

MICROBIOLOGICAL STUDIES ON HALVA TAHINIA AND SOME DATE PRODUCTS (AGWA) IN EGYPT.

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ABSTRACT: Fifty samples each of halva tahinia, pressed dates, destoned pressed dates and date paste (minced dates) were collected from 5 Egyptian Governorates. Microbiological profile of bulky size products served in slices form, were evaluated with regard to the following groups of microorganisms: aerobic bacteria, spore-forming aerobic bacteria, *Bacillus cereus*, *Staphylococcus aureus*, coliforms, *Escherichia coli*, *Clostridium perfringens*, *Salmonella spp.*, *Shigella spp.*, *Yersinia enterocolitica*, molds and yeasts. All of the studied samples were *Cl. perfringens*, *Salmonella spp.*, *Shigella spp.* and *Y. enterocolitica* free.

INTRODUCTION

Halva tahinia and agwa are among the popular foods in Egypt. Such foods are sometimes subject to contamination, either during manufacturing or due to mishandling and improper storage. Street vendors might add to the risk of consuming such foods. El-Sherbeeny et al. (1985) reported

that street vendors have come under suspicion for selling contaminated foods that have led to diarrheal diseases.

Studies on the risk of consuming such foods are few. Molds and yeasts tolerate high-osmotic and low-pH conditions, and grow at refrigeration temperature and can therefore

cause spoilage in the processed orange juice (Arias et al., 2002).

Confectionery products which have high-sugar content and low water a_w content are the optimum environment for the osmophilic yeasts. *Zygosaccharomyces rouxii*, *Hansenula anomala*, *Debaryomyces hansenii*, *Saccharomyces cerevisiae*, *Z. bailii*, *Issatchenkia orientalis* and *Torulospora delbrueckii* are among the osmophilic yeasts that were isolated and identified by Tokuoka et al. (1985), Gardini et al. (1988), Esperanza Casas et al. (1998) and De Silloniz (1999).

Outbreaks caused by multiresistant *Salmonella typhimurium* DT104 isolated from halva tahinia in Netherlands, England, Wales, Sweden, Germany, United Kingdom, Norway and Australia were reported by Van Pelt et al. (2001), O'Brien et al. (2001), Andersson et al. (2001), Brockmann (2001), Little (2001), Guérin et al. (2001) and Fisher et al. (2001). On the other hand, Kotzekidou (1998) found that halva tahinia resulted in the decrease of *Salmonella enteritidis* inoculated therein. Moreover, he mentioned that sulfite-reducing clostridia, *Salmonella spp.* and molds were

not detected; and aerobic bacterial count, Enterobacteriaceae, enterococci, aerobic mesophilic and thermophilic spore-formers, staphylococci, *Staphylococcus aureus*, lipolytic microorganisms and yeasts were in acceptable level.

Frazier (1967) stated that spores of bacteria and molds in dried fruits are likely to be most numerous.

Alifa Tamimi and Ben Youssef (1974) found that total counts of microorganisms present in dried and dehydrated dates were 266.000- 1.253.000, mold spores 200.000- 893.000 and yeasts 2000- 6.600 cells/g; while coliform bacteria were absent in all of the samples.

In dates, however yeasts were found to be generally predominant (46-57%), followed by molds (22-29%), bacterial spores (6-8%) and vegetative bacterial cells (6-15%) [Grecz et al., 1986].

From date samples Mahjoub et al. (1986) isolated molds as 38% of *Penicillium*, 25% of *Aspergillus* and 37% of other groups. They observed that *Aspergillus* group

was predominant in the fresh samples while *Penicillium* organisms were predominant in the stored samples.

The objective of this study was to investigate the microbiological profile in Egyptian popular confectionery products (halva tahinia, pressed dates, destoned pressed dates and date paste).

MATERIALS AND METHODS

• MATERIALS:

Fifty samples of each of halva tahinia, pressed dates, destoned pressed dates and date paste (minced dates) [50 samples of each in slices from bulky size] were collected from 5 Egyptian Governorates (Cairo, El-Sharkia, El-Dakahlia, Alexandria and North-Sinai) and prepared according to ICMSF (1978).

All the samples were put in tightly closed and sterile bags and then put in an ice box for personal delivery to the laboratory as soon as possible.

• METHODS:

Each sample was minced separately in a stomacher using peptone water to obtain a homogenous sample.

Each sample in this study was subjected to microbiological examinations according to ICMSF (1978 and 1996).

Plates containing media as plate count agar for aerobic bacterial count and spore-forming aerobic bacteria; polymyxin-pyruvate-egg yolk-mannitol-bromothymol blue-agar medium (PEMBA) for *B. cereus*; Baird-Parker's medium and coagulase test for *Staph. aureus*; perfringens agar (OPSP) for *Cl. perfringens*; lactose broth medium, S.S. medium and XLD medium for *Salmonella spp.* and *Shigella spp.*; *Yersinia enterocolitica* medium for *Y. enterocolitica* and yeast extract-glucose-chloramphenicol-bromophenol blue-agar (YGCB-Agar) for molds and yeasts; while coliform group was enumerated using most probable number (MPN) in MacConkey broth medium.

