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Effect of Bunch Bagging on Yield and Fruit Quality of Seewy Date Palm under New Valley Conditions (Egypt)

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ABSTRACT

A field study was performed on Seewy date palms grown in a private orchard located at El-Dakhla Oasis, New Valley, Egypt, during 2009, 2010 and 2011 seasons. The present study aimed to evaluate the effect of different bagging treatments on yield and fruit quality. The bunches were subjected to seven bagging treatments, white, blue, black and green perforated polyethylene bags as well as sackcloth, gauze bags and unbagged (control). Bagging bunches was performed at pre-fruit coloring stage and remained covered until harvest date. The results show that bagging bunches significantly increased the bunch weight, accelerated ripening and improved fruit quality compared with the unbagged ones. Blue and black polyethylene bags increased fruit weight and flesh percentage compared to other treatments. Blue color surpassed the other bagging treatments in these traits. The bagging with blue or black perforated polyethylene bags recorded the highest scores dealt with fruiting quality. Contrarily, the least score for dates quality was recorded by bagging with sackcloth and gauze bags. From this study it could be recommended the use of blue or black perforated polyethylene bags for Seewy date plant bunches at pre-fruit coloring stage under such conditions.

Key words: Bagging, yield, fruit quality, date palm.

Introduction

Date palm (*Phoenix dactylifera* L.) is one of the ancient domestic fruit trees in the Middle East countries and their fruits play an important role in the nutritional pattern of many people as well as a strategic crops in food and biochemical industries (Khayyat *et al*., 2007).

In Egypt, date palm culture extends from north (Alexandria) to south (Aswan), from the relatively cool and humid region of the Mediterranean (Lat. 31 N) to the extremely hot and dry region of Aswan (Lat. 22 N).

Among all Egyptian governorates, New Valley ranked the fourth position after Sharkia, Behaira and Aswan according to acreage and the number of female palms. Seewy date palm is covering all the acreage of the total cultivated area in such Governorate (according to Annual Statistical of the Ministry of Agriculture in 2012).

Date palm bunch covering offers several advantages and is commonly used in the date palm cultivated areas in order to protect fruits from high humidity, rain, bird and insects.

Bagging spathes of date palm cvs during flowering and fruit setting periods showed a beneficial effect on fruit set and yield, as well as accelerated ripening and improved fruit quality. Such treatment exhibited the highest fruit weight, flesh weight, total soluble solids, total sugars percentage and lowest tannins percentage (Kassem *et al*., 1994; El-Salhy, 2000, Rabah and Kassam, 2003 and Moustafa, 2007). In general, canvas, gauze or palm fibers, as well as polyethylene bagging with removing at later growth stages, caused a significantly early fruit ripening and improved the yield and fruit quality and also decreased the percentage of tip cracked fruits at harvest time comparing with unbagged (control). Blue color surpassed the other bag colors in the same traits. In addition, black paper lead to higher fruit content of nitrogen and calcium in Khalal stage and then, these fruits will be valid to storage (El-Salhy, 2000; Harhash and Al-Obeed, 2010 and Kassem *et al*., 2011).

Therefore, the present study aimed to evaluate the effect of different bagging treatments on fruit quality and ripening date of Seewy dates growing at Dakhla Oasis in New Valley governorate, Egypt.

Materials and Methods

The present experiment was performed during 2009, 2010 and 2011 seasons on 26-years old Seewy date palms, grown in a private orchard located at El-Dakhla Oasis, New Valley, Egypt.

Ten uniform date palms were selected and subjected to the same usual horticultural practices and pollinated from the same male palm tree. The number of bunches per palm were adjusted to 10 by removing excess ones, the (earliest, latest and smallest inflorescences) for achieving the following seven bagging treatments:

1 - Bagging bunches with white perforated polyethylene bags.

2 - Bagging bunches with blue perforated polyethylene bags.

