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Nutritional and Biochemical Characterization of Date Palm Varieties Growing in Palestine

توصيف لأصناف نخيل التمر التي تزرع في فلسطين من حيث القيمة الغذائية والكيمياء الحيوية

Walid Mahmoud Khalilia[1*], Osama Alabdallah[2], Rami Al-qaisi[2], Oday Zaid[2], Khaled Taha Thaher[1], Raid Alary[2], Jaber Amoor[2], Motasem Zaid[2]

وليد محمود خليلية [1*]، أسامة العبد الله، رامي القيسي [2]، عدي زيد[2]، خالد طه ظاهر[1]، رائد العري[2]، جابر عمور[2]، معتصم زيد [2]

[1] Faculty of Higher Studies and Scientific Research, Al Istiqlal University, Jericho, Palestine, [2] Palestinian National Agricultural Research Center (NARC), Jenin, Palestine.

[1]كلية الدراسات العليا والبحث العلمي، جامعة الاستقلال، أريحا، فلسطين، [2] المركز الوطني الفلسطيني للبحوث الزراعية، جنين، فلسطين

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Abstract: The date palm possesses substantial social and economic value because of its financial, nutrient, natural, cultural, medical, and religious aspects. It plays an important role in ensuring food availability in the Middle East and North Africa region by giving people nourishing foodstuffs. In Palestine, date palm growth and production have significantly increased subsequently. The objective of this study is to describe the biochemical and dietary composition of Palestinian date fruits. We examined the approximate biochemical profile of the fruit at full maturity for 34 diverse date plant genotypes from Jericho, Palestine. The results showed significant differences between genotypes for most studied biochemical parameters. The element analysis revealed that date palm extract contains several essential elements, such as calcium, potassium, and iron, the contents were 1636 mg, 1.5 mg, and 4.9 mg for 100 g of dry mass respectively. Ash and fiber substances were 2.92 g and 4.01g respectively. Moisture, acidity, and total solid contents were 24.78%, 0.23%, and 59.34% respectively.

Keywords: Date palm, biochemical characters, dietary fiber, Jericho.

المستخلص::يمتلك نخيل التمر قيمة اجتماعية واقتصادية كبيرة بسبب الجوانب المالية والغذائية والطبيعية، والثقافية، والطبية والدينية. يلعب النخيل دورًا كبيرًا في ضمان توافر الغذاء في منطقة الشرق الأوسط وشمال إفريقيا من خلال تزويد الناس بالمواد الغذائية ،في فلسطين. ازداد نمو وإنتاج نخيل التمر بشكل ملحوظ مؤخرا في منطقة اريحا. الهدف من هذا البحث هو وصف التركيب الكيميائي الحيوي والغذائي لثمار التمر الفلسطيني. قمنا بفحص المحتوى البيوكيميائي التقريبي لثمار التمر عند النضج الكامل لـ 34 نوعًا من نباتات التمر المتنوعة من أريحا- فلسطين. أظهرت النتائج وجود فروق معنوية بين الأصناف لمعظم الخصائص البيوكيميائية المدروسة. كشفت دراسة العناصر أن مستخلص نخيل التمر يحتوي على العديد من العناصر الأساسية والمفيدة، مثل الكالسيوم والبوتاسيوم والحديد. كانت المحتويات 1636مغم، 1.5مغم ، 4.9مغم لكل 100 غرام من الكتلة الجافة على التوالي كما أظهرت النتائج ان كمية مواد الرماد والألياف 2.92 غم و 4.01 غم على التوالي. كانت نسبة الرطوبة والحموضة والصلب الكلي 24.78٪، و0.23%، و 59.34٪ على التوالي.

* Corresponding Author E-mail: walidkhalilia@pass.ps

الكلمات المفتاحية: نخيل التمر، خصائص بيوكيميائية، الياف غذائية، أريحا.

