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Effect of post harvest treatment of GA_3 and temperature on physico-chemical parameter of date palm

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Abstract
The investigation on effect of post harvest treatment of GA_3 and storage temperature on physico-chemical parameter of date palm was carried out Date Palm Research Centre, SKRAU, Bikaner. In the experiment Khalal (*Doka*) stage freshly harvested fruits of date palm variety Khasab were treated with different concentrations of GA_3 and stored at different temperatures. The maximum TSS, ascorbic acid content and the minimum acidity were recorded in fruits treated with 75 ppm GA_3 during the whole storage duration while minimum loss in fruit quality characters as compared to fruits stored at room temperature and at 5 °C.

Keywords: Date palm, TSS, acidity, ascorbic acid, GA_3, temperature

Introduction
Date Palm (*Phoenix dactylifera* L.) a monoctyledonous and dieocious species belonging to Arecaceae (Palmaceae) family, is considered as one of the world's oldest cultivated fruit trees. A large number of seedling date palm groves exist in the western part of the India, in the *Kachchh* region of Gujarat state (Johnson *et al*., 2013). In Rajasthan, date cultivation was first introduced by the then ruler Ganga Singh ji of the erstwhile Bikaner state. Fruits of date palm are eaten as fresh fruits (hard ripe stage), dry dates (*Chhuhara*) and soft dates (*pind khajoor*). Different processed products like, sugar, starch, vinegar, juice, toffees, wine, chutney, jam, pickles etc. are also prepared from date fruits. Date palm fruits are highly nutritious and contain high calorific value (3150 calories / kilogram of fresh fruits), 60-65% sugar, fair amount of fibre (2.5%), protein (2%), less than 2 per cent fat, minerals up to 2 per cent *i.e.* iron, potassium, calcium, copper, magnesium, chloride, sulphur and phosphorus etc. (Gopalan *et al*., 1985). Leaves of date palm are used for making temporary huts, baskets, brooms, ropes, building material, fuel and paper. Date palm seeds are used for making cattle feed. Date seed oil is also suggested for use in nutritional and edible purpose (Abdul Afiq *et al*., 2013) [1].
In India, maximum fruits are harvested at hard ripen *khalal* or *doka* stage because, if kept on trees for longer duration fruits are spoiled due to rains and high humidity. Recently, at Date Palm Research Centre, SKRAU, Bikaner out of total expected production of 27.5 tonnes, nearly 70% (19.25 T) fruits spoiled on tree due to continuous rains in the last week of July, 2015. The remaining fruits on trees were of inferior quality and also imputed with fungi. Looking to the fruit loss on tree it was thought that a methodology is needed to increase shelf life of date fruits so that in case of rains during fruit ripening period, the fruit can be harvested and stored to avoid losses. Fruits of most of the varieties were affected by the rains in 2015 except few *viz.* Zahidi and Khasab which were found somewhat tolerant to rains possibly due to their late ripening nature. Khasab was observed comparatively more rain tolerant than Zahidi. Therefore, for the present investigation, variety Khasab has been chosen. Fruits of Khasab are red in colour with average fruit weight 11.68 g and TSS 26.38%.
Therefore, the present investigation is planned to study the effect of GA_3 and storage temperature on physico-chemical parameters of date palm fruits.

Materials and methods
The experiment was conducted at Date Palm Research Centre Swami Keshwanad Rajasthan Agricultural University Bikaner. The fresh, fully ripe, uniform sized sound fruits were selected

for experimentation. All the dirt dust, dust and other extraneous material from the fruit were removed by washing them thoroughly under tap water. The fruit, after selecting and washing were placed into 16 groups for different treatment. The fruit were treated with different concentrations of GA_3after initial physio-chemical analysis. (TSS: 33.5°Brix; Acidity: 0.27%; ascorbic acid: 8.9 mg $100g^{-1}$ pulp; Total sugars: 28.2%; reducing sugars: 25.6%; non-reducing sugars: 6.35;).

