

THE ECONOMICS EFFECT FOR SOME OPERATING OF FRUIT THINNING AND BUNCH COVERING TREATMENTS ON "SEWI CV." DATE PALM Productivity in Siwa Oasis

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ABSTRACT

This study had conducted during 2010 and 2011 seasons on "Sewi" date palm cultivar grown in a private orchard located in Siwa Oasis, Matrouh governorate, Egypt to study the effect of operating the bunch thinning and bunch covering factors in the horticultural and economic views. Bunch thinning treatments (without, 20% bunch thinning and 40% bunch thinning) were done after "Hababouk" stage and bunch covering treatments (without, 40% black thyan and 60% black thyan) were done at the end of "Kimri" stage until "Khalal" stage for two months. Bunch weight, fruit weight and fruit quality criteria, statistically have a positive response to both experimental factors either alone or in their interaction treatments in addition to decreasing the spoiled fruits. Although, the palm yield was decreased with thinning, but it increased with covering. The heaviest palm yield was related with non-thinning level (0% bunch thinning), while (40 % black thyan) treatment leads to the highest palm yield at the two study seasons. Applying the experimental treatments had canceled the alternate bearing phenomena and causes the balanced palm yield (arranging bearing) at the two seasons of study. Economic study indicated that (20% bunch thinning + 40% black thyan) experimental treatment attained the highest values of both total revenue per feddan (pounds/ feddan), net revenue per feddan (pounds/ feddan), earns to costs (%), net revenue to costs (%), high seal price at harvest time and return on invested (%), then highest net income (pounds/ feddan) because of increasing the fruit quality and early harvest of the crop (17 days) which leads to the best revenue value. It could be concluded that the treatment (20% bunch thinning at "Hababouk" stage + bunch covering with 40% black thyan bags at late "Kimri" until "Khalal" stage for two months) is recommended to improve the "Sewi" fruit quality traits and raising the net income which reflect positively on date palm farmers in Siwa Oasis.

INTRODUCTION

Siwa Oasis placed in western side of Egypt in western desert and extends to Libyan limits. It has sandy soil (light soil), middle calcium carbonate, high water table (25-50 cm), and flood irrigation using well water and there is no ranges system. High temperature in summer and winter with low relative humidity (RH) were the common adjectives of weather.

Few plant species have developed into an agricultural crop so closely connected with human life as has the date palm. The overall trend has been to move from mixed and random oasis date palm cultivation to organizing it as a plantation crop with similar varieties and even stands, allowing for more efficient execution of cultural practices. This road is proving long and arduous, limiting factors being the relative shortage of high quality offshoots for new plantations, and the lack of large-scale private commercial interests.

Bunch covering is old maintenance farm management for fruits protection against the damage which caused by birds, blights and wasps as well as diseases (Nixon, 1982). For improving dates yield and fruit quality, bunch covering alone (Osman and Soliman, 2001 and El-Assar, 2011) or in combination with other treatments (Darley and Wilbur, 1955) had won much investigation.

Alternate bearing is common in some cultivars of date palm. Fruit thinning is one of the major practices that often helps in overcoming this problem, in addition, it enhances fruit quality of dates and reduces compacting of fruit bunches, beside increase adequate flowering for the following year (Moustafa et al., 1984). Such results could be obtained either by reducing the number of fruit stalks per bunch or by reducing the number of bunches per palm. The purpose of the horticultural study is to obtain some information about the best degree and time of bunch thinning that would result in higher fruit quality without remarkable reduction in fruit yield of "Sewi" date palm cultivar under Siwa Oasis conditions.

Aim of the economic study is to identifying the impact of the implementation and activation of transactions of bunch thinning and bunch covering on the most important economic variables and marketing "Sewi" date palm crop of Siwa Oasis and assess the impact of such transactions on crop production and to educate farmers the importance of conducting such transactions for increase the feddan productivity and the expected revenue. Consequently, for increasing their net incomes and for stability of the average annual income which obtained from dates production, then improving their standard of living through the early production (harvest), reducing the phenomenon alternate bearing, increase the weight of the fruit and increase the content of total solids, total sugars, total proteins and improve the fruits quality characteristics as well as get free fruits from insect pests. Finally, ensure the highest available price for yield which can farmer (producer) get it.

MATERIALS AND METHODS

This experiment was executed for two consecutive seasons (2010 and 2011) in a private orchard located in Siwa Oasis, Matrouh province, Egypt to study the impact of bunch thinning (0.0%, 20% or 40 %) and bunch covering treatments by using bags made of any black thyrax (40% executing) or black thyrax (60% executing) on the yield attributes (palm yield, bunch weight, fruit weight, spoiled fruits and ripening date) and fruit quality traits (total acidity, TSS, total sugars, total protein and soluble tannins) of "Sewi" cultivar dates. Nine statistical treatments were arranged and replicated four times. Each treatment consisted of four palms more than 20 years old with (10: 1) leaf: bunch ratio. Experiment was arranged as following:

Factors and their levels:

Factor A) Bunch thinning practices at late "Hababouk" stage:

- a1) 0% bunch thinning (without).
- a2) 20% bunch thinning (removal of the central strands).
- a3) 40% bunch thinning (removal of the central strands).

Factor B) Bunch covering practices at the end of "Kimri" stage:

- b1) without covering.
- b2) covering with black thyran bags (40% executing).
- b3) covering with black thyran bags (60% executing).

