

# Bunch covering impact on the ripening time, marketable yield and fruit quality of "Zaghloul" dates

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## Abstract

This study targets to investigate the efficiency of date bunch covering treatments by using different bag types such as the polypropylene muslin, staved-plastic (polyethylene) or cecile tissue in comparison with uncovered bunches (control) in the same orchard (from the mid of July to mid of September) in Rossitta region (Rasheid), Behera province, Egypt. Quantity and quality of marketable yield for "Zaghloul" dates, beside the ripening time were assessed through two consecutive seasons. The main notice was, all kinds of used covers reduced the damage caused by birds, blights and wasps as well as no incidence of diseases was observed under the experimental covers. Polypropylene muslin treatment decreased the dropped fruits in both study seasons, consequently it increased the marketable yield. Fruits under the polypropylene muslin bags were late in the ripening. Date bunches under the staved-plastic covers were statistically superior than all other treatments regarding fruits quality and were early in the ripening. There were statistical differences in fruit quality traits and fruits ripening time according to the bunch cover types.

**Key words:** Polypropylene, dates, bunch covering, "Zaghloul", ripening time, fruit quality

## Introduction

Bunch bagging is one of the earliest known operations during last century, for fruit protection against the damage caused by birds, blights and wasps as well as diseases (Nixon, 1932). For improving dates yield and fruit quality, bunch-covering alone (Elmer, 1964 and Salem *et al.*, 1977) or in combination with other treatments (Bliss *et al.*, 1950 and Darley and Wilbur, 1955) had been much investigated. Bunch covers including paper, cloth, plastic screen or large-mesh sheets, jute bags or date-leaf bags have been tested (Bliss *et al.*, 1949; Bliss *et al.*, 1950; Brown, 1955; Dowson and Aten, 1962; Elmer, 1964; Sharpless and Hilgeman, 1951 and Salem *et al.*, 1977).

The aim of the study was to investigate the efficiency of date bunch covering treatments by using different bag types such as the polypropylene muslin, staved-plastic (polyethylene) or cecile tissue with regard to ripening time, quality and nutrient content.

## Materials and methods

The experiment was carried out for two consecutive seasons (2005 and 2006) in Rossitta region, Behera province, Egypt to study the impact of bunch covering treatments by using bags made of polypropylene muslin (Fig. 1), staved-plastic (polyethylene) (Fig. 2), or cecile tissue (Fig. 3) on the yield attributes (bunch weight, fruit weight, marketable yield and spoiled fruits); fruit quality traits (total acidity, TSS, total sugars and total protein) as well as minerals content of "Zaghloul" fruits dates in comparison with uncovered bunches. Four treatments were arranged and replicated five times. Each treatment consisted of five palms more than 15 years old with (9 : 1) leaf : bunch ratio. Palm trees were selected in symmetric morphology and bunch number was standardized at 8 bunches/palm. Bunches were covered for two months period

from the "late Kimri" stage to the harvest time (from the mid of July to mid of September).

Analysis of variance was performed using completely randomized design (Steel and Torrie, 1980).

## Results and discussion

**Ripening time:** The morphological observations on fruit bunches under staved-plastic and cecile tissue bags, indicated that fruits ripened 2-3 weeks earlier than fruits of un-covered bunches for 1<sup>st</sup> and 2<sup>nd</sup> seasons. However, fruits under polypropylene muslin bags ripened 2 weeks later than un-covered bunch fruits in both the study seasons. It means that, the staved-plastic and cecile tissue bag treatments lead to raising the temperature around the fruit bunch, causing earlier fruits ripening in comparison with control (un-covered bunch). Contrarily, the polypropylene bags treatment leads to lowering the temperature around the fruit bunch causing delay in fruits ripening in comparison with control. Nixon and Reuther (1947) reported that the use of covers was found to have slightly delayed ripening of Khadrawy dates.

### Yield attributes

**Bunch weight:** Bunches covered by polypropylene muslin bags were best in both the seasons followed by bunches covered by the staved-plastic bags, un-covered bunches and the bunches covered by cecile tissue bags (26.8, 23.7, 21.3 and 19.8 kg, respectively for the 1<sup>st</sup> season and 29.2, 24.5, 21.8 and 19.7 kg, respectively for the 2<sup>nd</sup> season). All differences among recorded values were significant (Table 1). These results were due to the decrease in fruit drop ratio for the polypropylene muslin bags treatment in comparison with all other treatments.

**Fruit weight:** Results of this trait were different than bunch weight trait. The fruits under staved-plastic bags were statistically heavy in comparison with all other treatments in both the seasons,



Fig. 1. Polypropylene muslin covers.



