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COMPARATIVE STUDY OF THE ANTIOXIDANT POTENTIAL AND NUTRITIONAL VALUE OF SOME GREEN FOLIAGE VEGETABLES COMMONLY USED BY THE VILLAGE PEOPLES

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ABSTRACT
The various types of Reactive oxygen species (ROS) are generated in human body as a result of metabolic reaction in form of free radicals and can cause harm to cellular macromolecules. Better nutritional status increase immunity and several antioxidants are produce internally or received exogenously through foods help against diseases. All the biochemical parameters for nutritional value and antioxidant potential were measured in *Amaranthus viridis*, *A. tricolor*, *Trigonella foeum-geaecum*, *Chenopodium album*. All the parameters are were tested separately in leaves as well as stems of the leafy vegetables and were found higher in leaves than stems. Antioxidant potential was determined by DPPH method was found maximum in *A. tricolor*. The result suggested that the tested leafy vegetables have high nutritional value and have the potential for use as food of antioxidant input.

KEY WORDS: Nutritional value; antioxidant potential; foliage vegetables.

INTRODUCTION

The presence of free radicals in biological materials was discovered less than 50 years ago (Droge, W. 2002). Exposure of biological systems to xenobiotics, pollutants, ionizing radiation, U.V. light, and development of certain pathological conditions lead to oxidative stress, consequently increase production of oxy radicals (Sies, H. 1996). Antioxidant is a molecule capable of slowing or preventing the oxidation of other molecules. Oxidation reactions can produce free radicals, which start chain reactions that damage cells. Antioxidants terminate these chain reactions by removing free radical intermediates and inhibit other oxidation reactions by being oxidized themselves. To keep a proper equilibrium between ROS and defense system components, there is a need to provide antioxidants as a part of diet (Yu *et al*., 2003). That is why potential sources of natural antioxidant have been searched in different types of plant materials such as vegetables, fruits, leaves, oilseeds, roots, spices and herbs (Rababah *et al*., 2004).

The main objective of this study to evaluate the nutritional value and antioxidant activity of the four indigenous vegetables like *Amaranthus viridis*, *A. tricolor*, *Chenopodium album*, *Trigonella foeum-graecum*.

MATERIALS & METHODS

1. **Collection of Plant materials**: Four leafy vegetables were collected *Amaranthus viridis*, *A. tricolor*, *Chenopodium album*, *Trigonella foeum-graecum* from market. Then plant materials are preserved in freezer for further use.
2. **Estimation of Dry weight of the plant sample**: After surface drying with blotting paper, freshly harvested nodules were weighted and kept at 50°C for 24h. Then final weight was taken and dry weight was determined or percentage of water present determined.
3. **Extraction and estimation of protein content of the plant**: Protein was estimated according to the method of Lowry *et al.* (1951). 1g nodule was extracted with 5ml of 50Mm phosphate buffer (pH- 7.5) centrifused at 10,000g for 10 min. To the supernatant known as buffer soluble protein equal volume of 20% TCA was added and kept for 30 min as 4^0C.The precipitate obtained after centrifugation collected. To the precipitate dissolve in 1(M) NaOH solution was considered as TCA insoluble fraction and the supernatant was considered as TCA soluble fraction. The known amount of protein extract from buffer soluble, TCA insoluble and TCA soluble fractions were mixed with 5ml of Lowry reagent. After 10 min 0.5 ml of Folin phenol reagent was added and intensity of color developed was measured in a spectrophotometer at 650nm after 30 min incubation.
4. **Extraction and estimation of the sugar content of the plant**: Total sugar was extracted and estimated according to the method of Antoniew and Sprent (1978). 1g nodules were extracted with 5ml of 50mM K-phosphate buffer (pH-8) at 4000g for 15min. Then supernatant was taken and 5 volumes of 80% ethanol was added, kept at 4^0C for 4days. Aquous phase was taken; 2ml of aliquote was mixed with 4ml of chilled anthrone reagent and heated at 90^0C for 15min in water bath. Then the tubes were allowed to stand at room temperature and the absorbancy was taken at 655nm using spectrophotometer.
5. **Extraction and estimation of the polyphenol content of the plant**: The polyphenol content was estimated by Folin-Ciocalteau reagent according to Px. Mallick and Singh (1980). 1g tissue grinds with 5ml of 80% etanol and centrifused at 1000g for 20 min. The supernatant was

taken and kept. Again re-extract the residue with same reagent, spin and pool the supernatant as above. Then dissolve the residue in 2ml distilled water, take 1ml in a test tube for experiment. In 1ml aliquote add 2ml 2% Na_2CO_3, after 2min incubation add 1ml of Folin-ciocalteau reagent. Then after incubation 30min in room temperature and the absorbancy was taken 1t 720nm.

