The Study of some Physical, Chemical and Microbiological Properties of Wheat and Date in Iraq

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Abstract

Dates fruits and wheat flour constitute a large part of the daily diet in both rural and urban population of Iraqi, the present study was conducted to estimate some physical, chemical characterization and microbial contamination for five types of Iraqi dates, (Zahdi, Barhi, Khistawi, Maktoum and khdrawi) and three samples of local wheat, (BB10, BB19 and BB20), beside two imported wheat samples from local markets (Zer and Al-Zaharaʹa). Microbial varieties were assessed by using total viable count technique (TVC), as well as some chemical and physical properties for examined samples were recorded such as moisture, total protein, lipids, and gluten for wheat samples, total sugars and gravimetric measurements for date fruits. Findings refer to that BB10 and Khdrawi have highest TVC (1.5×10^6 and 3.3×10^6) (CFU/gm) respectively, while *Pseudomonas sp.* showed in Barhi (2.3×10^3) CFU/gm, and *Staphylococcus sp.* recorded highest value in BB19 wheat flour (0.5×10^4) CFU/gm with significant differences at ($p\leq0.05$), *E coli* gave highest appearance in Barhi (3.5×10^3) CFU/gm.

Keywords: TVC; Microbial contamination; Economic crops; Dates; Wheat

دراسة الخواص الفيزيائية والكيميائية والتلوث الميكروبي في محصولي التمر والحنطة في العراق

الخلاصة

شكل محصولي التمر والحنطة جزءا كبيرا من غذاء الفرد العراقي في المناطق الحضرية والريفية على حد سواء، الدراسة الحالية هدفت الى قياس بعض الخواص الفيزيائية والكيميائية فضلا عن التلوث الميكروبي لخمسة اصناف من التمر هي (الزهدي، البرحي، الخستاوي، مكتوم والخضراوي) وثلاث اصناف من الحنطة المحلية هي: (BB10, BB19 and BB20) فضلا عن صنفين مستوردين هما (زير والزهراء). قيم التلوث المايكروبي باستخدام تقنية العد الكلي (TVC) اما الخواص الفيزيائية والكيميائية فقد شملت كل من الرطوبة، البروتين الكلي، الدهون، السكريات الكلية فضلا عن القياسات النوعية الاخرى بالنسبة لثمار التمر. من النتائج نجد ان صنف الحنطة BB10 والخضراوي اعطت اعلى عد مايكروبي (CFU/gm) (3.3×10^6) and (1.5×10^6) وعلى التوالي في حين سجلت بكتريا

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Pseudomonas sp. اعلى تواجد لها في صنف البرحي بـ (2.3×10^3 CFU/gm) اما بكتريا *Staphylococcus sp.* فكانت سائدة في صنف الحنطة BB19 (0.5×10^4 CFU/gm) بفرق معنوي عند مستوى احتمالية اقل من 5%.

الكلمات المرشدة: TVC، تلوث مايكروبي، محاصيل اقتصادية، التمر، الحنطة.

INTRODUCTION

Date palm *Phoenix dactylifera L.* grows along with the wheat *Triticum aestivum* in the alluvial plain in Iraq since thousands of years to form essential food for humans and animals, and became part of his own traditions and profession [1]. Date fruit is the main crop in arid and semi-arid regions, particularly in the western Asia and North Africa this tree is well adapted to desert environments that are characterized by extreme temperature and water scarcity beside is national income for many countries. In Iraq 27% of farm land invests for wheat cultivation, 33.33% of these lands located in resume watering region and 66.6% in the irrigated land [2] but the cultivated quantities doesn't enough for local needs, therefore it is imports from different regions like Australia, USA, Canada and other productive areas. Both of these crops exposed to microbial contamination during production, transporting, storage and processing [3,4] lead to deterioration in the physical and chemical properties causes' quality decline of the product and the reluctance of consumers**.** Many studies investigate the microbial flora of both dates and flour the presence and growth of such microbes as mainly depending on moisture content 10% for dates [5] and 15% [6] it has wide acceptance for microbial growth control beside other storage conditions like temperature and ventilation.

