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COMPARATIVE EVALUATION OF MINERAL AND ASCORBIC ACID CONTENTS OF SOME HALOPHYTES OF WESTERN RAJASTHAN

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Among all deserts of the world, Thar supports maximum livestock and bears highest grazing pressure. Our studies are concentrated to diagnose arid land species which can provide rich fodder value including mineral and ascorbic acid contents. Present paper deals with the comparative evaluation of selected halophytic species growing in Lunkaransar (area I) and Beechwal (area II) of Bikaner district of western Rajasthan. The amounts of minerals present in the plants were found directly proportional to the soil salinity. Potassium was present in less quantity as compared to sodium, supporting the fact that sodium ions compete with the uptake of K^+ due to affinity mechanism. This study reveals that the species chosen, for analysis, possess higher mineral and ascorbic acid contents, proving good supplement as fodder for the cattle.

Keywords: Ascorbic acid content; Fodder value; Grazing pressure; Halophytic species; Livestock; Minerals; Salinity; Thar.

Introduction

Minerals are required in livestock diets to meet nutritional and metabolic requirements. The concentration of individual minerals in forages varies greatly depending on soil, plant and management factors. Halophytes may have a good potential as a forage source not only because of its nutrients but also because of its adaptability to acid and poor soils that are widely extended in Thar region. The present study aims at assessing the mineral and ascorbic acid compositions.

Three plant species of family chenopodiaceae, *i.e., Haloxylon recurvum* (Moq.) Bonge ex Boiss., *Salsola baryosma* (Roem and Schult.) Dandy and *Suaeda fruticosa* (Linn.) Forsk, were chosen for the study. The plants were selected and collected from two different sites i.e., Beechwal and Lunkaransar areas of Bikaner district. All these plants are type of true halophyte which grow in gregarious patches on the salty land and also very well on non-saline soils. Flowering and fruiting takes place during the month of November to January.

Beechwal lies about 12 Km away from Bikaner city on the National Highway No. 15 and is of utmost importance as it is an industrial area. It is located between 28°01' to 28°02' Northern latitudes and 73°22' to 73°24' Eastern longitudes. Lunkarnasar is a place nearly 72 Km away from Bikaner on National Highway No. 15. It is located between 28°30' to 28°32' Northern latitudes and 73°45' to 73°46' Eastern longitude.

The vegetation of some Indian salt basins has been classified by Sen and Rajpurohit[1]. Later Rajpurohit[2] surveyed some of the salt basins of Rajasthan and reported a total of 122 plant species, including 10 true halophytes, 48 facultative halophytes and 64 glycophytes. The vegetation of this arid region falls under the broad natural division of tropical thorn forest, but due to low rainfall, extreme temperature, high evaporation and tremendous biotic disturbances it has been converted into a typical arid track. There are also some saline tracts spread throughout this region[3]. Some of the common halophytic plants found in such habitat are *Suaeda fruticosa, Tamarix troupii, Sesuvium sesuvioides, Trianthema triquetra, Zaleya redimita, Zygophyllum simplex, Salsola baryosma, Cressa cretica, Haloxylon recurvum, Haloxylon salicornicum, Chenopodium album* and *Partuloca oleracea.*

Salinity, temperature extremes and low soil nutrient content are responsible for sparse vegetation and low unstable yield of productivity in arid ecosystem[4]. The intense human and its livestock pressure further adds to its limitation[5].

Material and Methods

The present investigation deals with the evaluation of mineral and ascorbic acid contents of roots, shoots and fruits of *Salsola baryosma, Suaeda fruticosa* and

Table 1. Comparative analysis of mineral content of selected plant species in mg/l.

Mineral content	Site	*Salsola baryosma*			*Suaeda fruticosa*			*Haloxylon recurvum*		
		Root	Shoot	Fruits	Root	Shoot	Fruits	Root	Shoot	Fruits
Calcium	I	1.67	1.12	1.25	1.56	1.08	1.28	1.70	1.04	1.30
	II	1.22	1.03	1.30	1.39	1.09	1.31	1.57	1.11	1.31
Phosphorus	I	1.56	1.03	1.16	1.38	0.95	1.02	1.60	0.97	1.18
	II	1.02	0.92	1.18	1.20	0.99	1.17	1.20	1.00	1.20
Sodium	I	1.61	1.12	0.84	0.68	0.76	0.89	1.32	1.59	1.69
	II	0.93	0.82	0.79	0.59	0.51	0.63	1.06	1.39	1.49
Potassium	I	0.21	0.21	0.10	0.09	0.20	0.21	0.10	0.19	0.23
	II	0.18	0.16	0.12	0.08	0.16	0.15	0.09	0.17	0.21

Table 2. Comparative analysis of ascorbic acid content of selected plant species in mg/l.