INTRODUCTION:

Date palm Phoenix dactylifera L. is recognized as the earth's earliest known yield, having been produced in moisture and semi-arid areas for at least 5000 years (Johnson, 2010; Parvin et al., 2015). Arab regions have become home to 70% of the 120 million palm trees that are grown around the globe, and they produce 67% of the dates that are consumed worldwide (Zabar and Borowy 2012). In the Arab Region and parts of Northern Africa, it has been crucial in guaranteeing food security and providing people with good nutrition. In reality, date trees produce an abundance of fruit, earning them the epithet "trees of life" (Nixon, 1951; Ibrahim, 2010) as well as the blessed tree (Porter, 1993). Dates are served at three major developmental phases: the mature but under ripe Khalal or Bisr (50% moisture), ripened Rutab (30–35% moisture), and mature Tamar (10–30% moisture) (Baliga, et al., 2011).

Date palms, which have plantations throughout the Jordan Valley of the Occupied Territories, the Gaza Strip, and the areas surrounding Jericho, are among the most important agricultural field crops in Palestine. Dates make up 0.9% of the West Bank's entire farmed farmlands. Additionally, the Jordan Valley and the province of Jericho are thought to yield the softest dates accounts for 99% of all yield in the West Bank is made up of this production (Abu-Qaoud, 2015). In Palestine, date palm growth and output have significantly increased subsequently. According to the Palestinian Ministry of Agriculture at Jericho, the province of Jericho produced about 11000 metric tons (mt) in 2019 and has over 217000 fertile palm trees of which 95% are Medjool cultivar, and the remaining trees are mostly local varieties. In addition to a few of the introduced and improved varieties, such as Barhi and Deglet Nour (Khalilia et al., 2022). The unusually high temperatures and extremely low humidity levels that are present in Jordan Valley and Jericho during both spring and summer furnish the optimal environment for date palm development and enhancement in addition to the perfection of the crops (Sonneveld, et al., 2018).

Owing to its financial, nutritional, environmental, societal, healthcare, and religious benefits, the date palm has a significant financial impact (Abd Rabou and Radwan, 2017). People who live in arid regions and other drier climates commonly lack access to other food sources (Habib & Ibrahim 2008; El-Sohaimy and Hafez, 2010). It is a rich combination of nutritious fiber, vitamins, minerals, and carbs. Dates are rich in energy source and are rich in nutrients because of their high nutritive value (Jaradat and Zaid, 2004; Khanavi et al., 2015). Additionally, dates include pectin, tannin, small amounts of organic substances and antioxidant capacity, mineral deposits including selenium and fluorine, 23 distinct sorts of amino acids, source of vitamins including ascorbic acidity, and antioxidant capacity. Dates also have considerable therapeutic characteristics (Ghnimi et al., 2017). Dates are preferred in a variety of food recipes, including pastries, confections, communal meals, and healthful cuisine (Parvinet al., 2015). Date fruits have been proposed in traditional medicine as a treatment for cancer and cardiac problems (Al-Sayyed et al., 2014; Khalid et al., 2020). It has been evidenced that this fruit may aid diabetics in managing their blood sugar and cholesterol levels (Alkaabi,etal., 2011). Additionally, it has been asserted to possess anti-inflammatory, anti-microbial, and anti-mutagenic factors (Parvin et al., 2014; Verma and Gautam, 2016). To provide an incredibly nutrient-dense meal for domestic animals and horses in the desert, low-quality

date crops are commonly dried, chopped, and combined with starch. Livestock, sheep, camels, and fowl are all given date nuts to eat (Ghnimi et al., 2017). Date crops can generally be classified as delicate, semi-dry, or crunchy. Semi-dry dates are the most prevalent type; while they are slightly tasty compared to most others, they are more aroma and recognizable. Soft dates have a moderate flavor, more moisture, and less sugar than hard dates. In fact, dry dates are quite hard, dry, and incredibly sweet (Abu-Qaoud, 2015).

Making real-worth food items from dates, such as date flour, fiber concentrates, drinks, marmalade, fruit pastries made from dates, sugar, and beneficial additives for the refreshment, dairy, and culinary industries, would promote the palm date to become a more profitable natural resource. The nutritive value and biochemical makeup of the dates that are cultivated in Palestine are still unclear. The biochemical and nutritive analyses of the fruit that are accessible in Palestine are not fully reported. So, the aim of this study is to understand the biochemical characters and dietary benefits of dates local varieties for their better utilization in Palestine and generate qualitative data for consumer, processor and also for exporters. Biochemical analysis plays a vital role related to nutritional and health benefits.