In spite of the importance of dates and wheat in the diet of the Iraqi individual but there are few studies deals with the microbial contamination, for that the present study concentrated on the microbial assessment of five types of most consumed local date fruit, produced in different areas of Iraq, beside five types of wheat that examined to determine the microbial account and diversity by using serial dilution and viable count techniques.

Materials and Methods

Sample collection

Fifteen samples of dates belong to five varieties (Zahdi, Barhi, Khistawi, Maktoum and Khdrawi) were provided from the General Company of Dates Marketing) Baghdad- Al-Shalchia), from five different Iraqi governorates (Baghdad, Dyala, Anbar, Salaadin and Basrah) respectively in rutab stage. Three samples of local wheat (BB10, BB19 and BB20) have been brought in from General Company of Mills, Al-Huryha warehouse beside two imported samples wheat from local markets (Zer and Al-Zaharaʼa) were studied, each sample of wheat and date (1000g) was transported to the lab by sterile polyethylene bag, and divided into two parts the first one for microbial assessment while the second one for physicochemical properties determination.

Physicochemical Characteristics

Moisture for both wheat and dates fruit was examined according to [7], while total protein identified by using Coomassie Brilliant Blue G-250 method [8] while Ash was measured depending on [9]. Gluten determined by manual washing for

wheat dough [9]. Total sugar, lipids was evaluated according to [7] while gravimetric measurements of fruits followed the method contained in [7].

Microbial Analyses

For microbiological analysis (1 g) of date or flour was suspended in 10 ml of sterile distilled water and mixed well by sterile mortar. Then, serial dilutions (10^{-1}-10^{-5}) were prepared and plated in triplicate into each specific medium. TVC was enumerated on Plate Count Agar (Biomark Labolatories, India), by incubating at 37 ºC for 48 hrs. *Escherichia coli*, *Enterobacteriaceae* and coliform were grown on McCongy agar plates, *E coli* diagnosed on EMB agar (Biomark Labolatories, India). S*taphylococcus* was determined using manittol salt agar (Biomark Labolatories, India) after incubation at 37 ºC for 48 hrs. All plates were examined visually for typical colony types and morphological characteristics associated with each growth medium. Suspected colonies were tested biochemically by the methods as described in the Food and Drug Administration Bacteriological Analytical Manual [10]. Three replications of at least three appropriate dilutions were enumerated. Molds and yeasts enumerated using Potato Dextrose Agar (Biomark Labolatories, India) supplemented with Chloramphinecol (100µg/ml) after incubating at 28ºC for 72 hrs, further identification for fungi was grouped according to their culturing and morphological features. Cotton blue (lacto phenol stain) was used to identify unknown fungi [11].

Results and Discussion

All chemical properties for five studied wheat varieties were summarized in table (1). From results that imported wheat (Al-Zahraʹa and Zer) have greatest moisture percent in mean (9.37±0.097 and 9.19±0.188) respectively with significant differences at $p \leq 0.05$, while Zer brand was record highest value of gluten 22.52±0.36 mg/gm, with significant differences in $p \leq 0.05$. In spite of its effects on wheat allergy, gluten gives the dough-required elasticity, helping it rise and keeps its shape and often gives the final product a chewy texture and the wheat quality depending on gluten ratio. According to world food program, 2102 the moisture content shouldn't exceed 15.5%, because high moisture support microbes growth and producing of toxins, from results all examined wheat within acceptable limits

Table (1). Some chemical and physical proprieties of five varieties of wheat

Varieties	Moisture %	Ash %	Protein mg/gm	Gluten mg/gm
BB10	7.79±0.42a	0.39±0.06a	1.2±0.05a	21.42±0.88a
BB19	8.97±0.13b	0.39±0.065a	1.4±0.19a	20.85±0.16b
BB20	8.79±0.21b	0.38±0.06a	1.07±0.165b	21.29±0.25a
Zer	9.19±0.188c	0.68±0.03b	1.22±0.09a	22.52±0.36c
Al-Zharaʹa	9.37±0.097c	0.603 ±0.046b	1.4±0.19a	21.6±0.93a

- Each number refer M±SD of three replicate
- Different letters in the same column refer to significant differences at ($p<0.05$)

Table 2 shows some physical and chemical properties of five date varieties, there is a difference in the physical properties (fruit length, diameter, total weight, core weight and fleshy weight) which is depending on genetic variety of each type. From table two Maktoum have the longer 3.71cm and heavier fruit 10.92gm among the

other types while Barhi have shorter fruit 6.79 and the Khistawi have the lighter fruit. Data refer to that Zahdi have the higher proportion of total sugars and proteins content 82.14%, 2.16 mg/ml among the other varieties in significant differences at ($p \leq 0.05$), while Maktoum type gave higher proportion of lipid 1.73mg/ml among other types. From the table we can observe that dates have low contents of lipids but this is not signal about their nutritional value, because dates have high contents of minerals, sugars and vitamins.

