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Maturity and marketability of new cultivars of Jujube (*Ziziphus jujube* Mill) fruit grown under south Tahrir region

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ABSTRACT

In this study an attempt was carried out to collect information about the fruits of new cultivars (Lee, Lang, Balahy, and Seedy) and to determine fruit quality and marketability. The fruits were obtained from Southern Tahrir region, Behera governorate during two successive seasons 2005-2006. Fruits were picked at maturity stage and put at ambient temperature (18-20°C) to prolong the marketing period.

Considering all the physical and chemical characters matching with subjective parameters, results revealed that fruits of all cultivars were found commercially mature after 90-100 days of fruit set when the fruit color is converted to light greenish yellow to greenish yellow color.

Among the studied cultivars, Lee produced the greatest fruit weight, flesh thickness, texture%, TSS % and also the highest vitamin C content. The fruit weight of the other cultivars varied from 9.60 to 85.09g/5 fruits.

Mature fruits in perforated polyethylene bags were held at 18-20°C for 15 days turned to ripe. The lowest value of fruit weight loss and ripe % and the highest texture % were noticed for Lee cv. Ripe fruits can be held for another 15 days without significant quality deterioration or decay.

INTRODUCTION

Jujube, (Chinese date or ber), is a deciduous fruit of tropical and subtropical origin, the jujube trees can withstand a wide range of temperatures and tolerant marginal land, the fruits are a drupe (Reddy *et al.*, 1998).

Ber is one of the most nutritious fruits with medicinal value. It is one of the richest sources of vitamin C, next to guava but better than citrus fruits and apple (Islam *et al.*, 2015, and Bal and Uppal, 1992).

Aulakh *et al.* (2005) studied the performance of 8 jujube (*Zizyphus mauritiana Lamk*) cultivars, they found fruit set of all cultivars was observed during the second week of October.

Lal and Dhaka (2003) found that the greatest fruit weight and fruit size were recorded for Umran, Sanaur No. 2 produced fruits with higher total soluble solids and vitamin C content.

Islam (2007) observed what the fruits after 4 to 5 days of storage life for different cultivars of ber grown in Rajshahi region. In fact, the short storage life of BARI Kul-2 was considered in this study due its rapid browning tendency of fruit skin, i.e. pericarp browning within 2 to 5 days of storage at ambient condition. The pericarp of ber was found to become brown and shrivel with storage time. The skin of the fruits got blemish through browning, shriveling and undesirable.

Fruits harvested at the mature green stage were stored at 10°C or room temperature (27-30°C) for up to 22 and 6 days, respectively. Data concerning fruit TSS, ascorbic acid and total carotenoid content, on the percentage of titratable acidity, and on fruit physical indices such as colour, flavour, taste and texture throughout the storage period were tabulated. The overall evaluation

indicated that fruits held at room temperature for 6 days and at 10° for 22 days were in good and very good condition, respectively. (Abbas *et al.*, 1990).

The storage life of ber was found to be short likewise too many other tropical fruits (Abbas, 1997), depending on cultivar and storage conditions, it may vary from 4 to 15 days (Pareek, 2001)

The aim of this study was determining the maturity stage of four cultivars of Jujube fruit, studying fruit characters and evaluating fruit quality during shelf-life.

MATERIALS AND METHODS

The experiment was conducted at Southern Tahrir region, Behera governorate during two successive seasons 2005-2006. Fruits were picked at maturity stage and put at ambient temperature (18-20°C) to improve characteristics of the fruits through the marketing period.

Three plants of similar age from each cultivar were selected for this study, fruits were tagged at fruit setting stage and harvested at 90, 110, 130 days after fruit set. 50 Uniform mature fruits were collected from each tree to determine the physical and chemical characteristics.

The physicochemical characters such as fruit weight, shape index, flesh thickness, TSS (%), acidity (%), TSS-acid ratio and pH% were determined according to A.O.A.C. (1991), texture was estimated by measuring resistance of fruit flesh (at a middle position) for a penetrating needle of a texture analyzer instrument (L fra texture analyzer) for a fixed distance of 2 millimeters inside fruit flesh and firmness is expressed in gram unit. Color fruit measurements were obtained using Hunter colormeter (DP9000), (a, value: green, red) (b, value: blue, yellow), (L, value:lightness), McGure (1992).

