

RESEARCH ARTICLE

Identification of Late Maturing and Rain Tolerant Promising Genotype in Date Palm (*Phoenix dactylifera* L.) in Hot Arid Region

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Abstract

Date palm (*Phoenix dactylifera* L.) is most suitable drought hardy fruit tree of hot arid region of the country. Date palm fruits are harvested in our country at doka (khalal) stage due to early rains. Normally date palm fruits get spoiled by rains at maturity stage. With this objective, work on the identification of rain tolerant and late maturing genotype in date palm was carried out at ICAR-CIAH, Bikaner. On the basis of 5 years of evaluation study (2015–2019), one elite genotype (CIAH/DP/Sel.-01) of red color berry with average 45 to 50 kg fruit yield/tree was marked promising and fruits harvested at doka stage at the end of August and first week of September. Since the fruits were harvested after rainy season, they did not show any damage by rain. The length of bunch is about bigger in size (80–95 cm.), bunch weight 4 to 6 kg.; number of bunch 9–12; no. of berries/strands 24–28; fruit size 3.20 x 2.20 cm.; fruit weight 9 to 12 g and TSS 34–38.0 brix. The IC number 0624544 was obtained from NBPGR, New Delhi for specific traits. The fruit is red in color, sweet in taste and edible at the doka stage. Besides fresh consumption, it can be used for making value added products. The promising genotype would be source of gene for further breeding programme.

Keywords: Date palm (*Phoenix dactylifera*), Late maturity, Red color, Rain tolerant, Genotype, Arid region.

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Introduction

Date palm (*Phoenix dactylifera* L.; Family- Arecaceae) also known as *Khajoor*, *kharek* is an ancient cultivated fruit tree of semi-arid and arid regions of the world. It grows well under poor desertic soils due to its hardy plant characteristics and deep root system. There is a well-known phrase for date palm: its feet in water and head in fire/sun. It requires dry hot climate for growth and development of fruits. In date palm growing countries, there is no rain during fruit maturity and the ripening period from July to September. However, Medjool cultivar has reported intermediate tolerance to rains since it is a late maturing variety (Zaid, 1995). Date palm can be grown successfully at such places where adequate irrigation facility is available besides dry hot climatic conditions.

Date palm crop has industrial significance in the country and its cultivation should be increased in potential areas. Fruits are used to prepare soft date, dry date, RTS, squash, pickle, chutney, wine, bakery products, etc. All parts of date palm are useful since its history of cultivation in several ways to make handicraft items (Chao and Krueger, 2007). Its seed kernel is also used for cattle, poultry, fish feed, etc.

All the commercial date palm cultivars have been developed through the selection of chance seedlings based on local needs. In Rajasthan, plantation of tissue culture plants in about 850 ha in

districts of western Rajasthan. Due to less production, there is good demand for date fruits and products in the country. In India, date palm production is not meeting our domestic demand and dates are imported from date palm- growing countries. Keeping the above in view, the study was carried out to identify the rain tolerant and late maturing genotype for hot arid region.

A field survey of date palm orchards was conducted in 2015 in Bikaner to identify genotypes with late maturity, rain tolerance and better fruit characters. The survey was done during flowering/fruitletting period at date palm block. Late maturity was observed in a plant consecutive during three-four years. Color turning stage occurred at the end of July and doka stage of maturity was noted in the last week of August and first week of September. When maximum date palm varieties were harvested. A tree with prolific bearing, attractive fruit color, sweet in taste and disease free was marked. The vigorous growth of plant with erect stem, 12 to 13 feet high and length of leaf size 2 to 2.6 m was recorded, however, the number of sucker was low.

Data on an important bunch and fruit characters like spathes emergence, opening, number of bunches, length of bunch, no. of fruits/strand, fruit weight, fruit size, stone weight, size, TSS, acidity, tannin contents were recorded. The conservation of unique germplasm is being done at the Institute farm for further study.

The data pertaining to morphological and physico-chemical characters of fruit of date palm are presented in Table 1. The date palm elite type seedling plant growing on the boundary of the field was marked for observation and data on different morphological parameters were recorded. The height of plant was 12–13 feet and a number of suckers was less. The plant's growth was vigorous and prolific bearing habit, which might be due to fewer suckers and good numbers of leaves and crown formation. The fruit color was red and length of bunch was likely similar to cv. Sewi. However, the shape and size of fruit differed from red fruited commercial cv. Khuneizi, Sewi and Dayari (Figure 1). It seems the variation among the genotypes. The data on emergence

