

Effect of Morphological Characteristics of the Bunches on Fruit Thinning Percentage of Eight Date Palm Cultivars in Assiut Region

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Abstract

This study was carried out during 2011, 2012 and 2013 seasons on eight date palm cultivars namely Zaghoul, Haiany, Halawy, Eraby, Bent Aisha, Samani, Sewy and Amry grown at the Experimental Orchard, Faculty of Agriculture, Assiut University, Egypt.

The main objectives of this study were to:

- 1- Compare the morphological characteristics of the bunches of eight date palm cultivars.
- 2- Study the relation between bunch emergence level and its morphological characteristics.
- 3- Determine the optimum patterns and fruit thinning percentage of the eight cultivars.

The results of the present study showed that bunches and strands morphological characteristics were differed according to the cultivar and bunch emergence level. All the studied characteristics tended to increase according to bunch emergence level from lower to upper. Fruit thinning percentage determined according to cultivar and bunch emergence level. It is worth notable that cutting back (1 cm) of strand, reduced the initial fruit load by 3.11, 3.74 and 4.64% as average of upper, middle and lower bunches respectively for tested cultivars. So the fruit thinning method could be selected according to the bunch and their strand characteristics. This study is important from economic and cultural view to obtain high yield with good fruit quality of date palm production.

Keywords: Morphological characters, Bunch, Strand, Fruit thinning, Date Palm

Introduction

Date palm is one of the oldest cultivated fruit trees in the world and their fruits play an important role in the nutrition patterns of many people. Egypt is considered among the top ten date producers (FAO, 2012). The growth and productivity of tree depended on cultivar environmental and agricultural practice, thus the morphological characteristics identification could be used as a start point to improve the palm productivity (Rokba *et al.*, 1990; Salem and

Hamdy, 1993; El-Salhy *et al.*, 2004; Ibrahim, 2008 and Abdalla, 2011).

Fruit thinning is a critical cultural practice in the date palm production chain that affects fruit development, quality, yield and regulate tree yearly bearing. The fruits may be thinned either by reducing the number of fruits per bunch or by reducing the number of bunches per palm depending on the cultivar and other considerations (Nixon and Carpenter, 1978; Khalifa *et al.*, 1987 and Mostafa and El-Akkad, 2011).

The moderate bunch thinning is by removing either 10-25% of the number of strands from the center or cutting back strand tips (El-Kassas, 1983).

The response were pronounced by strands shortening rather than by strands removal (El-Kassas, 1983; Hassaballa *et al.*, 1983 and Hussein *et al.*, 1992 a&b).

Removing 30% of the total number of strands from the center of each bunch, 4 weeks after pollination gave a reasonable yield and the best fruit (Abbas, 1993; Mostafa, 1998; El-Shazly, 1999). Fruit thinning either by removing or cutting back 25% of strands are found to be suitable for obtaining high total yield and quality of date palm (Bamiftah, 2001; Abdel-Hamid, 2002; Bassal and El-Deeb, 2002; Hammam *et al.*, 2002; Karami and Heidari, 2006 and Nirmaljit *et al.*, 2006).

Moreover, removing 20% of the entire spikelets from bunch center accompanied with cutting back of 20% of the tips of spikelets was the best treatment which gave a reasonable yield with good fruit quality of Sewy date palms (Akl *et al.*, 2004 and Abdel-Galil *et al.*, 2008).

Flower thinning was found to enhance fruit quality and regulate the yield of Zaghoul, Haiany, Sewy and Amry date palm cultivars. Previous studies showed that, thinning by removing either 20 or 30% of strands before pollination was insignificantly increased the bunch weight, besides, a positive correlation between fruit physical traits and thinning rate (Ahmed-Amen *et al.*, 2007; Marzouk *et al.*, 2007 and Mostafa and El-Akkad, 2011).

The present investigation was carried out to compare the morphological characteristics of the bunches of some date palm cultivars grown in Assiut region. In addition, to determine the optimum pattern and fruit thinning percentage.

