APPENDIX - 3

NUTRITIONAL AND PHYTOCHEMICAL ASPECTS OF SOME VEGETABLES OF CHENOPODIACEAE*

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ABSTRACT

Seven edible members of Centrospermae were screened for proteins, total lipids, hemicelluloses, lignins, cellulose, flavones, flavonols, phenolic acids, glycoflavones, organic acids, steroids, alkaloids, coumarins, quinones and iridoids. Portulacca oleracea Linn. is the richest source of soluble polysaccharides and total lipids whereas the highest protein content is observed in Amaranthus gangeticus Linn. Maximum amount of hemicelluloses is noted in Salicornia brachiata Roxb. Amaranthus viridis Linn. has the highest lignin content and Sueda fruticosa Forsk. is found to have maximum cellulose. All the three Amaranthus species and Portulacca oleracea Linn. are devoid of flavonols and flavones whereas all the three chenopodiaceae members contain various types of methoxylated flavonols. Amaranthus gangeticus Linn, Sueda nudiflora Lag. and Sueda fruticosa contain alkaloids. Quinones, coumarins, iridoids and glycoflavones are absent in all the members screened.

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INTRODUCTION

Vegetables are valued for their vitamins and minerals rather for their nutrient content. These ingredients make them an ideal suppliment to the cereal and pulse rich foods. Most of the vegetables have little or no nutritive value. Though the underground vegetables are rich in carbohydrates, their protein content varies from 0.5-12%. The protein present in vegetables are counted favourable with that of cereals and pulses in biological value, since most of the protein (upto 75 %) in the latter is lost in process of cooking, while the former is mostly used raw (Kindall,1977). It is quite well known that a plant contains innumerable compounds in cell wall and within the cell. "Dietary fibre" forms such an important constituent of vegetables. It includes all unassimilable structural plant materials like cellulose, hemicelluloses, lignin, pectins and related polymers. All these compounds have an impact on proper functioning of gut due to their bulk, ability to absorb water, absorptive and combining properties and their being substrates for the normal bacteria of the gut. Various ailments like constipation, diverticular disease and appendicitis are connected with low intake of dietary fibre (Walker, 1977). It is found that dietary fibre rich in pectin lowered the level of plasma lipids especially cholesterol. The edible plant parts contain a number of compounds like phenolics, saponins, alkaloids, terpenes etc. These compounds present in appreciable quantities exert a significant role

in the metabolism of man and animals. It is quite possible that in lower quantities also they play some role which we are unaware of at present. Polyphenols like quercetin and isoflavones exert Vitamin 'P' and estrogenic activity respectively. The role of many other compounds are not known precisely. It is an urgent need of present day that we should know everything about what we consume.

In the present study seven members of Centrospermae i.e. Salicornia brachiata Roxb., Aueda fruticosa Forsk., Aueda nudiflora Moq., Amaranthus gangeticus Linn., Amaranthus viridis Linn., Amaranthus spinosus Linn. and Portulacaceae oleracea Linn. have been screened for proteins, total lipids, hemicelluloses, lignin, cellulose, flavonols, flavones, phenolic acids, saponins, tannins, iridoids, organic acids, steroids, glycoflavones, coumarins, quinones and alkaloids. Of these seven plants, three belong to Chenopodiaceae, three to Amaranthaceae, and remaining one to Portulaccaceae.

Materials and Methods

All the plants were collected from from Kutch and Baroda. The plants were properly identified and dried. Voucher specimens have been preserved in Herbarium, Department of Botany, The M.S.University of Baroda, Baroda, India. Standard procedures were followed for the extraction as well as identification of various compounds (Harborne 1984, Daniel and Sabnis, 1977, Whistler, 1965).