Fig. 2. Staved-plastic (polyethylene) covers.



Fig. 3. Cecile tissue covers.

followed by fruits under cecile tissue bags, then fruits resulted from un-covered bunches and fruits under the polypropylene muslin bags (32.8, 27.3, 20.8 and 18.7 g, respectively for the 1<sup>st</sup> season and 33.1, 28.2, 21.2 and 19.9 g, respectively for the 2<sup>nd</sup> season). All differences among recorded values were significant (Table 1). These results were due to the effect of temperature around the fruit bunches, which differed according to bags type. Nixon and Reuther (1947) reported that covering treatments had no significant effect on fruit weight of Khadrawy dates.

**Marketable yield:** Data in Table 1 indicate that the marketable yield of palm trees treated with the polypropylene muslin bag covers was statistically superior over all other treatments, followed by palms which received the staved-plastic bag covers treatment, while palms of control treatment (uncovered bunches) came third followed by cecile tissue bag covers treatment for both the seasons (196.3, 180.2, 157.8 and 145.2 kg, respectively for the 1<sup>st</sup> season and 189.5, 175.9, 153.1 and 147.3 kg, respectively for the 2<sup>nd</sup> season). All differences among recorded values were significant (Table 1). This result was due to the decrease of fruit drop ratio under the polypropylene muslin bags in comparison with all other treatments. Al-Bahrany *et al.* (1994) reported that

the bunch covers significantly reduced the total unmarketable yield (fruit drop; bird and insects damage) leading to higher marketable yield.

**Spoiled fruits:** Results indicate that the cecile tissue bags treatment had statistically highest amount of spoiled fruits, followed by the staved-plastic bags (9.2 and 7.3 kg and 8.6 and 7.8 kg for the 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively). While bunches covered by the polypropylene muslin bags had statistically the lowest amount of spoiled fruits (3.8 and 4.1 kg for the 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively). The differences among all treatments were significant (Table 1). It means that the polypropylene muslin bags allow good aeration around the fruit bunch and reduced fruit spoilage. Contrary to this, cecile tissue bags and staved-plastic bags cause a high temperature around the bunches, so they increase the spoilage of fruits. It must be mentioned that, the reason of spoiled fruits is a physiological reason, not fungal. Bliss *et al.* (1949) reported that the physiological and fungal fruits spoilage occurred with bunches covering treatments. Nixon and Reuther (1947) reported that covering treatments were related with reduced sunburn of Khadrawy dates.

Table 1. Effect of covering treatments on yield attributes

Covering treatments	2005 season				2006 season			
	Bunch weight (kg)	Fruit weight (g)	Market. yield (kg)	Spoiled fruits (kg)	Bunch weight (kg)	Fruit weight (g)	Market. yield (kg)	Spoiled fruits (kg)
Uncovered	21.3	20.8	157.8	4.9	21.8	21.2	153.1	5.1
Polypropylene	26.8	18.7	196.3	3.8	29.2	19.9	189.5	4.1
Staved-plastic	23.7	32.8	180.2	7.3	24.5	33.1	175.9	7.8
Cecile tissue	19.8	27.3	145.2	9.2	19.7	28.2	147.3	8.6
LSD ( $P=0.05$ )	1.3	1.0	6.2	0.9	1.4	1.1	4.9	0.9

Table 2. Effect of covering treatments on fruit quality traits

Covering treatments	2005 season				2006 season			
	Total acidity (%)	TSS (%)	Total sugars (%)	Total protein (%)	Total acidity (%)	TSS (%)	Total sugars (%)	Total protein (%)
Uncovered	1.63	18.29	66.14	1.88	1.66	19.65	67.17	1.84
Polypropylene	1.82	15.47	61.58	1.39	1.85	15.69	60.99	1.41
Staved-plastic	0.98	24.13	81.73	2.11	0.99	23.89	82.08	2.09
Cecile tissue	1.04	22.60	78.65	2.20	1.01	22.41	79.90	2.18
LSD ( $P=0.05$ )	0.17	0.88	2.43	0.19	0.16	0.83	2.35	0.21

Table 3. Effect of covering treatments on mineral contents of fruits

Covering treatments	2005 season					2006 season				
	N (%)	P (%)	K (%)	Fe (ppm)	Mg (ppm)	N (%)	P (%)	K (%)	Fe (ppm)	Mg (ppm)
Uncovered	0.33	0.08	0.75	59.0	181	0.35	0.08	0.76	61.5	178
Polypropylene	0.26	0.05	0.60	48.5	164	0.24	0.06	0.62	47.5	170
Staved-plastic	0.36	0.10	0.94	67.5	198	0.38	0.09	0.92	66.0	185
Cecile tissue	0.38	0.09	0.80	67.0	193	0.38	0.10	0.79	65.5	180
LSD ( $P=0.05$ )	0.06	0.02	0.12	4.3	11	0.07	0.02	0.12	3.8	N.S