Materials and Methods

This investigation was carried out on eight date palm cultivars: Zaghoul, Haiany, Halawy, Eraby, Bent Aisha, Samani, Sewy and Amry grown at the Experimental Orchard, Faculty of Agriculture, Assiut University, Egypt, during 2011, 2012 and 2013 seasons. Twenty-four palms were selected randomly and at similar age, uniform in vigour, healthy, good physical condition, free from insect, damage and diseases. Three palms were chosen of each cultivar. Three bunches were collected from each palm after initial fruit set was complete. The bunches were collected from the main directions of each palm as follows: one from each upper, middle and lower level. The following morphological characteristics were studied:

- 1- Bunch weight (g).
- 2- Bunch length (cm).
- 3- Bunch fruitful part length (cm)
- 4- Strands number/bunch.
- 5- Bunch fruitful length percentage.
- 6- Strand length (cm).
- 7- Strand fruitful part length (cm).
- 8- Strand fruitful length percentage.
- 9- Fruit numbers/strand.

10-Number of fruit/1 cm of strand fruitful part and the percentage of fruit thinning/1 cm removed from the strand fruitful part were calculated.

These characteristics were arranged in a split plot complete randomized design block including eight

cultivars and three bunch emergence level with three replicates each one bunch/level/palm.

Data were statistically analyzed and means were then compared using the Revised LSD test at 5% level for distinguishing the significant differences between various cultivar means (Snedecor and Cochran, 1990).

Results and Discussion

The morphological bunch characteristics involved bunch and strand characteristics were summarized as follow:

(A) Bunch characteristics

Data in Tables (1 to 5) declared great variability of bunch morphology due to different date palm cultivars and bunch emergence level during 2011, 2012 and 2013 seasons. It is obvious from such data that the results took similar trend during the three studied seasons.

Data in the above tables showed that cultivar and bunch emergence level and their interaction had significant differences in bunch morphological traits.

Concerning the effect of cultivars on bunch morphological characteristics, the results declared that, great variability were found in bunch morphological traits of various date palm cultivars. Samani cultivar had the heaviest bunch weight (874.4 g as an av. of the three studied seasons) followed by Zaghoul cv. (822.1 g), whereas Haiany cv. had the longest

bunch (118.9 cm) and fruitful length (50.11 cm) followed in descending order by Bent Aisha (113.2 cm), Samani cv. (48.0 cm) and Bent Aisha (76.15) for bunch length, fruitful part length and strands number, respectively. Halawy cv. had the highest bunch fruitful length percentage (47.99%) followed by Samani cv. (44.53%) and highest strands number/bunch (85.19). On the other hand, Eraby cv. had the lowest bunch weight (417.4 g as an av. of the three studied seasons), Halawy cv. had the shortest bunch (91.0 cm) and Amry cv. had the least values of bunch fruitful length (23.85 cm) and bunch fruitful length percentage (20.86%). In addition, Sewy had the least strands number/bunch (46.59 strand) compared to the other studied cultivars. Such findings emphasized the fact that bunch morphological traits depended on cultivar. The differences between cultivars or bunch of date palm may be due to either cytological differences between them or to the more genotypes that produced from seeds.

Concerning the bunch emergence level, dates in the prementioned tables showed that all the studied traits tend to decrease from upper bunch to lower ones. The upper bunch had the highest values of all the studied traits, whereas, the lower bunch had the least values.

Table 1. Bunch weight (g) of some date palm cultivars at upper, middle and lower bunches of the palm during 2011-2013 seasons.

Season Bunch level (B)	2011				2012				2013				Mean			
	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean
Variety (A)																
Zaghloul	1300.0	823.7	375.7	833.0	1250.0	850.0	323.3	807.8	1296.7	825.0	355.0	825.6	1282.2	832.9	351.3	822.1
Haiany	905.0	773.7	443.0	707.2	850.0	723.3	406.7	660.0	896.7	773.3	460.0	710.0	883.9	756.8	436.6	692.4
Halawy	914.7	415.0	279.0	536.2	871.7	386.7	238.7	499.0	918.3	428.3	286.7	544.4	901.6	410.0	268.1	526.6
Eraby	594.7	443.7	248.7	429.0	546.7	406.7	206.7	386.7	593.3	463.3	253.3	436.7	578.2	437.9	236.2	417.4
Bent Aisha	957.0	670.7	422.7	683.4	903.3	633.3	400.0	645.6	953.3	686.7	460.0	700.0	937.9	663.6	427.6	676.3
Samani	1145.0	960.7	550.3	885.3	1046.7	920.0	506.7	824.5	1156.7	971.7	561.7	896.7	1132.8	950.8	539.6	874.4
Sewy	753.0	546.0	206.0	501.8	705.0	503.3	200.0	469.4	745.0	558.3	226.7	510.0	734.3	536.0	210.9	493.7
Amry	960.0	420.0	329.3	569.8	920.0	353.3	303.3	525.6	981.7	426.7	346.7	585.0	953.9	400.0	326.4	560.1
Mean	941.2	631.7	356.6		892.9	597.1	323.2		942.7	641.7	368.8		925.6	623.5	347.6	
LSD5%	A	19.7			23.7				22.6				12.7			
	B	12.1			14.5				13.8				7.8			
	AxB	34.1			41.1				39.1				22.1			

Table 2. Bunch length (cm) of some date palm cultivars at upper, middle and lower bunches of the palm during 2011-2013 seasons.

