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Studies on physicochemical characters of fruits of Date palm genotypes

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Abstract

In Kachchh region of Gujarat, variability with respect to berry colour, weight, pulp content, fruit size, taste, bunch size and yield potential were observed in date palm orchards. A survey was carried out to identify suitable genotypes of date palm (*Phoenix dactylifera* L.) based on the fruit quality and yield attributing characters. Fruits of ten elite types were collected and physicochemical characters were studied. The genotypes showed considerable variation in morphological and physicochemical characters of fruits. The colour of berry at *doka* stage was yellow, red to dark red. Variation in fruit weight from 7.71 to 17.4g, stone weight 0.81-1.50g., TSS 19.8 -36.2 °brix and acidity 0.18-0.40 % was recorded. The suckers of identified genotypes DP-01 and DP -03 would be procured for multiplication and evaluation under hot arid region and it can be further utilized for improvement programme.

(**Key words**: Date palm, *Phoenix dactylifera*, variability, genotypes, fruit quality

Introduction

Date palm (*Phoenix dactylifera* L.; family-Palmaceae) is one of the most important fruit tree for semi arid and hot arid regions of the country. It is an ancient fruit and it is believed to be indigenous to countries around Persian Gulf. Date palm groves in coastal belt of Kachchh from Anjar to Mandvi have developed naturally through seeds, which were probably brought by Turk settlers, Traders, gardeners and Haj pilgrims. The seedlings are very old in Kachchh region and some new systematic plantations of date palm are being developed either through suckers or tissue culture plants of cv. Barhee. At present, about 500 acre area of tissue culture plantations has been covered. However, seedling populations are not found in other parts of country. The ripe fruits (*doka* or khalal) are used for fresh consumption and processing. Every part of the date palm plant is useful since its history of cultivation and utilization .Dried fruit pulp is used for flavoring the bakery products. Date palm leaves are used for making handicraft items *viz.* broom, hand-fan, mat, rope etc. Date is nutritious fruit having high calorific value in the form of sugar, mineral and vitamins (Zaid, 1999; Singh and Dhandar, 2007). It has high market potential since the production of soft dates (*Pind Khajoor*) and dry dates (*Chhuhara*) in our country is very less. Presently, India imports about 2, 30,926 MT dates every year from Gulf countries to meet out the domestic requirement.

At present, about 16,688ha area is under date palm cultivation in the coastal region of Kachchh with an estimated annual fruit production 1,23,490 tonnes. Variability in date palm exists through out Kachchh region because the date groves have originated from seeds. Date palm is a dioecious and monocotyledonous plant. The soil of the region is sandy loam and average annual rainfall is 425 mm. All the fruit from Kachchh palms are harvested during mid June to July at *doka* or khalal stage (hard ripe yellow, red or dark red colour) of maturity because of early rains. Intercrops viz. pearl millet, cluster bean, forage and small fruit plants are grown in association with date palm in Kachchh region (Muralidharan *et al*, 2008). Date palm plantations are economically important because it requires minimum care and it has tremendous potential in arid parts of western Rajasthan, Punjab and Haryana as well as in coastal belt of Gujarat. A very limited work has been conducted on post harvest management in India for proper utilization of date fruits. Therefore, major emphasis should be given on processing and value addition in date palm (Sharma *et al*, 2010).

Keeping in view, a survey was conducted to exploit genetic diversity of date palm to identify superior plus trees having better quality of fruits at *doka* stage, higher fruits yield, medium to heavy bearing types, suitability for processing, rain and *Graphiola* leaf spot disease tolerance, the details of survey, identification of elite type, fruiting and quality characters and production system have been discussed in this paper.

Material and methods

A survey of date palm orchards was conducted during the year 2010 in Kachchh region of Gujarat to identify genotypes having better quality and productivity of fruits and also having rain tolerance characters. The orchards surveyed in villages near Mundra, Dhrub, Motipar, Gharsisa, Anjar, Naninagalpar and nearby Bhuj.

Kachchh region of Gujarat is spread over 45,652 sq. km. lies between 22° 5 to 24 ° 4 N latitude and 68° 9 to 71° 5 E longitudes. This area is highly suitable for date palm

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cultivation in our country. Palms having prolific bearing, attractive colour of fruit, sweet in taste and disease free were identified and marked. Plant population, fruiting behavior, number of bunch /palm and fruit characters along with status of uses, marketing etc. were recorded to analyze date palm production and utilization. Ten fruit samples were collected from identified elite tree. Data on important fruit characters were assessed for the extent of variability and compared with better palm for further multiplication and evaluation through clonally and raising seedling progenies.

Results and discussion

The data pertaining to physicochemical characters of date palm fruits are presented in Table-1. The date palm orchards were surveyed near by Mundra, Bhuj, Kachchh region to identify elite type. The maximum seedling population exists on field or farm boundary, road side, river belt and depressions. The seedling palms are natural and very old, which are estimated to be around 1.9 million. However, some seedlings have been planted at close spacing at farmer's field. The palm trees are having good potential in natural population which should be multiplied. Among dates groves some are high yielding while others are unproductive because of high palm height, improper pollination, small size fruits and poor management.

