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International Journal of Current Research
Vol. 7, Issue, 08, pp.18900-18903, August, 2015

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

COMPARATIVE STUDY OF NUTRITIVE VALUE AND ANTIOXIDANT ACTIVITY ON SENNATORA AND CELOSIA ARGENTEA

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ARTICLE INFO

Article History:
Received 10th May, 2015
Received in revised form
05th June, 2015
Accepted 26th July, 2015
Published online 21st August, 2015

Key words:
Nutritive value,
Moisture content,
Mineral elements,
Proteins,
Carbohydrates,
Reducing,
Non-Reducing Sugars.

ABSTRACT

The healthy and well-balanced diet can play a significant role in the prevention of diseases associated with nutritional value. In the present study two commonly used wild vegetables like Celosia argentea, and Sennatora are taken to investigate. For studying nutritive value and antioxidant activity plant extracts were prepared from both fresh and dried materials as per methodology and showed significant result for both nutritive value like moisture content, mineral elements, proteins, carbohydrates, reducing and non-reducing sugars. And antioxidant activities like Total Phenols, Vitamin A, Vitamin C and Free radical scavenging activity. Demand for the accurate determination of antioxidant capacity is gaining importance in most areas within the food industry; therefore several analytical methods and measuring systems have been developed. According to above mentioned it is important and reasonable to get to know and to investigate the antioxidant characteristics of the vegetables and fruits which we intake and to know the compounds that play significant role in developing the antioxidant capacity. Similarly nutritive value of a given plant plays important role in maintaining health problems. And demand for the accurate nutritive analysis and measurement is increasing as people are moving more towards natural products as they are safe.

Citation: Korade, S. T. and Deokule, S. S. "Comparative study of nutritive value and antioxidant activity on Sennatora and celosia Argentea", *International Journal of Current Research*, 7, (8), 18900-18903.

INTRODUCTION

Plants have always proven themselves as the best friend of man in many ways as a Food, Shelter, Medicine or Drug and Clothing (Kirtikar and Basu. 2001). As we all know plants prepare their own food in the form of organic matter by using inorganic matter as raw material. This organic constituent plays a significant role in all living organism. Carbohydrates are the major nutrients of fruits and vegetables; with sucrose representing one third of totalsugars (Singh *et al*., 1993). This disaccharide is one of the important parameters for the assessment of the commercial quality of the fruit, since consumers prefer the sweetest fruits. Wild food plants play an important role in the diet of consumers. Some of these plants are drought-resistant and gathered throughout. These wild foods are an important source of nutrients. However, there is lack of comprehensive data regarding the nutrient contents of these indigenous plants. The purpose of this study was to document and assess the nutrient and mineral contents of the selected food plants. Ethno botanical surveys were used to collect data through formal and informal interviews and focused group discussions.

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They were analyzed for mineral nutrients such as calcium, iron, potassium, and phosphorus concentrations. Additionally nutrients such proteins, beta carotene, vitamin C and dietary fiber were determined. On average, vegetables were found to be richer in organic nutrients and minerals followed by fruits and seeds in that order. Generally the wild food plant species were found to be richer sources of mineral nutrient than their cultivated relatives.

MATERIALS AND METHODS

To study nutritive value of the selected wild vegetables, they were collected from different localities of Maharashtra, India. As wild edible vegetables are not found to be grown in one locality and in a particular season of the year, frequent visits were organized to collect the selected plants in various seasons. Efforts were made to collect these plants specifically in flowering and fruiting conditions for the correct botanical identification. The plants were initially identified with the help of The Flora of the presidency of Bombay (Cooke, 1901-1903) and later they were authenticated by "Botanical Survey of India" (Maharashtra) with Authentication letter number (BSI/WC/TECH./2015/137) Dated 19-06-2015.

Plant material collection

The different wild vegetables were collected from the various localities of western Ghats of Maharashtra at the same first-hand information was also collected from tribal communities regarding their utilization, and usually healthy and disease free plant material was collected, cleaned so as to remove soil or any dirt attached to it. After that the material is shade dried and grinded to get a fine powder. This powder is stored in an air tight container for further experiments.