Table (2). Physical and chemical proprieties of five varieties of date fruit

Varieties	Length (cm)	Diameter (cm)	fruit weight (gm)	Core weight (gm)	Weight of fleshy part	Moisture %	Ash %	Sugar %	Protein mg/ml	Lipids mg/ml
Zahdi	3.47 ±1.02a	1.63± 0.52a	7.27 ±0.74a	0.85± 0.02a	6.42± 0.42a	8.26±0.77a	1.86± 0.12a	82.14 ±0.7a	2.16±0.77a	0.43±0.06a
Barhi	2.62 ±0.27b	2.07± 0.33b	6.79 ±0.61b	1.67± 0.12b	5.12± 0.77b	20.9±0.93b	1.3±0 .15b	74.9± 1.56b	1.01±0.69b	0.1±0.02 b
Khistawi	3.52 ±0.3a	1.8±0. 176a	6.21 ±0.11c	1.2±0. 17c	5.01± 0.16b	11.1±0.93c	1.63± 0.04c	76.1± 0.95b	2.2±0.35a	0.16±0.04b
Maktoum	3.71 ±1.3a	2.91± 0.67c	10.92±0. 75d	1.61± 0.57b	9.31± 0.57c	12.1±1.35c	1.73± 0.19c	75.1± 1.53b	1.8±0.14a	1.73±0.2 c
Khdrawi	3.26 ±0.63a	1.4±0. 28d	6.93 ±0.60b	0.97± 0.1a	5.96± 1.2c	12.6±0.57c	1.4±0 .03b	74.2± 1.4b	1.7±0.13c	0.2±0.06 b

- Each number refer M±SD of three replicate
- Different letters in the same column refer to significantly differences at ($p<0.05$)

Microbial Analyses

Table (3) and figure (1) showed microbial diversity of five varieties of wheat and date fruits. From results we can observe BB10 and Khdrawi have highest TVC (1.5×10^6 and 3.3×10^6) (CFU/gm) respectively, while the lowest TVC recorded for AL-Zahara'a and Khistawi (3.2×10^3 and 3.5×10^5) CFU/gm respectively. *Pseudomonas sp.* showed strongly in Barhi 2.3×10^3 CFU/gm, while *Staphylococcus sp.* recorded highest value in BB19 wheat flour 0.5×10^4 CFU/gm with significant differences at ($p\leq0.05$), *E coli* gave highest appearance in Barhi 3.5×10^3 CFU/gm, in the same time molds and yeasts take their share of appearing, highest recurrence for *Aspergillus niger* 1.5×10^6 CFU/gm. Moisture, protein and sugar concentrations are affecting factors for microbes growth, in spite of the moisture mean of wheat flour 8.2% less than limitation of WPF, 2012 15.5% but the microbial content was high, this may be due to source of wheat grains, or from hydration water or from grinding, in addition to process of transporting, storage and milling, for that tougher measures required to put in place by the milling company harmonize with international food safety, to

prevent microbial contamination in terms of microbial contamination and protect consumers from food borne and related disease.