Storage life: Fruits were packaged with polyethylene, the shelf- life of fruits , physiological weight loss (%), ripening %, texture %, color (a, b, L., values), TSS% and nonmarketability parameters like decay at ambient condition were determined.

Statistical analysis:

The recorded data for the studied parameters of the fruits were analyzed statistically using the L.S.D. value at 5% level (Snedcor and Cochran (1990).

RESULTS AND DISCUSSION

Fruit character at maturity stage

Fruits of all cultivars were found commercially mature after 90-100 days of fruit set when the fruits turned into light greenish yellow to greenish yellow color.

The physical fruits characteristics are presented in Tables (1 & 2), significant differences were observed in the study among the cultivars in most of the characteristics.

The fruits are a drupe, fruit shape varied from round to elongate and at size of plum. The flesh was white, crispy, juicy, acid, or sub acid to sweet. Fully ripe fruits were wrinkled, the flesh buff-colored. The fruit contained one central brown stone.

Data presented showed that the averages of fruit weight (125.7, 108.5 g /5 fruits), flesh thickness (1.7, 1.8), texture % (160, 180), peel color "a values" (1.2, 0.11), TSS% (20.8, 20.9), vitamin C (591.7, 588.3), pH% (5.0, 5.1) of Lee cultivars were higher than other cultivars in both seasons, respectively. The longest fruit (1.29, 1.27 cm) was observed in Balahy.

Among the varieties the seed weight of the fruit was maximum (7.2, 7.1g) in Lee cultivars, during the

two seasons. These results were in agreement with those of Obeed *et al.* (2008), Ezz *et al.*, (2011).

The data revealed the significant difference among these cultivars in respect of total soluble solids. The highest total soluble solids were found in Lee (20.8-20.9 %) which was followed by Lang and Balahy (20.13-20.73, 20.47%). Lowest total soluble solids were recorded (19.5-19.0%) in Seedy cultivar.

Concerning total acidity, it was noticed that there were no significant differences between cultivars in the first season, while in the second year; seedy fruits contained the lowest values.

TSS/ acidity ratio of Balahy fruit was the highest in comparison with the rest of varieties (100.65) in the first season, while in the second year; Seedy cultivar had the highest ratio (146.6).

The pH value varied from 4.86 to 5.9 during first season and from 4.82 to 5.10 during the second in different varieties. Among the cultivars, the acid content was maximum in Lee and Lang which was determined as citric acid followed by Balahy and Seedy. Such results are in accordance with those of Ibrahim *et al.* (2009).

Ascorbic acid content was in the range of 463.3-591.7mg/100g with the lowest and highest value in seedy and Lee, respectively, these results are in harmony with those findings of Ezz *et al.* (2011) who reported that the average of ascorbic acid in Tofahy were higher than in Balahy variety by 16.16 % and 17.62% , respectively.

Shelf life of mature fruits

Mature fruits in perforated polyethylene bags held at 18-20 °C for 15 days turned to ripe, the lowest values of weight loss, ripe % and the highest texture % were noticed for fruits of Lee cv.

Table (1): Fruit characteristics at maturity stage in the first season 2005

Cultivar	Weight of 5 fruits g.	Shape index	Seed weight g.	Flesh thickness cm.	Peel color L	Peel color a	Peel color b	Texture%	TSS%	Acidity%	TSS/acidity ratio	pH	Vitamin C mg/100gm
Lee	125.7 ^A	0.95 ^D	7.20 ^A	1.73 ^A	40.1 ^A	1.2 ^A	40.0 ^A	160 ^A	20.80 ^A	0.23 ^A	90.4 ^C	5.09 ^A	591.7 ^A
Lang	76.54 ^C	1.23 ^B	5.03 ^C	1.23 ^B	38.8 ^B	-2.0 ^B	36.8 ^C	144 ^B	20.13 ^{AB}	0.26 ^A	77.4 ^D	4.96 ^A	549.7 ^{AB}
Balahy	85.09 ^B	1.29 ^A	6.56 ^B	1.23 ^B	38.4 ^B	-2.2 ^C	39.1 ^B	135 ^C	20.13 ^{AB}	0.20 ^A	100.65 ^A	4.77 ^{AB}	543.3 ^B
Seedy	9.00 ^D	1.07 ^C	1.90 ^D	0.43 ^C	37.0 ^C	-5.8 ^D	32.2 ^D	110 ^C	19.53 ^B	0.20 ^A	97.65 ^B	4.86 ^{AB}	463.3 ^C

