SHORT COMMUNICATION

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Effect of antioxidant and mustard oil emulsion on post harvest shelf life of fresh fruits of date palm cv. Barhee

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Date palm (*Phoenix dectylifera* L.) is a highly nutritious fruit crop. It is usually eaten as fresh (fruits harvested at khalal stage) and fully ripened fruit (harvested at pind or tamer stage). Date is highly nutritious fruit. Besides carbohydrate and protein, date fruit provides small amount of copper, magnesium, chlorine, sulphur, Vit A_1, B_1 and B_2. The following contents are an average for all date varieties at khalal stage: moisture 59.2%, nitrogen 1.2%, fat 0.4%, carbohydrate 33.8%, energy 144 calories/kg, calcium 22 mg/100g, and phosphorus 38 mg/100gm.

Its origin is not known exactly but is an ancient fruit indigenous to countries near to Persian Gulf. Till date in India the commercial plantations are restricted only to Kachchh district of Gujarat. Due to the climatic conditions of the region fruits do not reach to pind or tamer stage and hence growers are compelled to harvest the fruits at khalal stage (as fresh fruits). Earlier there was a little market of these fruits restricted to Kachchh and some parts of Saurashtra region in Gujarat. But now-a-days market of fresh fruits has spread to far southern states viz. Maharashtra, Karnataka, Tamilnadu and Kerala.

Like other horticultural commodities date fruits are also perishable. With the increase in demand of fresh fruits to far away places, it is challenging for the growers and traders to keep their fruits in fresh condition till they reaches to consumer.

Antioxidants have proved to improve the post harvest shelf life of various fruits (Jayachandran *et al.*, and Renhua Huang *et al.* 2007). Presence of antioxidant content in fruit and vegetable species itself has been found to enhance their keeping quality (Claire Hebert and Louis Gauthier, 2007). Several antioxidants are easily available. Out of hence, ascorbic acid considered as safe and on the other hand it adds nutritive value also.

Use of edible oils to extend the shelf life of horticultural produce is an old practice. Several workers have used mustard oil emulsion to extend the post harvest shelf life (Verma *et al*, 1999, Verma and Dashora, 2000).

In the present study, these two approaches were used alone and in combination to see their effect on post harvest shelf life of fresh date fruits of cv. Barhee.

Mature Barhee dates at khalal stage were harvested from the same tree from 11th block of farm of Date palm Research Station, Mundra – Kachchh. The orchard is under standard agricultural practices with proper pest management. Soil of orchard is sandy to sandy loam. Fruits were brought to laboratory for treatment immediately after harvesting. Fruits were thoroughly cleaned with a piece of cloth. After that they were subjected to different treatments. Fruits were dipped in 0.1 and 0.2 per cent ascorbic acid solutions separately. For mustard oil emulsion treatment first oil was added to water (for 4 % solution 40 ml mustard oil in 1 litre water.) and then emulsion was made using teepol so that oil could mix thoroughly in water. In case of combination of treatment fruits were treated first with ascorbic acid and then dipped in oil emulsion.

Fruits were given dipping treatment of 20 seconds and 5 seconds for ascorbic acid and oil emulsion respectively. An absolute control was also maintained. After this, total six treatment combinations viz. (i) control, (ii) mustard oil emulsion @ 4%, (iii) ascorbic acid @ 0.1%, (iv) ascorbic acid @ 0.1% + mustard oil emulsion 4%, (v) ascorbic acid @ 0.2%, (vi) Ascorbic acid @ 0.2% + mustard oil emulsion 4% were tried. Each treatment was replicated thrice. After proper treatment fruits were kept in perforated polyethylene bags of 100 gauge. Each bag was having 3 strands of date palm. All the treatments were kept in ambient condition. Initial observations were recorded before subjecting the fruits to treatments. Later observations were recorded on 4th, 8th and 12th day of experiment. Treatments were evaluated for PLW (%), rotting (%), marketability (%), fruit weight (g), seed weight (g), pulp: stone ratio and TSS (%). PLW was measured using the following formula:

$$PLW\% = \frac{\text{Initial weight} - \text{Final weight}}{\text{Initial weight}} \times 100$$

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Rotting and marketability were recorded by visual observation. Fruit and seed weight were recorded by simply weighing the fruit. TSS was recorded by hand refractometer. Experiment was laid out in factorial in completely randomized design using the technique of Cochran and Cox (1950).