6. **Antioxidant potential of Leaf by the use of stable DPPH radical**: DPPH (1, 1-diphenyl-2-picrylhydrazyl) can make stable free radicals in aqueous or ethanol solution (Hirata *et al*., 1988). When DPPH reacts with an antioxidant compound, it is reduced the change of color (from purple to light yellow) was measured at 517nm on UV-VIS spectrophotometer. The radical scavenging potential was calculated as RSC (% of inhibition).

Where, **% RSC=($OD_{control}$-OD_{sample})/$OD_{control}$*100**

RESULT & DISCUSSIONS

The study showed a good correlation between antioxidant potential and high polyphenol content. It was also found that high contents of sugar and protein directly related to antioxidant potential. The tested parameters were observed maximum in leaves than stems. The percentage of water content plays vital role for a number of metabolic reactions and also a fundamental sap of blood plasma. Thus the result shows the percentage of water content is high in stem tissue than leaf tissue. The *A. tricolor*s shows highest water content in both leaves (92.2%) and stem (96.6%) (Fig. 1C) tissue. The sequential water content present in other plants are- *Trigonella foeum-graecum >Chenopodium album>Amaranthus viridis* (Table.1.) So, consumption of those plants is important for survival of life.

TABLE 1. Percentage of water content of four leafy vegetables

SL. NO	PLANT NAME	% OF WATER CONTENT	
		LEAF	STEM
1	*Amarantus viridis*	85.2	87.69
2	*Amarantus tricolor*	92.2	96.6
3	*Trigonella foenum-graecum*	88.4	92
4	*Chenopodium album*	85.8	89.8

TABLE 2. Protein content mg/g fresh tissue of four leafy vegetables.

SL.NO.	PLANT NAME	PROTEIN CONTENT mg/g	
		LEAF	STEM
1	*Amarantus viridis*	4.43	1.02
2	*Amarantus tricolor*	5.41	0.906
3	*Trigonella foenum-graecum*	15.45	2.91
4	*Chenopodium album*	3.66	3.69

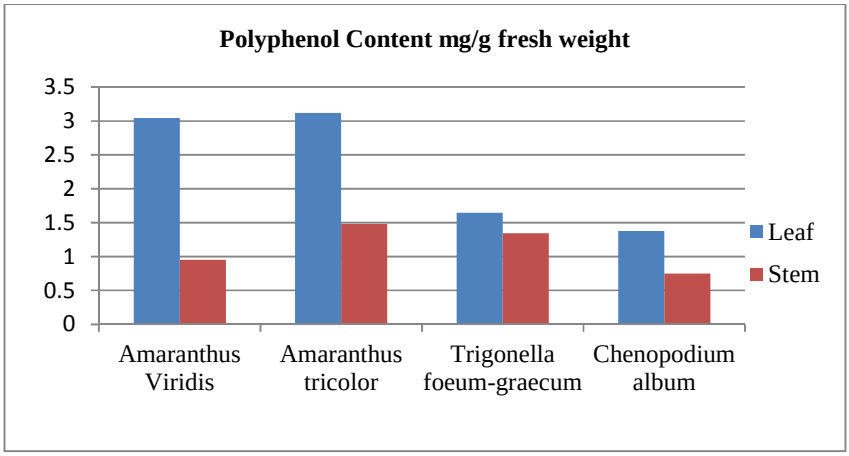

FIGURE 1A

The nutritional components such as sugar content is high in *C. album* (Leaf-0.602, Stem-0.518) (Fig.1B), but mainly sugar content comparatively high in leaf tissue. The order of sugar content are *Trigonella foeum-graecum >A. tricolor>Amaranthus viridis* (Table.3) The protein content is another aspects of nutrition of biological organism. The role of protein with in body has a specific, involvement in structural as well as defense mechanism against disease (Regina, B. 2008). Thus these four vegetables contained comparatively high protein content. The results of protein content shows very high amount in leaf (15.45mg) (Fig.1E) tissue of *T. foeum-graecum*., the sequential protein content present in this plants are *A. tricolor* > *C. album* >*A. viridis* (Table 2.). Thus consumption of these plants is very suitable for children as well as younger generation as nutrition requirement for growth. Cellular damaged caused by reactive oxygen species (ROS) and causes diseases in biological organism. Thus natural antioxidants have significance important in human health (Hazra *et al*., 2008). The plants and animals contain