### Fruit quality traits

**Total acidity:** Statistical analysis of data showed that the fruits under polypropylene muslin covers had highest total acidity percentage (1.82 and 1.85 % for 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively). On contrary, fruits covered by the staved-plastic bags had lowest total acidity percentage without significant difference in comparison to fruits covered by the cecile tissue bags (0.98 and 1.04 %, respectively for the 1<sup>st</sup> season and 0.99 and 1.01 %, respectively for the 2<sup>nd</sup> season). Fruits of uncovered bunches had medium values of total acidity percentage in two study seasons (1.63 and 1.66 % for 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively) (Table 2). It means that the fruits under staved-plastic bag covers had a good savor in comparison with fruits under polypropylene muslin bag covers. Al-Bakir *et al.* (1988) reported that bagging improves the fruit quality of "Zahdi" dates.

**TSS:** Statistical analysis of TSS (%) data indicated that staved-plastic bags treatment was superior over all other treatments (24.13 and 23.89 % for 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively) followed by fruits covered by cecile tissue bags (23.60 and 23.41 % for 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively). On contrary, the treatment of polypropylene muslin bags had statistically lowest TSS (15.47 and 15.69 % for 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively) in comparison to all other treatments for both the seasons. However, uncovered fruit treatment had a moderate TSS value in both the seasons (Table 2).

**Total sugars:** Data of Table 2 indicated that total sugars (%) of date fruits covered by the staved-plastic bag covers was statistically superior than all other treatments in both the seasons (81.73 and 82.08% for the 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively). However, no significant difference occurred in comparison with cecile tissue bags treatment in the 2<sup>nd</sup> season. Likewise, fruits under the cecile tissue bags were statistically superior than other two treatments in both the seasons (78.65 and 79.9% for 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively). Fruits under polypropylene muslin bag covers had statistically low total sugar (%) values in both the seasons (61.58 and 60.99% for 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively). It means that, the fruits produced under polypropylene bag covers had a sour savor in comparison with fruits produced from all other treatments. Al-Bakir *et al.* (1988) reported that bagging increased the total sugars of Zahdi dates.

**Total protein:** Total protein percentage was statistically affected by types of bunch covering bag. Fruits produced under the cecile tissue bags had a higher percentage of protein (2.20 and 2.18% for the 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively), followed by fruits under the staved-plastic bags (2.11 and 2.09% for the 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively) without significant difference. Contrary to this, fruits grown under the polypropylene muslin bags had a lower total protein percentage in both the seasons (1.39 and 1.41% for

the 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively). While, fruits grown without covering treatments had a medium values of this trait in both the seasons (Table 2).

It is revealed from the results that the bunch-covering using staved-plastic bags had improved the dates fruit quality. Dowson and Pasiote (1972) reported that the bagging of Deglet Noor fruit bunches had improved their quality.

### Fruits mineral contents

**Nitrogen:** Data tabulated in Table 3 indicated that nitrogen (%) in fruits related with the polypropylene muslin bag covers treatment (0.26 and 0.24 % for the 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively) was statistically lower in comparison with cecile tissue bags, staved-plastic bag covers and uncovered treatments which had nonsignificant differences in both the study seasons (0.38, 0.36 and 0.33 % for the 1<sup>st</sup> season, and 0.38, 0.38 and 0.35 % for the 2<sup>nd</sup> season, respectively).

**Phosphorous:** Staved-plastic bag covers, cecile tissue bag covers and uncovered (control) treatments had more P percentage in fruit in both the seasons (0.10, 0.09 and 0.08 % for the 1<sup>st</sup> season; and 0.09, 0.10 and 0.08 % for the 2<sup>nd</sup> season, respectively) without significant differences (Table 3). However, the polypropylene muslin bags treatment was related with the statistically low P percentage in fruit in both the seasons (0.05 and 0.06 % for 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively).

**Potassium:** The recorded K (%) values in Table 3 indicate that the staved-plastic bags treatment had highest value in comparison with all other treatments (0.94 and 0.92 %, for the 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively). While, the lowest values were observed in polypropylene muslin bag covers treatment (0.60 and 0.62 % for the 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively). Cecile tissue bag covers treatment was statistically not different than un-covered treatment in both the seasons (0.80 and 0.75% for the 1<sup>st</sup> season as well as 0.79 and 0.76% for the 2<sup>nd</sup> season, respectively).