Statistical Treatments or Experimental treatments:

- 1) 0% bunch thinning + without covering (control) [a1b1]
- 2) 0% bunch thinning + black Thyran bags (40%) [a1b2]
- 3) 0% bunch thinning + black Thyran bags (60%) [a1b3]
- 4) 20% bunch thinning + without covering [a2b1]
- 5) 20% bunch thinning + black Thyran bags (40%) [a2b2]
- 6) 20% bunch thinning + black Thyran bags (60%) [a2b3]
- 7) 40% bunch thinning + without covering [a3b1]
- 8) 40% bunch thinning + black Thyran bags (40%) [a3b2]
- 9) 40% bunch thinning + black Thyran bags (60%) [a3b3]

Selected palms were in symmetric morphology shape and bunches number (10 bunches/ palm). Bunches were covered for two months period from the late "Kimri" stage to "Khalal" (full color) stage. Trees get special fertilization application using compost of farm residuals and animal manure in winter. Neither foliar application, chemical fertilization nor hormone treatments were used. Head of palm has bad shape regarding pruning treatment (leaf bases were surround the trunk). Farmers of this location have no pruning skills. Handy pollination was run three times according to inflorescence appearance. Generally, date palm trees looks good, healthy and vigor. Regarding the environmental conditions, fruits have earlier ripening (at the beginning of September).

The yield indices were measured including date of harvesting (when the fruits reached the peak of full color stage) as mentioned by Brown and Bahgat (1983); yield per palm (kg/ palm), bunch weight (kg/ bunch), fruit weight (g/ fruit), spoiled fruits "inclusive all the mouldy or dropped fruits and fruits which infected by insects" (kg/ palm) and ripening date (harvesting). Likewise, characteristics of fruit quality were assessed on representative fruit samples (30 fruits) were collected at harvesting date. Fruit quality evaluation included total soluble solids content (TSS %) which determined by using hand refract-meter, juice acidity (as malic acid) percentage was titrated A.O.A.C. (1980), total sugar percentage was determined (fruit flash samples dried at 56° C in an oven to a constant weight) according to Malik and Singh (1980), total protein percentage was determined according to Jackson (1967) and tannins percentage was evaluated by method of Swain and Hillis (1959).

Statistical analysis of collected data was done according to completely randomized design (CRD), Steel and Torrie (1980).

For the experiment field operation costs, it calculated as following: 1) each palm bear 10 bunches, they need 10 bags, the price of bag = 3 pounds/ bag (depreciation rate = 1 pound/ year because the bag will use 3 times). The costs per palm = 10 bags x 1 pound/ bag/ year = 10 pounds/ palm/ year. So, the prices of bags per feddan = 10 pounds/ palm x 70 Palm/ feddan = 700 pounds/ feddan/ year. 2) Labor costs (to run the bunch thinning and covering

transactions for palms = 10 pounds/ Palm/ year. So, the cost of labor / feddan/ year = 10 pounds/ palm x 70 palm/ feddan = 700 pounds/ feddan / year. Then, the total costs/ feddan/ year = 700 pounds (as prices of bags) + 700 pounds (as costs of labor) = 1400 pounds/ feddan/ year.

Selling price for the produced fruits during the period 25/ 8 to 01/ 9 as average during the two seasons of study was 4 pounds/ kg, the selling price for the produced fruits during the period of 02/ 9 to 10/ 9 as average during the two seasons of study was 3 pounds /kg, the selling price of the produced fruits during the from 11/ 9 until the end of the harvest season as average during the two study seasons was 2.50 pounds / kg.

The most important economic indicators and benchmarks to measure the impact of using the bunch thinning and covering transactions of "Sewi" date palm cultivar are the total revenue/ feddan, net revenue / feddan, revenues to costs (%), net earnings to costs (%) and the produced unit cost. These indicators help in identifying the impact of the use such transactions and illustrate the importance of this applied study.

RESULTS AND DISCUSSION

Horticultural study:

Palm yield (kg/palm):

Data tabulated in Table (1) indicates that palm yield statistically was affected by both experimental factors. Both thinning levels (20% and 40%) significantly were decreased the palm yield at the two study seasons in comparison with non-thinned trees (128.90, 123.17 and 129.17 kg/palm for the 1st season and 129.80, 122.33 and 131.87 kg/palm for the 2nd season, respectively), Al-Saikhan (2008) found similar results on "Ruzeiz" date palm cultivar. Covering levels (40% and 60% black thyrar) significantly were increased the palm yield in comparison with non-covering treatment without significant difference at two study seasons (129.13, 128.17 and 123.73 kg/ palm for the 1st season and 131.17, 129.97 and 122.87 kg/palm for the 2nd season, respectively). Awad (2007) used different materials for bunch covering and found that black and blue polyethylene bags significantly increased Rutab yield per bunch of "Helali" date palm cultivar. Mawlood et al. (1990) reported that bagging for either two or three months produced positive results in fruit set improvement and yield of "Khastawi" date palm cultivar.

Likewise, yield of palm statistically was affected by the interaction among the levels of experimental factors (statistical treatments), Table (2). The heavy palm yield was related by the (a1b1) treatment at the 1st study seasons (150.0 kg/ palm), however it related with the absolute lowest value at the 2nd season of study (108.0 kg/ palm), this may due to alternate bearing phenomena. Regular bearing was found with all experimental treatment and the highest palm yield was related with (a1b2) treatment at the 2nd season (138.8 kg/ palm). Consequently, the best mean value of two study seasons was related with (a1b2) treatment as a result of arranging the palm bearing, Table (2).

Table (1): Effect of bunch thinning and bunch covering factors on the yield traits and ripening time of "Sewi" date palm cultivar in the two study seasons (2010 and 2011).