of spathes and opening exhibited that this is a medium to late maturing type. Manual pollination was done every year just after opening of spathes. Fruit set was about 90 to 95% which shows that this genotype is very compatible to pollination with pollen grains of local male type. The length of strand was also bigger like Sewi and number of berries per strand was 24 to 28. The number of berries was at par with yellow color variety Zahidi. The size of berry was recorded 3.20 to 3.40 cm length and 2.2 to 2.30 cm width and weight 9 to 12 g. It could be a better genotype from higher pulp content point of view for processing purpose. The size of stone was small having weight of 0.52 to 0.81 g. This fruit character is highly suitable for value added products. The weight of bunch ranged from 4 to 12 kg varied from year to year. The number of bunch was recorded 9 to 12 every year. The fruit yield potential was observed from 45 to 60 kg/tree. Fruits were harvested from end of August to first week of September. Varieties of date palms differ in their susceptibility to rain and humidity. This genotype differed with other red color varieties in respect of shape, size and maturity of fruits. It is mentioned that very early and late maturing varieties escape rains and consequently, their fruits are unaffected. The weather data of Bikaner presented in Table 2 showed that rains occur during the months of June, July, August and very little rain in September. The genotype matures after rainy period in the first week of September by this time harvesting is over under Indian conditions. Similarly, the following cultivars are reported to be most tolerant of humidity and rain: 'Halawy', 'Khadrawy', and 'Kaktoom'. The cultivar 'Medjool' is intermediate in its tolerance of humidity and rain (Zaid, 1995). However, there are no rains during fruit growth, maturity and ripening in date palm-growing countries in the world from May to October.

One bunch was left over on the tree to see the further maturity *pind* stage. The berry was found good up to end of September and there after spoilage of fruits started on the tree. The insect infestation was not observed in this genotype.



Figure 1: Bearing tree and berries of rain tolerant and late maturing genotype of date palm.

Table 1: Characters of late maturing, rain tolerant date palm (CIAH/DP/S-01) genotype

S. No.	Characters	2015	2016	2017	2018	2019
1	Date of spathe emergence	23.2.15	18.2.16	20.2.17	22.2.18	28.2.19
2	Spathe opening	14.3.15	11.3.16	16.3.17	18.3.18	25.3.19
3	Pollination	15.3.15	12.3.16	17.3.17	19.3.18	26.3.19
4	No of bunches/tree	10	9	10	12	17
5	Length of bunch (cm)	70.00	75.00	85.00	95.50	106.00
6	No of berries/strands	27	24	28	28	25
7	Length of strand (cm.)	60.5	62.0	65.4	67.3	65.5
8	Fruit weight (g)	12.24	10.90	10.50	10.53	10.10
9	Size of fruit (length & width cm)	3.30 x 2.33	3.20 x 2.20	3.30 x 2.22	3.40 x 2.30	3.31 x 2.030
10	Stone wt (g)	0.52	0.54	0.53	0.58	0.81
11	Stone size (length x width ,cm)	1.87 x 0.70	1.82 x 0.69	1.97 x 0.72	1.86 x 0.66	2.10 x 0.83
12	Date of harvesting	2.9.15	4.9.16	8.9.17	29.8.18	4.9.19
13	Av. wt. of bunch (kg.)	4.50	5.00	5.20	6.30	3.10
14	Yield (kg)	42.50	44.60	50.50	62.00	46.50
15	TSS ° Brix	34.0	30.2	38.0	38.3	30.2
16	Acidity (%)	--	0.22	0.14	0.13	0.21
17	Ascorbic acid (mg per 100 g sample)	--	--	4.00	5.06	4.08
18	Tannins (mg/100 g)	--	---	2.40	3.26	2.58

Table 2: Rainfall (mm.) pattern during fruiting season in hot arid region (Bikaner, India)

S. No	Year/month	Jan.	Feb.	March	April	May	June	July	August	Sept.
1.	2015	0.00	22.0	35.0	52.20	73.10	54.60	118.70	128.10	0.00
2.	2016	0.00	4.90	21.0	0.00	0.00	79.00	90.60	134.80	0.00
3.	2017	2.20	0.00	0.80	0.00	19.20	0.00	29.30	90.60	6.00
4	2018	0.00	0.00	1.40	4.20	5.60	54.30	189.80	54.80	0.00
5.	2019	2.70	0.00	1.80	31.00	9.00	12.80	40.60	128.20	16.20

At color turning stage, pulp was hard and astringent in taste possibly due to tannin content. TSS of the fruit recorded at *doka* stage varied from 34 to 38 °Brix. The total sugar estimated at *doka* stage during 2018 on fresh weight basis was 490.96 mg/100 g; reducing sugars 232.06 mg and non-reducing sugars (258.9 mg/100g). However, acidity was recorded 0.028% at *doka* stage which varied according to maturity stages.

The *doka* stage fruit of late maturing genotype of red color berry was also tried to prepare soft date by dipping in boiling water for 45 and 90 seconds and then drying during the year 2018. Soft date was prepared with a recovery percentage of 50 to 56% and the organoleptic test showed that 90 second dipping treatment was suitable for softness and sweetness in soft date (*pind*). However, the appearance was dark reddish color in soft date since its berry color is red.

The study concluded that this selected palm is a unique germplasm of specific traits like late maturing, rain tolerant, having red color berry. This promising date

palm genotype will be the gene source for rain tolerance for future crop improvement programme. Moreover, rain-tolerant varieties are not available for cultivation under such climatic conditions. Further, it will also be useful for *doka* fresh fruit availability during the month of September in hot arid conditions. Besides fresh consumption, fruits will be processed in to soft and dry date.

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