Pak. J. Agri. Sci.
25(1)45, 1988.

CHEMICAL COMPOSITION OF FRUIT FROM DIFFERENT WHORLS OF DATE PALM (*Phoenix dactylifera* L.)

*Muhammad Ibrahim Chaudhary and **Safdar Ali
Department of Horticulture, U. A. Faisalabad

Two cultivares of date palm (*Phoenix dactylifera* L.) i.e. Hillawi and Khadrawi were studied at the khalal, rutab stages and late 'rutub' of maturity for their moisture contents, vit. C and sugars contents Moisture vit. C and sugar percentage were non-significantly different in fruits from either of the whorl of a variety. A higher vit. C (8.76 gm/100g) and total sugar content (32.98%) were noted in Hillawi until rutab stage. In late rutab stage total sugar contents in both cultivars were same (53.79 and 53.41%), while vit. C concentration was higher in Hillawi (4.81 mg/100 g) than in Khadrawi (1.95 mg/100g).

INTRODUCTION

The information on the chemical composition of the important date varieties grown in different parts of the world is not scarce. However, the quality of of date fruit from differents spathes which emerge in whorls at far distant interval is seldom taken into consideration. The present studies are therefore, deemed poineer to explore if the quality of dates from different whorles is variable. Ashmawi *et al.* (1962) analysed Zagloul dates on dry weight basis. At khalal stage it contained 84.31% water, 45.4% reducing sugars and 10.57% sucrose, at 'Rutab' stage, 59.96% water, 62.0% reducing sugars, and 13.29% sucrose. Girad (1962) studied the sugar contents in Deglet-Noor dates on dry weight basis and observed 35.86% non-reducing sugars 44.77% reducing sugars and 80.63% total sugars. Yousif *et al.* (1982) studied the nutritive value of four commercial Iraqi date evs. i.e. Hillawi, Sayer, Zaidi and Khadrawi. Sawaya *et al.* (1983ab) analysed sugars and vit. C contents of fifty five date varietie grown in Saudi Arabia at two different stages of maturity viz. 'Khalal' and 'Tamer'. The results showed that total sugars as well as reducing sugars were high in 'Tamer'-stage (70-80 and 29-85% on fresh weight basis), than Khalal-stage (60-80 and 8-81%), but sucrose contents were high at 'Khalal' stage (35-70%) than Tamer stage (11-43%). Vit. C at khalal stage were more (1.8-14 3 mg/100g) as compared to that in 'Tamer'-stage (1.1-6.1mg/100 g).

Meligi *et al.* (1983) compared Iraqi date palm cvs. Burhi, Hillawi and Sayer with local Egyptian cv. Shamani. Total sugars were the highet in Hillawi fruit (30-30% on fresh weiht basis), followed by Sayer, Burhi (25-27%) and Shamani (21-23%). Reducing sugars highest in Hillawi (21%) followed by Shamani (18-19%), Sayer (11-14%) and Burhi (12%).

MATERIALS AND METHODS

These studies were conducted during 1984-85. Two important date varieties i. e. Hillawi and Khadrawi were selected for this study. The age of the trees was 10-15 years grown in the main experimental orchard of University of Agiculture, Faisalabad. Fruit, from spathes emerged in different whorls at far distant time (30-40 days) was taken for the analysis. Moisture contents, vit. C, reducing sugars and non-reducing sugars were analysed by using AOAC procedures at 'Khalal' 'Rutab' and 'Late Rutab' stages of ripening.

RESULTS AND DISCUSSION

1) *Moisture Contents*

The data on the moisture contents of fruit are reported in Table 1.

Table 1. *Moisture percentage of fruit in different whorls*

Dates of sampling	Hillawi			Khadrawi		
	W_1	W_2	W_3	W_1	W_2	W_3
D_1 (27.6.85) Khalal	75.79	70.60	76.42	72.39	69 92	70.76
D_2 (18.7.85) Rutab	57.92	57.66	58.24	58.41	57.91	55.49
D_3 (27.7.85) Late Rutab	36.37	36.57	36.50	35.85	35.73	35.77
V_2 54.59a	V_1 56.67b					
D_3 36.13a	D_2 57 61b		D_1 73.30c			

The statistical analysis of the data revealed that moisture percentage was higher in Khalal stage and decreased rapidly afterwards until Rutab and Late

Rutab-stages. Moisture contents were significant by higher in Hillawi than in Khadrawi. At Khalal-stage the moisture contents of Hillawi and Khadrawi ranged from 70.50 to 76 42% and 69.92 to 72.39%, at Rutab-stage, 57.66-58.24% and 55.49-58.41%, whereas at Late Rutab stage, the moisture contents ranged from 36.37-36.57% and 35.77-35.85% respectively. Moisture contents of fruit from either of the whorl was statistically identical indicating no significance on any stage. The earlier findings were similarly reported by Ashmawi *et al.* (1962) and Sawaya *et al.* (1983). Their findings were in complete agreement with the results of present studies.

2) *Vit. C Contents*

- The data regarding vit. C contents of two date varieties at different times during development are presented in Table 2.