RESULTS AND DISCUSSION

The mean values of the different species and groups of microorganisms found in the 4 products (halva tahinia, pressed dates, destoned pressed dates and date paste) are presented in Table (1). It can be shown that the highest microbial load was in date paste, while the lowest was in pressed dates product.

The mean values for aerobic bacterial counts were 6.8×10^5 , 3.6×10^5 , 1.4×10^6 and 3.8×10^6 CFU/g in halva tahinia, pressed dates, destoned pressed dates and date paste; respectively. Samples from El-Dakahlia Governorate contained the highest aerobic bacterial levels in the first 3 products, while Alexandria Governorate samples contained the highest of all regarding date paste (Fig. 1). Date past harbored the highest bacterial count which could be due to the extra step (mincing step) in manufacturing this product, thus add to the initial load due to contaminated mincers.

Spore-forming aerobic bacteria were in the range of 10^3 CFU/g (the mean being 4×10^3 , 1.8×10^3 , 5.2×10^3 and 5.6×10^3

CFU/g in halva tahinia, pressed dates, destoned pressed dates and date paste; respectively)[Table 1]. From Fig. (2) it can be shown that the highest spore-former counts were in pressed dates and date paste samples collected from Cairo Governorate while in halva tahinia and destoned pressed dates the highest counts were in El-Sharkia and El-Dakahlia Governorates samples; respectively. Since halva tahinia and date products samples were in bulky size (not sealed). The presence of mesophilic bacilli indicate that either the container was not hermetically sealed or that the heat-processing step was insufficient to destroy the spores (Elliott *et al.*, 1978).

Bacillus cereus mean values were found to be 2.5×10^2 , 1.8×10^2 , 3×10^2 and 5.6×10^2 in halva tahinia, pressed dates, destoned pressed dates and date paste; respectively (Table 1). The highest *B. cereus* counts were in El-Dakahlia Governorate samples; while in halva tahinia, the samples from Cairo Governorate were *B. cereus* free (Fig. 3).

The spores normally present in soil, air and some dehydrated ingredients. However, the occurrence of *B. cereus* in halva

Table (1): The mean values* of microbial profile (CFU/g) in samples of halva tahinia and date products from five Governorates in Egypt

	Halva tahinia	Pressed dates	Destoned pressed dates	Date paste
Aerobic bacterial count	6.8×10^5	3.6×10^5	1.4×10^6	3.8×10^6
Sporeforming aerobic bacteria	4×10^3	1.8×10^3	5.2×10^3	5.6×10^3
<i>B. cereus</i>	2.5×10^2	1.8×10^2	3×10^2	5.6×10^2
<i>Staph. aureus</i>	4.1×10^2	1.1×10^2	3.6×10^2	3.7×10^2
Coliform (MPN)	5.9×10	1.5×10	3.1×10	6.4×10
<i>Cl. perfringens</i>	0	0	0	0
<i>Salmonella sp.</i>	0	0	0	0
<i>Shigella sp.</i>	0	0	0	0
<i>Y. enterocolitica</i>	0	0	0	0
Molds	2.4×10^3	1.5×10^3	3.5×10^3	1.1×10^4
Yeasts	1.3×10^2	2.7×10^2	1.1×10^3	5.1×10^3

B.: *Bacillus* *Staph.*: *Staphylococcus* *Cl.*: *Clostridium* *Y.*: *Yersinia*

* The sum of the microbial counts in all of the samples divided by their number.

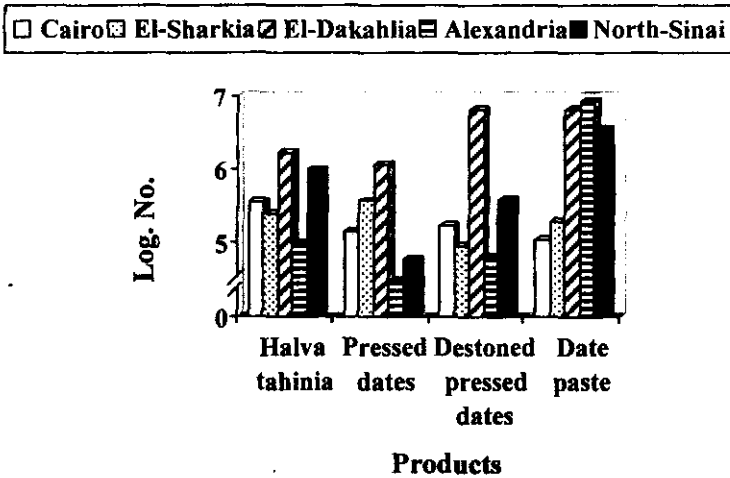


Fig. (1): Aerobic bacterial counts in halva tahinia and date products collected from five Egyptian Governorates (in logarithmic scale).