For preparing GA_3 solutions the required quantity of GA_3 was weighted and dissolved in required volume of distilled water the selected fruit were dipped in different concentration of GA_3 solution for 5 minutes. For control (0ppm GA_3) the fruits were dipped in distilled water. After application of GA_3 treatments, the fruits were dried for 15 minutes under the fan at room temperature. After giving different treatment the fruit were packed in polyethylene film bags of 23×10 cm size. After placing the fruits inside the polyethylene bags the open end of the bags was closed by folding the margin up to 1.5 cm. The fruits were stored different temperature *viz.* at room temperature 5 °C, 0 °C and -40 °C. Refrigerater was used to get 5 °C temperature and temperature 0 °C was obtained in freezer section of refrigerater. Temperature -40 °C was obtained in deep freezer. Observations were recorded at five days interval during the period of storage upto 45 days. Bio chemical analysis of TSS, acidity (%) and ascorbic acid were observed. The experiment was laid out in Completely Randomized Design. Data obtained on various characters were analyzed statistically according to the analysis of variance techniques as suggested by Panse and Sukhatme, (1985); Chandel, (1999).

Result and Discussion

Effect of GA_3: Amongst the various concentrations of GA_3 the maximum TSS was recorded in fruit treated with 75ppm GA_3 on all the day of storage from 5th(32.09%) to 45th (29.20%), all these values of TSS were at par with the values obtained with fruits treated with 50ppm GA_3 from 5th(31.60%) to 45th (29.20%) day of storage. The minimum TSS was recorded in fruits treated with 0ppm GA_3 during entire storage duration from 5th (30.05%) to 45th (27.39%) day. These TSS values were at par with the TSS values obtained with fruits treated with 25 ppm GA_3 from 5th (30.43%) to 45th (28.18%) day of storage. Significant effect of different concentrations of GA_3 on fruit acidity has been observed over the entire storage duration. The acidity was recorded maximum in fruits treated with 0 ppm GA_3 over the storage period from 5th (0.25%) to 40th (0.09%) day. The fruits treated with 75 ppm GA_3 showed the minimum acidity over the storage period from 5th (0.07%) to 40th (0.04%) day. The acidity in fruits stored at different temperatures showed a decreasing trend over the storage period and a non significant difference in acidity of fruits treated with different concentrations of GA_3 was found on 45th day of storage. The post- harvest treatment of fruits with various concentrations of GA_3 had significant effect on the ascorbic acid content of fruit during the storage period.

The minimum ascorbic was recorded in fruits treated with 0 ppm GA_3 on all the day of storage from 5th (9.37 mg/100g fruit pulp) to 45th (7.90 mg/100g fruit pulp) day. The values of ascorbic acid content in fruits treated with 0 ppm GA_3 were at par with the values of ascorbic acid content in fruits treated with 25 ppm GA_3 during entire storage duration.

The maximum ascorbic acid was recorded in fruits treated with 75 ppm GA_3 from 5th (10.22 mg/100g fruit pulp) to 45th (8.40 mg/100g fruit pulp) day of storage. The ascorbic acid content fruits treated with 75 ppm GA_3 was at par with ascorbic acid content obtained with fruits treated with 50 ppm GA_3 on all the days of storage except 10th and 15th day of storage.

Increase in TSS was observed over the storage period which might be due to hydrolysis of starch into sugar. Whereas, the decrease in acidity was recorded over the storage period. The decrease in acidity during the storage may be attributed to the conversion of acids in to sugars and further utilization in metabolic processes during storage. Similar results have been observed by Krishna and Sudhakar Rao (2014) [4] in guava during storage. The maximum TSS and the minimum acidity were recorded in fruits treated with 75 ppm GA_3 during the whole storage duration. The increase in TSS of fruits treated with GA_3 has been reported in banana (Patil and Hulamani 1998; Duguma *et al*. 2014) [5, 2]. The ascorbic acid content, in fruits were recorded maximum in fruits treated with 75 ppm GA_3 and these observations were at par with observations recorded on fruits treated with 50 ppm GA_3. These results are similar with findings of Ravi *et al*. (2005) [6] and Jayachandran *et al*. (2005) [3] in guava.

Effect of storage temperature

The fruits stored at RT had shelf life of 20 days only and the same fruits showed minimum TSS from 5th (30.97%) to 20th (28.76%) day of storage. After, there the minimum values for TSS was recorded with fruit stored at 5 °C from 25th (28.96%) to 45th (27.55%) day of storage. The maximum TSS on 5th day of storage was recorded in fruits stored at 5 °C (33.73%) which was followed by fruits stored at -40 °C (32.66%). While the highest values were recorded with the fruits stored at -40 °C from 10th (31.75%) to 45th (29.30%) day of storage. These values were at par with TSS values obtained with fruit stored at 0 °C.