complesx of antioxidant like polyphenol. The polyphenol content mainly present in high amount in *A. tricolor* (Leaf-3.12mg/g and Stem-1.48mg/g fresh tissue) (Fig. 1A) (Table 4). The consumption of dietary polyphenols is associated with reduction in inflammatory effects such as coronary heart diseases and also improves health of human beings.

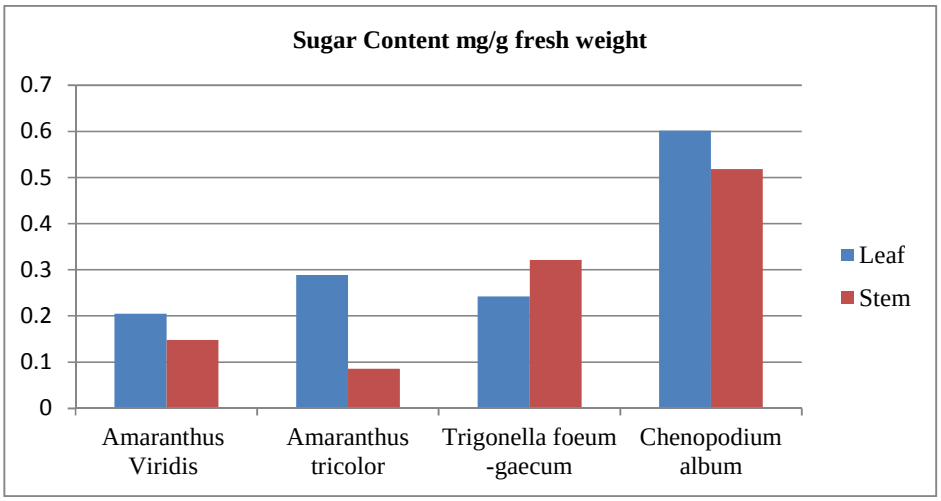

FIGURE 1B

TABLE 3. Sugar content mg/g fresh tissue of four leafy vegetables

SL. NO	PLANT NAME	SUGAR CONTENT mg/g fresh tissue	
		LEAF	STEM
1	*Amarantus viridis*	0.205	0.148
2	*Amarantus tricolor*	0.289	0.085
3	*Trigonella foenum-graecum*	0.242	0.322
4	*Chenopodium album*	0.602	0.518

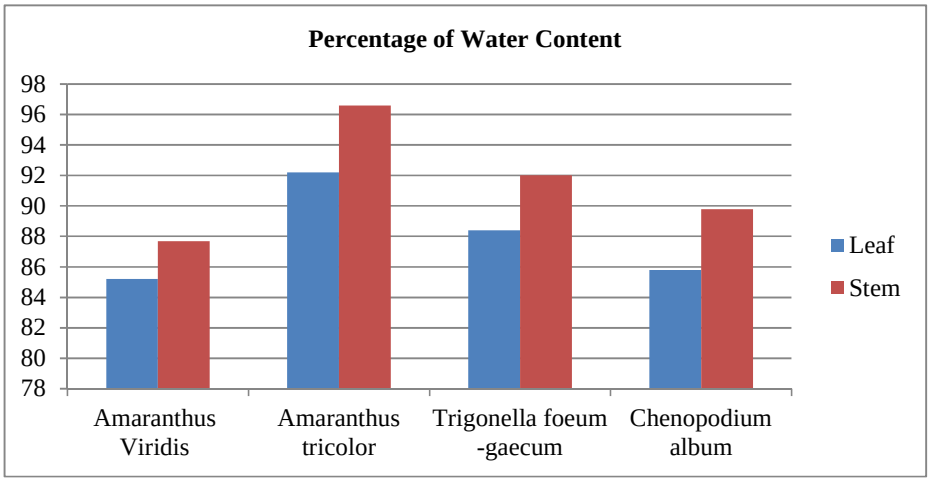

FIGURE 1C

TABLE 4. Polyphenol content mg/g fresh tissue of four leafy vegetables.