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3 - Bagging bunches with black perforated polyethylene bags.
4 - Bagging bunches with green perforated polyethylene bags.
5 - Bagging bunches with Sackcloth bags.
6 - Bagging bunches with gauze bags.
7 - Without bagging (control).

Bagging bunches was performed at pre-fruit coloring stage in the first week of July and bunches remained covered until harvest date, in the second week of October.

These treatments were applied on each palm. The experiment was set up in a complete randomized block design with ten replications of one bunch each.

All bunches were harvested at Tamar stage, in the three experimental seasons. The average fruit weight/bunch (kg) was determined for each treatment. Samples of 30 fruits were picked at random from each bunch to determine the fruit quality, i.e. fruit and seed weight (g), pulp weight (%), fruit dimensions and fruit chemical properties (moisture content, total soluble solids and sugar contents) according to A.O.A.C. method (1985)

Evaluation of bagging treatments was calculated on the bases of 100 units which were divided among the yield, fruit ripening %, fruit weight, moisture contents and T.S.S (20 units for each).

Each palm which gave the best results in any character had given the full mark dealt with this character, except the lowest value for moisture content, while each of the other tested palms took lower units equal to their quantities.

The following equation was used to determine these characters.

$$\text{Characters} = \Sigma \frac{B}{A} \times 10$$

Where:

A= the highest value recorded for the studied character among all treatments.

B= value recorded for the specific character for considered treatments.

All obtained data was tabulated and statistically analysed according to Gomez and Gomez (1984) and Snedecor and Cochran (1990) using the L.S.D test for distinguishing the significance differences between various means.

Results and Discussion

Effect of bunch bagging treatments on fruiting traits:

Yield Index:

Table (1) exhibit the effect of bagging treatments on the fruit weight/bunch, fruit ripening percentage and fruit moisture contents of Seewy dates in 2009, 2010 and 2011 seasons. It is obvious from the data that the results showed a similar trend during the three studied seasons.

The obtained results indicated that all bagging treatments significantly increased the fruit weight/bunch compared to the unbagged one. Moreover bagging bunches with Sackcloth and gauze bags gave the highest fruit weight/bunch compared to other treatments. The recorded fruit weight were (9.48, 9.41, 9.38, 9.64, 10.18, 10.10 and 9.25 kg/bunch as an av. of the three seasons) due to the use white (T_1), blue (T_2), black (T_3), green perforated polyethylene bags (T_4), sackcloth (T_5), gauze bags (T_6) and the unbagged bunches (control) (T_7), respectively. These findings might be due to the increase in the fruit moisture contents which increased the fruit weight and consequently increased the fruit weight/bunch.

Also, results indicated that the microclimate of bunches could be favorably changed by bunch covering. Samson (1980) observed a temperature rise of 1.1-1.6°C surrounding banana bunches and an increase in bunch weight by 1 k due to covered bunches. The fruit ripening percentage attained (84.14, 92.78, 93.76, 70.50, 62.22, 63.91 and 80.44% as an av. of the three studied seasons) due to T_1 to T_7, respectively. The increment in the percentage of fruit ripening due to usage of either blue or black perforated polyethylene bags over the unbagged ones was (15.34% and 16.56%) as an av. of the three studied seasons, respectively.

Bagging bunches with white, blue and black perforated polyethylene bags significantly increased the rate of fruit harvest as compared to the control bunches.

On other hand, bunches covered with green polyethylene, sackcloth and gauze bags significantly decreased the rate of fruit ripening compared with the unbagged ones. Using black perforated polyethylene bags gave the highest fruit ripening percentage, whereas sackcloth bags gave the lowest fruit ripening percentage compared to other treatments.

With regard to the moisture percentage, data showed that bunch bagging using white, blue and black bags significantly decreased the moisture content, whereas, using green polyethylene, sackcloth and gauze bags significantly increased the moisture content compared to the control. Black bag color gave the lowest moisture

content compared to the control and other treatments. However, using sackcloth bag showed higher moisture percentage than other treatments.