Mean separation by L.S.D at 0.05

Table (2): Fruit characteristics at maturity stage in the second season, 2006

Cultivar	Weight of 5 fruits g.	Shape index	Seed weight g.	Flesh thickness cm.	Peel color L	Peel color a	Peel color b	Texture%	TSS%	Acidity%	TSS/acidity ratio	pH	Vitamin C mg/100gm
Lee	108.5 ^A	0.95 ^D	7.16 ^A	1.80 ^A	44.2 ^B	0.11 ^A	32.8 ^C	180 ^A	20.9 ^A	0.26 ^{AB}	80.3 ^C	5.10 ^A	588.3 ^A
Lang	75.70 ^B	1.20 ^B	4.96 ^C	1.20 ^C	43.1 ^C	-3.4 ^D	34.4 ^B	155 ^B	20.73 ^B	0.30 ^A	69.0 ^D	4.99 ^A	545.0 ^B
Balahy	84.17 ^B	1.27 ^A	6.33 ^B	1.26 ^B	50.1 ^A	-1.7 ^C	36.0 ^A	150 ^C	20.47 ^C	0.23 ^B	88.6 ^B	4.88 ^{AB}	546.7 ^B
Seedy	11.07 ^C	1.05 ^C	1.80 ^D	0.50 ^D	40.4 ^D	-1.4 ^B	30.9 ^D	145 ^D	19.07 ^D	0.13 ^C	146.6 ^A	4.82 ^{AB}	505.7 ^C

Mean separation by L.S.D at 0.05

After 5, 10 and 15 days of storage at room temperature 18-20°C, the data of the four cultivars showed that shelf life of cultivars was ranged from 15 days to mature fruits and another 15 days to ripe fruits at room temperature 18-20°C during two seasons (Table 3). The weight loss percentage increased significantly during shelf life and the highest weight loss was observed in Seedy cultivar after 15 days (13.3, 12, 7) during the two seasons.

Ripe% of mature fruits

Data presented in Table (4) showed that the percentage of ripe fruits was increased significantly at ambient temperature, fruits of Lee cultivar was recorded the lowest percentage. Such result in accordance with those of Adel *et al.* (1982). They concluded that after 15 days at 20°C, 75% of the fruits were more than 75% brown, 15% were 50- 75% brown, 7% were 25-50% brown, and 3% were less than 25% brown, thus, fruits picked whitish-green can continue their maturation and ripening after harvest.

Texture % of mature fruits

The present results in Table (5) showed a significant decrease in texture percentage for fruits all cultivars during two seasons, the highest texture of fruit was recorded for fruits Lee; the lowest texture was found in fruits of seedy cultivar in both seasons.

Color of peel fruit

It is clear from Table (6) that there was significant increase in "a values" at 15 days from shelf-life during the two seasons of the study, the increase in "a values" due to loss of green color, while the decrease in "b values" reflects brown color development with ripening. These results were in agreement with those reported by Abbas *et al.* (1990).

TSS% of mature fruit

Data in Table (7) indicated that TSS content increased significantly during shelf-life, it increased from

Table (3): Weight loss% of mature fruit at shelf-life at 18-20°C during two seasons 2005&2006

	Cultivars	Days	5 days	10 days	15 days	Means
2005	Lee		5.06 ^F	9.06 ^D	10.87 ^C	8.33 ^C
	Lang		6.50 ^E	9.26 ^D	11.23 ^C	9.00 ^B
	Balahy		5.50 ^F	9.53 ^D	12.20 ^B	9.07 ^B
	Seedy		6.66 ^E	10.60 ^C	13.33 ^A	10.20 ^A
	Means		5.93 ^C	9.61 ^B	11.91 ^A	
2006	Lee		5.267 ^E	8.333 ^C	10.93 ^B	8.178 ^C
	Lang		5.967 ^{DE}	9.033 ^C	12.50 ^A	9.167 ^B
	Balahy		5.367 ^E	9.067 ^C	12.40 ^A	8.944 ^B
	Seedy		6.567 ^D	10.73 ^B	12.73 ^A	10.01 ^A
	Means		5.792 ^C	9.292 ^B	12.14 ^A	

Mean separation by L.S.D at 0.05

Table (4): %Ripe of mature fruit at shelf-life at 18-20°C during two seasons 2005&2006