MATERIAL AND METHODS:

Plant observations:

Thirty-four local and improved exotic female date palm varieties were selected from three date palms fields in the Jericho province (31°52′16″N, 35°26′39″E) (Figure 1). Forty fruits from each sample were collected from thirty-four identified varieties at the full ripening stage (rutab) at a rate of 5 to 6 fruits per bunch at various heights, during the harvest (September 2019). Fruit samples were compiled, sanitized, and placed in polypropylene fabric wrappers, which were then immediately refrigerated and maintained at -80°C until upcoming biochemical testing. A randomized block design replicated three times was used to create the research study.

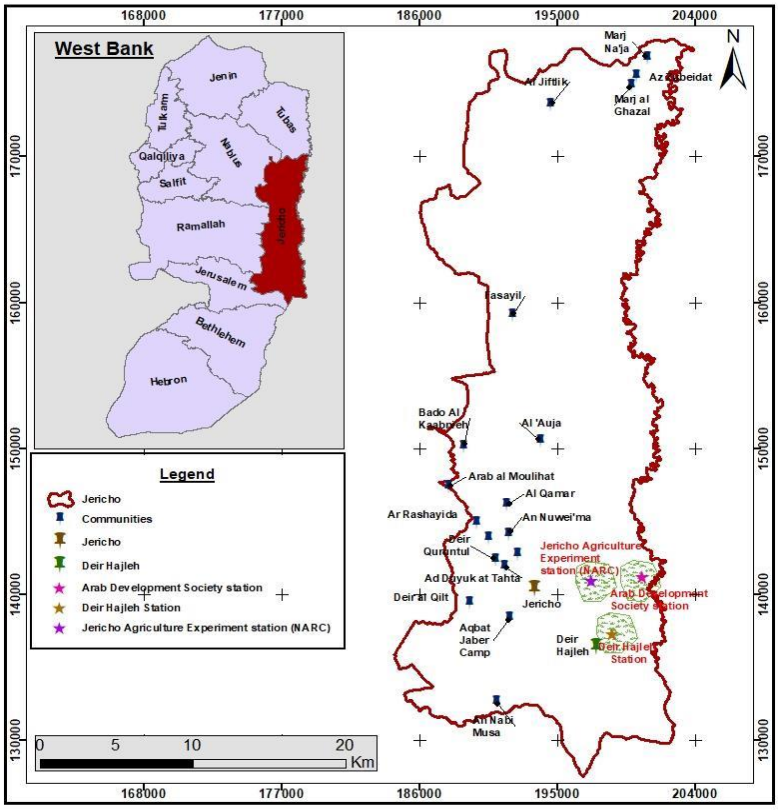

Figure (1). The geographical distribution of date palm farms used in this study at Jericho governorate in Palestine

Fruit chemical compositions:

To calculate the moisture content and dry mater, 10 g of date's pulp was dried in an oven at 85 °C (dry matter). This technique relies on calculating the mass of water in a specified quantity of sample both before and after the water evaporates. The date fruits' amount of dampness was calculated based on the following equation:

$$Moisture\ (\%) = W1\text{-}W2/W1 * 100 \quad \text{(Eq. 1)}$$

While the total solids are reported by the following equation:

$$Solids\ (\%) = W2/W1 \times 100 \quad \text{(Eq. 2)}$$

Thus,

$$Percentage\ Total\ solids = (100 - \%\ Moisture) \quad \text{(Eq. 3)}$$

Where; W1 = Weight (g) of the sample before drying; W2 = Weight (g) of the sample after drying (Qadri et al., 2016).

The Association of Official Analytical Chemist (AOAC) out lined the method used to calculate the amount of ash and organic matter. 10 grams of deseeded dates were processed in a furnace for eight hours at 85 ^{0}C. The processed sample was then progressively heated in a kiln from 85 ^{0}C to 550 ^{0}C to ash it. Ash (%) was specified as grams per 100 g of dry weight (AOAC, 2000).