**Iron:** The statistically superior values of Iron (ppm) were recorded in staved-plastic bag and cecile tissue bag treatments without significant difference in both the seasons (67.5 and 67.0 ppm for the 1<sup>st</sup> season; and 66.0 and 65.5 ppm for the 2<sup>nd</sup> season, respectively). While the lowest Fe (ppm) was recorded in the polypropylene muslin bag covers treatment in both the study seasons (48.5 and 47.5 for the 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively), (Table 3).

**Magnesium:** The significant differences among magnesium (ppm) content were recorded only in the 1<sup>st</sup> season. The staved-plastic bag covers treatment was superior without significant difference over cecile tissue bags treatment (198 and 193 ppm, respectively). Magnesium (ppm) content in polypropylene muslin bag covers treatment was statistically lowest among studied

treatments (164 ppm) (Table 3). The differences among values of all studied treatments were insignificant for the 2<sup>nd</sup> season.

Nixon and Reuther (1947) reported that dry weight of Khadrawy dates determinations from composite samples in the different bunch treatments did not show differences that could be correlated with the type of covering used.

It can be concluded from the results that date bunch covering treatments influenced ripening time, quality and mineral contents of fruits significantly and bunches with staved-plastic covers were statistically superior than all other treatments regarding fruits quality and were early in the ripening..

## References

- Al-Bahrany, A.M., M.A. Suwwan, M. Faid and M.A. Al-Amer, 1994. Effect of bunch cover on marketable yield and fruit spoilage in “Khalas” dates. *Alex. J. Agric. Res.*, 39(3): 585-569.
- Al-Bakir, A.Y., Th.K. Ibrahim and M.A.A. Ali, 1988. Effect of covering of Zahdi dates on invertase, polyglacturornse and cellulase activity. *J. Agri. Water Reco. Res.*, 7(1): 201-216.
- Bliss, D.E., D.L. Lindgern, W.D. Wilbur and L.E. Vincent, 1949. Date-bunch covers and their relation to the fruit spoilage complex Deglet Noor dates. Rep. 26<sup>th</sup> Annual Date Growers’ Inst. Held at Coachella, Calif. pp.7-15.
- Bliss, D. E., D.L. Lindgern, W.D. Wilbur and L.E. Vincent, 1950. Second report on date-bunch covers and their relation to the fruit spoilage complex of Deglet Noor dates. Rep. 27<sup>th</sup> Annual date Growers. Inst. Held at Coachella, Calif. pp.7-12.
- Brown, T.R. 1955. New developments in paper bags. Rep. 32<sup>nd</sup> Annual date Growers. Inst.Held at Coachella, Calif. (13).
- Darley, E.F. and W.D. Wilbur, 1955. Results of experiments on control of fruit spoilage of Deglet Noor and Saidy dates in California, 1935-1954. Rep. 32<sup>nd</sup> Annual Date Growers. Inst. Held at Coachella. Calif. (14-15).
- Dowson, V.H.W. and A. Aten, 1962. “Dates”: Handling, processing and packing. Rome. FAO Agric. Develop. Paper, 72: 392.
- Dowson, V.H.W. and F. R. Pansiote, 1972. Draft improvement of date palm growing. Cited from the Date Palm (A.J.Al- Baker), Al-Ani press, Baghdad.
- Elmer, H.S. 1964. Date protection from injury caused by the apache cicada. Rep. 41<sup>st</sup> Annual Date Growers. Inst. Held at Coachella, Calif, (16).
- Hilgeman, R.H. 1953. Report to Israel on the culture of citrus fruits and the date palm. Rome. FAO/EPTA report No. 100.
- Nixon, R.W. 1932. Observations on the occurrence of blacknose. *Ann. Rep. Date Growers Inst.*, 9: 3-4.
- Nixon, R.W. and W. Reuther, 1947. The effect of environmental conditions prior to ripening on maturity and quality of date fruit. *Amer. Soc. Hort. Sci.*, 49: 81-91
- Salem, M.R.A., A.H. Kamel and A. Badawi, 1977. Control of insect pests of date bunches in the New Valley (Egypt). 1. Effect of type and date of bunch coverage on infestation with certain pests. *Agric. Res. Rev.*, 55: 15-18.
- Sharpless, B.C. and R.H. Hilgeman, 1951. The influence of irrigation and bunch management upon shrivel of the Maktoom date. Rep. 28<sup>th</sup> Annual Date Growers Inst. Held at Coachella, Calif. pp.9-11.
- Steel, R.G.D. and T.H. Torrie, 1980. *Principles and Procedures of Statistics*. 2<sup>nd</sup> ed. McGraw Hill, N.Y., U.S.A.