0.2-1.0 mL and 0.5 mL and 1.0 mL of the supernatant was taken. The amount was made up to 2.0 mL with 4% TCA. 2,4-dinitrophenyl hydrazine (DNPH) reagent (0.5 mL) was added to each of tubes, along with 2 drops of 10% thiourea solution. The substance were blended and incubated at 37°C for 3 h bringing about the arrangement of osazone crystals. The crystals were melted in 5 mL of 80% sulfuric acid in cold. DNPH reagent and

thiourea were included after the addition of sulfuric acid. The tubes were chilled in ice and the absorbance was read at 540 nm in a spectrophotometer [**8**].

Total soluble sugar: Weigh 2 g of the samples were homogenized in 80 % methanol using mortar and pestle and take it to a flask that contained 20 mL of boiled water (70°C). Hydrolyze by keeping it in a boiling water bath for three hours with 10 mL of 80% Methanol and cool to room temperature. Prepare the volume of 100 mL and centrifuge. A suitable aliquot (0.2 mL) was taken and volume made to 2.0 mL with the distilled water followed by 1.0 mL 5 % redistilled phenol and mixed thoroughly. To this, 5.0 mL 96 % sulfuric acid was added in tube. After mixing, the tubes were retained in boiling water bath for 20 min, till the yellow-orange color change. The absorbance was measured at 490 nm. The content was calculated with the help of a reference curve prepared from D-glucose as standard and expressed as g $100g^{-1}$ [**9**].

Total carbohydrate: Weigh 100 mg of the sample into a boiling tube. Hydrolyze by putting it in a warm water bath for 3h with 5 mL of 2.5 N HCl and cool to room temperature. Neutralize it with solid sodium carbonate until the effervescence made up the volume to 100 mL and centrifuge. Glucose was used as a standard stock solution prepared at a concentration of 50 mg 50 mL^{-1} in distilled water. Working standard solution was prepared by diluting 10 mL of stock solution to 100 mL with distilled water. Take 0.2, 0.4, 0.6, 0.8 and 1 mL of the working standard into a series of test tubes. Further, measure 0.1 and 0.2 mL of the sample solution in 2 different test tubes and prepare the amount in each tube to 1 mL with water. Set a blank with 1 mL of water then add 1 mL of phenol solution to each tube and 5 mL of 96% sulfuric acid to each tube and wobble well. 10 min later, shake the substance in the tubes and put in the water bath at 25-30°C for 20 min., the development of green color was measured at 490 nm [**9**].

Total protein: The residues left after 80% acetone extraction was hydrolyzed in 5 mL of 1N NaOH for overnight and centrifuged at 5000 rpm for 20 min. The supernatant was kept aside and the residue was again extracted with 5 mL of 1N NaOH for 1 h and then centrifuged. Both the supernatants were pooled and made the volume of 10 mL. A 0.5 mL aliquot was taken in the test tube and mixed with 5 mL of reagent (Alkaline copper solution) solution allowed for 10 min. Thereafter, 0.5 mL of reagent (Folin-Ciocaltaeu reagent) was poured with instant mixing. After 30 min, absorbance was recorded at 570 nm through spectrophotometer against a reagent blank. A standard curve was prepared with a graded concentration of bovine serum albumin and calculated the amount of protein in the sample [**7**].

Calorie (energy): An oxygen bomb calorimeter was utilized to decide the calorific estimation of the plant sample. The bomb calorimeter and the metal compartment encompassing it frame the part of the calorimetric framework, which is set in a thermally protected coating. An essential temperature transducer set inside the unit records the adjustment in the system temperature because of the burning of the fuel in the bomb [**10**].

Ash value: Total ash usually consists of carbonates, phosphates, silicates, and silica [**10**]. Total Ash values of APL and GT L were determined by muffle furnace incineration by AOAC [**37**]. 2 g accurately weighed powdered leaves of APL and GTL were separately placed in a dry crucible. The content was incinerated at a temperature not exceeding 450°C until free from carbon. The crucible was cooled in a desiccator and weighed. The percentage of ash was calculated by using the following formula:

$$\text{Ash (\%)} = \frac{\text{Weight of Ash}}{\text{Weight of sample}} \times 100 \qquad \text{--(1)}$$

Water-soluble ash value: Total ash obtained was warmed up to 450°C with the addition of 25 mL of water for 10 min. It was filtered in an ash less filter paper (Whatman No. 41) and the buildup was ignited in the furnace to get a steady weight.