Table 2. *Vitamin C concentration in Date Fruit from different whorls*

Dates of sampling	Hillawi			Khadrawi		
	W_1	W_2	W_3	W_1	W_2	W_3
D_1 (27.6 85) Khalal	12.38	12.64	14.13	11.41	11.3	13.2
D_2 (18.7.85) Rutab	9.04	8.93	8.33	7.78	7.78	7.07
D_3 (27.7.85) Late Rutab	5.53	4 53	4.37	2.01	2.81	1 06

V_2 7.25a	V_1 8.82b	
D_3 3.25a	D_2 8.166b	D_1 12.58c

The statistical analysis of the data revealed that vit. C contents were higher at Khalal stage and later dropped to the lower levels in Rutab and late Rutab' stage. Vitamin C contents were significantly higher in Hillawi than Khadrawi. However no significant difference in vit. C contents was noted in fruits from spathes emerged at different times in the whorls. Vit. C contents were higher at 'Khalal' stage which decreased at Tamer stage. Similar observations were reported by Yousif *et al.* (1982), Sawaya *et al.* (1983 ab). The results of their studies are quite similar to our findings.

3) *Sugar analysis*

The results of total sugars, reducing sugars and non-reducing sugars are presented in Table 3. The statistical analysis of the data revealed that the total sugars were significantly lower at Khalal stage and increased gradually in 'Rutab' and late 'Rutab' stages. Total sugars were significantly higher in Hillawi than Khadrawi. Total sugar of the fresh sample of Hillawi and Khadrawi dates ranged from 17.74 to 18.8% and 15.95-16.47% at Khalal stage; 32.21-33.49% and 31.28-32.37% at 'Rutab' stage; 53.04-53.34% and 53.06-53.37% at late Rutab -stage respectively. However, no significant difference in total sugars were noted in the fruits from spathes emerged in different whorls at different times. Similarly the results for total sugars on fresh weight basis were reported by Sawaya *et al.* (1983b), Meligi *et al.* (1983) and on dry weight basis by Sawaya (1983a). Their result, both on fresh and dry weight basis were higher to our findings, which may be attributed to the milder and wet climatic conditions during fruit ripening under which this experiment was conducted.

4) *Reducing Sugars*

The reducing sugars were significantly lower at 'Khalal' stage which increased gradually in 'Rutab' and late 'Rutab' stages. The analysis also revealed significant interaction between whorls and dates of sampling, which indicated differences in levels of reducing sugars in fruits from different whorls at various times of sampling. However, no significant differences in reducing sugars were noted in fruits from whorls emerged at different time and also non-signiference difference among both the varieties. At 'Khalal' stage reducing sugars ranged from 5.75 to 6.28% and 5.77-5.78% at Rutab-stage 11.51-11.76% and 10.49-12.03% at late Rutab stage 19.24-19.93% and 19.65-20.07% respectively, in Hillawi and Khudrawi cvs. The results on both fresh and dry weight basis reported by Girad (1963), Ashmawi *et al.* (1962), Meligi *et al.* (1983) and Sawaya *et al.* (1983) were higher to our findings. The differeuce may be attributed to the varieties and climatic conditions under which the experiments were conducted.

5) *Non-reducing Sugars*

The statistical analysis of the data revealed that non-reducing suars were lowar significantly at Khala-stage add theu increased gradually in Rutab and late Rutab stages. The analysis also indicated that nou-reducing sugars were

higher in Hillawi than Khadrawi. However, no significant difference in non. reduciug sugars were noted in fruits from whorls which emerged at different time. Non-reducing sugar contents of Hillawi and Khadrawi dates at Khalal stage ranged from 12.16-12.72% and 10.17 10-74% at Rutab-stage 20.81 -21.98% and 13.69-29% at late Rutab-stage 33.27-33.0 and 33.41-33.95% respectively. Non-reducing sugars ou fresh whight basis were higher at Khalal and then decreased in Rutab aud Tamer stages reported by Sawaya *et al.* 1983 b. Similarly ou dry weight basis non.reducing sugars at Khalal stage 10.57-40% at Rutab-stage 12.39-62.0% as reported by Ashmawi *et al·* (1962) and Sawaya *et al.* 1983 b. The sugar contents on freshweight basis were higher in their findings and almost similar on dry weight basis to our findings

Table 3 : *Percentage of total Sugars, reducing sugars and non-reductng sugars in different whorls (fresh weight basis)*

Dates of samplieg		Hillawi			Khadrawi		
		W_1	W_2	W_3	W_1	W_2	W_3
D_1 (27.6.85) Khalal	T.S.	18.75	28.81	17.90	16.47	16.24	16.95
	R.T.	6.03	6.58	6.75	5.73	5.76	5.78
	N.R.S.	12.72	12.53	12.15	10,64	10.46	10.17
D_2 (18.7.85) Rutab	T.S.	33.37	33.49	32.21	31.53	31.28	32.37
	R.S.	11.76	19.51	11.40	11.84	10.49	11.03
	N.R.S.	21.61	21.98	20.98	16.69	20.79	20 34
D_3 (27.7.85) Late	T.S.	53.04	53.20	53.34	53.06	53.74	53.58
Rutab	R.S.	19.74	19.93	19.93	19.65	19.79	20.07
	N.R.S.	33.80	33.27	33.41	33.41	33.95	33.51

T. S. = Total sugars, R. T. (Reducing sugar) N. R. S. (Non-reducing sugars)

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