Bunch thinning (factor A)										
Levels	Palm yield (kg/palm)		Bunch weight (kg/ bunch)		Fruit weight (g/ fruit)		Spoiled fruits (kg/palm)		Ripening date (harvesting)	
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
a1	129.17	131.87	13.47	13.53	17.07	16.63	2.67	2.70	11/9	11/9
a2	128.90	129.80	13.00	13.07	23.73	23.13	1.27	1.17	25/8	25/8
a3	123.17	122.33	12.33	12.23	26.13	26.43	0.70	0.73	25/8	25/8
LSD (0.05)	1.13	1.32	0.50	0.50	0.76	0.85	0.33	0.32	----	----

Bunch covering (factor B)										
Levels	Palm yield (kg/palm)		Bunch weight (kg/bunch)		Fruit weight (g/ fruit)		Spoiled fruits (kg/palm)		Ripening date (harvesting)	
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
b1	123.73	122.87	12.57	12.57	20.17	20.20	3.23	3.33	11/9	11/9
b2	129.13	131.17	13.30	13.23	23.80	23.53	0.70	0.63	25/8	25/8
b3	128.17	129.97	12.93	13.03	22.97	22.47	0.70	0.63	02/9	02/9
LSD (0.05)	1.11	1.15	0.35	0.44	0.77	0.83	0.46	0.56	----	----

Table (2): Effect of interaction treatments on the yield traits and ripening time of "Sewi" date palm cultivar in the two study seasons (2010 and 2011).

Treat.	2010 season					2011 season				
	Palm yield (kg/p)	Bunch weight (kg/b)	Fruit weight (g/f)	Spoiled fruits (kg/p)	Rip. date	Palm yield (kg/p)	Bunch weight (kg/b)	Fruit weight (g/f)	Spoiled fruits (kg/p)	Rip. date
a1b1	150.0	12.6	15.2	5.6	11/9	108.0	12.7	14.8	5.9	11/9
a1b2	133.7	14.3	18.3	1.2	02/9	138.8	14.1	17.9	1.1	02/9
a1b3	132.5	13.5	17.7	1.2	02/9	138.2	13.8	17.2	1.1	02/9
a2b1	128.1	12.9	20.1	2.6	02/9	129.7	12.9	20.4	2.5	02/9
a2b2	129.7	13.1	25.7	0.6	25/8	130.8	13.2	24.9	0.5	25/8
a2b3	128.9	13.0	25.4	0.6	02/9	128.9	13.1	24.1	0.5	02/9
a3b1	121.8	12.2	25.2	1.5	02/9	120.3	12.1	25.4	1.6	02/9
a3b2	124.6	12.5	27.4	0.3	25/8	123.9	12.4	27.8	0.3	25/8
a3b3	123.1	12.3	25.8	0.3	02/9	122.8	12.2	26.1	0.3	02/9
LSD (0.05)	1.2	0.4	0.2	0.4	-----	1.3	0.4	0.2	0.3	-----

Bunch weight (kg/ bunch):

Statistically, bunch weight trait was affected by experimental factors. Regarding the thinning factor, data of Table (1) shows that the significant heaviest bunch weight was related by (a1) level (without thinning) without significant difference in comparison with value of (a2) level, while the lowest bunch weight was related with (a3) levels at the two study seasons (13.47, 13.00 and 12.33 kg/ bunch for the 1st season and 13.53, 13.07 and 12.23 kg/ bunch for the 2nd season, respectively). Moustafa (1998) found similar results on "Sewi" date palm cultivar. Concerning the bagging factor, data of Table (1) indicates that the significant best bunch weight was related by (b2) treatment followed by (b3) then (b1) level at the two study seasons (13.30, 12.93 and

12.57 kg/ bunch for the 1st season and 13.23, 13.03 and 12.57 kg/ bunch for the 2nd season, respectively), while no significant difference was found between bunch weight values of two kinds of bagging at 2nd season. Kassem et al. (2011) decided that covering bunches of "Zaghloul" date palm cultivar increased the weight of bunches in comparison of non-covered bunches.

Also, bunch weight character was affected by the field experimental treatments. The heights bunch weight was related with (a1b2) treatment for the two study seasons (14.3 and 14.1 kg/ bunch for 1st and 2nd seasons, respectively), however no significant difference was found in comparison with (a1b3) treatment at 2nd season (13.8 kg/ bunch). The absolute lowest value of bunch weight was related with (a3b1) treatment at the two study seasons (12.2 and 12.1 kg/ bunch for the 1st and the 2nd seasons, respectively), however no significant differences were found in comparison with (a3b2) and (a3b3) treatments at the two study seasons. Other statistical differences were found in Table (2). These results are harmony with those of Moustafa (1998) on "Sewi" Cv. and Kassem et al. (2011) on "Zaghloul" date palm cultivar.

Fruit weight (g/ fruit):

Data of Table (1) illustrates that differences among fruit weight values due to levels of experimental factors were statistical. The highest significant fruit weight value was related with (a3) level (26.13 and 26.43 g/fruit for 1st and 2nd seasons, respectively) followed by values which related with (a2) and (a1) levels at the two study seasons, the differences among these values were significant. Al-Khateeb et al. (1993) found that fruit weight was developed with various models of bunch thinning on "Khalas" date palm cultivar. Likewise, (b2) bagging level caused the highest significant fruit weight value (23.80 and 23.53 g/ fruit for 1st and 2nd seasons, respectively) followed by (b3) and (b1) levels at the two seasons of study. Kassem et al. (2011) and El-Assar (2011) were reported similar results on "Zaghloul" date palm. Harhash and Al-Obeed (2010) reported that bunch bagging with blue bags significantly improved fruit weight of "Succary" and "Khalas" date palm cultivars.