The fruit acidity varied significantly in fruits stored at different temperatures during the entire duration of fruit storage. The acidity in fruit was recorded maximum in fruits stored at 0 °C during entire storage period from 5th (0.16%) to 45th (0.07%) day. The acidity values of fruits stored at 0 °C were found at par with the values recorded for fruits stored at 5 °C from 20th day onwards to 45th day of storage. The fruit acidity was observed minimum in fruits stored at -40 °C during the entire storage period from 5th (0.08%) to 45th (0.03%) day of storage. Overall a decreasing trend in fruit acidity has been observed over the storage period of 45 days. Over the storage duration a significant effect of storage temperature was observed on the ascorbic acid (mg/ 100g fruit pulp) content of fruits. From 5th (9.09 mg/100g fruit pulp) to 20th (7.41 mg/100g fruit pulp) day of storage the ascorbic acid was observed minimum in fruits stored at room temperature. On 20th day the whole fruits stored at room temperature decayed and no further observations were recorded on them. Thereafter, from 25th (8.64 mg/100g fruit pulp) to 45th (7.90 mg/ 100g fruit pulp) the ascorbic acid content was recorded minimum in fruits stored at 5 °C. On 5th day of storage the maximum ascorbic acid content was recorded in fruits stored at 5 °C (10.22 mg/100g fruit pulp). On 10th day the ascorbic acid was observed maximum in fruits stored at -40 °C (9.85 mg/ 100g fruit pulp). From 15th day onwards to 45th day of storage the ascorbic acid content in fruits was recorded highest in fruits stored at 0 °C. The TSS increased during the storage period. The maximum TSS, were recorded in fruits stored at -40 °C followed by fruits stored at 0 °C. Yahia (2004) [8] and Kader and Hussein (2009) also

stored date fruits at 0 °C with much loss in quality. Increase in TSS has been reported by Krishna and Sudhakar Rao (2014) [4] in guava. The acidity was observed minimum in fruits stored at -40 °C and the ascorbic acid content was recorded maximum in fruits stored at 0 °C. There was decrease in acidity and ascorbic acid during the storage. The same trend of decrease in ascorbic acid and acidity during storage has been reported in mango (Shinde *et al*., 2009) [7] and guava (Krishna and Sudhakar Rao, 2014) [4].

Table 1: Effect of GA_3 and storage temperature on the TSS (%) of date palm fruit during storage

Treatments	TSS (%)								
	Storage day								
GA_3 (ppm)	5th	10th	15th	20th	25th	30th	35th	40th	45th
0	30.05	30.05	29.59	28.84	28.70	28.67	28.29	27.90	27.39
25	30.43	30.43	29.99	29.31	29.30	29.10	28.82	28.48	28.18
50	31.60	31.60	30.92	29.86	29.75	29.55	29.35	29.08	28.90
75	32.09	32.09	31.12	30.62	30.22	29.87	29.68	29.45	29.20
SEm±	0.29	0.29	0.34	0.27	0.26	0.28	0.259	0.26	0.26
C.D.	0.87	0.88	1.02	0.82	0.82	0.87	0.807	0.83	0.80
Temperature(°C)									
RT (Ambient temp.)	30.97	30.06	29.44	28.76					
5	33.72	31.42	30.94	29.83	28.96	28.81	28.48	28.05	27.54
0	31.67	30.94	30.50	29.63	29.45	29.20	28.92	28.61	28.41
-40	32.66	31.75	30.75	30.40	30.06	29.87	29.70	29.53	29.30
SEm±	0.29	0.29	0.34	0.27	0.23	0.24	0.22	0.23	0.22
C.D.	0.87	0.88	1.02	0.82	0.71	0.75	0.69	0.72	0.69

Interaction of GA_3 x storage temperaturewas found non – significant

Table 2: Effect of GA_3 and storagetemperatureon the acidity (%) of date palm fruit during storage