Ascorbic acid content	Site	*Salsola baryosma*			*Suaeda fruticosa*			*Haloxylon recurvum*		
		Root	Shoot	Fruits	Root	Shoot	Fruits	Root	Shoot	Fruits
	I	71.23	82.64	83.66	56.79	68.71	86.84	58.34	74.43	89.61
	II	74.63	80.07	86.86	51.24	72.41	83.87	51.27	79.66	92.13

Haloxylon recurvum collected from Lunkaransar (area-1) and Beechwal (areas-II) of Bikaner district.

Plant parts of *Salsola baryosma, Suaeda fruticosa* and *Haloxylon recurvum* were collected in polythene bags. The samples were separately dried at 100°C for 15 minutes, so as to inactive the enzymes, followed by 60°C till a constant weight was achieved. These dried samples were powered using 20-mesh screen in Willey mill and then subjected for estimation of minerals *i.e.* Calcium, Phosphorus, Sodium and Potassium.

For the estimation of Calcium, method given by Talpatra *et al.*[6] was followed. For the estimation of Sodium and Potassium content, method given by Bhargava and Raghupati[7] was followed. The quantitative estimation of ascorbic acid was carried out colorimetrically using the method developed by Chinoy[8].

Results and Discussion

(A) Evaluation of Mineral contents : Ca^{2+} was observed maxinum in the roots of *H. recurvum* (area I) and minimum in the shoots of *S. baryosma* (area II), indicating crucial role of Ca^{2+} for K^+ uptake from soil when it is present in less quantity compared to Na^+ (Table 1). Phosphorus was observed maximum in the roots of *H. recurvum* (area I) and minimum in the shoots of *S. baryosma* (area II). Na^+ was found maximum in the fruits of *H. recurvum* (area I) and in minimum in the shoots of *S. fruticosa* (area II). K^+ was maximum in the fruits of *H. recurvum* (area I) and minimum in the roots of *S. fruticosa* (area II).

Area I, being more salty indicates higher value of minerals from the plants collected in comparison to area II (Fig. 1-6). Studies on poor presence of K^+ in plants reveals that Na^+ ions in soil compete with the same due to

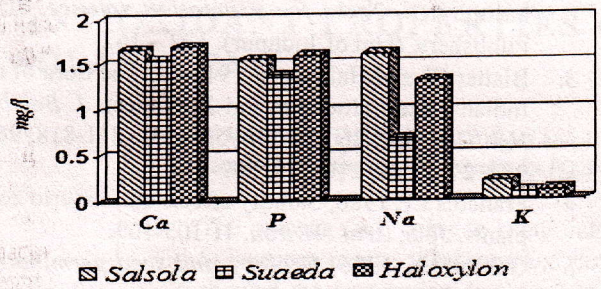


Fig. 1. Mineral contents in roots (Area I)

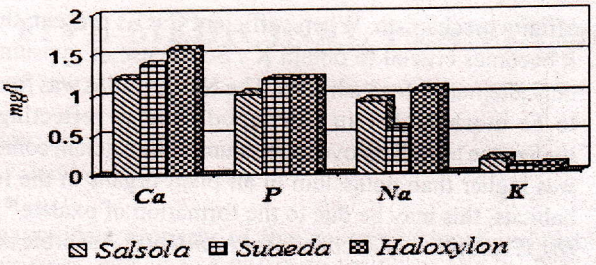


Fig. 2. Mineral contents in roots (Area II)

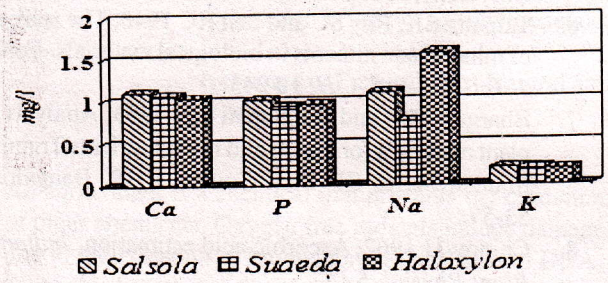


Fig. 3. Mineral contents in Shoots (Area I)