Season Bunch level (B)	2011				2012				2013				Mean			
	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean
Variety (A)																
Zaghloul	136.0	102.7	55.3	98.0	133.7	101.3	53.7	96.2	138.7	105.0	57.3	100.3	136.1	103.0	55.4	98.2
Haiany	135.3	115.7	105.0	118.7	132.7	114.3	102.0	116.3	137.7	119.0	108.0	121.6	135.2	116.3	105.0	118.9
Halawy	139.7	79.0	54.0	90.9	138.0	77.3	52.7	89.3	141.3	80.0	57.0	92.8	139.7	78.8	54.6	91.0
Eraby	123.7	92.7	87.0	101.1	118.0	90.7	85.0	97.9	126.3	95.7	89.3	103.8	122.7	93.0	87.1	100.9
Bent Aisha	151.0	105.3	82.3	112.9	148.0	102.7	81.0	110.6	153.0	108.0	87.7	116.2	150.7	105.3	83.7	113.2
Samani	135.7	116.0	71.3	107.7	131.7	114.3	69.0	105.0	138.7	119.7	74.0	110.8	135.3	116.7	71.4	107.8
Sewy	124.3	116.7	74.3	105.1	121.0	114.3	71.0	102.1	127.7	120.0	76.7	108.1	124.3	117.0	74.0	105.1
Amry	150.3	106.7	85.0	114.0	147.7	103.3	82.0	111.0	154.0	111.7	88.0	117.9	150.7	107.2	85.0	114.3
Mean	137.0	104.3	76.8		133.8	102.3	74.5		139.7	107.4	79.8		136.8	104.7	77.0	
LSD5%	A	1.99			2.07				2.36				1.24			
	B	1.22			1.27				1.44				0.76			
	AxB	3.45			3.60				4.09				2.15			

Table 3. Bunch fruitful length (cm) of some date palm cultivars at upper, middle and lower bunches of the palm during 2011-2013 seasons.

Season Bunch level (B)	2011				2012				2013				Mean			
	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean
Variety (A)																
Zaghloul	34.67	30.67	17.00	27.44	33.00	29.00	15.67	25.89	35.67	31.67	17.67	28.33	34.44	30.44	16.78	27.22
Haiany	63.00	48.00	40.33	50.44	61.67	46.00	38.00	48.56	64.33	49.00	40.67	51.33	63.00	47.67	39.67	50.11
Halawy	63.00	35.00	33.33	43.78	61.67	33.00	32.00	42.22	64.00	36.00	35.00	45.00	62.89	34.67	33.44	43.67
Eraby	48.00	38.67	34.33	40.33	46.00	36.67	32.67	38.44	49.00	39.67	35.00	41.22	47.67	38.33	34.00	40.0
Bent Aisha	55.33	53.00	34.00	47.44	53.33	52.00	31.33	45.56	57.00	54.67	36.00	49.22	52.22	53.22	33.78	47.41
Samani	60.00	52.00	32.00	48.00	56.00	50.00	30.00	46.00	62.00	54.00	34.00	50.00	60.00	55.00	32.00	48.00
Sewy	49.00	41.33	24.00	38.11	47.33	40.33	22.33	36.67	50.67	43.33	26.00	40.00	49.00	41.67	24.11	38.26
Amry	37.00	17.67	17.00	23.89	34.67	16.67	16.33	22.56	38.00	19.33	18.00	25.11	36.56	17.89	17.11	23.85
Mean	51.25	39.54	22.87		50.52	37.91	27.29		48.49	40.96	30.29		51.10	39.49	28.86	
LSD5%	A	0.40			0.66				0.68				0.34			
	B	0.25			0.40				0.41				0.21			
	AxB	0.69			1.14				1.17				0.54			

Table 4. Bunch fruitful length percentage % of some date palm cultivars at upper, middle and lower bunches of the palm during 2011-2013 seasons.