The plant characters basically depend upon genetic composition as well as soil and climatic features of the growing site. In general, 20-30 feet trees height was observed while some old date groves were about 50 feet in height. The palm had good foliage, vigorous growth and 5-10 offshoots per palm. However, some date groves are well managed by removing suckers for new plantations or better fruiting. But the maximum date groves are in natural state. Now tissue culture plantations of cv. Barhee have been done in which suckers has not been allowed to grow for early fruiting. Variability in fruiting in tissue culture plantation was also observed. All tissue culture plantations are under drip system and spaced at 8x8m. Branching in date palm is rare (Zaid, 1999) but from one place 3-4 palms were growing in groves. It has been observed that if aerial suckers are not removed from mother plants, the growth of aerial suckers also looks like branch in date palm.

The fruit yield in date palm directly depends upon size of bunch and berry, number of bunches/palm and number of fruits per bunch. Variation in number of bunches from 4 to 10 per tree was observed. Variation in number of bunches, size of bunches and berries might be due to genetic features of the type, soil types, plant density per unit area and management practices employed. The bunch weight also varies from 5 to 20 kg depending on size of berries and thinning practices. Fruit thinning improves the size of berry in date palm is known practice to growers. However, all the growers do not practice thinning of fruits. Variation in number of bunches per plant and fruit yield has also reported by Murlidharan *et al,* (2008).

Variability in date palm fruits was observed with respect to weight of berry (7.71 to 17.41 g), fruit size (3.00 x 4.22cm length and 1.54x2.58cm width) and pulp content (6.59 to 16.30 g) besides fruit shape and colour. Variation in size, berry colour, length of bunch, weight and yield have also been described by Muralidharan *et al.*(2008). As far as fruit weight is concerned DP-01 and DP-03 were found superior in size and quality characters in comparison to other germplasm lines (Table 1). Variation in pulp stone ratio was 5.5 to 16.6 in DP-01 collected from Mundra. The variations in colour of fruits from yellow to dark red were observed at doka stage, which is very useful to popularize date for fresh consumption. The data on biochemical parameters such as TSS and acidity also reveals a wide variation among the fruits. The minimum TSS was recorded in DP 08 with a value of 20.83° Brix whereas the highest TSS was recorded in DP03 with a magnitude of 34.50 ° Brix. Perusal of data in table 1 reveals that the difference between the genotypes in fruit size, pulp weight, pulp stone ratio and seed size were varied. Fruit characters vary greatly depending on variety, environmental conditions and technical care given like fertilization,

Table 1. Physico-chemical characters of date palm germplasm line fruits

Genotypes	Source	Fruit colour	Fruit shape	Fruit characters			Fruit flesh weight (g)	Stone weight (g)	Pulp: stone ratio	Acidity (%)	T.S.S.(°Brix)
				Weight (g)	Width (cm)	Length (cm)					
DP01	Dhrub	yellow	oblong	13.11	2.48	4.04	11.61	1.59	7.28	0.233	32.5
DP02	Mundra	yellow	oblong	11.31	2.36	3.6	9.48	1.66	5.71	0.4	27
DP03	Radhanpur	yellowish brown	oblong	11.03	1.94	4.09	9.66	1.28	7.53	0.267	34.5
DP04	Mundra	red	oblong	8.37	1.82	3.92	7.27	1.3	5.59	0.283	27.83
DP05	Mundra	red	oblong	8.1	1.92	3.44	6.82	1.23	5.53	0.233	28.5
DP06	Anjar	light red	oblong	7.71	1.54	3.4	6.59	1.08	6.11	0.267	26.66
DP07	Nagalpar	yellow	oblong	10.06	2.04	3	9.12	0.9	10.07	0.183	36.16
DP08	Mundra	greenish yellow	oblong	8.96	1.9	3.1	7.59	1.17	6.48	0.35	19.83
DP09	Mundra	redish orange	oblong	7.88	2	3.02	7.11	0.81	6.07	0.367	22.83
DP10	Mundra	yellowish orange	oblong	17.41	2.58	4.22	16.29	0.97	16.69	0.233	20.5

pollination, etc. (Zaid, 1999).The palm bearing big size dark red or yellow colour sweet in taste fruits were considered promising. The fruit yield vary from 50 to 100 kg per tree which depends upon the age of tree, extents and pattern of rainfall, pollination, number of bunches / tree, number of berries / strand, management practices besides soil and climatic conditions. In general, 50-60 kg fruits/palm is harvested at *doka* stage by the farmers. The quality of *doka* fruits varied greatly because of genetic variability in seedling palms. The elite palms, which bear good quality, sweet fruits fetches good price in the market. In Mundra area, fruit bunches were harvested and packed with berry strand in carton for sale in local mandi. The wholesale price of *doka* fruits varies from Rs. 5 to 10 per kg in local mandi which depends upon quality of fruits, grading, packing, etc. Use of date fruits for processing and value addition is very less as narrated by the date growers.

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