Acid-insoluble ash value: Total ash obtained was heated with the addition of 25 mL of dilute HCl for 10 min. It was separated in an ash less filter paper (Whatman No.41) and the buildup was ignited in the furnace to get a steady weight.

Determination of moisture content and dry matter: Dry matter and moisture of the material were determined by following the method by AOAC (1990) [37]. Dishes were washed with detergents and then were dried at 105°C in the oven. Then dishes were removed from the oven and then kept in a desiccator for cooling and weights. 25 g leaves sample was taken in dishes and put in the oven at 105°C for 6 h. The dry matter and moisture were derived from below equations:

$$\text{Moisture} = [(\text{Fresh weight} - \text{Dry weight})/(\text{Fresh weight})] \times 100 \quad \text{--(2)}$$

$$\text{Dry matter} = [(\text{Weight of dried sample})/(\text{Weight of sample before drying})] \times 100 \quad \text{--(3)}$$

This oven-dried matter was used for the further analytical procedure.

Determination of crude fiber using fibertherm: 2 g of sample (w_1) powder was weighed and transferred to fiber bag. Fiber bag was placed in sample holder vials in fibertherm digestion and the hood was closed. Digestion method was as per below was executed, then digested samples were kept at the 105ºC temperature for drying. After that, dried samples were transferred into pre-weighted (w_0) empty crucible and weights of the crucible with the dried sample (w_2) were taken, the crucible was kept into muffle furnace at 600°C or 30 min. The weight of the crucible together with ash (w_3) was taken. Percent (%) fiber content was calculated using the formula given below:

$$\% \text{ of Fiber} = \frac{(W2-W0)-(W3-W0)}{W1} \times 100 \quad \text{--(4)}$$

Where, W_0 =Weight of empty crucible
W_1 = Weight of sample
W_2 = Weight of crucible along with dried sample
W_3 = Weight of crucible along with ash.

Fibertherm instrument program/method for extraction: There are 3 different stages of the method which are shown in table 1.

Table 1. Fibertherm instrument program/method for extraction

Stages	A	B	C
Solvent	H_2SO_4 (1.8 L)	NaOH (2.0 L)	H_2O (1.0)
Heating	42%	38%	45%
Circulation time	10 sec	15 sec	10 sec
Circulation pause	30 sec	10 sec	10 sec
Boiling time	20 min	10 min	5 min
Suction	2 min 10 sec	2 min 10 sec	2 min
Rinsing	2 cycles	2 cycles	0 cycles

Crude fat: The Crude fat content in sample was evaluated by soxhtherm extraction for 6 h with n-hexane. 20 g dried sample weighed accurately into labeled thimbles (33 x 80 mm) were extracted with 750 mL n-hexane for six hours through Gerhardt soxhtherm apparatus. Later, the soxhtherm apparatus was collected and kept for reflux for 3 h [10]. The thimble was detached and n-hexane composed from the upper bowl. Later, the flask was dried at 105°C for 6 h when it was free of n-hexane. Subsequent to drying, it was cooled in a desiccator and weighed. % of fat in the leaves sample was calculated by the following equation:

$$\% \text{ Crude fat or oil} = \frac{\text{Weight of the oil}}{\text{weight of sample}} \times 100 \quad \text{--(5)}$$

Essential Elements Analysis

Nitrogen analysis: 0.5 g sample and 10 mL conc. H_2SO_4 have been added with digestion mixture for digestion for nitrogen. The analysis nitrogen was done by Vapodest 50s instrument which is an automatic unit of a Gehdal method for nitrogen analysis [**11**].

$$N\ \% = \frac{(A-B)\times N \text{ of } H_2SO_4 \times 1.4 \times V}{v \times S} \quad \text{--(6)}$$

where, A = Sample reading (mL), B = Blank reading (mL), S = weight (gm) of plant material, V = mL of total digest, v = mL of digest distilled.

Na-K estimation: The plant sample (0.5 g) were digested in 8 mL di-acid (Nitric acid). Digested sample was diluted with distilled water and the absorbance was measured against the 25 mg, 50 mg and 100 mg KI solution in the flame photometer. First, the flame photometer was calibrated with distilled water and then against the standard solution.