Crude fibers were determined by Filter Bag Technique; this method determines crude fiber which is the organic residue remaining after digesting with 0.255N H_2SO_4 and 0.313N NaOH. Crude fat contents of the dates were determined by rapid determination of oil/fat utilizing a high-temperature solvent extraction method; this method determines crude fat by extracting with petroleum ether. The Association of Official Analytic Chemists' official analytical procedures was used to conduct a laboratory test of the items to determine the presence of crude fibers (AOAC, 2000).

Mineral content was determined by drying 10 gm of deseeded date fruits left overnight in an oven at 85 ^{0}C. The dried sample was then ratified in a furnace at a degree that was gradually raised from 85 ^{0}C to 550 ^{0}C. A mixture of nitric acid (HNO_3) and hydrochloric acid (HCl) (3:2 v/v) was added to each sample and heated at low flame to remove carbonaceous matter left in the ash. Only a few droplets of strong HNO_3 acid were then injected into it when it had cooled, dissolving the samples entirely. The samples were subsequently put into a 100 ml volumetric flask, and 50 mL of purified water was used to fill it to the proper level. According to AOAC (2000), these mixtures were employed as a sample mixture for the examination of minerals using the Atomic Absorption method for iron and the Flaming photometric method for calcium, potassium, and sodium. Milligrams of mineral deposits were calculated for every 100 g of dry mass.

To determine the percentage of total solubility substances (TSS) in the juice, a hand refractometer was employed. However, 10 mL of juice (specified fruit flesh weight combined with recognized water volume) was used to measure the acidic of the fruit and was adjusted against sodium hydroxide using phenolphthalein as the indicator. It was then determined that malic acid represented the treatable acidity (Harhash et al., 2020).

Data analysis:

Statistical analyses were performed using the analysis of variance. The means were separated by Duncan's multiple range test. Significance was accepted at 0.05 level of probability ($p<0.05$).

RESULTS:

The mean values of the measured biochemical parameters are given in Tables 1 and 2. The data show great variability between varieties for most studied parameters. In general, the results showed that moisture revealed a difference between various varieties. According to the element technique of date palm extracts, the fruits of the plants provided a range of necessary and advantageous elements, such as

calcium, potassium, and iron. The mean of ash and fiber contents were 2.91g and 4.01g respectively and its statistical analysis showed a difference between the studied local varieties. In addition, the results showed that the mean of studied varieties of date palm fruit extract at the rutab stage contains 24.78% moisture, 0.23% acidity (percent of malic acid content) and 59.34% total solid. Moreover, total nitrogen and lipids contents were 0.50% and 0.62%, respectively.

Element analysis:

Analysis of such constituents in date palm extraction revealed that the fruit of the date palm includes fruitful and practical minerals including potassium, calcium, and iron. We observed that potassium had the highest overall average of all the minerals we had analyzed 1636 mg for 100 g of dry mass it was significantly high in LV8, LV9, LV12, LV20, LV23, LV24, LV26, and LV27 varieties. LV12 was the highest value 3170 mg for 100 g of dry mass. This figure was almost thrice the potassium level of LV21, which was recorded at 1384.6 mg for 100 g of dry mass, while the lowest value was found to be 757.3 mg for 100 g of dry mass in LV4 (Table 1). Additionally, dates contain a lot of iron, with the highest concentration in LV14 (3.1 mg/100 gm) while the lowest was measured in LV24 (0.5924 mg/100 gm). These 34 dates varieties have low sodium and calcium levels, with the highest in LV15 (7.2128 mg/100 gm) and LV26 (9.6 mg/100 gm) respectively.

Table (1). Minerals proximate content of selected varieties of dates collected from Jericho governorate at rutab ripening stage (mg/100 g dry weight*).