Season Bunch level (B)	2011				2012				2013				Mean			
	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean
Variety (A)																
Zaghloul	25.49	29.86	30.74	28.70	24.68	28.63	29.18	27.50	25.72	30.16	30.84	28.91	25.30	29.55	30.25	28.37
Haiany	46.56	41.49	38.41	42.15	46.47	40.24	37.25	41.32	46.72	41.18	37.66	41.85	46.58	40.97	37.77	41.77
Halawy	45.10	44.30	61.72	50.37	44.69	42.69	60.72	47.37	45.29	45.00	61.40	50.56	45.03	44.09	61.28	49.43
Eraby	38.80	41.72	39.46	39.99	38.98	40.43	38.44	39.28	38.80	38.32	39.19	38.77	38.86	40.16	39.03	39.35
Bent Aisha	36.64	50.33	31.31	39.43	36.03	50.63	38.68	41.78	37.25	50.62	41.05	42.97	36.64	50.53	37.01	41.39
Samani	44.22	44.83	44.88	44.64	42.52	43.74	43.48	43.25	44.70	45.11	45.95	45.25	43.81	44.56	44.77	44.38
Sewy	39.42	35.42	32.30	35.71	39.12	35.28	31.45	35.28	39.68	36.11	33.90	36.56	39.41	35.60	32.55	35.85
Amry	24.62	16.56	20.00	20.39	23.47	61.14	19.91	64.03	24.68	17.31	20.45	20.81	24.26	31.67	20.12	35.08
Mean	37.41	37.91	29.78	35.03	37.06	37.06	36.63	36.92	34.71	38.14	37.96	36.94	36.39	37.70	34.79	
LSD5%	A	1.19			1.34				1.25				0.74			
	B	0.74			0.81				0.76				0.46			
	AxB	2.08			2.28				2.17				1.28			

Table 5. Strands number/bunch of some date palm cultivars at upper, middle and lower bunches of the palm during 2011-2013 seasons.

Season Bunch level (B) Variety (A)		2011				2012				2013				Mean			
		Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean
Zaghloul		93.00	646.7	53.00	70.22	91.33	63.00	52.00	68.78	94.00	65.67	54.33	71.22	92.79	64.44	53.11	70.11
Haiany		105.33	85.33	64.67	85.11	104.33	84.33	63.67	84.11	106.33	86.33	66.33	86.33	105.33	85.33	64.89	85.19
Halawy		81.67	68.67	67.00	72.44	80.33	67.00	66.00	71.11	82.67	70.00	68.67	73.78	81.56	68.56	67.22	72.44
Eraby		97.00	82.00	37.00	72.00	96.00	80.67	35.67	70.78	98.67	84.00	38.00	73.56	97.22	82.22	36.89	72.11
Bent Aisha		87.00	76.67	65.33	76.33	85.00	75.33	64.00	74.78	88.00	77.67	66.33	77.33	86.67	76.56	65.22	76.15
Samani		88.00	68.67	64.67	73.78	87.00	67.33	63.67	72.67	89.33	70.33	66.00	75.22	88.11	68.78	64.78	73.89
Sewy		76.33	35.33	28.00	46.56	75.00	34.33	27.00	45.44	77.33	36.33	29.67	47.78	76.22	35.33	28.22	46.59
Amry		85.67	58.67	41.00	61.78	84.33	57.33	40.00	60.56	87.33	60.67	42.22	63.33	85.78	58.89	41.00	61.89
Mean		89.25	67.50	52.58	69.78	87.92	66.17	51.50	68.53	90.46	68.88	53.92	71.09	89.21	67.51	52.67	
LSD5%	A	0.956				0.953				1.062				0.57			
	B	0.586				0.583				0.651				0.35			
	AxB	1.656				1.650				1.840				0.99			

Moreover, the interaction between the cultivar and bunch emergence level on bunch morphological characteristics (Tables 1 to 5) showed that all bunch emergence on the upper level had significantly higher levels on all the studied traits, whereas that bunches at lower level had the least values of these studied traits. The heaviest bunches (1282.2 followed by 1132.8 g as an av. of the three studied seasons) were found on Zaghoul and Samani cv. where emergence was on upper level and the longest one were seen on Bent Aisha and Amry cvs. (150.7 cm). Also, the longest fruitful percentage (46.72% followed by 45.29%) were seen on Haiany and Halawy cvs. where emergence was on upper level compared to the least values (20.35 & 30.48%) that were recorded on bunch of Sewy and Zaghoul date palm cvs that their emergence was on lower level. Moreover, the highest strands number/bunch (105.33 and 97.22 strands as av. of the three studied seasons) were recorded on Haiany and Early bunches that their emergence was on upper level in contrast to the lowest ones (28.22 & 36.89) on Sewy and Eraby bunches that were on lower level, respectively. It is evident from the foregoing results that the date palm types differ greatly in their morphological bunch characteristics.