Phosphorus analysis: Vanedo-Molybdo phosphoric method has been used for analysis of phosphorus. 5 mL aliquot with 5 mL nitro venedo reagent (100 mL of 5% ammonium molybdate solution + 100 mL of 0.25% ammonium vanadate solution + 100 mL of diluted nitric acid) was added and final volume up to 25 mL distilled water. Has been prepared for reading in UV spectrophotometer at 440 nm. The intensity of the yellow color obtained was measured at 440 nm using spectrophotometer.Phosphorus content was expressed in % and calculated using the below-mentioned formula:

$$P\ (\%) = \frac{\text{Biuret reading} \times \text{dilute factor} \times \text{graph factor}}{10000} \quad \text{--(7)}$$

Sulfur analysis: 5 gm both plant materials were mixed with 2 mL of saturated magnesium acetate slurry in nickel crucible. The mixture was ashed at 480°C in a muffle furnace for 4 h, cooled and the contents were melted in water, filtered and the volume was madeup to 100 mL with distilled water. The sulfur content in the digested samples was determined by following the turbidity method.

Analysis of Ca and Mg: Macroelements (Calcium and Magnesium) present in the leaves sample were quantified using MPAES. 0.5 g of powdered leaves sample was weighed first digested using 15 mL of diacid mixture, (nitric acid: perchloric acid, 1:1 v/v). The digestion mix was left aside for half an hour for pre-digestion and the fumes were allowed to evaporate. It was then heated at 100ºC for about 30 min to allow it to concentrate to about 0.5 mL. The digested mixture was taken into a 100 mL volumetric flask and diluted upto the mark with Milli Q water. This prepared sample was then directly used for MP-AES analysis and the content of the mineral elements calculated against a standard curve prepared accordingly. Calcium and manganese were analyzed in MP-AES with proper standards.

Trace elements: The plant powder sample (0.5 g) has been digested with 8 mL Conc. HNO_3 in a closed system of MARS (Microwave Digestion system unit-6). High temperature up to 170°C and pressure have been applied for proper digestion. After digestion samples have been diluted to 50 mL with 1% HNO_3 and it can be further used for trace element analysis like Cu, Fe, Mn, and Zn. The trace element was determined by using MP-AES and ICP-MS. Different Standards of particular elements have been used. By use of ICP-MS trace metals and heavy metals with a different method for digestion were found [**11**].

Heavy elements: Leaves powder sample were first converted to ash form by heating on 480°C for 4h. HCl, $HNO_3$and H_2O_2 were poured to 1 g ash and the blend was warmedon 95°C for 1 h. Afterward, the total amount was prepared to 50 mL with ultrapure water [12]. Heavy metal adsorptions were examinedby ICP-MS. Calibration samples were made with 10 mg L^{-1} trace element standard stock solution and 10 mgL^{-1} heavy metals standard stock solutions. Values of calibration curves for trace and heavy metals are shown in table 2.

Table 2. Values of nutritional and proximate analysis of APL and GTL

S. No.	Parameter	APL	GTL	Unit	Method	R^2
1	Free Amino Acid	0.97	1.25	%	Ninhydrin	0.9985
	Ascorbic acid	0.87	0.98	%	DNPH	0.9990
2						
3	Total Sugar	4.1	4.2	%	Phenol-Sulfuric acid	0.9976
4	Total Carbohydrate	25.47	26.25	%	Phenol-Sulfuric acid	0.9976
5	Total Protein	37.93	38.54	%	Folinlowry's	0.9998
6	Calorie	276.87	269.83	Kcal $100g^{-1}$	Bomb Calorie	-
7	Total Ash	9.87	8.50	%	AOAO	-
8	Water-soluble ash	2.97	1.23	%	AOAO	-
9	Acid-insoluble ash	0.99	1.61	%	AOAO	-
10	Dry Matter	98.10	98.34	%	Oven Dry	-
11	Moisture	1.90	1.66	%	Oven Dry	-
12	Fiber	16.63	48.62	%	Automated Fibertherm	-
13	Crude fat	2.55	1.18	%	Soxhlet	-

RESULT AND DISCUSSION

The findings of the nutritional and proximate analysis confirm different proportions of biochemical and other contents.

