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EFFECT OF PLANTING SEASONS ON GROWTH PERFORMANCE OF CACTUS PEAR GENOTYPES

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ABSTRACT

An experiment was conducted to study the growth performance of Cactus pear (*Opuntia ficus indica* (L.) Mill.) genotypes. Four exotic genotypes including two fruiting and two vegetable types were planted in two seasons to evaluate their performance under Indian condition. Both the fruiting genotype-1271 and 1280 performed well, whereas vegetable type/ genotype-1308 was superior to *Nopalea* sp. in respect of plant growth, cladodes production and quality attributes. To obtain early sprouting, better growth and quality of cladodes, spring season was found to be the best for planting of cactus pear.

INTRODUCTION

Cactus pear (*Opuntia ficus indica* (L.) Mill.), commonly known as Prickly pear or 'Tuna' is a succulent xerophytic plant and belongs to family Cactaceae. Being a CAM (Crassulacean Acid Metabolism) plant, cacti is ideally suited to water scarce dry zones of the world and provide food and nutritive fodder (Wessels, 1988; Mizrahi *et al.,* 1997; Singh and Felker, 1998). It is largely cultivated for edible sweet fruits, delicious vegetable and fodder in many countries likes Mexico, USA, Africa, Italy, Israel, Spain, Argentina etc. (Barbera *et al.,* 1995). Looking to its high economic potential, cactus pear was introduced in India from Texas (USA) during recent years. The introduced cactus pear genotypes are spineless and edible type. Tender cladodes of vegetable cactus are used as green vegetable and salad while mature ones are used as fodder for milch animals. Cactus pear is characterized by a thick succulent stem/pad with green cortex, called cladodes which is also used for multiplication. The cladodes bear numerous small 'areoles' which functions like meristemic bud and are also responsible for both vegetative and reproductive growth under favourable conditions (Buxbaum, 1950). The information on growth behaviour of cactus pear genotypes is scanty and no systematic work has been done in India to study the influence of planting seasons on growth performance in cactus pear genotypes, i.e. fruiting and vegetable types.

Therefore, the present study was undertaken with a view to find out the suitability of exotic cactus pear genotypes under Indian conditions.

MATERIALS AND METHODS

The present study was carried out at Department of Horticulture, R.B.S. College, Bichpuri, Agra (UP) in two seasons, i.e. spring and monsoon during the year 1998 and 1999. Four exotic cactus

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pear genotypes viz. fruiting type (1271, 1280) and vegetable types (1308 and *Nopalea* sp.) were taken for vegetative growth study. The soil of experimental site was sandy loam. The cladodes i.e. planting materials were procured from CSSRI, Karnal and CIAH, Bikaner where these exotic cactus have been introduced from Texas (USA) and Israel. The field experiment was laid out in Randomized Block Design with six replications. To check rotting, the cladodes were treated with Bavistin (0.2 per cent) at the time of planting. One-year-old cladodes of each genotype were planted in well-prepared beds by upright method of planting facing east west direction at 3 x 1 m spacing during both the seasons. The standard cultural operations were followed.

For vegetative growth study, observations on sprouting (days taken to sprout), number of cladodes formed per plant, length and width of cladodes (cm) and average weight/cladode at harvest were recorded. The chemical analysis for moisture percentage, titrable acidity, ascorbic acid, total, reducing and non-reducing sugars in fresh cladodes were determined during both the seasons. The available moisture content in cladodes was calculated on the basis of fresh and dry weight. Titrable acidity and ascorbic acid in fresh cladodes were estimated by the method described by Ranganna (1977). Reducing and total sugars were estimated by the Nelson's method. Average data of both seasons of respective years was analysed statistically.

Results and Discussion

Sprouting :

Data on days taken for sprouting in cladodes of cactus pear genotypes were recorded in both the seasons and pooled data is presented in Table-1. All the cactus pear genotypes differed significantly with respect to sprouting time. Vegetable type (1308, *Nopalea*) sprouted earlier than fruiting types (1271, 1280) during both the seasons. The spring season planting took less time to sprout as compared to monsoon season planting. The maximum average days, i.e. 37.5 and 80.0 was taken by fruiting genotype-1271 in spring and monsoon season, respectively whereas the minimum days was taken by vegetable var.-1308 planted in spring season. It is also evident from Table-1 that both the vegetable type was statistically at par either planted in spring or monsoon season. However, fruiting genotype-1271 and 1280 differed to a great extent in respect of sprouting in monsoon season of planting. The variation in sprouting might be due inherent genetic features, activity of areoles in addition to season of planting. Felker *et al.* (1997) have also expressed similar views regarding sprouting of cactus genotypes under semi-arid conditions at Karnal, India.