Results are presented in Tables 1 and 2. Perusal of data indicated that with the use of 4 per cent mustard oil emulsion, per cent PLW, rotting per cent and TSS increased while marketability, fruit weight and pulp: stone ratio decreased significantly over without oil. So it is clear that ripening process enhanced by the use of oil emulsion instead of retarding it.

After this analysis, the comparison of main effect of ascorbic acid will not give the right idea, hence in the present study, comparison among ascorbic acid treatment alone i.e. without oil was made to know the effect of ascorbic acid. Minimum PLW of 2.53, 7.46 and 10.95% was recorded in fruits treated with 0.2% ascorbic acid while maximum of 3.60, 9.60 and 17.57 % in control on 4th, 8th and 12th day respectively. Same trend was also recorded in rotting and marketability also where minimum rotting i.e. 4.05, 20.73 and 26.19% was found in 0.2% ascorbic acid treated fruits which was significantly at par with 0.1% ascorbic acid while maximum rotting of 10.60, 28.79 and 33.65% was recorded in control on 4th, 8th and 12th day respectively. Marketability per cent was also non significantly affected by the concentration of ascorbic acid, though maximum marketability 85.91, 70.11 and 64.50% was observed in ascorbic acid @ 0.2 per cent and minimum in control (80.21, 61.85 and 56.93%) on 4th, 8th and 12th day of storage, respectively.

Perusal of Table 2 revealed that maximum fruit weight (11.78, 10.00 and 10.51 g on 4th, 8th and 12th day, respectively) was recorded in ascorbic acid 0.2 per cent treated fruits. Effect on pulp: stone ratio and TSS was found to be non significant. Better effect of ascorbic acid to enhance shelf life is due their role in protecting the tissue against stress and participates to disease resistance also (Claire and Gauthier, 2007). In the cell or tissue system first they get digested and then reduce the respiration process. Present study provides evidence that post harvest shelf life of cv. Barhee can be increased by using ascorbic acid, which is well supported by Farag (1998) in date palm, Jayachandran *et al.*, (2007) in guava and Mohammed and Wickham (2005) in pineapple.

Oil emulsion enhanced the ripening process which reduces the shelf life instead of improving it. Though the several workers have been found to increase the shelf life of other fruits (Verma *et al.*, 1999 and Verma and Dashora, 2000). But result of the present study were not in line them and oil emulsion was not able to prevent

Table 1. Effect of ascorbic acid and mustard oil emulsion on PLW, rotting % and marketability %.

	PLW								
	4th day			8th day			12th day		
	Without oil	With oil	Mean	Without oil	With oil	Mean	Without oil	With oil	Mean
	Initial value = 0								
Without Asc. acid	3.60	3.66	3.63	9.60	9.50	9.55	17.57	23.43	20.50
Asc. Acid (0.1%)	3.03	4.26	3.65	8.16	9.00	8.58	11.99	20.58	16.29
Asc. Acid (0.2%)	2.53	5.40	3.96	7.46	10.76	9.11	10.95	20.94	15.95
Mean	3.05	4.44		8.41	9.75		13.51	21.65	
	SEm+	CD (5%)		SEm+	CD (5%)		SEm+	CD (5%)	
Ascorbic acid (A)	0.030	0.094		0.105	0.325		0.902	2.778	
Oil emulsion(B)	0.025	0.077		0.086	0.265		0.736	2.269	
A X B	0.043	0.133		0.149	0.459		1.275	NS	
Rotting (%)									
	Initial value = 0								
Without Asc. acid	10.60	21.00	15.80	28.79	51.25	40.02	33.65	70.90	52.28
Asc. Acid (0.1%)	4.05	21.18	12.61	23.17	60.13	41.65	28.51	74.22	51.36
Asc. Acid (0.2%)	4.05	22.98	13.51	20.73	57.80	39.26	26.19	75.22	50.70
Mean	6.23	21.72		24.23	56.39		29.45	73.45	
	SEm+	CD (5%)		SEm+	CD (5%)		SEm+	CD (5%)	
Ascorbic acid (A)	1.025	NS		0.524	1.614		1.333	NS	
Oil emulsion(B)	0.837	2.578		0.428	1.318		1.088	3.353	
A X B	1.449	4.465		0.741	2.283		1.885	5.807	
Marketability (%)									
	Initial value = 100								
Without Asc. acid	80.21	69.83	75.02	61.85	39.29	50.57	56.93	20.03	38.48
Asc. Acid (0.1%)	85.91	69.65	77.78	67.59	30.48	49.03	62.14	16.81	39.47
Asc. Acid (0.2%)	85.91	67.78	76.84	70.11	32.79	51.45	64.50	15.86	40.18
Mean	84.01	69.09		66.51	34.19		61.19	17.57	
	SEm+	CD (5%)		SEm+	CD (5%)		SEm+	CD (5%)	
Ascorbic acid (A)	0.918	NS		0.533	1.644		1.295	NS	
Oil emulsion(B)	0.749	2.309		0.436	1.342		1.057	3.257	
A X B	1.298	3.999		0.754	2.325		1.831	5.642	