	Cultivars	Days	5 days	10 days	15 days	Means
2005	Lee		13.33 ^H	41.00 ^F	71.67 ^{CD}	42.00 ^C
	Lang		18.67 ^{GH}	64.33 ^D	77.33 ^{BC}	53.44 ^B
	Balahy		22.33 ^G	52.67 ^E	75.00 ^{BC}	50.00 ^B
	Seedy		50.00 ^E	79.33 ^B	91.33 ^A	73.56 ^A
	Means		26.08 ^C	59.33 ^B	78.83 ^A	
2006	Lee		7.233 ^F	50.00 ^C	79.00 ^A	45.41 ^C
	Lang		15.00 ^{EF}	70.33 ^B	83.00 ^A	56.11 ^B
	Balahy		16.67 ^E	37.33 ^D	82.67 ^A	45.56 ^C
	Seedy		36.33 ^D	66.00 ^B	83.33 ^A	61.89 ^A
	Means		18.81 ^C	55.92 ^B	82.00 ^A	

Mean separation by L.S.D at 0.05

Table (5): Texture % of mature fruit at shelf-life at 18-20°C during two seasons 2005&2006

	Cultivars	Days			Means
		5 days	10 days	15 days	
2005	Lee	161.0 ^A	144.0 ^B	121.7 ^D	142.2 ^A
	Lang	140.0 ^B	121.0 ^D	97.00 ^E	119.3 ^B
	Balahy	131.7 ^C	122.3 ^D	86.67 ^F	113.6 ^C
	Seedy	130.0 ^C	98.00 ^E	82.67 ^F	103.6 ^D
	Means	140.7 ^A	121.3 ^B	97.00 ^C	
2006	Lee	158.3 ^A	145.0 ^B	130.3 ^C	144.5 ^A
	Lang	143.7 ^B	130.7 ^C	117.7 ^D	130.7 ^B
	Balahy	140.3 ^B	116.3 ^D	90.67 ^E	115.7 ^C
	Seedy	134.0 ^C	96.67 ^E	82.67 ^F	104.4 ^D
	Means	144 ^A	122.1 ^B	105.3 ^C	

Mean separation by L.S.D at 0.05

Table (6): Peel color (a, b, L values) of mature fruit at shelf-life at 18-20°C during two seasons

	Cultivars	a				b				L				
		Days	5 days	10 days	15 days	Means	5 days	10 days	15 days	Means	5 days	10 days	15 days	Means
2005	Lee	-0.90	3.4	8.3	3.6 ^A	41.6	37.8	28.2	35.9 ^A	34.4	30.1	21.6	28.7 ^B	
	Lang	-1.2	2.2	8.0	3.0 ^B	34.8	34.0	29.5	32.8 ^C	39.3	35.5	23.1	32.6 ^A	
	Balahy	-2.1	3.0	7.8	2.9 ^C	40.1	38.1	27.6	35.3 ^B	32.5	28.8	22.1	27.8 ^C	
	Seedy	-3.5	5.1	7.5	3.0 ^B	34.4	30.2	29.0	31.2 ^D	37.1	26.4	17.7	27.1 ^D	
	Means	-1.9 ^C	3.4 ^B	7.9 ^A		37.7 ^A	35.0 ^B	28.6 ^C		35.8 ^A	30.2 ^B	21.1 ^C		
2006	Lee	0.8	4.0	8.7	4.5 ^A	37.2	32.8	26.6	32.2 ^C	35.0	28.1	25.7	29.6 ^B	
	Lang	-3.4	4.4	7.9	3.0 ^C	37.4	35.1	29.2	33.9 ^B	38.4	36.0	22.0	32.1 ^A	
	Balahy	-2.3	3.6	6.9	2.7 ^D	40.0	38.0	30.1	36.0 ^A	31.5	29.2	24.1	28.3 ^C	
	Seedy	-1.8	4.7	7.8	3.6 ^B	36.6	30.1	23.9	30.2 ^D	38.0	26.1	16.6	26.9 ^D	
	Means	-6.7 ^C	4.2 ^B	7.8 ^A		37.8 ^A	34.0 ^B	27.5 ^C		35.7 ^A	29.9 ^B	22.1 ^C		