The free amino acid contents were found in APL and GTL (0.97% and 1.25% respectively). Amino acids are essential building blocks in the synthesis of proteins including antioxidant enzymes and precursors in the formation of secondary metabolism molecules [13]. Ascorbic Acid or Vitamin C found in APL (0.87%) and GTL (0.98%), it is a water-soluble antioxidant [14]. Ascorbic acid is significant in the appropriate functioning of the immune system. Its antioxidant property is related with the reduction of cancer rates [15]. Ascorbic acid also has other beneficial effects on our body, such as preventing common cold/heart diseases and strengthening the human immune system. A higher amount of Ascorbic acid is used in the inhibition and treatment of glaucoma, cataracts, macular degeneration, atherosclerosis, diabetes, cancer, and stroke etc [16]. Insufficiency of this vitamin can cause muscle degeneration, scurvy, anaemia, poor wound healing, bleeding gums, capillary haemorrhaging, atherosclerotic plaques, and neurotic disorders [8, 16]. The Upper Intake Levels (ULs) for adults for vitamin C is 2,000 mg day^{-1} based on the adverse effect of osmotic diarrhoea [15]. The sugars are a constitutive part of the central carbohydrate metabolism. It was found to be 4.1% and 4.2% in APL and GTL respectively. The carbohydrate content in the GTL (4.2 and 26.25%) is higher than APL (4.1 and 25.47%) respectively. Carbohydrates serve as a source of energy and aid digestion and the assimilation of other nutrients [13, 17]. Total Protein content is present in the leaves of APL (37.93%) and GTL (38.54%). Total Protein is involved in the formation of hormones, which controls a variety of body functions such as growth, repair, and maintenance of the body, and creation of enzymes and structural membranes [18]. Energy in terms of calorific value, it acts as good nutritional sources of energy and it was found to be 276.87 kcal $100g^{-1}$ and 269.83 kcal $100g^{-1}$ in APL and GTL respectively [19]. The total ash content values were found to be 9.87% and 8.50% in APL and GTL respectively. A higher value of ash content is an indication that the plant has a high level of inorganic minerals content such as calcium, magnesium, zinc, potassium, copper and phosphorus and organic matter present in the leaves [20]. In the present investigation, moisture content in APL and GTL is shown 1.90% and 1.66% respectively. The crude fiber content of the GTL (48.62%) is significantly

higher than the APL (16.63%). The crude fiber is very useful to prevent diverticulosis, constipation, coronary heart diseases, hypertension, colon, breast cancer and diabetes [20] The crude fat is known as a source of lipid contain which prevent atherosclerosis and aging reported that low fat reduces cholesterol level and obesity [21].

Minerals play a vital role in keeping proper function and decent health of the human body [22]. Minerals are ions set up in blood plasma and cell cytoplasm, for example, sodium, potassium, and chloride. In addition, minerals contain much of the chemical composition of bones (calcium, phosphorus, oxygen). They also subsidize nerve and muscle activity (sodium, potassium, calcium) [23]. Insufficient consumption of minerals in the diet is often accompanying an increased weakness to infectious diseases due to the failing of the immune system. Plants, drinking water, and animal foods are significant sources of essential elements [24]. The mineral elements are shown in table 3.

Table 3. Values of elements in APL and GTL and its comparison with permissible limits given by WHO and RDA [6, 26-28]