(B) Strand characteristics

Data in Table (6 to 9) showed significant differences of strand characteristics due to different date palm cultivars, bunch emergence level and their interaction during 2011, 2012 and 2013 seasons. Regarding the culti-

vars, data revealed that there were a significant variations in strand traits of some date palm cultivars under Assiut conditions. The values of strand traits tended to vary within the range from 30.78 to 66.44 cm of length, 18.08 to 38.88 cm of fruitful length, 49.79 to 61.52% of fruitful length percentage and 9.96 to 18.41 fruit of fruit number for the different cultivars. Sewy cultivar had the longest strands (66.44 cm as an av. of the three studied seasons) followed by Halawy cultivar (63.56 cm), against the shortest one (30.78 cm) on Early date palm cultivar. Halawy cultivar had the highest value of fruitful length (38.99 cm), fruitful length percentage (61.52%) and fruit number (23.15 fruit) compared to the other studied cultivars. On other hand, the shortest ones (30.78 cm) and shortest fruitful length (18.08 cm) were recorded on Early date palm cultivar. In addition, the least fruitful length percentage (49.89%) and lowest fruit number (9.96 fruit) were recorded on Amry cultivar compared to the other studied cultivars.

Such findings emphasized the fact that bunch and their strand morphological characteristics depended on cultivar.

Regarding, the data cultivar, the previous tables revealed that all the studied traits of strands tend to decrease from upper bunch to lower ones. The strands of upper bunch had the highest values (58.15 cm, 34.21 cm, 59.57% and 19.75 fruit as av. of the three studied seasons) for strand fruitful length, fruitful length

Table 6. Strands length (cm) of some date palm cultivars at upper, middle and lower bunches of the palm during 2011-2013 seasons.

Season Bunch level (B)	2011				2012				2013				Mean			
	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean
Variety (A)																
Zaghloul	61.00	57.00	42.00	53.33	60.00	56.00	41.00	52.33	62.00	58.00	43.00	54.33	61.00	57.00	42.00	53.33
Haiany	52.00	44.00	39.00	45.00	51.00	43.00	38.00	44.00	53.00	45.00	40.00	46.00	52.00	44.00	39.00	45.00
Halawy	72.00	62.67	56.00	63.56	71.00	61.67	55.00	62.56	73.00	63.67	57.00	64.56	72.00	62.67	56.00	63.56
Eraby	38.67	28.33	25.33	30.78	37.67	27.33	24.33	29.78	39.67	29.33	29.33	31.78	38.67	28.33	25.33	30.78
Bent Aisha	42.67	42.33	35.00	40.00	41.67	41.33	33.67	38.89	43.67	45.33	36.00	41.67	42.67	43.00	34.89	40.19
Samani	62.67	62.33	59.33	61.44	61.67	61.33	58.33	60.44	63.67	63.33	60.33	62.44	62.67	62.33	59.33	61.44
Sewy	84.00	71.00	44.00	66.33	83.33	70.00	43.00	65.44	85.00	72.33	45.33	67.56	84.11	71.11	44.11	66.44
Amry	52.00	43.00	38.00	44.33	51.00	42.00	37.00	43.33	53.33	44.00	39.00	45.44	52.11	43.00	38.00	44.37
Mean	58.13	51.33	42.33		52.17	50.33	41.29		59.17	52.62	43.75		58.15	51.43	42.33	
LSD5%	A	0.589			0.580				0.829				0.39			
	B	0.355			0.508				0.239				0.24			
	AxB	1.020			1.005				1.436				0.68			

Table 7. Strands fruitful part length (cm) of some date palm cultivars at upper, middle and lower bunches of the palm during 2011-2013 seasons.