These results may be due to that bunch bagging with these bags had accumulated higher heat units than the other bag colors a well as the control. Consequently, the accumulated heat might induce higher respiration rates and the CO_2 accumulation within bags might lead to more acetaldehyde production and removal of astringency, hence induce an advance of fruit ripening (El-Salhy, 2000 and Kassem *et al*., 2011).

Table 1: Effect of bagging bunches with different colors and materials of bags on fruit weight/bunch, fruit ripening % and fruit moisture content of Seewy dates during 2009, 2010 and 2011 seasons.

Characteristics. / Year / Treat.		Fruit weight/bunch (kg)				Fruit ripening %				Fruit moisture %			
		2009	2010	2011	Mean	2009	2010	2011	Mean	2009	2010	2011	Mean
Bagging bunches with white perforated polyethylene bags	T_1	9.49	9.50	9.47	9.48	84.13	84.53	83.76	84.14	11.92	12.20	11.38	11.83
Bagging bunches with blue perforated polyethylene bags	T_2	9.43	9.53	9.29	9.41	92.50	92.45	93.40	92.78	11.62	12.40	11.42	11.81
Bagging bunches with black perforated polyethylene bags	T_3	9.39	9.39	9.37	9.38	93.83	93.37	94.09	93.76	11.75	12.01	11.50	11.75
Bagging bunches with green perforated polyethylene bags	T_4	9.59	9.65	9.69	9.64	70.62	70.12	70.77	70.50	12.35	13.20	12.32	12.62
Bagging bunches with Sackcloth bags	T_5	10.15	10.17	10.22	10.18	62.51	61.97	62.18	62.22	14.38	13.85	14.30	14.18
Bagging bunches with gauze bags	T_6	10.07	10.09	10.15	10.10	63.89	64.18	63.68	63.91	13.16	12.48	13.75	13.13
Without bagging (control)	T_7	9.30	9.31	9.15	9.25	80.63	80.42	80.28	80.44	11.98	12.33	12.25	12.19
L.S.D. 5%		0.25	0.12	0.40	0.11	0.84	0.52	1.84	0.61	0.36	0.28	0.30	0.31

Physical fruit properties:

Data in Table (2) show the effect of bagging bunches by different materials and colors of bags on fruit weight, flesh weight percentage and fruit dimensions (length & diameter) of Seewy dates during 2009, 2010 and 2011 seasons.

Using all bagging materials significantly increased the fruit weight and flesh weight percentage compared to the control. It can be noticed that bagging bunches with sackcloth (T_5) and gauze bags (T_6) gave the highest fruit weight and flesh weight percentage. Whereas, control treatment gave the least values compared to other treatments. The obtained fruit weights were (10.02, 9.97, 9.96, 10.03, 10.54, 10.40 and 9.91 g) and flesh weight percentages were (87.06, 87.33, 86.59, 86.48, 88.37, 87.35 and 85.85% as an av. of the three studied seasons), respectively. Data indicated that fruit weight and flesh weight percentage took almost a similar trend and significantly increased as the percentage of fruit moisture increased (Table 1).

Moreover, data cleared that using black perforated polyethylene bags (T_3) gave the highest fruit length, whereas using sackcloth bags (T_5) gave the highest fruit diameter. On the contrary, using gauze bags (T_6) gave the least values of fruit length, whereas using black perforated polyethylene (T_3) gave the least value of fruit diameter compared to other treatments.

The present results are in harmony with those of Ghalib *et al* (1988), Kassem *et al.* (1994), El-Kassas *et al.* (1995), El-Salhy (2000), Moustafa (2007), Harhash and Al-Obeed, 2010 and Kassem *et al*. (2011).

Table 2: Effect of bagging bunches with different colors and materials of bags on some physical properties of Seewy dates during 2009, 2010 and 2011 seasons.