Type of	Wheat (flour)	Dates fruits

microorganisms/ viable count (CFU/gm)	BB10	BB19	BB20	Zer	AL-Zaharaa	Zahdi	Barhi,	Khistawi	Maktoum	Khdrawi
Total viable count	1.5×10^{6}a	3.8×10^{5}b	4.5×10^{3} a	6.5×10^{4}a	3.2×10^{3} a	0.6×10^{6} a	2.5×10^{6} a	3.5×10^{5}a c	1.6×10^{6} a	3.3×10^{6}a
Pseudomonas sp.	1.6×10^{2} a	0.2×10^{3}b	0.6×10^{3}b	/	0.2×10^{3}b	0.4×10^{2} b	2.3×10^{3}b	0.5×10^{2}b	/	/
Staphylococcus sp.	0.2×10^{2} a	0.5×10^{4}b	5×10^{2}c	/	2.1×10^{3}c	1.2×10^{2} b	0.6×10^{2}c	/	/	3.5×10^{2} b
E. coli	8.2×10^{2}a	1.6×10^{3}b	/	0.4×10^{2} b	1.4×10^{3}c D	0.1×10^{2} b	3.5×10^{3}b	/	/	/
Cryptococcus perfringens	0.1×10^{2}a a	0.6×10^{2}a	/	1.3×10^{2} c	2.3×10^{3}c	2.5×10^{3} c	4.2×10^{3}d	2.1×10^{3}c	4.1×10^{2}b	7.5×10^{2} b
Bacillus sp.	0.4×10^{2} a	1.5×10^{6}b	1.5×10^{6}b	/	/	/	0.4×10^{3}e	0.6×10^{2}b	0.4×10^{2}c	1.3×10^{3} c
Aspergillus niger	2.5×10^{3} a	1.5×10^{6} b	0.5×10^{5}c	3.2×10^{3}d	1.2×10^{4}d	4.5×10^{3} c	3.3×10^{4}f	2.1×10^{2}d	0.4×10^{3}b	0.6×10^{3} c
Fusarium sp.	/	6.5×10^{4}a	2.5×10^{3}b	3.5×10^{2} c	1.2×10^{2} e	/	/	0.6×10^{2}b	0.2×10^{2}b	2.5×10^{2} b
Penicillium sp.	2.4×10^{2} a	3.5×10^{3}b	1.2×10^{2}a	2.4×10^{2} b	5.1×10^{2} e	1.5×10^{2} b	1.2×10^{3}b	3.3×10^{3}c	0.4×10^{3}d	4.4×10^{2} c
Mucor sp.	0.3×10^{2} a	2.1×10^{2}b	0.6×10^{3}c	/	2.5×10^{2} e	1.2×10^{3} c	/	1.7×10^{4}d	/	4.5×10^{2} c

Table (3). Microbial Analyses of Wheat and Date samples

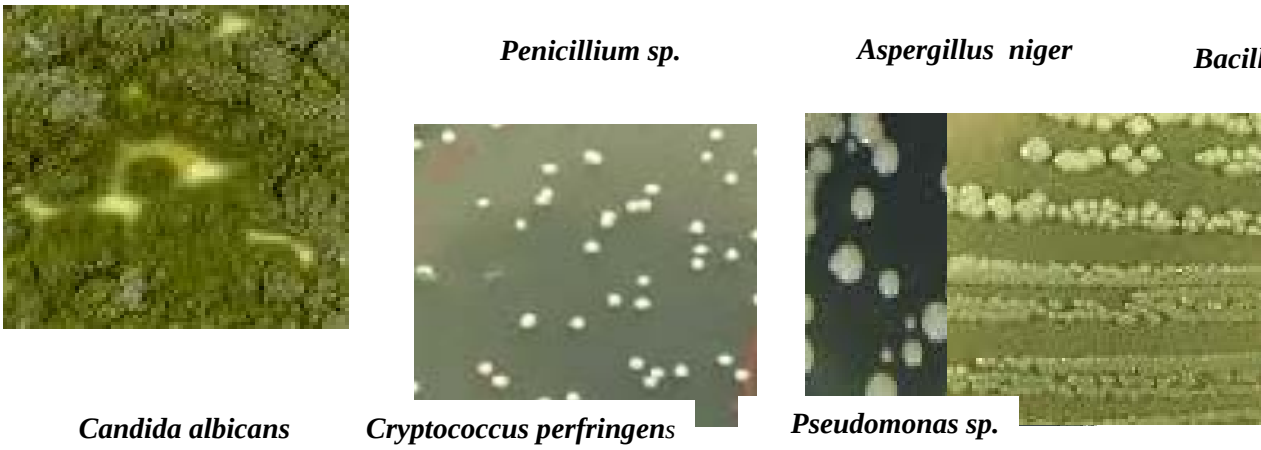

Figure (1). Some isolated microorganesmes from examened samples

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