RESULTS AND DISCUSSION

The results of chemical screening of various edible plant parts of centrospermae are presented in Table I - II. Portulaca oleracea is found to be the richest source of soluble polysaccharides (21%) and lipids (5.1%). Amaranthus gangeticus contains highest percentage of protein (4.5%). The maximum amount of hemicelluloses is in Salicornia brachiata (36.12%) Amaranthus viridis has the highest lignin content (49.32%) and Sueda fruticosa is found to have maximum cellulose (28.4%). Chemical screening of these seven centrospermae members for various other chemical compounds revealed characteristic flavonoid patterns. Three Amaranthus species and Portulacea oleracea are devoid of flavone and flavonols, whereas all the three Chenopodiaceae members contain flavonols. 4'-O-methoxy quercetin and 3',-4'-dimethoxy quercetin are present in Sueda nudiflora and Sueda fruticosa. But in Salicornia brachiata, 7,4'di-methoxy quercetin is present. Seven phenolic acids have been identified in the plants screened. Vanillic acid is universally present and syringic acid is absent only in Amaranthus viridis. All the three Amaranthus species and Sueda nudiflora contain ferulic acid. In Amaranthus viridis both cis and trans forms of ferulic acid are present. Melilotic acid is present only in Amaranthus viridis. Amaranthus gangeticus showed the presence of p-OHbenzoic acid, Sueda nudiflora Moq. and Salicornia brachiata Roxb. contain -resorcylic acid. Gentisic acid is present only in Sueda

TABLE -I . THE RELATIVE AMOUNTS OF VARIOUS MAJOR CONSTITUENTS OF SEVEN EDIBLE GREENS OF CUNTAKSERAB

Name of the plants	% Proteins	% Soluble Polysaccharides	% Total Lipids	% Hemicelluloses	% Lignin	% Cellulose
Amaranthus gangeticus Linn.	4.9	18.56	2.30	19.63	39.60	11.33
Amaranthus viridis Linn.	2.57	15.45	2.43	19.04	49.32	9.77
Amaranthus spinosus Linn.	3.00	20.45	2.51	28.48	33.55	12.31
Sueda nudiflora Moq.	3.13	20.52	2.05	27.30	37.24	12.885
Sueda fruticosa Frosk.	3.54	15.00	2.21	31.00	26.62	26.00
Salicornia brachiata Roxb.	2.93	11.9	2.29	36.12	20.85	4.64
Portulaca oleracea Linn.	3.05	21.63	5.10	27.65	35.52	11.00

TABLE II . DISTRIBUTION OF VARIOUS SECONDARY METABOLITES IN SEVEN EDIBLE MEMBERS OF CHENOPODIACEAE

Name of the Plant	Flavonoids			Phenolic acids							Alkaloids	Steroids	Saponins
	1	2	3	4	5	6	7	8	9	10			
Amaranthus gangeticus Linn.	.	.	.	+	+	+	+	.	.	.	+	+	+
A. viridis Linn.	.	.	.	+	.	.	+	+	.	.	.	+	+
A. spinosus Linn.	.	.	.	+	+	.	+	.	.	.		+	+
Suaeda nudiflora Moq.	+	+	-	+	+	.	+	.	+	.	+	+	+
S. fruticosa Forsk	.	.	+	+	+	.	.	.	.	+	+	+	+
Salicornia brachiata Roxb.	+	+	.	+	+	.	.	.	.	+	.	+	+
Portulaca oleracea Linn.	.	.	.	+	+	.	.	.	.	.	.	+	+

1 = 4'-Methoxy quercetin, 2 = 3'4'-Dimethoxy quercetin, 3 = 7,4'-Dimethoxy quercetin,
4 = Vanillic acid, 5 = Syringic acid, 6 = p-OH Benzoic acid,
7 = Ferulic acid, 8 = Melilotic acid, 9 = Gentisic acid,
10= -Resorcylic acid

nudiflora. All the members screened showed the presence of steroids - (2-5 spots in TLC), organic acids (1-2 bands in P.C) and considerable amount of saponins. Amaranthus gangeticus, Suaeda nudiflora and Suaeda fruticosa contain alkaloids in very less amounts. Quinones, coumarins, iridoids and glycoflavones are absent in all members screened.