S.No.	Parameter	APL	GTL	Health Based	Water Based	Plant Based	Unit	Method	R^2	Wave-length (nm)
1	Total Nitrogen	2.26	2.19	3.0	N/A	N/A	%	Micro kjeldahl	-	-
2	Total Potassium	2900	2400	3500	N/A	0	ppm	Flame Photometric	0.9962	-
3	Total Phosphorus	790	810	1000	N/A	N/A	ppm	Vanedo-Molybdo phosphoric	0.9983	213.6
4	Calcium	900	1113	1000-1200	75	N/A	ppm	MP-AES	0.9992	445.48
5	Magnesium	355	320	280-350	N/A	N/A	ppm	MP-AES	0.9985	383.83
6	Sulfur	0.18	0.15	0.25	N/A	N/A	%	Turbidity	-	-
7	Copper	0.935	0.954	0.3-2	2	10	ppm	MP-AES	0.9989	324.8
8	Iron	1.03	1.05	0.2-1.3	0.5-50	20	ppm	MP-AES	0.9992	259.94
9	Manganese	1.458	1.388	0.02-3	0.5	0.5	ppm	MP-AES	0.9990	257.61
10	Zinc	9.36	6.18	3-12	5	50	ppm	MP-AES	0.9989	213.8
11	Copper	0.173	0.198	0.3-2	2	10	ppm	ICP-MS	0.9983	324.8
12	Iron	0.29	0.26	0.2-1.3	0.5-50	20	ppm	ICP-MS	0.9991	259.94
13	Manganese	2.382	1.508	0.02-3	0.5	0.5	ppm	ICP-MS	0.9984	257.61
14	Zinc	2.112	0.906	3-12	5	50	ppm	ICP-MS	0.9983	213.86
15	Chromium	0.35	0.17	0.020	0.05	0.05	ppm	ICP-MS	0.9962	267.72
16	Nickel	0.016	0.011	0.008-0.03	0.03	0.2	mgL^{-1}	ICP-MS	0.9985	231.60
17	Cadmium	$7x10^{-4}$	$5x10^{-4}$	0.003	0.005	0.001	mgL^{-1}	ICP-MS	0.9983	228.3
18	Lead	$3.5x10^{-6}$	$1.9x10^{-6}$	0.21	0.05	0.2	mgL^{-1}	ICP-MS	0.9984	405.78

The mineral elements contains significant amount of essential elements [Organic nitrogen (2.26% and 2.19%), Potassium (0.29% and 0.24%), Phosphorous (0.079% and 0.081%), Calcium (0.09% and 0.1113%), Magnesium (0.036% and 0.032%) and Sulphur (0.18% and 0.15%)]. Among the essential elements of both plants, N > K > S > Ca > P > Mg were found by various methods. Trace elements like Copper (0.935 and 0.954 ppm), Iron (1.03 and 1.05 ppm), Manganese (1.46 and 1.39 ppm) and Zinc (9.36 and 6.18 ppm) were found in APL and GTL respectively. Among the trace elements of both plants, Zn > Mn > Fe > Cu were found by MP-AES method. Heavy elements like Chromium (0.35 and 0.17 ppm), Nickel (0.06 and 0.011ppm), Cadmium ($7x10^{-4}$ and $5x10^{-4}$ ppm) and Lead ($3.5x10^{-6}$ and$1.92x10^{-6}$ ppm) were found in APL and GTL respectively. Among the heavy elements of both plants, Cr > Ni > Cd > Pb were found by ICP-MS method. Except Ni and Cr, the concentration of trace elements in both plants is lower than the recommended maximum acceptable levels proposed by the Joint FAO/WHO Expert Committee [23]. The trace element was analyzed by MP-AES and ICP-MS. Mn and Zn were found in higher amount in both plants. The organic nitrogen is of great interest, as it can be considered approximately equivalent to protein content multiplied by a factor of 6.25 [5]. When nitrogen is provided in higher amount, the plant exhibits bottle green leaves with a