Treatments	Acidity (%)								
	Storage day								
GA_3 (ppm)	5th	10th	15th	20th	25th	30th	35th	40th	45th
0	0.25	0.22	0.17	0.15	0.14	0.10	0.09	0.09	0.08
25	0.09	0.09	0.08	0.07	0.07	0.06	0.06	0.06	0.05
50	0.07	0.07	0.06	0.06	0.07	0.06	0.06	0.05	0.04
75	0.07	0.06	0.06	0.05	0.06	0.05	0.05	0.04	0.04
SEm±	0.01	0.01	0.02	0.01	0.02	0.01	0.01	0.01	0.01
C.D.	0.03	0.03	0.04	0.03	0.05	0.03	0.03	0.03	NA
Temperature (°C)									
RT (Ambient temp.)	0.12	0.09	0.06	0.05					
5	0.12	0.12	0.10	0.09	0.09	0.08	0.07	0.06	0.06
0	0.17	0.15	0.14	0.12	0.19	0.09	0.08	0.08	0.07
-40	0.08	0.08	0.07	0.06	0.06	0.04	0.04	0.04	0.03
SEm±	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01
C.D.	0.02	0.03	0.04	0.03	0.04	0.03	0.03	0.027	0.03

Table 3: Effect of GA_3 and storage temperature on the ascorbic acid (mg/100g fruit pulp) of date palm fruit during storage.

Treatments	Ascorbic acid(mg/100g fruit pulp)								
	Storage day								
GA3 (ppm)	5th	10th	15th	20th	25th	30th	35th	40th	45th
0	9.37	8.98	8.67	8.55	8.52	8.48	8.36	8.13	7.90
25	9.48	9.05	8.94	8.82	8.78	8.60	8.40	8.23	7.93
50	10.03	9.44	9.10	9.16	9.13	8.97	8.73	8.50	8.16
75	10.22	9.89	9.50	9.44	9.25	9.03	8.85	8.65	8.40
SEm±	0.13	0.12	0.11	0.11	0.09	0.09	0.09	0.09	0.09
C.D.	0.39	0.37	0.35	0.32	0.31	0.29	0.31	0.28	0.30
Temperature(°C)									
RT (Ambient temp.)	9.09	8.22	7.75	7.41					
5	10.22	9.81	9.55	9.42	8.67	8.58	8.39	8.20	7.90
0	9.75	9.46	9.34	9.16	9.10	8.91	8.75	8.52	8.15
-40	10.04	9.85	9.57	9.44	9.02	8.81	8.59	8.39	8.25
SEm±	0.12	0.12	0.13	0.10	0.08	0.08	0.08	0.08	0.30
C.D.	0.39	0.37	0.35	0.32	0.26	0.25	0.27	0.24	0.08

Reference

1. Abdul Afiq ML, Abdul Rahman R, Che Man YB, AL-Kahtani HA, Mansor TST. Date seed and date seed oil. International Food Res. J. 2013; 20(5):2035-2043.
2. Duguma T, Egigu MC, Muthuswamy M. The effects of gibberellic acid on quality and shelf life of banana (*Musa* spp.). International Journal of Current Research and Review. 2014; 6(23):63-69.

3. Jayachandran KS, Srihari D, Reddy YN. Changes in post-harvest quauty of guava fruits affected by pre-harvest appucation of growth regulators, Agric. Sci. Digest, 2005; 25(3):210-212.
4. Krishna KR, Sudhakar Rao V. Effect of coationg on the physiochemical characteristics of guava (*Psidium guvajava* L.) fruits during storage at room temperature. Indian J Sci. and Tec., 2014; **7**(5):554-558.
5. Patil SN, Hulamani NC. Effect of post harvest treatments on physical characters and shelf life of banana fruits. Karnataka Journal of Agricultural Sciences, 1998; 11(2):535-537.
6. Ravi Bhatshanoo K. Effect of pre-harvest application of plant growth regulaters (GA_3 NAA AND CCC) on post harvest quatily of guava (*Psidium guvajava* L.) CV. Sardar. Journal of Research, SKUASTJ. 2005, 4(1).
7. Shinde GS, Viradia RR, Patil S, Kakade DK. Effect of post harvest treatments of natural plant extract and wrapping material on storage behavior of mango (cv.Kesar). International Journal of Agricultural Sciences. 2009; 5(2):420-423.
8. Yahia EM, Gross KC, Wang CY, Satveit M. (Eds.). The commercial storage of fruits and vegetables and florist and nursery stocks. Agriculture Handbook No. 66. Beltsville, Maryland, USDA, 2004; 672.