Regarding the effect of experimental treatments, data of Table (2) indicates that the differences among the values of fruit weight were statistical. The best significant value was found with (a3b2) treatment at the two study seasons (27.4 and 27.8 g/ fruit for the 1st and 2nd seasons, respectively). The lowest significant value was found with (a1b1) treatment at the two seasons of study (15.2 and 14.8 g/ fruit for the 1st and 2nd seasons, respectively). More statistical differences were found among values of Table (2). These results are on line with those of Awad and Al-Qurashi (2012) on "Barhee" date palm cultivar.

Spoiled fruits (kg/palm):

Communiqué of Table (1) shows that the thinning and bagging factors statistically were decreased the spoiled fruits of the treated bunches in comparison with non- thinning or non- bagging bunches. The 40% thinning level (a3) significantly related with the lowest spoiled fruit value (best value) followed by (a2) level at the two study seasons (0.70 and 1.27 kg/ palm for the 1st season and 0.73 and 1.17 kg/ palm for the 2nd season, respectively). While the highest spoiled fruit value was related with (a1) level and all

differences among values were significant at the two seasons of study. Likewise, (b2 and b3) levels lead to the lowest significant values of spoiled fruits without significant difference (0.70 and 0.63 kg/ palm for 1st and 2nd seasons, respectively for both levels) in comparison with no- bagging bunches (b1 level) at the two study seasons. This result means that the bagging of bunches have decreased the spoiled fruits, regardless the intensity of cover bags. The obtained result is on line with those of El-Assar (2011) on "Zaghloul" date palm cultivar and Pezhman et al. (2005) on "Mozafti" date palm cultivar.

Regarding the field treatments effect, data of Table (2) assures the above results. Where the highest significant value of spoiled fruits (bad value) was related with control treatment (a1b1) at the two study seasons (5.6 and 5.9 kg/ palm for the 1st and the 2nd seasons, respectively), while the lowest significant value of spoiled fruits (best value) was related with (a3b2) and (a3b3) treatments (0.30 kg/palm for both for the two seasons of study. These results are going with those of Kassem et al. (2011) on "Zaghloul" date palm cultivar.

Ripening date (harvesting):

Vision observation indicates that fruits of thinned bunches or which covered by black thyan bags were ripened early in comparison with non-thinned or non-covered bunches. The 20% and 40% thinned bunches treatments (a2 and a3 levels) have 17 days earlier ripping fruits at the two study season (Table 1). However, bagging with 40% black thyan (b2 level) leads to 17 days earlier period for both study seasons, while the 60% black thyan (b3 level) lead to 9 days earlier at both study seasons. Shareef (2008) decided that bunch bagging and spraying by natural extract treatments have early harvest time on "Sayer" and "Hillawi" date palm cultivars. El-Assar (2011) run bunch covering by poly-propylene muslin, staved-plastic or cecile tissue bags for "Zaghloul" date palm cultivar and reported that poly-propylene muslin bags delayed the fruit ripening.

Concerning the field treatments, they lead to earliness the ripening date from 9-17 days at both seasons in comparison with control treatment. Interaction treatments (a2b2) and (a3b2) were harvested at August, 25 at both seasons with earlier 17 days period in comparison with the control treatment (a1b1) which harvested at eleventh of September (11/9). While the other treatments were harvested at the second of September (02/9) with 9 days earlier period. There is other result can mention heir, the interaction among levels of both thinning and bagging factors leads to maximizing the benefit of using 60% black thyan bags.

Total acidity (%):

Statistical analysis shows that total acidity percentage of fruit juice was affected by both studied factors and their levels interaction (experimental treatments). Data of Table (3) indicates that both thinning levels (a2 and a3) were significantly decreased the total acidity (%) in comparison the control level (a1) at the two study seasons (0.21 and 0.20 % for the 1st season and 0.20 % for both levels for the 2nd season, respectively), no significant difference was found between the two mention values. Osman and Soliman

(2001) reported that all models of thinning decreased the fruit juice acidity. Bagging with 40% black thyrans bags (b2) level was statistically decreased the total acidity (%) in comparison the two other levels, and no significant difference was found between values of non-bagged fruits and those bagged with 60% black thyrans bags (b1 and b3) levels at the two study seasons (0.22, 0.25 and 0.26 % for the 1st season and 0.21, 0.25 and 0.26 % for the 2nd season, respectively), Table (3). El-Assar (2011) reported that polypropylene muslin bags decreased the fruit quality traits including the fruit juice acidity.

Table (3): Effect of bunch thinning and bunch covering factors on the fruit quality criteria of "Sewi" date palm cultivar in the two study seasons (2010 and 2011).

Bunch thinning (Factor A)										
Levels	Total acidity (%)		TSS (%)		Total sugars (%)		Total protein (%)		Soluble Tannins (%)	
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
a1	0.24	0.24	36.20	36.27	33.16	33.26	1.63	1.65	0.32	0.32
a2	0.21	0.21	38.10	37.87	35.90	35.66	1.92	1.93	0.29	0.29
a3	0.21	0.21	37.86	38.20	36.23	36.26	2.02	2.06	0.28	0.28
LSD (0.05)	0.02	0.02	1.40	1.30	0.30	0.40	0.25	0.15	0.02	0.02
Bunch covering (Factor B)										
Levels	Total acidity (%)		TSS (%)		Total sugars (%)		Total protein (%)		Soluble Tannins (%)	
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
b1	0.22	0.22	37.90	38.07	35.43	35.40	1.78	1.85	0.30	0.30
b2	0.21	0.20	39.93	39.96	38.26	38.30	2.20	2.18	0.28	0.27
b3	0.24	0.24	34.33	34.30	31.60	31.50	1.58	1.62	0.32	0.32
LSD (0.05)	0.02	0.02	1.30	1.35	1.55	1.60	0.25	0.25	0.02	0.02

Data of Table (4) illustrates that the lowest significant fruit juice acidity percentages (best test) related with (a2b2, a3b1, a3b2 and a2b1) treatments without statistical differences for the 1st season (0.20, 0.20, 0.20 and 0.21 %, respectively). And it related with (a2b2, a3b2, a2b1 and a3b1) treatments for the 2nd season without significant differences (0.19, 0.19, 0.20 and 0.20 %, respectively). The highest significant value of this trait (bad test) was related with (a1b3 and a1b1) treatments for both study seasons without statistical difference (0.26 and 0.25 % for both seasons, respectively). More statistical relations were found in Table (4). These results are going with the above mention results.