Mean separation by L.S.D at 0.05

Table (7): TSS %of mature fruit at shelf-life at 18-20°C during two seasons

	Cultivars	a				b				L				
		Days	5 days	10 days	15 days	Means	5 days	10 days	15 days	Means	5 days	10 days	15 days	Means
2005	Lee	19.67 ^{EF}	23.10 ^D	25.73 ^B	22.83 ^B	19.67 ^{EF}	23.10 ^D	25.73 ^B	22.83 ^B	19.67 ^{EF}	23.10 ^D	25.73 ^B	22.83 ^B	
	Lang	19.37 ^F	22.77 ^D	27.73 ^A	23.29 ^B	19.37 ^F	22.77 ^D	27.73 ^A	23.29 ^B	19.37 ^F	22.77 ^D	27.73 ^A	23.29 ^B	
	Balahy	22.00 ^D	24.33 ^C	28.10 ^A	24.81 ^A	22.00 ^D	24.33 ^C	28.10 ^A	24.81 ^A	22.00 ^D	24.33 ^C	28.10 ^A	24.81 ^A	
	Seedy	18.73 ^F	20.80 ^E	25.17 ^{BC}	21.57 ^C	18.73 ^F	20.80 ^E	25.17 ^{BC}	21.57 ^C	18.73 ^F	20.80 ^E	25.17 ^{BC}	21.57 ^C	
	Means	19.94 ^C	22.75 ^B	26.68 ^A		19.94 ^C	22.75 ^B	26.68 ^A		19.94 ^C	22.75 ^B	26.68 ^A		
2006	Lee	18.90 ^H	22.00 ^E	25.07 ^B	21.99 ^C	18.90 ^H	22.00 ^E	25.07 ^B	21.99 ^C	18.90 ^H	22.00 ^E	25.07 ^B	21.99 ^C	
	Lang	20.90 ^F	23.03 ^{DE}	25.20 ^B	23.04 ^B	20.90 ^F	23.03 ^{DE}	25.20 ^B	23.04 ^B	20.90 ^F	23.03 ^{DE}	25.20 ^B	23.04 ^B	
	Balahy	20.00 ^{FG}	24.33 ^{BC}	28.67 ^A	24.33 ^A	20.00 ^{FG}	24.33 ^{BC}	28.67 ^A	24.33 ^A	20.00 ^{FG}	24.33 ^{BC}	28.67 ^A	24.33 ^A	
	Seedy	18.33 ^H	19.00 ^{GH}	23.33 ^{CD}	20.22 ^D	18.33 ^H	19.00 ^{GH}	23.33 ^{CD}	20.22 ^D	18.33 ^H	19.00 ^{GH}	23.33 ^{CD}	20.22 ^D	
	Means	19.53 ^C	22.09 ^B	25.57 ^A		19.53 ^C	22.09 ^B	25.57 ^A		19.53 ^C	22.09 ^B	25.57 ^A		

Mean separation by L.S.D at 0.05

(19.9, 19.5%) to (26.6, 25.5%) at the end of shelf-life in both seasons, respectively.

Fruits of Balahy cv. contain the highest values (24.8, 23.3%), while the lowest values were recorded for fruits Seedy cv. (21.5, 20.2%). These results are in line with those of Abbas *et al.* (1990).

Ripe fruit at ambient temperature

Ripe fruits can be held for another 15 days without significant quality deterioration or decay.

Weight loss% of ripe fruits: It is evident from Table (8) that weight loss increased with advanced shelf-life, there were significant differences between cultivars, the lowest weight loss was observed in fruits Lee cv. (9.9, 8.8 %) during the two seasons of the study.

Texture% of ripe fruit

The data introduced in Table (9) showed that the percentage of texture were decreased gradually as the shelf-life advanced, the differences among all cultivars were significant, fruits Balahy cv. recorded the highest percentage of texture, while those of Seedy cv. had the lowest texture percentage during the two seasons, this may be due to the spongy nature of the flesh and its relatively low water content.