great quantity of foliage and compact development of the root system. Potassium is essential in huge quantities for appropriate development and reproduction. The deficiency of potassium affects hypertension, cardiac arrhythmia, muscle weakness, nausea, lethargy, drowsiness etc. The recommended daily intake of potassium varies from 0.4 g for infants, 3.8 g for children aged 4-8 years and 4.7 g for adolescent men and women [**11, 23**]. Calcium is an important nutrient that performs a vigorous role in neuromuscular function and blood clotting. Phosphorus and calcium are necessary for blood clotting, muscle functions, bone, and teeth formation [**7**]. Calcium deficiency can lead to rickets, osteomalacia and tooth decay. The RDA of Ca 210 mg for infants, 800 mg for children of 4-8 years, 1300 mg for adolescents and 1000 to 1200 mg for adolescent men and women [**11**]. In the human being, Mg plays a significant role in retaining heart rhythm and cholesterol level in the body and also controls heart diseases. Mg converts blood sugar into energy and also prevent headache [**25**]. Deficiency of Mg creates neurological and neuromuscular signs, loss of appetite, vomiting, nausea, retention of sodium, rapid heartbeat, tingling or numbness, fatigue, hallucinations, delirium, low circulating levels of parathyroid hormone, weakness and affects arrhythmia and myocardial infarction. The RDA for infants is 30 mg, 130 mg for children of 4-8 years, and about 400 mg for women and men [**11**]. The most common symptoms of Cu deficiency are bones deformities hair depigmentation, anaemia, fatigue, and a decreased number of WBC. Sometimes, nerves are damaged, that cause tingling and loss of sensation in the feet and hands. Some persons become confused, ill-tempered, and mildly depressed [**26**]. The pre-defined RDA for Cu in normal healthy adults is 2 mg day^{-1} [**23, 11**]. Iron expedites the oxidation of biomolecules to regulate obesity, which influences human to several diseases. Fe deficiency causes anaemia, drowsiness, and faintness due to the insufficient oxygen supply to the body cells, shallowness in the hands and eyelids [**27**]. As stated by USDA, the daily recommended intake of Fe is 8 mg and 18 mg for adult male and female respectively [**11**]. Manganese is vital for proper operation of the central nervous system. Its deficiency causes hypercholesterolemia, changes in hair color, dermatitis, impaired glucose tolerance, deafness, skeletal abnormalities, and infant abnormalities [**28**]. RDA for Mn is 2.3 mg day^{-1} and 1.8 mg day^{-1} for adult male and female respectively [**23, 11**]. Zn is essential in protein creation, cellular differentiation and duplication. Zn deficiency causes hair loss, delayed sexual maturation, impotence, delayed healing of wounds, hypogonadism in males, weight loss, eye and skin scratches, taste abnormalities, and mental lethargy may also occur [**28, 29**]. As stated by USDA, the RDA for Zn is 8 mg day^{-1} and 11 mg day^{-1} for adult women and for adult men respectively [**11**].

Chromium in trace proportion is required in the body in definite amount [**30**]. An acceptable intake of Cr is 35 mg day^{-1} and 25 mg day^{-1} for adult males and females respectively [**23, 11**]. Ni in trace proportion is required in the body, however, the more consumption may be hazardous to the human fitness [**30**]. Researchers have shown that severe exposure of the human body to Ni may cause numerous health problems, for example, spine, brain and tissue damage, kidney, liver, lung and nasal cancer, vesicular eczema [**31**]. Cadmium was detected in the quantity of 0.1 mg kg^{-1} APL and GTL. It is a carcinogen that has a detrimental effect on the kidney and heart [**28, 31**]. Lead has no any known health benefit or the biological role in the human body. On the contrary, lead has adverse effects that deleterious the human body. It is rapidly absorbed into the bloodstream of the human body through inhalation, ingestion, or skin contact [**28, 31**]. Through the bloodstream, lead is distributed among three main compartments: Blood, soft tissue that includes kidney, bone marrow, liver, brain, and mineralized tissue that includes bones and teeth. Lead poisoning can affect almost every organ and system in the human body such as the brain function and the nervous system, the reproductive system, creates high blood pressure, and reduces the intelligence level. At the most, it may even cause death [**32**].

APPLICATION

In current scenario, research is focused on natural systems of treatment for curing against different pathogens, because of the harmful effects of synthetic system. So, the present research work has been done on nutritional, proximate and elemental analysis of medicinal plant (APL and GTL) to reveal the

importance to the people. This analysis is primary step for measuring useful and toxic effects of particular plant. This study can be fruitful in natural medicinal area and pharmaceutical industries.

CONCLUSION

APL and GTL are rich in nutrients like crude protein, free amino acid, sugar, carbohydrate, crude fat, vitamins and high levels in ash content. They could be important contributors to improving the nutritional contents of the health of rural and desert people in Kachchh. The results of the nutritional and proximate analysis indicate that the leaves of the GTL have greater nutritional value compared to APL. For this purpose, common plant species are taken in their diet which provides a good quantity of these basic nutrients, micro, and macro elements. The essential and trace elements contents found from the APL and GTL plant samples were estimated below the respective RDA and WHO limits. The heavy metal (Pb, Cd, Cr and Ni) contents found from the APL and GTL plant samples were estimated below the respective RDA or WHO limits, except, of Cr and Ni contain. These plants are consumed by the local clinician and people in large amount for medicinal purposes.

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