Seasonal Changes In Concentrations of Carbohydrates In Pentatropis Nivalis Wight & Arn, Succulent Halophyte Growing In Secondary Salt-Affected Soil From Baramati Tehasil (M.S.) India

B. S. Mali[1], R. D. Chitale[2], M. B. Kanade[3]
Dept of Botany
Tuljaram Chaturchand College of Arts, Science and Commerce,
Baramati, Dist. Pune - 413 102, Maharashtra, India

Abstract- *The present investigation was undertaken to understand the mechanism of carbohydrates as an osmolyte in Pentatropis nivalis growing in man-made secondary salt-affected soils. Concentrations of carbohydrates varied between 5.11 to 24.75%, 5.46 to 46.18% and 5.72 to 50.18% dry matter in leaves, stems and roots of plants respectively collected from six sites located in Baramati Tehasil (M.S.) India. However, seasonal variations indicated that, carbohydrates accumulated in three vegetative parts of P. nivalis were maximum during summer season.*

Keywords- Carbohydrates, man-made secondary salt affected soils, osmolyte, Pentatropis nivalis Wight & Arn.

I. INTRODUCTION

Although large number of mangroves and halophytes growing on about 700 km long Indian coastline and 7-8 million hectares of saline wastelands spread in various parts of India. Limited information is available to know the halophytes can grow in such natural habitats till today (Mali, 1995; Ricardo *et al.* 2011). Similarly much remains to be done for understanding the role of osmolytes to enhance potential of halophytes for tolerating stress condition.

The accumulation of sugars in plants subjected to salinity has remained topic of controversy because various physiologists have made conflicting reports on sugar content in halophytes and its help to find in sustaining saline salt stress conditions. Carbohydrates are important organic compatible solute since they are primary energy source for most of living organisms and their role as osmoprotectant in halophytes (Raheja, 1966; Bhosale, 1974; Albert and Popp, 1978; Gorham *et al.* 1980; Murakeozy *et al.* 2003).

However, increased salinity had little effect on sugar accumulation in *Plantago maritima* (Ahmad *et al.*1979) and varying response of *Juncus* to salt stressed condition (Rozema, 1976). Recently Mohamad Al Hassan (2016) reported that sodium chloride (upto 400 mM) treated leaves of *Plantago* species showed no significant increase of total soluble sugars over the non-treated leaves.

Thus from the above information it is clear that salinity causes varying effects on carbohydrate accumulation in salt tolerant plants. The present investigation therefore, was undertaken to examine the functional role of carbohydrate as an osmolyte in *P. nivalis* while plant is growing under salt stress conditions. However, the efforts taken to find out correlation between seasonal changes in salinity and the concentration of carbohydrate organic osmolyte in plant considered for study.

II. MATERIALs AND MethodS

Plant materials of *P. nivalis*, succulent climber halophyte growing in man-made secondary salinized habitats was collected seasonally during the year 2013-14 from six different sites located in Baramati Tehasil (M.S.) India ($18^0$09'06''N and $74^0$34'39''E). The collected plants were washed thoroughly, blotted to dry and separated into leaves, stems and roots, then sundried, powdered and analyzed for carbohydrates. The carbohydrates were estimated by using Anthrone method given by Yemm and Willis (1954). Furthermore, the data was subjected to analysis of variance (ANOVA) as suggested by Gomez and Gomez (1984).

III. RESULTS AND DISCUSSION

Results of accumulation of carbohydrates in vegetative organs of *P. nivalis* in Baramati Tehasil (M.S.) India are presented in Table 1. Concentrations of carbohydrates varied between 5.11 to 24.75%, 5.46 to 46.18% and 5.72 to 50.18% dry matter in leaves, stems and roots of *P.*

nivalis collected from six various sites located in Baramati Tehasil (M.S.) India.

While working on succulent halophyte *Arthocnemum indicum* growing on Gujarat Coast, Sagar Kumar (1987) reported 13.6 to 78.4 mg/g fresh wt. carbohydrate but considerably low amount of total sugar (0.3 to 1.4%) had been noticed in other halophytic species such as *Suaeda* and *Salicornia* (Warick, 1960). From above reports and present study on accumulation of sugars in salt tolerant plants, even single species collected from different sites may shows variations in their capacity of sugar synthesis.

The data indicates that mean amount of carbohydrates (%) in leaves, stems and roots of *P. nivalis* during three different seasons are significantly different. The present study also showed that *P. nivalis* contained greater amount of carbohydrate during summer season (high salt stress) in comparison with other two seasons (low salt stress seasons).

Similarly, Baysal Furtana *et al.* (2013) reported maximum amount of carbohydrates in three species of *Limmonium* during summer season, *Prosopis juliflora* (Joshi and Hinglajia, 2000) and two grass species *Aeluropus lagopoides* (Bhoite, 1987), *Helochloa setulosa* (Sagar Kumar, 1987) accumulated maximum amount of sugar during summer season. Ijin (1957) as early as concluded that plants growing under high salt stress season (in summer season) accumulated greater amount of sugars than those of growing in monsoon (low salt stress season). In addition to that Langolis (1971) also observed that *Salicornia,* succulent halophyte growing on un-inundated habitats accumulated greater amount of sugar compared to those occurring in habitats being made wet two times within a day.

Recently, Yokota (2003), Patel *et al.* (2010) and Thaewetiya *et al.* (2014) reported that amount of total sugar increases when plants are exposed to salt-stress condition. The present investigation too indicated that *P. nivalis* accumulated greater concentration of total sugar on its exposure to salt stress condition (summer season) and similar reports of Gil *et al.* (2013) strongly support this.

From the present investigation it can be concluded that greater accumulation of carbohydrate in *P. nivalis* during summer season, plays active role in osmoregulation to tolerate salt stress and there is a positive correlation between degree of salt stress and concentration of carbohydrate. Further research on effect of salt stress on accumulation of carbohydrate and its role as an osmolyte in salt loving plant is required.

Table 1. Seasonal variations of Carbohydrates (in percentage) in *Pentatropis nivalis*.

Seasons	Percentage of Carbohydrates		
	Leaves	Stems	Roots
Monsoon	6.60±2.5	10.59±2.8	11.72±2.84
Winter	9.39±2.4	8.38±1.87	8.74±1.41
Summer	15.37±5.04	32.52±17.7	34.88±26.19
C. D.	4.40	7.20	12.42

* Each value represents mean ± SEM of six observations.

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