Total soluble solids percentage (TSS %):

Data of Table (3) indicated that both thinning levels (a2 and a3) significantly increased the TSS (%) in comparison with control treatment (a1 level) in the two studied seasons without significant difference (39.3 and 38.8 for the 1st season and 39.1 and 39.3 for the 2nd season, respectively). Concerning the covering factor, level (b2) significantly related with the highest TSS (%) value in the two studied seasons (38.9 and 39.2 for the 1st and 2nd seasons, respectively). TSS (%) values which related with other covering levels (b1 and b3) had no significant difference in the two seasons of study. These results are in the same line with finding of Moustafa (2007).

Table (4): Effect of interaction treatments on the fruit quality criteria of "Sewi" date palm cultivar in the two study seasons (2010 and 2011).

Treats	2010 season					2011 season				
	Total acidity (%)	TSS (%)	Total sugars (%)	Total protein (%)	Soluble Tannins (%)	Total acidity (%)	TSS (%)	Total sugars (%)	Total protein (%)	Soluble Tannins (%)
a1b1	0.25	35.6	32.3	1.45	0.33	0.25	35.8	31.9	1.50	0.32
a1b2	0.22	38.9	37.1	2.05	0.28	0.21	39.2	37.2	1.95	0.28
a1b3	0.26	34.1	30.1	1.40	0.35	0.26	33.8	30.7	1.50	0.36
a2b1	0.21	39.3	36.8	1.85	0.29	0.20	39.1	36.7	1.90	0.29
a2b2	0.20	40.2	38.8	2.25	0.28	0.19	40.1	38.9	2.30	0.28
a2b3	0.23	34.8	32.1	1.65	0.30	0.23	34.4	31.4	1.60	0.31
a3b1	0.20	38.8	37.2	2.05	0.29	0.20	39.3	37.6	2.15	0.29
a3b2	0.20	40.7	38.9	2.30	0.27	0.19	40.6	38.8	2.30	0.27
a3b3	0.23	34.1	32.6	1.70	0.30	0.23	34.7	32.4	1.75	0.30
LSD (0.05)	0.02	1.1	1.08	0.15	0.02	0.02	1.3	1.05	0.15	0.02

Regarding the field treatments effect, data of Table (4) showed that (a3b2) treatment significantly had the highest TSS (%) value without significant difference in comparison with (a2b2) treatment in the two studied seasons (40.7 and 40.2 for the 1st season and 40.6 and 40.1 for the 2nd season, respectively). Meanwhile, (a2b1, a1b2 and a3b1) treatments significantly seemed superior all other studied treatments without significant differences among their related TSS (%) values (39.3, 38.9 and 38.8 for the 1st season and 39.1, 39.2 and 39.3 for the 2nd season, respectively). Absolute lowest TSS (%) value was related with (a3b3) treatment in the 1st season (34.1) and without significant difference in comparison with control treatment for the 2nd season (34.7 and 35.8, respectively).

Total sugars percentage:

As shown in Table (3), total sugar percentage values taken a positive reflect with the bunch thinning levels in the two studied seasons. Whereas, the (a3) and (a2) levels ranked first and second, respectively without significant difference between their related values and (a1) level significantly ranked third for the total sugar (%) value (37.2, 36.8 and 32.3 for the 1st season and 37.6, 36.7 and 31.9 for the 2nd season, respectively). While, the (b2) covering level significantly was superior other two covering levels in the two studied seasons followed by (b1) level and (b3) level and the differences among these values were significant (37.1, 32.3 and 30.1 for the 1st and 37.2, 31.9 and 30.6 for the 2nd seasons, respectively).

Tested the effect of field treatments, data of Table (4) showed that the highest total sugar (%) values were (38.9) and (38.8) which related with (a3b2) and (a2b2) treatments, respectively without significant difference for the 1st season. The opposite values for the 2nd season were (38.8 and 38.9 %, respectively) without significant difference. The absolute lowest value of total sugar (%) was related with (a1b3) treatment in the two seasons of study

(30.1 and 30.7, respectively). More significant differences were found in Table (4).

Total protein percentage:

This trait statistically had a positive relation with increasing the bunch thinning percentage in the two study seasons (Table 3). Whereas the highest significant value was related with (a3) level followed by (a2) then (a1) level in the two seasons of study (2.10, 1.85 and 1.45 % for the 1st season and 2.15, 1.90 and 1.50% for the 2nd season, respectively). Regarding the effect of covering factor, (b2) level significantly had the highest total protein (%) value in both study seasons (2.05 and 1.95 for the 1st and 2nd seasons, respectively). No significant difference was found between values which related with control (b1) and (b3) level in both study seasons (Table 3).

Concerning the effect of field treatments, (a3b2) and (a2b2) treatments significantly were superior in comparison with all other applied treatments in the two study seasons (2.30 and 2.25 for the 1st season and 2.30 and 2.30 for the 2nd season, respectively). Beside, (a3b1) and (a1b2) treatments have ranked second without significant difference between their related protein values in the 1st season (2.05 % for both), while (a3b1) and (a1b2) treatments ranked second and third with significant difference between their related protein values in the 2nd season (2.15 and 1.95 %, respectively). Also, data noted that (a2b1) treatment significantly was superior all remained treatments without significant difference in comparison with (a1b2) treatment in the 2nd season, Table (4).