Size of cladodes :

Fruiting type cactus differed significantly with vegetable type in respect of length of cladode produced at final stage during both the seasons (Table-1). The maximum length of cladode (21.61 cm in spring and 19.06 cm in monsoon) was observed in genotype-1271. However, the length of cladode in vegetable type (1308 and *Nopalea*) was alike in both the seasons. The pattern of length increment of cladodes in fruiting as well as vegetable type was more or less similar in both the planting seasons.

A perusal of data in Table-1 indicates that there was a significant difference in width of cladode among the cactus pear genotypes in both the planting seasons. The width of cladode in fruiting type

Moisture content :

The moisture content (%) in cladodes of fruiting and vegetable type varied significantly during both the seasons. The fruiting type-1271 was significantly better than 1280, 1308 and *Nopalea* sp. in respect of moisture percentage in cladodes in spring season. The latter three genotypes were statistically at par in both the seasons except genotype-1280 in monsoon season when it was at par with genotype -1271.

Titrable acidity and ascorbic acid content in cladode :

All the genotypes differed significantly among themselves in respect of per cent acidity during both the seasons (Table-2). The minimum titrable acidity was observed in cladodes of vegetable type particularly in variety-1308. Fruiting type cladodes (1271) were more acidic in both the seasons. The variation in per cent titrable acidity and vitamin C content might to due to varietal effect in addition season of planting. Similar views have also been expressed by Nerd *et al.* (1997) in post harvest studies of cactus pear. All the cactus pear genotypes differed significantly among themselves in respect of ascorbic acid content during both the seasons. The maximum ascorbic acid content i.e. 11.92 and 12.00 mg/l00g of fresh cladode was observed in vegetable genotype. The minimum vitamin C content of 5.33 and 4.92 mg/l00g of fresh weight was noted in fruiting type cladodes (1271) in spring and monsoon season, respectively. Cactus pear is a CAM plant in which acid content changes during daytime and also vary according to the species and maturity of cladodes. This finding is similar to the results reported by Rodriguez-Felix and Cantwell (1988), Nerd *et al.* (1997); Rodriguez, Felix and Villegas-Ochoa (1998).

Sugars content in cladode :

The data pertaining to total sugars content in fresh cladode showed that it was affected significantly by the genotypes (Table 2). The maximum total sugar content (4.29 mg/g of fresh weight) was observed in genotype 1280 and was closely followed by vegetable type *Nopalea* (4.23 mg) during both the seasons. The lowest sugar content (2.17 mg/g of fresh weight) was recorded in fruiting genotype 1271. However, similar result was observed during monsoon season.

It is evident from Table-2 that reducing sugar in cladodes varied greatly during both the seasons. Moreover, genotype-1271 was poor in respect of reducing sugar content during both the season of planting.

Non-reducing sugar contents in cladodes of cactus pear genotypes differed significantly among themselves during both the seasons. The non-reducing sugar content in cladodes of genotype-1271 and variety-1308 was almost alike in spring and monsoon season. The maximum non-reducing sugar (2.0 mg/g of fresh weight) was observed in 1280 followed by *Nopalea* sp. (1.20 mg/g of fresh weight) during monsoon season. The minimum and at par non-reducing sugar was observed in genotype-1271 and var. 1308 (Table 2). The variation in sugars in cladodes of cactus pear genotypes is perhaps due to inherent genetic characters besides environmental factors. Similar findings concerning the variation in composition of cladodes at developmental stages have been reported by Rodriguez-Felix and Cantwell (1988) and Nerd *et al.* (1997).

Table 2: Chemical composition of cladodes of cactus pear genotypes in different seasons

Cactus pear genotypes	Spring Season						Monsoon Season					
	Moisture content (%)	Titrable acidity (%)	Ascorbic acid (mg/100g)	Total Sugar (mg/g fresh weight)	Reducing sugar (mg/g fresh weight	Non-reducing (mg/g fresh weight	Moisture content (%)	Titrable acidity (%)	Ascorbic acid (mg/100g)	Total sugar (mg/g fresh weight)	Reducing sugar (mg/g fresh weight	Non-reduing (mg/g fresh weight
1271	93.58	0.821	5.33	2.17	1.39	0.78	93.61	0.917	4.92	2.20	1.38	0.81
1280	93.07	0.491	9.33	4.29	2.70	1.58	92.41	0.661	8.92	4.25	2.25	2.00
var. 1308	92.78	0.459	11.33	3.08	2.33	0.75	91.16	0.437	11.25	3.10	2.30	0.80
Nopalea	92.70	0.672	11.92	4.23	3.19	1.07	90.41	0.747	12.00	4.35	3.14	1.20
C.D. at 5%	0.49	0.052	0.76	1.07	0.15	0.17	1.37	0.066	0.66	0.13	0.10	0.14

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