Standardization of plant material

The process of standardization can be achieved by stepwise pharmacognostic studies (Harbone, 1973). These studies help in identification and authentication of the plant material. Correct identification and quality assurance of the starting materials is an essential prerequisite to ensure reproducible quality of herbal medicine which will contribute to its safety and efficacy. The study includes:

Phytochemistry

The chemical investigations of this plant consist of percentage extractives, ash analysis, fluorescence analysis, qualitative tests for the presence of starch, proteins, tannins, saponins, reducing sugars, anthroquinones, flavonoids and glycosides were carried out (Harbone, 1973).

Determination of crude fiber

Extract 2g of ground material with ether or petroleum ether to remove fat (initial boiling temperature 35-38 ^{0}c and final temperature 52^{0}c. If fat content is below 1%, extraction may be omitted. After extraction with ether boil 2 g of dried material with 200 ml of sulphuric acid for 30 min with bumping chips. Filter through muslin and wash with boiling water until washings are no longer acidic. Boil with 200 ml of sodium hydroxide solution for 30 min. Filter through muslin cloth again and wash with 25 ml of boiling 1.25% H_2SO_4, three 50 ml portions of water and 25 ml alcohol. Remove the residue and transfer to ashing dish (preweighed dish W_1). Dry the residue for 2h at 130 ± 2^{0}c. Cool the dish in a desiccator and weigh (W_2). Ignite for 30 min at 600 ± 15^{0}c. Cool in desiccators and reweigh (W_3) (Sadasivam and Manikam. 1987).

Determination of Total Carbohydrate by Anthrone method

Weigh 100mg of the sample into a boiling tube. Hydrolyse by keeping it in a boiling water bath for three hours with 5 ml of 2.5 N HCL and cool to room temperature. Neutralise it with solid sodium carbonate until effervescence ceases. Make up the volume to 100ml and centrifuge. Collect the supernant and take 0.5 and 1 ml aliquots for analysis. Prepare the standard by taking 0, 0.2, 0.4, 0.6, 0.8 and 1 ml of the working standard, "0" serves as blank. Make up the volume to 1ml in all the tubes including the sample tubers by adding distilled water. Then add 4ml of anthrone reagent. Heat for eight minutes in a boiling water bath and Cool rapidly and read the green to dark green colour at 630nm.Draw a standard graph by plotting concentration of the standard on the X – axis versus absorbance on the Y-axis.

From the graph calculate the amount of carbohydrate present in the sample tube (Sadasivam and Manikam. 1987).

Estimation of reducing sugars by Dinitrosalicylic acid method

Weigh 100mg of the sample and extract the sugars with hot 80% ethanol twice (5 ml each time).Collect the supernatant and evaporate it by keeping on a water bath at 80^{0}C.Add 10ml water and dissolve the sugars. Pipette out 0.5 to 3ml of the extract in the test tube and equalize the volume to 3ml with water in all the tubes. Add 3ml of DNS reagent. Heat the content in a boiling water bath for 5min.When the content of the tubes are still warm, add 1ml of 40% Rochelle salt solution. Cool and read the intensity of dark red colour at 510nm. Run a series of standards using glucose (0 - 500µg) and plot a graph (Sadasivam and Manikam. 1987).

Estimation of protein by Bradford method

Prepare a series of protein samples in test tubes in the concentration. This is preferably prepared in PBS. Prepare the experimental samples (a few dilutions) in 100µl of PBS. Add 5ml of diluted dye binding solution to each tube. Mix well and allow the colour to develop for at least 5 min but no longer than 30 min. Then red dye turns blue when it binds protein. Read the absorbance at 595 nm. Plot a standard curve using the standard protein absorbance V concentration. Calculate the protein in the experiment sample using the standard curve (Sadasivam and Manikam. 1987).