Soluble tannins percentage:

Data presented in Table (3) showed that soluble tannins percentage values taken a negative trend with the bunch thinning levels and (a1) level significantly had a highest value in the two seasons of study (0.33 and 0.32 % for the 1st and 2nd seasons, respectively). However, no significant difference was found between soluble tannins percentage values which related with (a2) and (a3) thinning levels in the two study seasons. Although the covering factor leads to statistical impact on soluble tannins percentage property, but the (b2) level lead to the significant best value (0.28 % for both seasons) in comparison with both control (b1) and (b3) levels in the two study seasons (0.33 and 0.35 % for the 1st season and 0.32 and 0.36 % for the 2nd season, respectively). Also, there was a significant difference between values related with (b1) and (b3) covering levels. Significantly (b3) level leads to the bad soluble tannins percentage value in both study seasons, Table (3).

Regarding the field applications, data of Table (4) indicated that (a3b2) treatment significantly had a lowest soluble tannins (%) value (the best test) in the two study seasons (0.27 % for both seasons), however no significant differences were found in comparison with (a1b3) and (a2b3) treatments in the two study seasons (0.28 % for both in the two seasons). Always, (a1b3) treatment significantly had the highest soluble tannins (%) value (the griper test) followed by control treatment (a1b1) in the two study seasons (0.35 and 0.33 % for the 1st and 0.36 and 0.32 for the 2nd seasons, respectively), however the difference between values was significant. More significant relations were found in Table (4).

Economic study:

Total revenue per feddan:

Data in Tables (5) showed that total income per feddan kidney in case of use of treatments No. 2, 3, 4, 5, 6, 7, 8 and 9 were 28612, 28423, 27069, 36470, 27100, 25420, 34790 and 25819 pounds/ feddan, respectively. While, it was 21875 pounds/ feddan with control treatment.

The estimated differences were 6737, 6548, 5194, 14595, 5225, 3545, 12915 and 3944 pound in representing 30.8%, 29.9%, 23.7%, 66.7%, 23.9%, 16.2%, 59.0% and 18.0% increase in yield per feddan in case of using these transactions, respectively.

Table (5): Economic efficiency indicators for using of bunch thinning and bunch covering transaction on "Sewi" date palm cultivar in average for the two study seasons (2010- 2011).

Treatments	Efficiency indicators					
	Total revenue/ feddan (pounds/ feddan)	Total costs/ feddan (pounds /feddan)	Net revenue/ feddan (pounds/ feddan)	Return to costs (%)	Net return to costs (%)	Produced unit costs (pounds/ Ton)
1	21875	5887	15988	3.72	2.72	673
2	28612	7287	21325	3.93	2.93	767
3	28423 771	7287	21136	3.90	2.90	771
4	27069	7287	19782	3.71	2.71	800
5	36470	7287	29183	5.00	4.00	792
6	27100	7287	19813	3.72	2.72	779
7	25420	7287	18133	3.49	2.49	857
8	34790	7287	27503	4.77	3.77	838
9	25819	7287	18532	3.54	2.54	847

*Tabulated data were collected and calculated from the results of analysis of variance for the two field study seasons and data of Tables (2 and 5).

Total costs per feddan:

Data of Table (5) showed that the total costs/ feddan of control treatment were 5887 pounds/ feddan, while it reached to 7287 pounds/ feddan in the case of the use of each of these transactions because of prices of bags (700 pounds/ feddan) and labors salary (700 pounds/ feddan).

Net revenue per feddan:

Net revenue per feddan in case of using each of transactions No. 2, 3, 4, 5, 6, 7, 8 and 9 were 21325, 21136, 19782, 29183, 19813, 18133, 27503, and 18523 pounds/ feddan, respectively. While, it was 15988 pounds/ feddan in case of control transactions, Table (5).

Previously, it seems that the economic indicators and criteria for the impact of the use of bunch thinning and covering transactions on "Sewi" date palm cultivar were raised in comparison with control treatment. This result was due to raising the selling prices of fruit and rising in prices of supply to factories as response of the high quality of fruit recipes as well as early in harvest, consequently rising in total income of farmers.

Studying the relationship between the ratios of revenue to the costs, it amounted to 3.72% with control treatment while they were 3.93, 3.90, 3.71, 5.00, 3.72, 3.49, 4.77 and 3.54%, respectively in case of using transactions No. 2, 3, 4, 5, 6, 7, 8 and 9. It can reflect the higher revenue in case of using such transactions in comparison with non-use (control).

Return on invested:

Moreover, the return on invested with control transactions was 2.72 pounds, while in the case of the use of treatments No. 2, 3, 4, 5, 6, 7, 8 and 9 were 2.93, 2.90, 2.71, 4.00, 2.72, 2.49, 3.77 and 2.54 pounds, respectively for each spender pound in production process. It can be seen the high return on fairly investor in case of the use of such transactions, which demonstrates the high economic efficiency, Table (5).

Produced unit costs:

Data of Table (5) showed that the produced unit costs were 693 pounds/ ton with control transaction, they were 767, 771, 800, 792, 779, 857, 838 and 847 pounds/ton, respectively in case of using any of the treatments No. 2, 3, 4, 5, 6, 7, 8 and 9, respectively.

Examination of some measures of economic efficiency for "Sewi" date palm crop in sample study indicated that rising of values of these indicators, which was due to higher revenue and gain increased net income, which leads to improving economic efficiency indicators of each case of using of such transactions.