Season Bunch level (B)	2011				2012				2013				Mean			
	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean
Variety (A)																
Zaghloul	33.17	25.00	22.00	26.72	32.17	24.17	21.13	25.82	34.00	26.00	23.00	27.67	33.11	25.06	22.04	26.74
Haiany	30.00	27.00	22.00	26.33	29.20	26.10	21.17	25.39	31.00	28.00	23.33	27.44	30.07	27.03	22.17	26.42
Halawy	49.00	36.67	31.00	38.89	48.10	35.83	30.13	38.02	50.33	37.67	32.17	40.06	49.14	36.72	31.10	38.99
Eraby	22.00	18.17	14.00	18.06	21.20	17.17	13.20	17.19	23.00	19.00	15.00	19.00	22.07	18.11	14.07	18.08
Bent Aisha	28.00	27.00	18.00	24.33	27.07	26.83	17.17	23.69	29.00	28.00	19.00	25.33	28.02	27.28	18.06	24.45
Samani	38.00	35.00	33.00	35.33	37.17	34.00	32.07	34.41	39.33	36.00	34.00	36.44	38.17	35.00	33.02	35.40
Sewy	44.00	40.00	29.00	37.67	42.83	40.17	28.00	37.00	45.33	42.00	30.00	39.11	44.06	40.72	29.00	37.93
Amry	29.00	20.17	17.00	22.06	28.10	19.17	16.20	21.16	30.00	20.67	18.00	22.89	29.03	20.00	17.07	22.03
Mean	34.15	28.63	23.25		33.23	27.93	22.38		35.25	29.67	24.31		34.21	28.74	23.32	
LSD5%	A	0.211			0.423				0.341				0.19			
	B	0.129			0.259				0.209				0.12			
	AxB	0.366			0.732				0.591				0.34			

Table 8. Strands fruitful length percentage % of some date palm cultivars at upper, middle and lower bunches of the palm during 2011-2013 seasons.

Season Bunch level (B)	2011				2012				2013				Mean			
	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean
Variety (A)																
Zaghloul	54.38	43.86	52.38	50.20	53.62	43.16	51.54	49.44	54.84	44.83	53.49	51.05	54.28	43.95	52.47	50.23
Haiany	57.69	61.36	56.41	58.49	57.26	60.70	55.71	57.89	58.49	62.22	58.33	59.68	57.81	61.43	56.82	58.69
Halawy	68.06	58.51	55.36	60.64	67.75	58.10	54.78	60.21	68.95	59.16	56.44	61.52	68.24	58.59	55.53	60.79
Eraby	56.89	64.14	55.27	58.77	56.28	62.82	54.25	57.78	57.98	64.78	51.14	57.97	57.05	63.91	53.55	58.17
Bent Aisha	65.62	63.79	51.43	60.28	64.96	64.92	51.00	60.29	62.10	61.77	52.78	58.88	64.23	63.33	51.74	59.77
Samani	60.64	56.15	55.62	57.47	60.27	55.44	54.98	56.90	61.77	56.85	56.36	58.33	60.89	56.15	55.65	57.56
Sewy	52.38	56.34	65.91	58.21	51.40	57.39	65.12	57.97	53.33	58.07	66.18	59.19	52.37	57.27	65.74	58.46
Amry	55.77	46.91	44.74	49.14	55.10	45.64	43.78	48.17	56.25	46.98	46.15	49.79	55.71	46.51	44.89	49.04
Mean	58.75	55.78	54.93		63.70	55.94	54.20		59.57	56.39	55.57		60.67	56.04	54.90	
LSD5%	A	2.56			2.83				2.38				1.55			
	B	1.57			1.33				1.45				0.94			
	AxB	4.43			4.91				4.12				2.66			

Table 9. Fruit number/strand of some date palm cultivars at upper, middle and lower bunches of the palm during 2011-2013 seasons.

Season Bunch level (B)	2011				2012				2013				Mean			
	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean
Variety (A)																
Zaghloul	20.00	15.33	7.33	14.22	19.00	14.00	6.33	13.11	21.00	16.33	8.33	15.22	20.00	15.22	7.33	14.19
Haiany	15.00	8.00	7.00	10.00	14.00	7.00	6.00	9.00	16.00	9.00	8.00	11.00	15.00	8.00	7.00	10.00
Halawy	29.00	25.00	15.00	23.00	28.67	24.67	14.00	22.44	30.00	26.00	16.00	24.00	29.22	25.22	15.00	23.15
Eraby	25.00	17.00	11.00	17.67	24.00	16.00	11.33	17.11	26.00	18.00	12.00	18.67	25.00	17.00	11.44	17.81
Bent Aisha	19.00	18.00	16.00	17.67	18.00	17.00	15.00	16.67	20.00	19.00	17.00	18.67	19.00	18.00	16.00	17.67
Samani	12.00	11.00	10.00	11.00	13.00	11.33	10.33	11.56	13.00	12.00	11.00	12.00	12.67	11.44	10.44	11.52
Sewy	22.00	18.00	15.00	18.33	21.00	17.00	14.67	17.56	23.00	19.00	16.00	19.33	22.00	18.00	15.22	18.41
Amry	15.00	8.00	7.00	10.00	14.33	7.00	6.00	9.11	16.00	8.33	8.00	10.78	15.11	7.78	7.00	9.96
Mean	19.63	15.04	11.04		19.00	14.25	10.46		20.63	15.96	12.04		19.75	15.08	11.18	
LSD5%	A	0.212			0.407				0.286				0.18			
	B	0.130			0.249				0.175				0.11			
	AxB	0.367			0.705				0.495				0.31			