Estimation of Ascorbic acid

Pipette out 5 ml of the working standard solution into a 100 ml of conical flask. Add 10 ml of 4% oxalic acid and titrate against the dye (V_1ml) end point is the appearance of pink colour which persists for a few minutes. The amount of the dye consumed equivalent to the amount of ascorbic acid. Extract the sample (0.5- 5 g depending on the sample) in 4% oxalic acid and make up to a known volume (100 ml) and centrifuge. Pipette out 5 ml of this supernatant, add 10 ml of 4% oxalic acid and titrate against the dye (V_2 ml) (Sadasivam and Manikam. 1987).

Statistical analysis

All data presented are means of six determinations along with standard deviations. Statistical analysis used the MS Excel software (CORREL Statistical function) to calculate ascorbic acid, vitamins, total sugars and proteins content.

RESULTS AND DISCUSSION

The present study includes physiochemical parameters for the preliminary investigation of biochemical compound present in plants and main concern was to find out nutritive value.

Table 1. Represents the ash value

SR. NO.	PLANT SAMPLE	SENNA	CELOSIA
1	ASH VALUE	0.26	0.29
2	ACID INSOLUBLE ASH	0.002	0.014

*Results are the mean of three different readings

Table 2. Represents the Percentage extractive value

SR. NO.	SOLVENT	S. tora	C. argentea
I	DISTILLED WATER	18%	20%
II	PETROLEUM ETHER	16%	16%
III	ACETONE	24%	19%
IV	METHANOL	40%	34%
V	CHLOROFORM	30%	22%

*Results are the mean of three different readings.

and it also shows presence of Calcium and Phosphorus as macro-element and Sulphur, Chlorine, Zinc, and Tin (Table 1, 2 & 3) as micro-element significantly more than *C. argentea.* Whereas crude fiber, Protein, Carbohydrate, total sugar, reducing sugar, Vitamin A and Vitamin C content and Silicon, Aluminium, Potassium, Magnesium and iron as macro-element and Cromium, Nickel, Copper, and Bromine as Micro-element is more in *C. argentea* (Table 3, 6, 7).

Table 3. Represents the Nutritive values content in both the plants

Sr. No.	Plant Sample	Moisture content (%)	Crude Fiber (mg/100gm)	Total protein (mg/100gm)	Total Carbohydrate (mg/100gm)	Total sugars (mg/100g)	Total reducing sugars (mg/100g)	Vit. A (mg/ 100gm)	Vit. C (mg/ 100gm)
1	S. tora	88%	16.78	110.8	14.63	12.74	8.56	2.55	57%
2	C. argentea	70%	21.01	128.8	32.93	18.14	7.06	3.19	60%

*Results are the mean of three different readings

Table 4. Represents the Fluroscence analysis

NAME OF THE PLANT		C. argentea			S. tora		
SR. NO.	CHEMICAL/ REAGENT	SHORT	DAY	LONG	SHORT	DAY	LONG
I	POWDER AS SUCH	Green	Brown	Pruple	Yellow green	Brown	Black
II	POWDER + NITROCELLULOSE	Dark green	Brown	Black	Light green	Brown	Purple
III	POWDER + NITROCELLULOSE+ 1N NaOH IN METHANOL	Green	Dark brown	Black	Green	Dark brown	Purplish black
IV	POWDER + NITROCELLULOSE + 1N NaOH IN METHANOL FOR 30min.	Green	Golden yellow	Black	Green	Dark brown	Black brown

Table 5. Represents the Micro-element

MICRO ELEMENTS		
ELEMEMENT	CONCENTRATION IN PPM	
	C. argentea	S. tora
Sulfur	2287	3453
Chlorine	7086	11210
Chromium	6.7	2.6
Cobalt	6.3	3
Nickel	4.7	2.2
Copper	18.1	10.1
Zinc	26.4	33.7
Bromine	87.9	4.3
Tin	11.4	13.7

*Results are the mean of three different readings.