Indicators of feddan productivity, selling prices of the crop, increase in total revenue and increase in net income for studied treatments:

Data of Table (6) showed that feddan productivity had increased with treatments No. 2, 3, 4, 5 and 6 while it declined with transactions No. 7, 8 and 9. However, it earns increase in both of total revenue and net revenue as a result of using bunch thinning and bunch covering transactions. Beside, obtained higher selling prices for fruits as a result of these transactions for high quality characteristics and early harvest in comparison with control transaction as following results:

Treat. No. 1: Data of Table (6) showed that total productivity of "Sewi" dates reached to 8.75 tons/ feddan and the total revenue was 21875 pounds/ feddan because of the fruit prices were 2500 pounds/ ton at the harvest time (11/9 or after).

Treat. No. 2: Data presented in Table (6) indicated that the feddan productivity of "Sewi" dates reached to 9.54 tons/ feddan in case of applying the field treatment No. 2, while it was 8.75 tons/ feddan with the control treatment. The amount of yield increase was 790 kg/ feddan represent nearly 9%. Regarding the sale price of the fruits as a result of early in harvest (in 02/ 9), it reached to 3000 pounds/ ton with 16.7% increase in comparison with control treatment, and this was harvested after 9 days (in 11 / 9 or after). So, the applying treatment No. 2 gain an increase in the total value of the revenue amounted to 6737 pounds/ feddan represent 30.8% of total revenue of control treatment. Whereas, the costs of applying such treatment were 1400 pounds/ feddan, it means that the value of net income per feddan amounted to 5337 pounds/ feddan.

Treat. No. 3: Data in Table (6) explained that the feddan productivity of "Sewi" dates reached to 9.50 tons/ feddan in case of applying the field treatment No. 3, while it was 8.75 tons/ feddan with the control treatment. The amount of yield increase was 750 kg/ feddan represent nearly 8.6%. Regarding the sale price of the fruits as a result of early in harvest (in 02/ 9), it reached to 3000 pounds/ ton with 16.7% increase in comparison with control treatment, and this was harvested after 9 days (in 11/ 9 or after). So, the applying treatment No. 3 gain an increase in the total value of the revenue amounted to 6548 pounds/ feddan represent 29.9% of total revenue of control treatment. Whereas, the costs of applying such treatment were 1400 pounds/ feddan, it means that the value of net income per feddan amounted to 5148 pounds/ feddan.

Table (6): Feasibility of using transactions of bunch thinning and covering on the "Sewi" date palm cultivar grown in Siwa Oasis as average of two studied seasons (2010 – 2011).

Treatments	Feasibility indicators								
	Feddan produc. (tons/ feddan)	Chang in amount		Sale price at harvest time (pounds/ ton)	Total earn/ feddan (pounds/ feddan)	Chang in total earns/ feddan		Costs of Treat. (pound/ feddan)	Return on invested (pounds/ feddan)
		%	Kg			%	Pounds		
1	8.75	-	-	2500	21875	-	-	-	-
2	9.54	9.0	790	3000	28612	30.8	6737	1400	5337
3	9.50	8.6	750	3000	28423	29.9	6548	1400	5148
4	9.23	5.5	480	3000	27069	23.7	5194	1400	3794
5	9.12	5.0	400	4000	36470	66.7	14595	1400	13195
6	9.02	3.0	270	3000	27100	23.8	5225	1400	3825
7	8.50	-2.9	-250	3000	25420	16.2	3545	1400	2145
8	8.70	-0.6	-050	4000	34790	59.0	12915	1400	11515
9	8.61	-0.6	-140	3000	25819	18.0	3944	1400	2544

*Tabulated data were collected and calculated from the results of analysis of variance for the two field study seasons and data of Tables (2 and 5).

Treat. No. 4: As shown from Table (6) the feddan productivity of "Sewi" dates reached to 9.23 tons/ feddan in case of applying the field treatment No. 4, while it was 8.75 tons/ feddan with the control treatment. The amount of yield increase was 480 kg/ feddan represent nearly 5.5%. Regarding the sale price of the fruits as a result of early in harvest (in 02/ 9), it reached to 3000 pounds/ ton with 16.7% increase in comparison with control treatment, and this was harvested after 9 days (in 11/ 9 or after). So, the applying treatment No. 4 gain an increase in the total value of the revenue amounted to 5194 pounds/ feddan represent 23.7% of total revenue of control treatment. Whereas, the costs of applying such treatment were 1400 pounds/ feddan, it means that the value of net income per feddan amounted to 3794 pounds/ feddan.

Treat. No. 5: Data presented in Table (6) indicated that the feddan productivity of "Sewi" dates reached to 9.12 tons/ feddan in case of applying

the field treatment No. 5, while it was 8.75 tons/ feddan with the control treatment. The amount of yield increase was 370 kg/ feddan represent nearly 4.2%. Regarding the sale price of the fruits as a result of early in harvest (in 25/ 8), it reached to 4000 pounds/ ton with 62.5% increase in comparison with control treatment, and this was harvested after 17 days (in 11 / 9 or after). So, the applying treatment No. 5 gain an increase in the total value of the revenue amounted to 14595 pounds/ feddan represent 66.7% of total revenue of control treatment. Whereas, the costs of applying such treatment were 1400 pounds/ feddan, it means that the value of net income per feddan amounted to 13195 pounds/ feddan.