SL. NO	Plant name	Polyphenol content mg/g fresh weight	
		LEAF	STEM
1	*Amarantus viridis*	3.042	0.954
2	*Amarantus tricolor*	3.12	1.48
3	*Trigonella foenum-graecum*	1.649	1.346
4	*Chenopodium album*	1.375	0.748

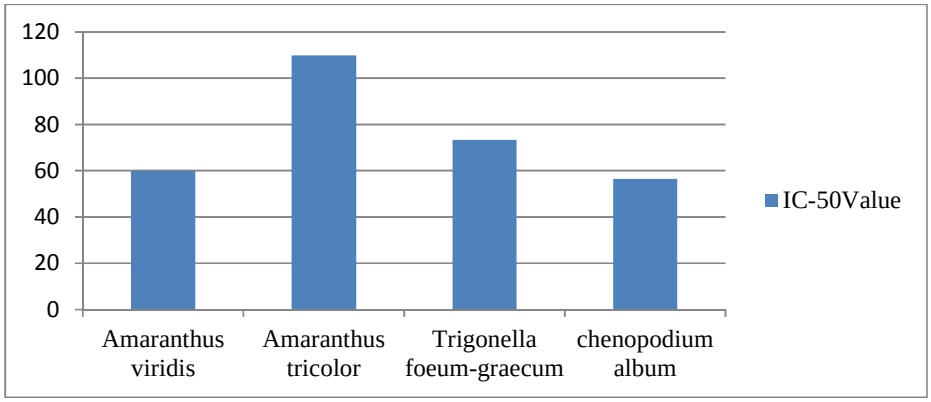

FIGURE 1D

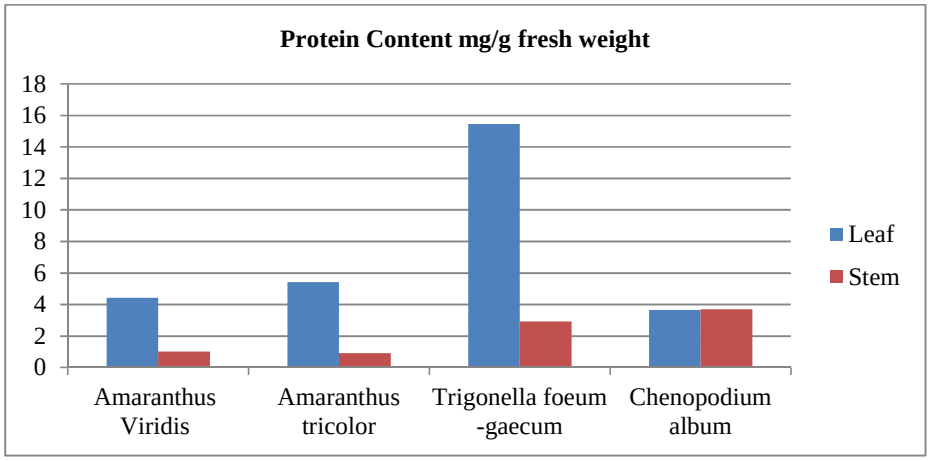

FIGURE 1E

FIGURE.1. Graphical representation showing (A) Polyphenol content (B) Sugar Content (C) Percentage of water content (D) Antioxidant activity in terms of IC-50 value (E) Protein Content.

The antioxidant potential also determined by DPPH having free radical scavenging capacity (Kato and Hirata, 1988). The methanolic extract of dried leaf samples of those plants shows high antioxidant properties. The *C. album* is main source of antioxidant because it have the IC-50 value (56.54mg) (Fig.1D) is lower than the other plants. But free radical scavenging capacity is high about 90%. But *A. tricolor* shows IC-50 value (109.89mg) is very high indicates presence of low antioxidant activity. Sometimes oligosaccharides and polysaccharides has role in generation of ROS, in different biological systems (Radman *et al*., 2010). Thus these plants are necessary to solve the photo-ageing problem.

CONCLUSION

The nutrition is the most important factor for growth, development and health of human beings. Many common health problems can be prevented with a healthy diet. Thus *A. tricolor* have high water content as well as high polyphenol content. So, it can be prescribed for older peoples for presence of high antioxidant potential and thus peoples can solve their skin ageing and *A. viridis* used for diabetic patient for presence of low sugar content, and other cellular damaging diseases (if present) by consumption of these plants. The *C. album* contains high sugar content as well as high antioxidant property, thus it can be recommended for younger generations to solve their skin and health problems.

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