Characteristics / Year / Treat.	Fruit weight(g)				Pulp weight %				Fruit length (cm)				Fruit diameter (cm)			
	2009	2010	2011	Mean	2009	2010	2011	Mean	2009	2010	2011	Mean	2009	2010	2011	Mean
T_1	10.02	10.07	9.97	10.02	86.93	87.35	86.92	87.06	3.89	3.91	3.85	3.88	2.33	2.36	2.35	2.34
T_2	9.99	9.97	9.97	9.97	87.23	87.54	87.23	87.33	4.00	3.92	3.97	3.96	2.29	2.30	2.31	2.30
T_3	9.98	9.96	9.96	9.96	87.19	85.38	87.22	86.59	4.04	4.14	4.31	4.16	2.29	2.31	2.26	2.28
T_4	10.03	10.04	10.03	10.03	86.79	85.85	86.81	86.48	3.92	4.01	3.69	3.87	2.34	2.34	2.34	2.34
T_5	10.55	10.49	10.59	10.54	89.05	87.03	89.05	88.37	3.82	3.81	3.89	3.84	2.45	2.43	2.49	2.45
T_6	10.40	10.41	10.40	10.40	88.25	85.56	88.25	87.35	3.64	3.67	3.56	3.62	2.35	2.35	2.36	2.35
T_7	9.88	9.94	9.92	9.91	85.85	85.83	85.87	85.85	3.96	4.12	3.92	4.00	2.32	2.33	2.35	2.33
L.S.D. 5%	0.06	0.07	0.11	0.05	0.34	0.69	0.50	0.60	0.42	0.39	0.53	0.16	0.08	0.04	0.19	0.03

Chemical fruit properties:

Data in Table (3) show the effect of different bagging treatments on some chemical properties of Seewy dates during 2009, 2010 and 2011 seasons.

Data indicate that T.S.S. % and sugar contents were significantly varied according to bagging treatments. Bagging with white, blue or black perforated polyethylene bags significantly increased the T.S.S. % and sugar

contents compared the control. Whereas, using either green perforated polyethylene bag, sackcloth or gauze bags significantly decreased the T.S.S. % and total sugars contents compared to the control. Using bagging with black color bags gave the highest T.S.S. % whereas, using blue color bags gave the highest total sugars content in comparison to other bagging treatments. On the contrary, using gauze bags gave the least T.S.S. % and total sugars compared to other treatments.

The obtained values of T.S.S. were (81.14, 81.08, 81.35, 79.36, 79.18, 79.18 and 80.12%) and total sugars content were (75.29, 75.40, 75.06, 72.84, 73.21, 73.26 and 74.08% as an av. of the three studied seasons), respectively.

Also, the reducing sugars percentage significantly differed according to bagging treatments. Using either white or blue perforated polyethylene bags gave the highest reducing sugars content, whereas using sackcloth gave the least reducing sugars percentage compared to other bagging treatments.

Moreover, the results presented in Table (3) show that the non-reducing sugar percentage of Seewy dates were influenced by different bagging treatments. The obtained results indicated that using either sackcloth or gauze bags gave the highest non reducing sugar percentage. On the other hand, the control gave the least value of non-reducing sugar percentage.

These results indicated that microclimate around the treated bunch could be favorable for different chemical fruit properties. Bagging bunches with either white, blue or black perforated polyethylene bags significantly increased the rate of fruit growth and its maturation.

Bagging bunches with this bags enhanced the accumulation of higher heat units than the other bags colors and the control. Therefore, the accumulated heat might induce higher respiration rates and hastened the fruit maturation, consequently improved the chemical constituents of Seewy dates, thus the increasing the T.S.S. % and sugars contents.

The present results are in harmony with those of Ghalib *et al* (1988), Kassem *et al* (1994), El-Kassas *et al* (1995), El-Salhy (2000), Awad (2007) and Kassem *et al* (2011). Moreover Harhash and Al-Obeed, (2010) mentioned that blue color increased fruit and flesh weight, fruit size, fruit length and fruit diameter of Succary and Khalas cultivars. Bunch bagging treatments improved fruit chemical properties as compared with the unbagged one. Blue color surpassed the other bag colors in the same traits. Finally it can be recommended the bunch bagging with blue color for maintaining high yield and good fruit quality.