Variety	K	Fe	Na	Ca	Variety	K	Fe	Na	Ca
LV 1	1111.4	1.5221	6.0945	7.7542	**LV 18**	1805.4	2.4068	1.875	4.0514
LV 2	1164.9	1.5211	2.2294	4.7774	**LV 19**	1747.5	1.3026	3.0723	4.25
LV 3	1272	1.0555	1.4206	6.5414	**LV 20**	2861.3	1.1025	5.7749	4.2613
LV 4	757.3	2.0872	1.7174	2.6551	**LV 21**	1384.6	1.1095	5.6442	7.2479
LV 5	805.5	1.904	1.6995	2.592	**LV 22**	1801.5	1.17	3.8332	2.0712
LV 6	801.58	2.1363	1.6474	2.6884	**LV 23**	2683.9	0.973	6.8047	6.3987
LV 7	1428.8	1.498	2.8931	5.2912	**LV 24**	2281.9	0.5924	2.6556	5.4453
LV 8	2783.5	2.1425	4.7411	3.2004	**LV 25**	1366.3	1.53	5.3683	7.34
LV 9	2633.5	1.8585	4.4975	4.2584	**LV 26**	2471.1	1.8762	3.6845	9.606
LV 10	1820.5	1.9518	2.7498	3.0672	**LV 27**	3021.8	1.4574	2.9927	7.0911
LV 11	1553.8	1.0311	3.846	5.6656	**Maijhool**	1923.5	0.8486	4.6231	5.2545
LV 12	3170	0.6886	5.37	4.9614	**Barhi**	874.3	1.3977	3.6536	5.8693
LV 13	1777.1	1.1729	2.6306	3.6329	**Deglet Nour**	805.44	0.8664	2.1542	4.7179
LV 14	1963.4	3.1114	6.0227	6.3647	**Hijazi**	1189.9	1.8761	5.795	4.5417
LV 15	1459	1.0891	7.2128	2.9061	**Zhedi**	899.06	1.5234	5.7395	4.6277
LV 16	1056.1	0.8171	2.4988	5.6791	**Khadrawy**	853.06	2.5213	2.6378	5.6337
LV 17	1131	0.6654	1.861	2.5036	**Hayani**	965.67	1.4667	1.2833	4.0433
Mean						**1636**	**1.4786**	**3.728**	**4.9115**

*Mean of three replicates of two consecutive seasons; LV: Local Variety

Moisture and dry matter content:

Results of this study showed that date fruit samples from the investigated varieties cultivated in Jericho differed in moisture content from 17.3 to 37.6% at the rutab phase (Table 2). The obtained results showed that LV20 and LV27 had the lowest moisture content, 17.3 – 17.7% respectively, and LV15 and LV2 had the highest values, 37.6 – 36.2% respectively. While there were a few varieties that are considered bad moisture content such as LV15 and LV2. On the other hand, the mean value of dry matter (total solid) percent content for all studied varieties was 75.2 % at the rutab stage. The dates produced by the LV20 had the highest dry matter content i.e., 82.7%, whereas the LV15 had the lowest, 62.4% (Table 2).

Table (2). Nutrition proximate content of selected varieties of dates collected from Jericho governorate at rutab ripening stage (mg/100 g dry weight*).