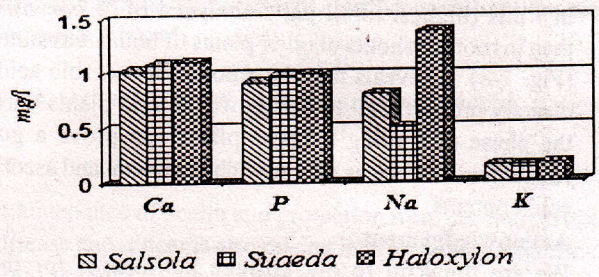


Fig. 4. Mineral contents in Shoots (Area II)

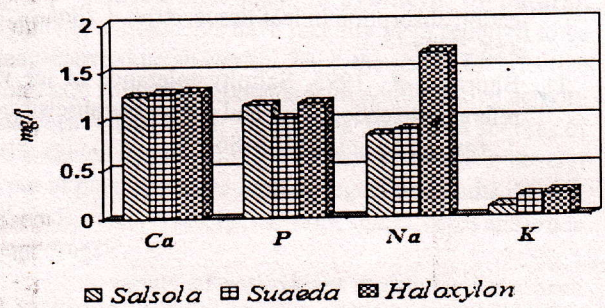


Fig.5. Mineral contents in fruits (Area I)

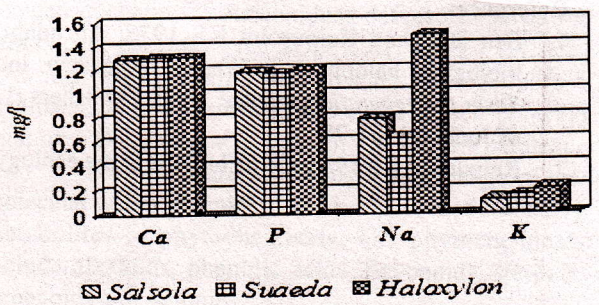
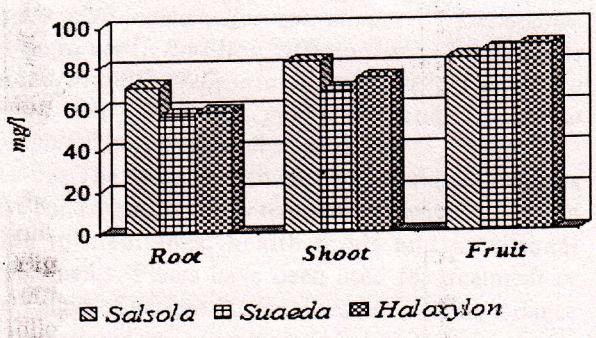
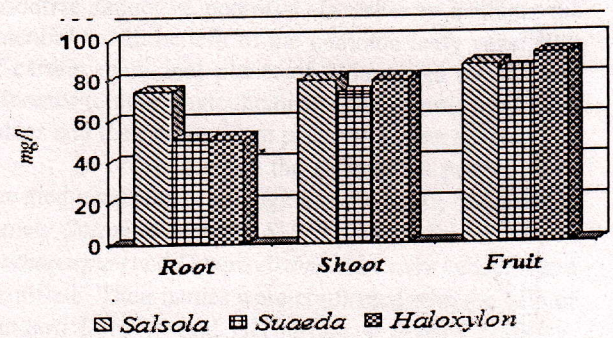


Fig.6. Mineral contents in fruits (Area II)



Area I : Lunkaransar

Fig.7. Ascorbic acid contents (Area I)



Area II : Lunkaransar

Fig.8. Ascorbic acid contents (Area II)

affinity mechanism. When sufficient Ca^{2+} is present, then it becomes crucial to obtain K^+. So the use of gypsum is only alternative for such soils. The Na^+/K^+ ratios was found to be much higher in Chenopod species reflecting a preference to sodium over potassium[9]. The calcium content was higher than potassium in all plant organs in the two habitats, this may be due to the formation of oxalate[10].

(B) Evaluation of Ascorbic Acid contents : Ascorbic acid was maximum in the fruits of *H. recurvum* (area II) and minimum in the roots of *S. fruticosa* of same area studied (Table 2). Ascorbic acid value was comparatively greater in fruits (highest in all parts analyzed of *S. baryosma*) than in roots or shoots of other plants of both areas studied (Fig. 7-8). It reveals that the amount of ascorbic acid is directly proportional to the growth in arid plants during the phase of fruiting[11]. These plants can prove a good fodder for livestock as they are rich in mineral and ascorbic acid contents.

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