Table 2. Effect of ascorbic acid and mustard oil emulsion on fruit weight (g), seed weight (g), pulp: stone ratio and TSS (%).

	4th day			8th day			12th day		
Fruit weight (g)	Initial value = 12.19								
	Without oil	With oil	Mean	Without oil	With oil	Mean	Without oil	With oil	Mean
Without Asc. acid	11.09	10.18	11.09	9.70	9.63	9.66	10.08	10.39	10.23
Asc. Acid (0.1%)	11.03	10.43	10.43	10.00	8.98	9.49	9.40	8.38	8.89
Asc. Acid (0.2%)	11.78	11.61	11.20	10.00	9.04	9.52	10.57	7.93	9.22
Mean	11.27	10.74			9.92		9.99	8.90	
	SEm±	CD (5%)		SEm±	CD (5%)		SEm±	CD (5%)	
Ascorbic acid (A)	0.149	NS		0.071	NS		0.291	0.895	
Oil emulsion(B)	0.122	0.375		0.058	0.178		0.237	0.731	
A X B	0.211	0.650		0.100	0.309		0.411	1.266	
Seed weight (g)	Initial value = 1.04								
Without Asc. acid	1.25	1.34	1.30	1.11	1.11	1.11	1.18	1.25	1.21
Asc. Acid (0.1%)	1.18	1.14	1.16	1.12	0.99	1.05	1.05	1.12	1.08
Asc. Acid (0.2%)	1.17	1.12.	1.14	1.18	1.11	1.14	1.10	1.15	1.12
Mean	1.20	1.20		1.14	1.07		1.11	1.17	
	SEm±	CD (5%)		SEm±	CD (5%)		SEm±	CD (5%)	
Ascorbic acid (A)	0.029	0.091		0.013	0.041		0.041	NS	
Oil emulsion(B)	0.024	NS		0.011	0.034		0.033	NS	
A X B	0.042	NS		0.019	0.058		0.057	NS	
Pulp: Stone ratio	Initial value = 10.72								
Without Asc. acid	7.80	7.31	7.55	7.69	7.67	7.68	7.54	7.28	7.41
Asc. Acid (0.1%)	8.32	8.14	8.23	7.92	8.04	7.98	7.92	6.50	7.21
Asc. Acid (0.2%)	9.05	8.48	8.76	7.43	7.15	7.29	8.77	5.92	7.34
Mean	8.39	7.97		7.68	7.62		8.08	6.56	
	SEm+	CD (5%)		SEm+	CD (5%)		SEm+	CD (5%)	
Ascorbic acid (A)	0.145	0.445		0.082	0.251		0.466	NS	
Oil emulsion(B)	0.118	0.364		0.067	NS		0.381	1.173	
A X B	0.204	NS		0.115	NS		0.659	NS	
TSS (%)	Initial value = 28								
Without Asc. acid	29.00	30.50	29.75	30.50	32.50	31.50	32.00	35.00	33.50
Asc. Acid (0.1%)	29.00	30.00	29.50	30.00	33.00	31.50	32.00	35.00	33.50
Asc. Acid (0.2%)	29.00	30.00	29.50	30.00	32.00	31.00	31.00	34.00	32.50
Mean	29.00	30.16		30.16	32.50		31.66	34.66	
	SEm+	CD (5%)		SEm+	CD (5%)		SEm+	CD (5%)	
Ascorbic acid (A)	0.479	NS		0.612	NS		0.479	NS	
Oil emulsion(B)	0.391	NS		0.500	1.54		0.391	1.204	
A X B	0.677	NS		0.866	NS		0.677	NS	

the ripening process. It is concluded that (1. There is great potential in antioxidants to increase the post harvest shelf life. (2. Oil emulsion retards the shelf life and should not be used. (3. Ascorbic acid should be further used with different concentrations. (4. Some other antioxidants should also be tried.

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