Variety	Organic matter	Ash content	Dry matter	Moisture content	Total fat	Total fiber	Total nitrogen	Acidity %	TSS %
LV1	97.266 def	2.734 def	80.13 gh	19.875 abc	0.56 cd	6.17 gh	0.491 cde	0.12 a	55.11 c
LV2	94.97 abc	5.027 hi	63.766 a	36.234 h	0.41 bc	5.54 fg	0.452 cd	0.22 bc	41.93 ab
LV3	94.91 abc	5.091 hi	75.52 d	24.478 de	0.53 cd	6.3 fg	0.671 ef	0.28 bc	37.96 a
LV4	98.512 fg	1.488 bc	75.94 de	24.063 de	0.7 cde	8.21 ij	0.378 bcd	0.20 b	58.79 cd
LV5	98.035 fg	1.965 bcd	75.99 de	24.27 de	0.84 de	7.95 i	0.389 bc	0.19 ab	61.37
LV6	98.512 fg	1.488 bc	75.94 de	24.063 de	0.88 e	7.77 hi	0.378 abc	0.20 b	58.35 cd
LV7	96.877 cd	3.123 ef	76.02 ef	23.979 de	0.30 bc	2.77 d	0.659 ef	0.17 ab	61.02
LV8	95.16 abc	4.836 h	67.64 ab	32.36 g	0.56 cd	7.75 hi	0.466 cde	0.13 ab	42.65 ab
LV9	97.342 def	2.658 de	79.39 fg	20.61 abc	0.22 ab	2.44 cd	0.322 abc	0.24 bc	64.89
LV10	97.474 def	2.526 de	73.11 cd	26.894 fg	0.42 bc	2.28 cd	0.47 cde	0.41 de	61.12
LV11	96.012 cd	3.988 fg	64.59 ab	35.412 gh	0.55 cd	0.79 a	0.459 cde	0.21 bc	47.02 b
LV12	97.651 def	2.349 de	75.07 cd	24.93 def	0.37 bc	2.02 c	0.386 bcd	0.22 bc	60.38
LV13	97.184 def	2.816 def	70.03 b	29.967 fg	0.5 bcd	1.94 bc	0.418 cd	0.16 ab	58.91 cd
LV14	97.541 def	2.459 de	81.53 gh	18.47 abc	0.15 a	3.43 de	0.682 efg	0.20 bc	67.04 de
LV15	96.93 cd	3.07 ef	62.405 a	37.595 i	0.21 ab	6.43 g	0.55 de	0.23 bc	61.05 cde
LV16	97.918 def	2.082 d	76.62 ef	23.377 de	0.30 ab	1.99 bc	0.73 fg	0.18 ab	61.43 cde
LV17	94.602 ab	5.398 i	80.79 gh	19.215 abc	0.72 d	4.13 fg	0.633 f	0.34 cd	64.81 de
LV18	97.51 def	2.49 de	80.67 gh	19.331 abc	1.2 def	8.17 ij	0.538 de	0.15 ab	68.57 de
LV19	99.045 gh	0.955 a	77.08 f	22.923 cd	0.25 b	4.11 fg	0.638 ef	0.26 bc	56.15 cd
LV20	97.374 def	2.626 def	82.66 ghi	17.338 a	0.64 cd	1.86 bc	0.693 f	0.28 c	61.88 cde
LV21	97.46 def	2.54 de	77.17 fg	22.826 cd	0.40 bc	3.4 de	0.275 ab	0.22 bc	65.31 de
LV22	97.763 def	2.237 de	79.15 fg	20.852 bc	0.62 cd	8.69 j	0.572 e	0.23 bc	60.36 cde
LV23	98.133 fg	1.867 bcd	75.36 cd	24.641 de	0.41 bc	1.23 b	0.566 de	0.37 d	66.12 de
LV24	97.538 def	2.462 de	82.05 ghi	17.952 ab	0.46 bc	1.66 bc	0.457 cd	0.29 cd	63.72 cde
LV25	97.375 def	2.625 def	77.08 fg	22.925 cd	0.39 bc	3.37 de	0.29 ab	0.26 bc	63.92 cde
LV26	97.71 def	2.29 de	80.91 gh	19.092 abc	0.46 bc	0.90 ab	0.532 cde	0.22 bc	60.85 cde
LV27	96.153 cd	3.847 fg	82.26 ghi	17.744 ab	1.35 ef	4.01 fg	0.593 de	0.19 ab	61.11 cde
MAIJHOOL	94.761 a	5.239 ij	68.96 ab	31.044 fg	0.87 de	2.12 cd	0.439 bcd	0.17 ab	67.21 de
BARHI	96.451 cd	3.549 efg	67.91 ab	32.093 g	1.03 de	3.08 de	0.342 abc	0.23 bc	63.28 cde

DEGLET NOUR	96.873 ^{cd}	3.127 ^{ef}	71.29 ^{bc}	28.702 ^{f}	0.96 ^{de}	3.78 ^{f}	0.528 ^{de}	0.30 ^{cd}	68.19 ^{e}
HIJAZI	97.731 ^{def}	2.269 ^{de}	68.76 ^{ab}	31.24 ^{fg}	1.45 ^{ef}	1.88 ^{bc}	0.499 ^{cde}	0.21 ^{bc}	63.78 ^{de}
ZHEDI	96.951 ^{cd}	3.049 ^{ef}	76.71 ^{fg}	23.294 ^{d}	0.60 ^{cd}	3.59 ^{ef}	0.393 ^{abc}	0.21 ^{bc}	61.43 ^{cde}
KHADRAWY	98.343 ^{fg}	1.657 ^{bc}	78.39 ^{fgh}	21.61 ^{c}	1.21 ^{de}	2.78 ^{de}	0.714 ^{fg}	0.26 ^{bcd}	39.87 ^{ab}
HAYANI	96.9 ^{cd}	3.1 ^{f}	76.77 ^{fg}	23.235 ^{d}	0.59 ^{c}	3.69 ^{ef}	0.384 ^{abc}	0.20 ^{bc}	62.15 ^{cde}
MEAN	**97.087** ^{def}	**2.913** ^{ef}	**75.22** ^{ef}	**24.783** ^{de}	**0.62** ^{cd}	**4.01** ^{fg}	**0.50** ^{de}	**0.23** ^{bc}	**59.34** ^{cd}