Table 3: Effect of bagging bunches with different colors and materials of bags on some chemical properties of Seewy dates during 2009, 2010 and 2011 seasons.

Characteristics. / Year / Treat.	T.S.S%				Reducing sugars %				Non-Reducing sugars %				Total sugars			
	2009	2010	2011	Mean	2009	2010	2011	Mean	2009	2010	2011	Mean	2009	2010	2011	Mean
T_1	81.11	81.10	81.21	81.14	66.11	65.70	65.85	65.88	9.22	9.60	9.41	9.41	75.33	75.30	75.26	75.29
T_2	81.17	81.63	80.44	81.08	65.62	65.88	65.89	65.79	9.76	9.52	9.52	9.60	75.38	75.41	75.41	75.40
T_3	80.79	83.05	80.23	81.35	65.26	65.30	65.50	65.35	9.66	9.69	9.76	9.70	74.92	74.99	75.26	75.06
T_4	79.59	79.10	79.40	79.36	64.00	64.13	63.03	63.72	8.88	8.69	9.78	9.12	72.88	72.82	72.81	72.84
T_5	79.16	79.20	79.19	79.18	63.00	63.60	62.82	63.13	10.26	9.26	10.73	10.08	73.26	72.86	73.55	73.21
T_6	79.09	79.12	79.35	79.18	63.04	63.63	62.84	63.17	10.07	9.42	10.77	10.08	73.11	73.05	73.61	73.26
T_7	80.48	80.11	79.79	80.12	65.04	64.89	65.22	65.05	8.86	9.5	8.73	9.03	73.90	74.39	73.95	74.08
L.S.D. 5%	0.66	0.90	1.01	0.72	0.80	0.58	1.76	0.46	1.20	0.86	1.36	0.80	0.83	0.71	1.56	0.45

General evaluation of the studied bagging treatments:

Data in Table (4) show the general evaluation of the used bagging treatments as an average of the three studied seasons, according to, yield index and fruit quality.

Table 4: General evaluation of bagging treatments on fruiting traits of Seewy dates as an average of the three studied seasons.

Characters	Yield index		Fruit Quality					G. Total
	Bunch weight	Total	Fruit ripening %	Fruit weight	Fruit moisture %	T.S.S %	Total	
Score units	**20**	**20**	**20**	**20**	**20**	**20**	**80**	**100**
Treatments								
T_1	18.63	18.63	17.96	19.00	19.87	19.95	76.78	95.41
T_2	18.49	18.49	19.81	18.91	19.90	19.79	78.55	97.04
T_3	18.43	18.43	20.00	18.89	20.00	20.00	78.89	97.32
T_4	18.94	18.94	15.05	19.03	18.52	19.51	72.11	91.05
T_5	20.00	20.00	13.28	20.0	15.87	19.47	68.62	88.62
T_6	19.85	19.85	13.64	19.73	17.65	19.47	70.49	90.34
T_7	18.18	18.18	17.17	18.80	19.25	19.70	74.92	93.10

It can be easily seen that these results emphasized the pre-mentioned findings, since the bagging with blue (T_2) or black (T_3) perforated polyethylene bags recorded the highest scores according to fruiting traits. Such fruit quality improvement is due to hasting the maturation and decreasing the moisture content which increase the packable yield and raise its price and may improve the storage life. Such improvement in fruit maturation could be attributed to the accumulated heat which may induce activation of most metabolic processes and growth regulation which improve fruit growth, hasten fruit maturation and increase their quality. Contrarily, the least score for fruit quality was recorded by bagging with sackcloth and gauze bags.

As a whole, these results are important for economic and horticultural point of view.

Accordingly, it could be recommended to use of blue or black perforated polyethylene bags for Seewy date palm bunches at pre-fruit coloring stage under such conditions.

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