Peel color of ripe fruit

The rate of color development increases with temperature and it is optimum at 20°C, brown spots develop on the surface of fruits and increase in size until the entire skin becomes reddish brown. Data recorded in Table

Table (8): Weight loss % of ripe fruit at shelf-life during the two seasons 2005 & 2006

Cultivars	a				b				L				
	Days	5 days	10 days	15 days	Means	5 days	10 days	15 days	Means	5 days	10 days	15 days	Means
Lee	6.767 ^H	8.000 ^{FG}	15.07 ^C	9.944 ^D	6.767 ^H	8.000 ^{FG}	15.07 ^C	9.944 ^D	6.767 ^H	8.000 ^{FG}	15.07 ^C	9.944 ^D	
Lang	7.267 ^{GH}	8.467 ^F	16.67 ^B	10.80 ^C	7.267 ^{GH}	8.467 ^F	16.67 ^B	10.80 ^C	7.267 ^{GH}	8.467 ^F	16.67 ^B	10.80 ^C	
2005 Balahy	7.833 ^{FG}	10.10 ^E	17.33 ^B	11.76 ^B	7.833 ^{FG}	10.10 ^E	17.33 ^B	11.76 ^B	7.833 ^{FG}	10.10 ^E	17.33 ^B	11.76 ^B	
Seedy	8.300 ^F	14.17 ^D	20.03 ^A	14.17 ^A	8.300 ^F	14.17 ^D	20.03 ^A	14.17 ^A	8.300 ^F	14.17 ^D	20.03 ^A	14.17 ^A	
Means	7.542 ^C	10.18 ^B	17.27 ^A		7.542 ^C	10.18 ^B	17.27 ^A		7.542 ^C	10.18 ^B	17.27 ^A		
Lee	6.500 ^J	7.967 ^{GH}	11.93 ^D	8.800 ^D	6.500 ^J	7.967 ^{GH}	11.93 ^D	8.800 ^D	6.500 ^J	7.967 ^{GH}	11.93 ^D	8.800 ^D	
Lang	6.967 ^{IJ}	8.333 ^G	14.47 ^C	9.922 ^C	6.967 ^{IJ}	8.333 ^G	14.47 ^C	9.922 ^C	6.967 ^{IJ}	8.333 ^G	14.47 ^C	9.922 ^C	
2006 Balahy	7.133 ^{HIJ}	9.833 ^F	15.70 ^B	10.89 ^B	7.133 ^{HIJ}	9.833 ^F	15.70 ^B	10.89 ^B	7.133 ^{HIJ}	9.833 ^F	15.70 ^B	10.89 ^B	
Seedy	7.867 ^{GHI}	10.87 ^E	17.77 ^A	12.17 ^A	7.867 ^{GHI}	10.87 ^E	17.77 ^A	12.17 ^A	7.867 ^{GHI}	10.87 ^E	17.77 ^A	12.17 ^A	
Means	7.117 ^C	9.250 ^B	14.97 ^A		7.117 ^C	9.250 ^B	14.97 ^A		7.117 ^C	9.250 ^B	14.97 ^A		

Mean separation by L.S.D at 0.05

Table (9): Texture % of ripe fruit at shelf-life during the two seasons 2005 & 2006

Cultivars	a				b				L				
	Days	5 days	10 days	15 days	Means	5 days	10 days	15 days	Means	5 days	10 days	15 days	Means
Lee	112.0 ^B	85.00 ^D	67.67 ^F	88.22 ^B	112.0 ^B	85.00 ^D	67.67 ^F	88.22 ^B	112.0 ^B	85.00 ^D	67.67 ^F	88.22 ^B	
Lang	104.3 ^{BC}	86.00 ^D	70.33 ^{EF}	86.89 ^B	104.3 ^{BC}	86.00 ^D	70.33 ^{EF}	86.89 ^B	104.3 ^{BC}	86.00 ^D	70.33 ^{EF}	86.89 ^B	
2005 Balahy	120.7 ^A	99.67 ^C	66.67 ^F	95.67 ^A	120.7 ^A	99.67 ^C	66.67 ^F	95.67 ^A	120.7 ^A	99.67 ^C	66.67 ^F	95.67 ^A	
Seedy	107.3 ^{BC}	78.33 ^{DE}	52.00 ^G	79.22 ^C	107.3 ^{BC}	78.33 ^{DE}	52.00 ^G	79.22 ^C	107.3 ^{BC}	78.33 ^{DE}	52.00 ^G	79.22 ^C	
Means	111.1 ^A	87.25 ^B	64.17 ^C		111.1 ^A	87.25 ^B	64.17 ^C		111.1 ^A	87.25 ^B	64.17 ^C		
Lee	130.0 ^A	94.00 ^C	75.00 ^E	99.67 ^A	130.0 ^A	94.00 ^C	75.00 ^E	99.67 ^A	130.0 ^A	94.00 ^C	75.00 ^E	99.67 ^A	
Lang	115.7 ^B	94.00 ^C	64.67 ^F	91.44 ^B	115.7 ^B	94.00 ^C	64.67 ^F	91.44 ^B	115.7 ^B	94.00 ^C	64.67 ^F	91.44 ^B	
2006 Balahy	125.7 ^A	98.33 ^C	81.67 ^D	101.9 ^A	125.7 ^A	98.33 ^C	81.67 ^D	101.9 ^A	125.7 ^A	98.33 ^C	81.67 ^D	101.9 ^A	
Seedy	109.7 ^B	80.00 ^{DE}	60.67 ^F	83.44 ^C	109.7 ^B	80.00 ^{DE}	60.67 ^F	83.44 ^C	109.7 ^B	80.00 ^{DE}	60.67 ^F	83.44 ^C	
Means	120.3 ^A	91.58 ^B	70.50 ^C		120.3 ^A	91.58 ^B	70.50 ^C		120.3 ^A	91.58 ^B	70.50 ^C		