percentage and fruit number/strand, respectively. On the other hand, the corresponding least values were 42.33 cm, 23.32 cm, 55.57% and 11.18 fruit for strand of lower bunch, respectively. In addition, the interaction between the cultivar and bunch emergence level on strands traits (Tables 6 to 9) showed that all bunch emergence on the upper level had significantly higher values on all the studied strand traits, whereas, the strands of bunches emergence at lower level recorded the lowest values. The longest strand (84.11 cm) was recorded on Sewy cultivar. The longest fruitful length (49.14 cm), fruitful length percentage (68.95%) and fruit number (29.22 fruit as an av. of the three studied seasons) were found on Halawy cultivar that its emergence was on the upper level. On other hand, the lowest values (25.33 cm, 14.07 cm, 46.15% and 7.0 fruit) were recorded on strand of Earby, Amry and Haiany or Amry bunch where their emergence was on the lower level, respectively.

It is evident from the foregoing results that the date palm cultivars had a wide variations in their morphological bunch and strand characteristics. These results are in line with those found by Salem and Hamdy (1993), El-Salhy *et al.* (2004), Ibrahim (2008), Abdalla (2011), Hamed (2012) and Gadalla (2013).

(C) Number of fruit/1 cm of strand fruitful length and the percentage of fruit thinning/1 cm

Data in tables (10 & 11) showed that the number of fruit/1 cm of strand fruitful length were variable according to the cultivars and bunch level. Eraby cultivar had the highest

number of fruit/1 cm of strand fruitful length (1.13, 0.94, 0.82 for upper, middle and lower bunch, respectively), while Samani had the lowest values (0.33, 0.32, 0.31). On the other hand fruit thinning percentage tend to increase from the upper, middle and lower bunches. Eraby cultivar had the highest percentage of fruit thinning/1 cm removed from the strand fruitful part (4.54, 5.54 & 7.15%/1 cm), while Halawy had the lowest one (2.04, 2.72 & 3.23%/1 cm) of strand fruitful part for upper, middle and lower bunch, respectively. Thinning as cutting back 1 cm of strand, reduced the initial fruit load which attained 3.11, 3.74 and 4.64% as av. of the three studied seasons of upper, middle and lower bunches, for tested cultivars, respectively. The results of the present investigation indicated that bunches morphological characteristics were different according to the cultivar and bunch emergence level. In addition, fruit thinning patterns and percentage could be done according to bunch and strand traits and their emergence level.

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Table 10. Number of fruit/1 cm of strand fruitful length of upper, middle and lower bunches of some date palm cultivars during 2011, 2012 and 2013 seasons.

Season Bunch level (B) Variety (A)	2011				2012				2013				Mean			
	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean
Zaghloul	0.60	0.61	0.33	0.51	0.59	0.58	0.30	0.49	0.62	0.63	0.36	0.54	0.60	0.61	0.33	0.51
Haiany	0.50	0.30	0.32	0.37	0.48	0.27	0.28	0.34	0.52	0.32	0.34	0.39	0.50	0.30	0.31	0.37
Halawy	0.59	0.68	0.48	0.58	0.60	0.69	0.47	0.59	0.60	0.69	0.50	0.60	0.60	0.69	0.48	0.59
Eraby	1.14	0.94	0.79	0.96	1.13	0.93	0.89	0.98	1.13	0.95	0.80	0.96	1.13	0.94	0.82	0.96
Bent Aisha	0.68	0.67	0.89	0.75	0.67	0.63	0.87	0.72	0.69	0.68	0.90	0.76	0.68	0.66	0.89	0.74
Samani	0.32	0.31	0.30	0.31	0.35	0.33	0.32	0.33	0.33	0.33	0.32	0.33	0.33	0.32	0.31	0.32
Sewy	0.50	0.45	0.52	0.49	0.40	0.42	0.52	0.45	0.51	0.45	0.53	0.50	0.50	0.44	0.52	0.49
Amry	0.52	0.40	0.41	0.44	0.51	0.37	0.37	0.42	0.53	0.40	0.44	0.46	0.52	0.39	0.41	0.44
Mean	0.61	0.55	0.51		0.59	0.53	0.50		0.62	0.56	0.52		0.61	0.54	0.51	