Different superscript letters in a column denote significant differences, P< 0.05; *Mean of three replicates of two consecutive seasons; LV: Local Variety

Dietary fiber content and acidity:

Our results showed significant (p< 0.05) variations of total fiber content between studied varieties. The mean value was 4.01 g per 100 g of dry weight at the rutab stage, with LV22 having highest fiber content followed by LV4 and LV18 varieties (Table 2). Considerable (p< 0.05) variation in acidity was found between varieties as shown in Table (2). In our results, the percent of acidity ranged from 0.12 to 0.369 at the rutab stage.

Ash, organic matter and TSS content:

In general, the results showed that ash content revealed significant (p< 0.05) difference between various studied varieties. The mean values of ash, organic matter, and TSS content for all studied varieties were 2.9, 97.1, and 59.34% respectively. Our research revealed that the ash content varied between 0.96 g and 5.4 g. The organic matter percent varied between studied varieties at the rutab stage and the dates produced, the LV20 had the highest organic matter content (99.05%), whereas the LV15 had the lowest, (94.6%) . Our findings also indicated that the spectrum of dates' TSS concentration for the rutab phase was between 37.96 and 68.57% (Table 2).

Total nitrogen and total fat content:

The study of variance reveals substantially notable variation in nitrogen and high-calorie levels between examined date palm varieties at the rutab phase. Nitrogen content ranged from 0.275 to 0.73 % of dry weight. The date produced by the LV16 presented the highest nitrogen content, 0.73 % of dry weight (Table 2). The overall total fat levels of the various date fruit kinds had examined at the rutab stage. All of the investigated types have a mean lipid content of 0.62%, while the Hijazi type got the highest fatty acid profile, 1.45% of dry weight, and the least, 0.15% of dry weight (Table 2).

DISCUSSION:

Dates were relatively high in potassium and minimal in sodium, according to an overall study of the components that were tested; this minimal sodium: potassium proportion made dates a suitable food for people with hypertension. Potassium is a nutrient that is very helpful in maintaining a healthy neural function and in regulating the neurological body's nerve system. To support bone health and growth,

phosphorus collaborates with calcium, which also supports proper muscle function. Additionally, dates are recommended as a supplement to treat anemic and vitamin deficiency. These findings agreed with other earlier studies, which showed that the date palm possesses an appropriate amount of calcium, potassium, and iron. These components are essential for the functioning of internal organs and biochemical activities in living cells (USDA, 2012; Ghnimi et al., 2017).

One of the key components of the date fruit is hydration. It played a crucial role in dates' freshness and preservation efforts. The ultimate wetness percentages among the investigated cultivars varied significantly ($P< 0.05$). Date fruit samples from the investigated varieties cultivated in Jericho differed in moisture content (Table 2). Said et al., (2014) provided evidence for this conclusion where investigators demonstrated comparable moisture rates in 54 date palms cultivars grown in Algeria. Similar results were obtained by (Al-Abdoulhadi et al., 2001; Nadeem et al., 2011). Other studies assessed date fruits quality according to moisture content to be good (10 - 24%), acceptable (24 - 28%), and bad character (greater than 28%) in different date palm fruits cultivars (Mohammed et al., 1983; Said et. al., 2014). Based on these studies, most of the locally investigated date palm varieties are considered to have acceptable percent of moisture content, while there were a few varieties that are considered bad moisture content such as LV15 and LV2, which had the highest values, 37.6 – 36.2% respectively. In the other hand, the mean value of dry matter (total solid) percent content for all studied varieties was 75.2 % at the rutab stage (Table 2). The investigation by Parvin et al. (2015), in which investigators demonstrated equal total solid core beliefs in fresh date fruits from three major types cultivated in Bangladesh, lends credence to this conclusion.

