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Effect of post-harvest treatments of plant growth regulator and temperature on storage life of date palm

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Abstract

An investigation on "Effect of GA₃ and storage temperature on shelf life of Date Palm (*Phoenix dactylifera* L.) fruits" was conducted at Date Palm Research Centre, College of Agriculture, SKRAU, Bikaner. The date palm variety Khasab were treated with different concentrations of GA₃ (0, 25, 50 and 75 ppm) for 5 minutes and stored at different temperatures (room temperature, 5°C and 0°C and -40°C) for 45 days in polyethylene bags. The minimum physiological loss in weight was observed in fruits treated with 75 ppm GA₃ over the whole 45 days duration of storage. The fruits stored at room temperature were rotten completely on 20th day of storage. The fruits stored at lower temperatures (0°C and -40°C) secured higher values for organoleptic evaluation and visual appearance with minimum loss in fruit quality characters as compared to fruits stored at room temperature and at 5°C.

Keywords: Date palm, physiological loss in weight, plant growth regulator, GA₃

Introduction

Date Palm (*Phoenix dactylifera* L.) a monocotyledonous and dioecious species belonging to Arecaceae (Palmaceae) family, is considered as one of the world's oldest cultivated fruit trees. Fruits of date palm are eaten as fresh fruits (hard ripe stage), dry dates (*Chuhhara*) 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) [1]. 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) [2].

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. 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.

Low temperature (-50°C to 0°C) storage of fresh fruits of date palm have been reported by Shomer *et al.* (1998) [3], Yahia (2004) [4] and Kader & Hussein (2009) [5]. Application of Gibberellic Acid (GA₃) to improve shelf life has been reported in many crops *viz.* sapota (Rao and Chundawat, 1988) [6], and tomato (Pila *et al.*, 2010) [7]. Therefore the present investigation is carried out to evaluate the "Effect of post-harvest treatments of plant growth regulator and temperature on shelf life of Date palm".

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 there were two replications for each treatment and 600g fruit were taken from which 100g were kept separately and used for physiological weight (PLW) loss study.

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 GA₃ after initial physio-chemical analysis. For preparing GA₃ solutions the required quantity of GA₃ was weighed and dissolved in required volume of distilled water. The selected fruit were dipped in different concentration of GA₃ solution for 5 minutes. For control (0 ppm GA₃) the fruits were dipped in distilled water. After application of GA₃ 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. Refrigerator was used to get 5°C temperature and temperature 0°C was obtained in freezer section of refrigerator. Temperature -40°C was obtained in deep freezer. For determination of physiological loss in weight 100g fruits from each treatment were marked. The marked fruits kept in separate polyethene bags and were weighed at five days interval during storage. The loss in weight was expressed as a percentage of the original weight of fruits. The rotten fruit were counted out of total fruits at an interval of five days &

intervals during storage and expressed in percentage.

Results and Discussion

The data presented in table 1 shows the effect of different concentration of GA₃ and storage temperature on PLW of fruits during storage period. The maximum physiological loss in weight was observed in fruits treated with 0 ppm GA₃ while the physiological loss in weight was the minimum in fruits treated with 75 ppm GA₃ over the whole 45 days duration of storage. GA₃ has been known to retard ripening and senescence of fruits and used in many fruits for prolonged shelf life. The beneficial effect of GA₃ in reducing the PLW during storage have been reported in many fruits crops *viz.* date palm (Ghazzawy, 2013)^[8], apple (Singh and Pal, 2006) and papaya (Rajkumar *et al.*, 2005)^[10].

The rotting of fruits was observed only in fruits stored at room temperature and 5°C, in both these storage temperatures the rotting was observed higher in fruits which were either not treated with GA₃ (0 ppm) or treated with lower concentration of GA₃ (25 ppm). The rotting was observed comparatively lower in the fruits treated with higher concentration of GA₃ (75 ppm). These results are in accordance with findings of Sandeep *et al.* (2003)^[11] in ber and Singh and Pal (2006) in apple where they reported reduction in spoilage loss during storage by use of GA₃.

Table 1: Effect of GA₃ and storage temperature on the physiological loss in weight of date palm fruit during storage.