Table 11. Fruit thinning percentage (%)/1 cm removed of strand fruitful length of upper, middle and lower bunches of some date palm cultivars during 2011, 2012 and 2013 seasons.

Season Bunch level (B) Variety (A)	2011				2012				2013				Mean			
	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean	Upper	Middle	Lower	Mean
Zaghloul	3.00	3.98	4.50	3.83	3.11	4.14	4.74	4.00	2.95	3.86	4.32	3.71	3.02	3.99	4.52	3.84
Haiany	3.33	3.75	4.57	3.88	3.42	3.86	4.67	3.98	3.25	3.56	4.25	3.69	3.33	3.72	4.50	3.85
Halawy	2.03	2.72	3.20	2.65	2.09	2.80	3.36	2.75	2.00	2.65	3.13	2.59	2.04	2.72	3.23	2.66
Eraby	4.56	5.53	7.18	5.76	4.71	5.81	7.59	6.04	4.35	5.28	6.67	5.43	4.54	5.54	7.15	5.74
Bent Aisha	3.58	3.72	5.56	4.29	3.72	3.71	5.80	4.41	3.45	3.58	5.29	4.11	3.58	3.67	5.55	4.27
Samani	2.67	2.82	3.00	2.83	2.69	2.91	3.10	2.90	2.54	2.75	2.91	2.73	2.63	2.83	3.00	2.82
Sewy	2.27	2.50	3.47	2.75	2.33	2.47	3.55	2.78	2.22	2.37	3.31	2.63	2.27	2.45	3.44	2.72
Amry	3.47	5.00	5.86	4.78	3.56	5.29	6.17	5.01	3.31	4.80	5.50	4.54	3.45	5.03	5.80	4.77
Mean	3.11	3.75	4.67		3.20	3.87	4.87		3.01	3.73	4.42		3.11	3.74	4.65	

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تأثير الصفات المورفولوجية للأغاريض على نسبة خف الثمار لثمانية أصناف نخيل بلح في أسيوط

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الملخص

أجريت هذه الدراسة خلال أعوام ٢٠١١، ٢٠١٢، ٢٠١٣ على ثمانية أصناف لنخيل البلح هي الزغلول – الحيانى – الحلاوى- العريبي – بنت عيشة – السمانى- السيوى والعمرى والنامية في المزرعة البحثية بكلية الزراعة جامعة أسيوط . وكانت أهداف الدراسة كالتالي :

- ١- مقارنة الصفات المورفولوجية لأغاريض ثمانية أصناف لنخيل البلح.
- ٢- دراسة العلاقة بين مستوى خروج الأغاريض وصفاتها المورفولوجية.
- ٣- تحديد نسبة خف الثمار للثمانية أصناف.

وقد أوضحت النتائج:

- اختلفت الصفات المورفولوجية للأغاريض والشماريخ تبعا لاختلاف الأصناف ومستوى خروج الأغاريض.
- اتجهت جميع الصفات المدروسة نحو الزيادة تبعا لمستوى خروج الأغاريض من المستوى الأدنى إلى المستوى الأعلى.
- اختلفت نسبة الخف باختلاف الأصناف ومستوى خروج الأغاريض .
- أظهرت الدراسة أنه بتقصير ١ سم من الشماريخ يقلل المحصول الأولي بحوالي (٣,١١ ، ٤,٦٤ ، ٣,٧٤)% كمتوسط لأغاريض المستوى الأعلى والأوسط والأدنى على التوالي تبعاً للأصناف موضع الدراسة.

تعتبر هذه الدراسة هامة من الناحية الاقتصادية والبستانية. حيث أنها توضح أهمية خف الثمار علي أساس صفات الأغاريض والشماريخ للحصول علي محصول عال ذو صفات ثمرية جيدة.