

SEASONAL FLUCTUATION OF PHYSICAL AND CHEMICAL CHARACTERISTICS OF PINNAE OF SOME DATE PALM CULTIVARS

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ABSTRACT

This investigation was conducted in order to study the fluctuation in the physical and chemical characteristics of pinnae of some Egyptian date cultivars. The obtained results indicated that the average pinnae dry and fresh weights and other physical characters varied from one cultivar to another and throughout the growing season. Moreover, sugars, tannins and mineral contents, also, followed the same trend. In some minerals, the data indicated that no definite trend was observed.

INTRODUCTION

Date palm (*Phoenix dactylifera* L.) has been an important crop in the regions of Middle Eastern countries, and has formed the basis of survival for many ancient nomads. In Egypt, the total number of fruiting female palms is about 7.951 millions which produce 741,000 tons of dates in 1997 (Statistics, 1998). Pinnae analysis is being widely used to determine the nutritional status of fruit trees (Leece and Cradock, 1971). Also, the nutritional value of pinnae makes them valuable to use for feeding livestock and animal or mixed with other foragecrops (Nour and Tag El-Din, 1993). The objective of this study is to evaluate the physical and chemical characteristics of pinnae of some important Egyptian cultivars (Zaghloul, Samany, Bent Aisha and Halawy) for their contents of pinnae dry and fresh weight, sugars, tannins and minerals content during the period of fruit development and ripening.

MATERIALS AND METHODS

The present investigation was conducted during two successive seasons of 1997 and 1998 in El-Bosiley Horticultural Experimental Station, Behera Governorate, Egypt on four date palm cultivars namely; Zaghloul, Samany (fruits consumed at Khalal stage), Bent Aisha and Halawy (fruits consumed at Rutab stage). The palms of the four cultivars were about 36-years-old and planted at 10 meters apart. Five palms of each cultivar, as uniform as possible, were selected for this study. All samples of pinnae were picked at two-week intervals from June, 1st to October, 15th; from leaves located just over the fruiting zone (less than one year old). Pinnae samples were obtained by removing to median pinnae (five from each side of mid-point of laminar-pinnae-bearing portion of the rachis) from three consecutive leaves around the axis, making a total of 30 pinnae per sample for each replicate. Samples were washed thoroughly with tap and distilled water, oven-dried at 70°C to a constant weight. Total sugars were determined according to Malik and Singh (1980), while tannins were estimated according to A.O.A.C. (1980). Nitrogen and phosphorus were determined colorimetrically according to Evenhuis (1976) and Murphy and Rily (1962), respectively. Potassium was determined by Flame Photometer, calcium was determined by versenate method (Cheng and Bray, 1951), while iron and zinc were determined by Perkin Elmer Atomic Absorption Spectrophotometer. The experiment was randomized split plot design and the obtained data were statistically analyzed according to Snedecor and Cochran (1972).

It is worth mentioning that the data in Tables (1 and 2) represent the values of three dates; June, 15th (Hababouk), July, 15th (Kimri) and October, 15th (Khalal).

RESULTS AND DISCUSSION

Physical characteristics:

The data of pinnae physical characteristics occurring during the development of fruits of Zaghloul, Samany, Bent Aisha and Halawy cultivars are presented in Table (1). The average fresh and dry weight of the pinnae ranged from 2.67 to 6.52 gm and 1.15 to 2.98 gm, respectively. It was also found that pinnae fresh and dry weight generally reached the highest value in October, 15th (Khalal stage) in 1997 and 1998 seasons.

However, no constant trend was observed through the growing seasons. The previous results are in accordance with those reported by Abdalla *et al.* (1998).

Chemical characteristics:

The data concerning pinnae chemical contents of the studied cultivars, as well as the fluctuations of their values during fruit growth and development are listed in Table (1). The average pinnae sugars and tannins content during the two growing seasons ranged from 1.95 to 4.96% and 0.42 to 2.53%, respectively. These values of pinnae sugars content generally showed a significant decrease on July, 15th then followed by a pronounced increase at the end of growing seasons. It could be mentioned that the decrease of total sugars in the pinnae may be attributed to sugar accumulation in fruits (Aldrich and Young, 1941). Regarding the concentration of pinnae tannins decreased at the end of season, whereas the other pinnae samples did not show a constant trend. The obtained results are in accordance with those reported by Attala and Warrag (1999).

Table (1): Physical and chemical characteristics in the pinnae of the studied date palm cultivars in 1997 and 1998 seasons.