Treat. No. 6: As shown in Table (6) the feddan productivity of "Sewi" dates reached to 9.02 tons/ feddan in case of applying the field treatment No. 6, while it was 8.75 tons/ feddan with the control treatment. The amount of yield increase was 270 kg/ feddan represent nearly 3.0%. Regarding the sale price of the fruits as a result of early in harvest (in 02/ 9), it reached to 3000 pounds/ ton with 16.7% increase in comparison with control treatment, and this was harvested after 9 days (in 11/ 9 or after). So, the applying treatment No. 6 gain an increase in the total value of the revenue amounted to 5225 pounds/ feddan represent 23.9% of total revenue of control treatment. Whereas, the costs of applying such treatment were 1400 pounds/ feddan, it means that the value of net income per feddan amounted to 3825 pounds/ feddan.

Treat. No. 7: Data in Table (6) explained that the feddan productivity of "Sewi" dates was 8.50 tons/ feddan in case of applying the field treatment No. 7, while it was 8.75 tons/ feddan with declining as much as about 250 kg/ feddan represent about 2.8% decrease in productivity in comparison with control treatment. Regarding the sale price of the fruits as a result of early in harvest (in 02/ 9), it reached to 3000 pounds/ ton with 16.7% increase in comparison with control treatment, and this was harvested after 9 days (in 11/ 9 or after). So, the applying treatment No. 7 gain an increase in the total value of the revenue amounted to 3545 pounds/ feddan represent 16.2% of total revenue of control treatment. Whereas, the costs of applying such treatment were 1400 pounds/ feddan, it means that the value of net income per feddan amounted to 2145 pounds/ feddan.

Treat. No. 8: Data in Table (6) showed that the feddan productivity of "Sewi" dates was 8.70 tons/ feddan in case of applying the field treatment No. 8, while it was 8.75 tons/ feddan with declining as much as about 50 kg/ feddan represent about 0.6% decrease in productivity in comparison with control treatment. Regarding the sale price of the fruits as a result of early in harvest (in 25/8), it reached to 4000 pounds/ ton with 62.5% increase in comparison with control treatment, and this was harvested after 17 days (in 11/ 9 or after). So, the applying treatment No. 8 gain an increase in the total value of the revenue amounted to 12915 pounds/ feddan represent 59.0% of total revenue of control treatment. Whereas, the costs of applying such treatment were 1400 pounds/ feddan, it means that the value of net income per feddan amounted to 11515 pounds/ feddan.

Treat. No. 9: As shown in Table (6) the feddan productivity of "Sewi" dates decreased to 8.61 tons/ feddan in case of applying the field treatment No. 9,

while it was 8.75 tons/ feddan with declining as much as about 140 kg/ feddan represent about 1.6% decrease in productivity in comparison with control treatment. Regarding the sale price of the fruits as a result of early in harvest (in 02/9), it reached to 3000 pounds/ ton with 16.7% increase in comparison with control treatment, and this was harvested after 9 days (in 11/ 9 or after). So, the applying treatment No. 8 gain an increase in the total value of the revenue amounted to 3944 pounds/ feddan represent 18.0% of total revenue of control treatment. Whereas, the costs of applying such treatment were 1400 pounds/ feddan, it means that the value of net income per feddan amounted to 2544 pounds/ feddan.

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الآثر الاقتصادي لبعض معاملات الخف و التغطية للسباطات على إنتاجية أصناف البلح في واحة سيوه

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**قسم بحوث الدراسات الاقتصادية, مركز بحوث الصحراء, القاهرة, مصر

أجريت هذه الدراسة أثناء الموسمين المتعاقبين ٢٠١٠ و ٢٠١١ على محصول نخيل البلح صنف "السيوى" النامى فى مزرعة خاصة بواحة سيوه, محافظة مطروح بمصر لدراسة تأثير إجراء عمليات خف وتغطية السباطات برؤية بستانية واقتصادية. حيث أجرى خف السباطات مبكراً فى طور "الحبابوك" (بدون, ٢٠% خف و ٤٠% خف). بينما أجرى تغطية السباطات فى نهاية طور "القمرى" (بدون, أكياس ثيران أسود ٤٠% و أكياس ثيران أسود ٦٠%) واستمرت حتى طور "الخلال" لمدة شهرين. وأظهرت النتائج تأثير إيجابى معنوى لهذه المعاملات على خصائص وزن السباطة, ووزن الثمرة وجودة الثمار وتقليل وزن الثمار التالفة. وقد أدت معاملات الخف إلى انخفاض محصول النخلة بينما زاد المحصول مع معاملات التغطية. وقد سجلت معاملة التغطية بأكياس ثيران أسود ٤٠% مع عدم الخف أعلى محصول للنخلة فى كلا الموسمين. وقد أظهرت النتائج الاقتصادية ارتباط المعاملة (٢٠% خف + التغطية بأكياس ثيران أسود ٤٠%) مع أعلى قيم لكل من العائد الكلى للفدان (جنيه/فدان), صافى العائد للفدان (جنيه/فدان), الإيرادات إلى التكاليف (%), صافى العائد إلى التكاليف (%), سعر للثمار وقت الجمع (جنيه/طن), عائد على الاستثمار (%), وبالتالي أعلى صافى دخل للفدان (جنيه/فدان) وذلك بسبب ارتفاع جودة الثمار والجمع المبكر للمحصول (تبيكر ١٧ يوماً) مما يؤدي لأفضل عائد. ويمكن التوصية باستخدام المعاملة (٢٠% خف السباطات أثناء طور "الحبابوك" + تغطية السباطات بأكياس ثيران أسود ٤٠%) فى نهاية طور "القمرى" حتى طور "الخلال" لمدة شهرين) وذلك لتحسين صفات جودة ثمار البلح السيوى والنهوض بصافى الدخل للفدان الذى ينعكس إيجابياً على مزارع نخيل البلح فى واحة سيوه.

قام بتحكيم البحث

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