Treatments	Physiological loss in weight (%)								
	Storage day								
GA ₃ (ppm)	5 th	10 th	15 th	20 th	25 th	30 th	35 th	40 th	45 th
0	12.51	14.61	15.58	16.42	13.73	14.72	17.00	18.03	19.19
25	10.26	11.21	12.64	13.97	12.40	13.73	15.17	15.50	18.46
50	8.82	9.99	11.88	12.76	11.69	13.00	14.63	15.07	16.89
75	6.73	7.78	9.101	10.72	10.53	11.30	13.13	14.24	15.75
SEm±	1.20	1.36	1.06	1.07	0.290	0.74	0.79	0.39	0.52
C.D.	3.62	4.13	3.21	3.24	0.90	2.30	2.46	1.23	1.63
Temperature (°C)									
RT (Ambient temp.)	14.68	16.55	19.18	20.80					
5	8.91	10.60	11.85	13.18	13.54	14.63	17.29	17.70	20.11
0	7.81	8.74	9.68	10.90	12.24	13.67	14.92	15.95	17.76
-40	6.99	7.72	8.48	8.99	10.49	11.29	12.73	13.48	14.84
SEm±	1.20	1.36	1.06	1.07	0.25	0.64	0.69	0.34	0.45
C.D.	3.63	4.13	3.21	3.24	0.78	2.00	2.14	1.06	1.41

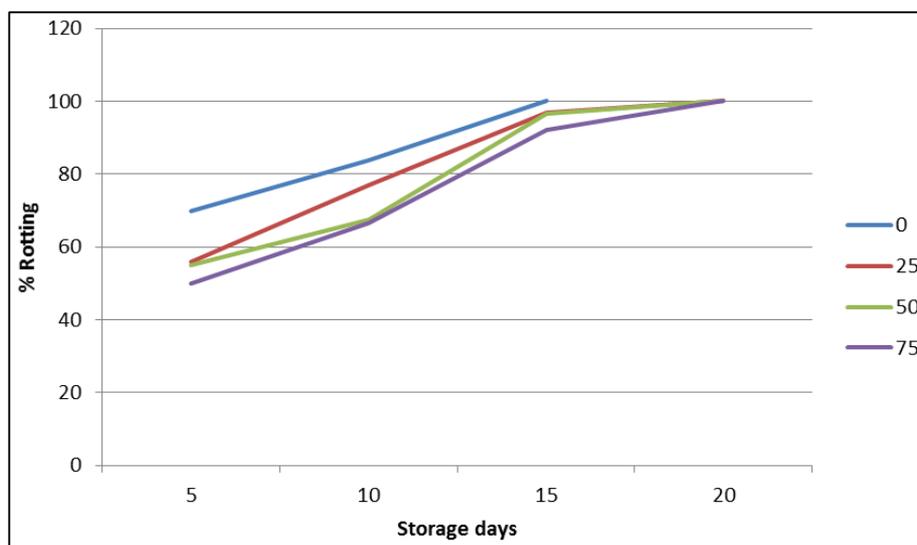


Fig 1: Effect of GA₃ on the rotting of date palm fruit stored at room temperature

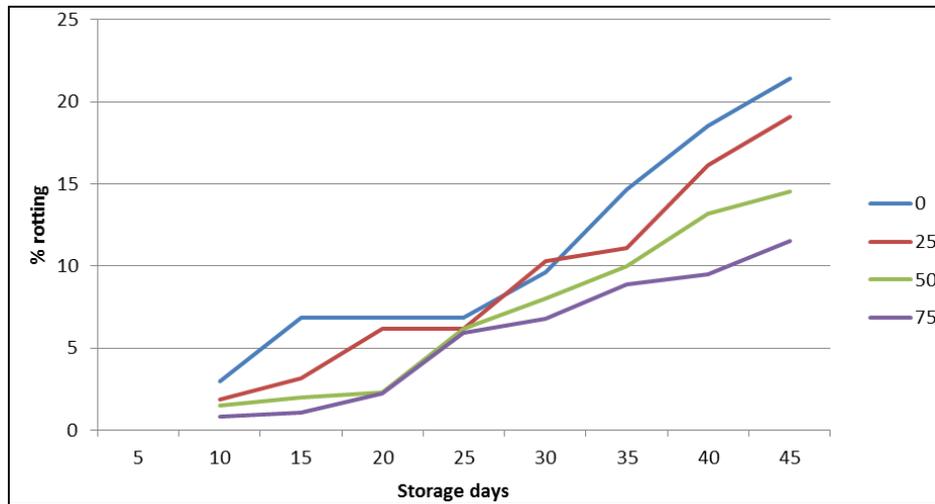


Fig 2: Effect of GA₃ on the rotting of date palm fruit stored at 5°C temperature

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