Cultivars	Sampling date	Fresh weight (gm)		Dry weight (gm)		Sugars (%)		Tannins (%)	
		97	98	97	98	97	98	97	98
Zaghloul	June, 15	3.15	2.67	1.39	1.15	3.04	3.76	2.53	1.25
	July, 15	3.30	2.77	1.22	1.29	2.49	2.78	0.80	1.32
	Oct., 15	3.91	3.00	1.74	1.41	3.95	4.34	0.42	0.62
Samany	June, 15	5.77	4.56	2.30	2.44	2.79	2.35	1.91	1.33
	July, 15	5.45	5.45	2.39	2.25	2.25	2.97	1.44	1.61
	Oct., 15	6.52	5.99	2.93	2.98	4.92	4.93	0.58	0.58
Bent-Aisha	June, 15	3.09	2.79	1.47	1.71	2.56	3.92	1.89	1.14
	July, 15	3.79	3.04	1.46	1.37	1.95	2.91	1.83	1.67
	Oct., 15	4.55	3.00	2.16	1.50	3.87	4.96	0.57	0.88
Halawy	June, 15	4.29	3.67	1.72	2.13	2.44	3.34	1.52	0.96
	July, 15	4.11	4.25	1.81	2.08	2.33	2.44	1.36	1.22
	Oct., 15	4.15	4.25	2.45	2.16	4.26	3.79	0.55	0.54
L.S.D _{0.05}		0.84	0.76	0.38	0.37	0.38	0.30	0.16	0.16

Pinnae mineral content:

Mineral composition of pinnae is presented in Table (2). The pinnae nitrogen and calcium ranged from 0.97-3.80% and 0.61-0.94%, respectively. The present values of nitrogen showed a significant increase with fruit growth stage advanced, while pinnae calcium generally showed a significant increase in October as compared with that of June in the season of study. This increase of nitrogen percentage may possibly be due to more growth and leaf maturity thus accumulating more protein (Al-Kahtani *et al.*, 1986). Pinnae phosphorus and potassium contents ranged from 0.40-0.43% and 0.42-0.84%, respectively, and decreased significantly with growing seasons. With respect to the micronutrients, pinnae analysis showed different trends for the uptake of iron and zinc at various growth stages. The following ranges of Fe and Zn were 93-232 ppm and 24-60 ppm, respectively. All the reported micronutrients showed no definite trend for the four studied cultivars and during the two growing seasons (Table 2). These results were partially in agreement with those reported by Ibrahim and Sinbel (1989), Attalla *et al.* (1994), El-Kassas *et al.* (1995) and Abdalla *et al.* (1998).

It could be concluded that the pinnae are rich in some minerals, sugars and tannins. Therefore, they can be used for feeding livestock or mixed with dates, pits and other forages or fodder crops.

Table (2): Mineral composition (on dry weight) in the pinnae of the studied date palm cultivars in 1997 and 1998 seasons.

Cultivars	Sampling date	Nitrogen		Phosphorus		Potassium		Calcium		Iron		Zinc			
		%										ppm			
		97	98	97	98	97	98	97	98	97	98	97	98		
Zaghloul	June,15	1.08	1.82	0.37	0.33	0.80	0.80	0.72	0.68	139	197	49	48		
	July,15	2.24	2.94	0.26	0.25	0.75	0.68	0.69	0.61	120	191	40	43		
	Oct.,15	3.80	3.58	0.23	0.14	0.60	0.84	0.78	0.78	93	103	54	53		
Samany	June,15	0.97	1.39	0.39	0.28	0.60	0.71	0.83	0.68	145	152	38	44		
	July,15	2.68	2.91	0.34	0.24	0.65	0.44	0.67	0.74	139	157	44	35		
	Oct.,15	3.57	3.20	0.23	0.16	0.45	0.48	0.81	0.82	122	108	48	47		
Bent Aisha	June,15	1.19	1.22	0.42	0.28	0.81	0.63	0.68	0.62	165	93	24	28		
	July,15	2.68	2.61	0.32	0.24	0.58	0.61	0.80	0.86	232	215	42	38		
	Oct.,15	3.13	3.20	0.21	0.11	0.52	0.42	0.86	0.86	98	104	51	52		
Halawy	June,15	1.79	1.96	0.43	0.30	0.80	0.74	0.64	0.91	154	141	29	29		
	July,15	3.06	2.46	0.31	0.27	0.52	0.59	0.76	0.89	219	184	59	60		
	Oct.,15	3.80	3.50	0.22	0.17	0.63	0.46	0.94	0.92	106	106	45	46		
L.S.D _{0.05}		N.S	0.60	0.04	0.03	0.10	0.16	0.08	0.09	26	17	7	7		

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