Mean separation by L.S.D at 0.05

(10) showed that “a, values” showed significant increases till the end of shelf-life, the highest value (22.7) on fruits of Balahy in the first season and (22.5) on fruits of seedy cv. in the second one “b, values” showed significant decreases till the end of shelf-life, the highest value (21.1) on Lee in the first season and (15.6) on Lang cv. in the second one. “L, values” showed significant decreases till the end of shelf-life, the highest values (13.7, 15.2) on Lee and the lowest values (11.8, 11.5) on seedy cv. in the two seasons. These results are in agreement with those of Adel *et al.*, (1982) and Islam (2007).

TSS% of ripe fruit

The data presented in Table (11) showed a significant increase in TSS% of ripe fruits at shelf-life during the two seasons, seedy cv. had highest content of TSS% during the two seasons. These results were in agreement with Obeed *et al.* (2008). They reported that the fruit

of Um-suleam cv. had high content of juice acidity percentage compared with the other cultivars. Also, it had the highest TSS percentage.

CONCLUSION

Considering physical and chemical characters, it might be concluded that jujube fruit can achieve horticultural maturation within 110 to 120 days after fruit set. Lee, Lang and Balahy have good characteristics under south Tahrir region. Mature fruits in perforated polyethylene bags held at 18-20°C for 15 days whereas it turned to ripe. Ripe fruits can be held for another 15 days without significant quality deterioration or decay.

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Table (10): peel color (a, b, L) of ripe fruit at shelf-life at 18-20°C during two seasons

Cultivars	a				b				L			
	Days 5	10	15	Means	5	10	15	Means	5	10	15	Means
2005 Lee	13.4	16.0	19.5	16.3 ^D	28.9	24.4	10.2	21.1 ^A	17.8	13.5	9.8	13.7 ^A
Lang	15.1	19.9	23.7	19.6 ^C	24.1	18.8	15.4	19.4 ^B	18.8	12.4	10.3	13.8 ^A
Balahy	19.5	21.2	27.3	22.7 ^A	25.9	19.9	8.7	18.1 ^C	18.1	12.7	6.1	12.3 ^B
Seedy	17.0	21.7	23.4	20.7 ^B	24.1	17.3	13.1	18.1 ^C	18.4	9.7	7.4	11.8 ^C
Means	16.3 ^C	19.7 ^B	23.5 ^A		25.75 ^A	20.1 ^B	11.8 ^C		18.2 ^A	12.0 ^B	8.4 ^C	
2006 Lee	16.5	17.9	18.7	17.7 ^C	16.3	11.9	9.0	12.4 ^D	22.2	15.4	8.1	15.2 ^A
Lang	15.6	16.4	21.2	17.7 ^C	18.2	15.4	13.2	15.6 ^A	16.4	10.8	7.1	11.4 ^C
Balahy	17.1	23.3	23.1	21.1 ^B	17.1	13.2	11.8	14.0 ^B	19.2	10.1	7.8	12.3 ^B
Seedy	19.6	23.4	24.5	22.5 ^A	15.6	13.9	11.9	13.8 ^C	17.4	9.8	7.4	11.5 ^C
Means	17.2 ^C	20.3 ^B	21.9 ^A		16.8 ^A	13.6 ^B	11.4 ^C		18.8 ^A	11.5 ^B	7.6 ^C	

