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Seasonal Changes in Trace Elements in *Pentatropis nivalis* J. F. Gmel (Field and Wood) Growing in Secondary Saline Habitats from Baramati Tahasil (M.S.) India

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The present investigation was made to study the accumulation of trace elements in different parts of *Pentatropis nivalis* J. F. Gmel, a succulent halophytic plant growing in association with *Prosopis juliflora* Linn, collected from secondary saline soils of Barhanpur and Baramati (M.S.) India. The amount of Fe^{3+}, Mn^{2+}, Zn^{2+} and Cu^{2+} varied between 155 ppm to 910 ppm; 12 ppm to 247 ppm; 22 ppm to 99 ppm and 12 ppm to 45 ppm respectively in vegetative organs of study plant.

Keywords : Halophytic plant, *Pentatropis nivalis* J. F. Gmel, trace elements.

INTRODUCTION

Accumulation of salts in soil is one of the major limiting factor that adversely affects growth and development of plant results into reduction in their yield (Hamdy *et al.,* 2002, Vera-Estrella *et al.,* 2005).

Saline soils looses their productivity and it is difficult to turn them productive ones (Somani and Lodha, 1973). However, soil salinity in combination with drought responsible for reduction in production of crops and determines distribution of natural flora (Boyer, 1982; Reddy *et al.,* 2003; Bartels and Sunkar, 2005; Watson and Byrne, 2009).

Natural calamities and global climate change (Hasanuzzaman *et al.,* 2013) more than 45 million hectare of irrigated land are affected by accumulation of salt which, account for 20% of the total land and 1.5 million hectare of land are taken out of production each year owing to high salinity levels (Pitman and Lauchli, 2002; Munns and Tester, 2008); if continues in such way 50% of cultivable lands will be lost by middle 21st century (Mahajan and Tuteja, 2005).

Plant growing under salt stress develop mechanism like maintained water use efficiency, net carbon assimilation and osmotic assimilation and osmotic adjustment of plant to tolerate temporary changes in various stress and genetically controlled (Bohnert *et al.,* 2006; Ezawa and Tada, 2009; Lauchli and Grattan, 2007).

Halophytes and mangroves which are good source of fodder, fuel, food, oils, etc. grown in large areas in our country but little is known regarding their eco- physiology (Joshi and Sagar Kumar, 1986). It has been shown that, salt stress induces accumulation of free amino acids, quaternary and other osmo-regulatory compounds in salt tolerant plants (Stewart and Lee, 1979 and Popp, 1984). However, the information on accumulation of free amino acids in plant organs on one hand and salinity variations in natural habitat on the other is scanty. It is also essential to examine the mineral composition of halophytes that are used as forage.

Although mineral metabolism in halophytes has remained interested field for plant physiologist, limited information is available on trace elements in these species. Considering these views the study is undertaken to find out the seasonal variation of Fe^{3+}, Cu^{2+}, Zn^{2+} and Mn^{2+} in *Pentatropis nivalis* growing in secondary salt affected soils from Baramati Tahasil (MS) India.

MATERIAL AND METHODS

Pentatropis nivalis is collected from two sites in Monsoon, Winter and Summer seasons during the year 2013-14. Collected plants were washed thoroughly with fresh water followed by distilled water then blotted to dry and separated in leaves, stems and roots. Furthermore, plant material was oven dried, powdered and used for analysis of trace elements by using the method of Toth *et al.,* (1948)

1g oven dried plant material was digested in double acid (20ml cone. HNO_3 + 10ml 60% H_3PO_4). The digested volume was reduced to 2 to 3 ml by evaporation on waterbath and was made up to 100 ml by adding double distilled water. The extract was filtered through What man No.1 filter paper and filtrate was used as source for trace elements estimation by using the AAS (Atomic Absorption Spectrophotometer).

RESULTS AND DISCUSSION

Findings of accumulation of trace elements in vegetative organs of *P. nivalis* collected from two different sites showed that, Fe^{3+} content varied between 171 to 909 ppm g^{-1}; concentration of Mn^{2+} between 14 to 134 ppm g^{-1}; that of Cu^{2+} between 12 to 45 ppm g^{-1} and Zn^{2+} between 20 ppm g^{-1} to 99 ppm g^{-1} (Table 1 and 2).

While working on seven species of halophytes, Baumeister and Ernst (1978) reported that the Fe^{3+} content fluctuated between 134 to 4731 ppm dry matter; Mn^{2+} between 11 to 100 ppm dry matter; Cu^{2+} between 19 ppm dry matter; and Zn^{2+} between 19 to 143 ppm dry matter. However, Mutsch (1980) noticed less concentration ion of these halophytes growing in Wienna. According to him, amount of Fe^{3+} varied between 58 to 214 ppm dry matter; that of Mn^{2+} between 11 to 57 ppm dry matter; Cu^{2+} between 3 to 14 ppm dry matter and Zn^{2+} between 5 to 76 ppm dry matter.

The relative concentrations of Fe^{3+} in vegetative organs collected from two sites indicated that maximum concentration of Fe^{3+} than the Mn^{2+}, Zn^{2+} and Cu^{2+} at two sites. No consistency was observed for seasonal variations in trace elements. The plants collected from Baramati showed minimum accumulation of Fe^{3+} in Monsoon and maximum accumulation of Fe^{3+} in Monsoon was observed in plants collected from Barhanpur.

Thus, the present investigations add interesting information on accumulation of trace elements in *Pentatropis nivalis*.

CONCLUSION

Variations in accumulation of trace elements namely Fe^{3+}, Cu^{2+}, Mn^{2+} and Zn^{2+} showed that concentrations of Fe^{3+} in vegetative organs was greater than remaining three elements. The accumulation of trace elements was not affected by seasonal changes.

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Table 1 : Seasonal variations of Fe^{3+} and Mn^{2+} (ppm g^{-1}) elements in *Pentatropis nivalis* .

Sites	Seasons	Fe^{3+} (ppm g^{-1})			Mn^{2+} (ppm g^{-1})		
		Leaves	Stems	Roots	Leaves	Stems	Roots
Baramati	Monsoon	496	334	910	136	67	111
	Winter	659	266	665	153	14	15
	Summer	909	497	486	125	122	160
Barhanpur	Monsoon	467	377	856	247	30	54
	Winter	648	325	306	221	98	12
	Summer	171	370	155	130	134	101

Table 2 : Seasonal variations of Cu^{2+} and Zn^{2+} (ppm g^{-1}) trace elements in *Pentatropis nivalis*.

Sites	Seasons	Cu^{2+} (ppm g^{-1})			Zn^{2+} (ppm g^{-1})		
		Leaves	Stems	Roots	Leaves	Stems	Roots
Baramati	Monsoon	12	20	26	20	64	34
	Winter	23	35	21	36	99	50
	Summer	22	33	12	37	84	80
Barhanpur	Monsoon	12	45	26	22	92	26
	Winter	14	28	34	57	66	33
	Summer	15	30	*	38	68	*

* Material not available

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