Table. 6. Represents the Macro-element

MACRO ELEMENTS		
ELEMEMENT	CONCENTRATION IN PRECENTAGE (%)	
	C. argentea	S. tora
Silicon	2.078	1.039
Aluminum	0.2187	0.113
Potassium	3.057	1.09
Calcium	5.675	8.959
Magnesium	4.173	2.208
Phosphorus	0.3025	0.4839
Iron	0.1663	0.09919

*Results are the mean of three different readings.

As we all know nutrients are very important. Nutrients mainly include carbohydrates, fats, proteins, vitamins and minerals and also crude fiber and moisture content. All are equally important for our well-being. As per our present investigation, if we compare both the wild vegetables for their nutritive values and antioxidant values it is observed that both are equally important but as pre study Ash value, Percentage extractive values and Moisture Content were more in *S. tora*

Table 7. Represents the Total phenol content

ESTIMATION OF TOTAL PHENOLS			
CONC.	Total phenol content (mg/100gm)		
	STD	S. tora	C. argentea
0.2	0.492	3.25	0.76
0.4	0.568	2.65	1.59
0.6	0.813	6.08	2
0.8	0.986	6.29	2.68
1	1.361	8.74	6.77
1.2	1.504	11.14	7.63
1.4	1.801	12.53	8.73
1.6	1.898	13.64	10.69
1.8	2.018	14.55	14.58
2	2.983	15.59	15.98

*Results are the mean of three different readings

Table 8. Represents the antioxidant value

S.No.	SAMPLE	EXTRACT	0.5	1	1.5	2	2.5
		STD	1.03	1.4	1.93	2.54	2.7
	ANTIOXIDANT ACTIVITY BY DPPH METHOD (mg/100gm)						
			0.5	1	1.5	2	2.5
1	*C. argentea*	Methanol	10.1	13	14.5	21.9	22.4
		Butanol	5.96	6.57	7.22	9.33	18
		Ethyl Acetate	5.19	10.3	14.8	16.8	21.7
		Chloroform	7.16	11.5	15.2	19.1	23.8
2	*S. tora*	Methanol	8.92	11.7	16.3	23.5	24
		Butanol	6.68	9.25	11.3	13.9	21.9
		Ethyl Acetate	7.55	9.31	13.2	16.6	18.4
		Chloroform	7.79	11.9	16.1	16.6	21.8

*Results are the mean of three different readings.

The free radical scavenging activity is observed to be optimum in both the plants in methanol extract and comparatively it is more better in *S. tora* (Table 8). The main aim of the present investigation was to promote the wild vegetables for the greater production and consumption in day today life. High

nutrient and antioxidant value are the common features which would lead to better nutrion and health.

Summary and Conclusion

Plants mostly provide all the nutrients that we require in sufficient quantity and in proper proportion such as carbohydrates, proteins, fats, vitamins and minerals for good health (AOAC, 2006). Men have always turned to plants for all the smaller and bigger needs like food, fodder, shelter and medicines. Wild plants can be used as emergency food; such food is not consumed regularly on account of their limited seasonal availability while others are frequently consumed due to easy availability. It has been noticed that the tribes who still live in their undisturbed forest areas and having the traditional food habit like consumption of large variety of seasonal foods to be healthy and free from most of the diseases. Today a large number of wild edible plants are used as supplementary food, which not only satisfy hunger but are nutritious too. From the present study we can give an idea that wild vegetables are very good in nutrition and also shows highest values for the free radical scavenging activity. So their consumption or daily intake in diet is important.

Below mentioned are the wild vegetables selected for the present investigation

Sr. No.	Name of the Plant	Family	Location
1	*Celosia argentea* L.	Amaranthaceae	Dapoli
2	*Sennatora* L.	Caesalpinaceae	Pune

Acknowledgement

Both the authors would like to express a sincere thanks to Head, Department of Botany, University of Pune, Maharashtra, India for encouragement and necessary laboratory facilities and The first author is grateful to authorities of Pune University for providing financial support in the form of research stipend.

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