Mean separation by L.S.D at 0.05

Table (11): TSS % of ripe fruit at shelf-life during the two seasons 2005 & 2006

Cultivars	a				b				L			
	Days 5	10	15	Means	5	10	15	Means	5	10	15	Means
2005 Lee	24.00 ^C	25.83 ^C	33.83 ^A	27.89 ^B	24.00 ^C	25.83 ^C	33.83 ^A	27.89 ^B	24.00 ^C	25.83 ^C	33.83 ^A	27.89 ^B
Lang	23.50 ^C	25.00 ^C	32.47 ^{AB}	26.99 ^B	23.50 ^C	25.00 ^C	32.47 ^{AB}	26.99 ^B	23.50 ^C	25.00 ^C	32.47 ^{AB}	26.99 ^B
Balahy	24.67 ^C	26.00 ^C	31.90 ^{AB}	27.52 ^B	24.67 ^C	26.00 ^C	31.90 ^{AB}	27.52 ^B	24.67 ^C	26.00 ^C	31.90 ^{AB}	27.52 ^B
Seedy	25.67 ^C	30.07 ^B	33.63 ^A	29.79 ^A	25.67 ^C	30.07 ^B	33.63 ^A	29.79 ^A	25.67 ^C	30.07 ^B	33.63 ^A	29.79 ^A
Means	24.46 ^C	26.73 ^B	32.96 ^A		24.46 ^C	26.73 ^B	32.96 ^A		24.46 ^C	26.73 ^B	32.96 ^A	
2006 Lee	21.90 ^G	24.40 ^F	29.30 ^C	25.20 ^C	21.90 ^G	24.40 ^F	29.30 ^C	25.20 ^C	21.90 ^G	24.40 ^F	29.30 ^C	25.20 ^C
Lang	21.23 ^G	25.17 ^{EF}	31.77 ^B	26.06 ^C	21.23 ^G	25.17 ^{EF}	31.77 ^B	26.06 ^C	21.23 ^G	25.17 ^{EF}	31.77 ^B	26.06 ^C
Balahy	24.00 ^F	27.30 ^D	32.13 ^B	27.81 ^B	24.00 ^F	27.30 ^D	32.13 ^B	27.81 ^B	24.00 ^F	27.30 ^D	32.13 ^B	27.81 ^B
Seedy	26.00 ^{DE}	30.97 ^B	34.50 ^A	30.49 ^A	26.00 ^{DE}	30.97 ^B	34.50 ^A	30.49 ^A	26.00 ^{DE}	30.97 ^B	34.50 ^A	30.49 ^A
Means	23.28 ^C	26.96 ^B	31.93 ^A		23.28 ^C	26.96 ^B	31.93 ^A		23.28 ^C	26.96 ^B	31.93 ^A	

Mean separation by L.S.D at 0.05

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المخلص العربي

اكتمال النمو والقدرة التسويقيه لاصناف جديده من العناب تحت ظروف منطقه جنوب التحرير

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اجريت هذه الدراسة لتحديد اكتمال النمو والقطف ودراسه القدره التسويقيه لثمار اصناف جديده من العناب (Lee, Lang Balahy, seedy) وقد تم الحصول على ثمار من منطقه جنوب التحرير بمحافظة البحيرة خلال موسمين متتاليين ٢٠٠٦-٢٠٠٥. قطفتم الثمار في مرحلة اكتمال النمو وضعت في درجة حرارة الغرفة (١٨-٢٠م) لإطالة فترة التسويق. اظهرت النتائج أنه يمكن جمع ثمار جميع الاصناف في مرحلة اكتمال النمو والتي تتراوح من ٩٠-١٠٠ يوما من العقد أنتج الصنف لي أكبر قيمة لوزن الثمرة، سمك اللحم، والصلابه %، نسبة المواد الصلبه الكليه الذائبه % وأيضاً أعلى محتوى فيتامين C.

يمكن ان تخزين الثمار المعياه في أكياس البولي إثيلين مثقبة علي درجة حراره الغرفه ١٨ - ٢٠ درجة مئوية لمدة ١٥ أيام إلى ان تتحول الى مرحله النضج. وقد لاحظت أقل قيمة من فقدان وزن الثمرة وأقل نسبه ثمار ناضجه وأعلى نسبه صلابه لصنف Lee. ويمكن تخزين الثمار الناضجة لمدة ١٥ يوما أخرى على درجة حراره الغرفه دون تدهور لجودتها او ظهور أى اعراض للعفن.