Date fruits are a better source of dietary fiber, which is defined as the polysaccharides and lignin components of plant foods that are indigestible by enzymes in the human gastrointestinal tract (Ghnimi et al., 2017). Our results showed significant ($p<0.05$) variations of dietary fiber content between studied varieties and the mean value were 4.01 g per 100 g of dry weight at the rutab stage (Table 2). This result is in line with Parvin et al., (2015) and the investigation of Borchani, et al., (2010) where they demonstrated relatively similar substance qualities of crude fiber in date fruit varieties grown in Bangladesh and Tunisia. On the other hand, our results disagreed with Al-Shahib and Marshall's (2003) who found that the optimum fiber level for nine different types of dehydrated dates from different regions (Iraq, Iran, Saudi Arabia, and Egypt) was 10.2%. These results have affected by numerous variables, such as the type of dates, their maturity, and the atmosphere.

In our results, the percent of acidity ranged from 0.12 to 0.369 at the rutab stage. The research of Qadri et al., (2016) lend weight to this finding where researchers have displayed comparable acidity ratios in some varieties grown in Pakistan. Amira, et al., (2012) stated that the fruit has more tannic present at the Khalal stage, which makes the fruit sourer. As the tannic diminished over the developmental phase, the acidity also did likewise, and at the Tamar phase, both changes were irreversible. In general, ash material serves as a gauge of a food's nutritional worth. Our research revealed that the mean values of ash content was 2.9%, which is extremely consistent with the investigation of El-Sohaimy and Hafez (2010).

One of the important quality characteristics that affect a date's marketability is its TSS content. Since sugar is a significant component of the dissolved solid substance, the TSS substance can be applied to measure the sugar concentration of dates. In addition, dates' TSS is mostly made up of several varieties of sugars, making it a reliable indicator of the level of sugar overall (Manickavasagan et al., 2014). Our findings indicated that the mean values of dates' TSS concentration for the rutab phase was 59.34%. This finding is supported by research performed by Manickavasagan et al., (2014), where the researchers note that three varieties produced in Oman displayed identical TSS levels.

Even though dates are a poor protein-rich food and fatty acids (Parvin et al., 2015), they may contribute to the human diet with high quality of some essential amino acids (Borchani, et al., 2010). The results from this study closely match the numbers that have already been observed by (Zabar and Borowy, 2012; Parvin et al., 2015). We also assessed the overall total fat levels of the various date fruit kinds we had previously examined at the rutab stage. All of the investigated types have a mean lipid content of 0.62% of dry weight. These findings corroborated the values provided by Al-Farsi and Lee (2008).

CONCLUSION:

Substantial variations between the primary kinds of date palm fruits cultivated in the Jericho province were determined by biochemical profiling. These findings showed that most regional varieties have positive traits. According to the moisture level (24.78%) of most locally investigated date palm varieties, the moisture content is considered good and acceptable for human use. LV22, LV4, and LV18 have a decent component of dietary fiber, which is important for gastrointestinal health. Also, a high concentration of certain nutrients such as calcium, potassium, and iron (1636 mg), (1.5 mg), and (4.9 mg) for 100 g of dry mass respectively. In addition to Ash and total solid contents were (2.92 g) and (59.34%) respectively. Overall result, Palestinian dates may be considered as a nutritious food that can play a major role in human nutrition and health because of their wide range of nutritional and functional properties.

The local varieties LV14, LV17, LV18, LV20, LV22, and LV27 have been selected by farmers over the years and are closely similar to the improved and introduced varieties. It was determined that all these date types would be appropriate for table use and may be incorporated to enhance the nutritional potential of various cuisines. The importance of these date fruit kinds as nutritious components is; therefore, recommended to be collected and propagated. Further research is required to better establish the quality, the digestion, and the adsorption access of these nutrients.

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