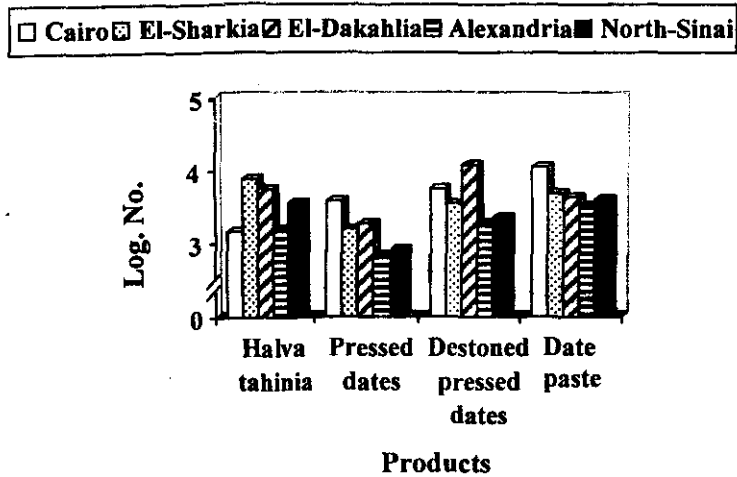


Fig. (2): Spore-forming aerobic bacterial counts in halva tahinia and date products collected from five Egyptian Governorates (in logarithmic scale).

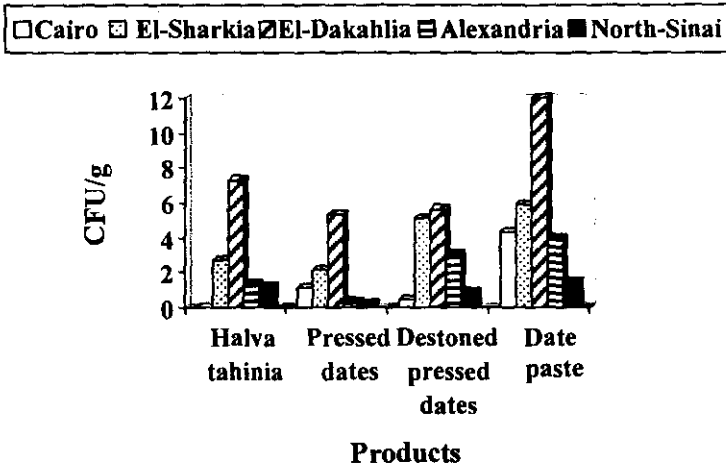


Fig. (3): *Bacillus cereus* counts in halva tahinia and date products collected from five Egyptian Governorates.

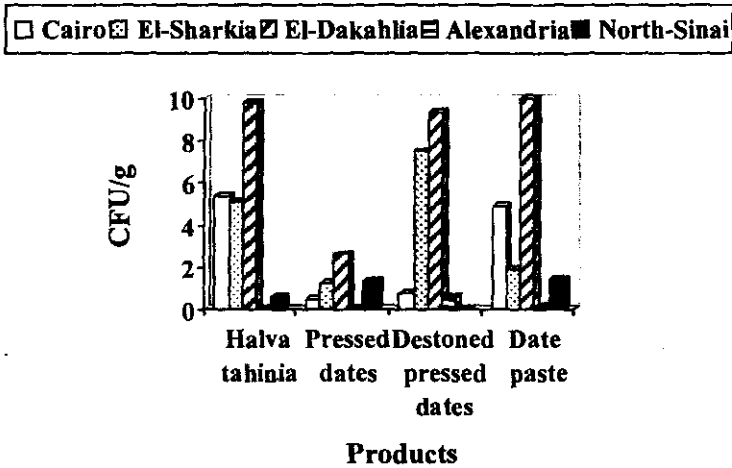


Fig. (4): *Staphylococcus aureus* counts in halva tahinia and date products collected from five Egyptian Governorates.

tahinia due to illegal use of wheat flour in manufacturing.

The mean values of the *Staph. aureus* were 4.1×10^2 in halva tahinia and 1.1×10^2 , 3.6×10^2 and 3.7×10^2 CFU/g in pressed dates, destoned pressed dates and date paste; respectively (Table 1). The highest *Staph. aureus* counts were in samples from El-Dakahlia Governorate in all of the products; while halva tahinia and pressed date samples from Alexandria Governorate and destoned pressed date samples from North-Sinai Governorate were *Staph. aureus* free (Fig. 4).

The positive samples could have been cross-contaminated by handlers, and stored at favorable conditions of heat and moisture, etc which favored microbial growth .

The common usage of utensils specially knives, might be the main source of coliform bacteria in some samples, i.e., 5.9×10 , 1.5×10 , 3.1×10 and 6.4×10 CFU/g in halva tahinia, pressed dates, destoned pressed dates and date paste; respectively (Table 1). Figure (5) shows that El-Dakahlia Governorate samples contained the highest coliform group counts.

Pressed dates and destoned pressed dates were fecal coliform free, while was found in halva tahinia and date paste as 28 and 8%; respectively (Fig. 6).

All of the studied samples were *Cl. perfringens*, *Salmonella spp.*, *shigella spp.* and *Y. enterocolitica* free (Table 1).

Molds were found in high mean values especially in date products, being 2.4×10^3 , 1.5×10^3 , 3.5×10^3 and 1.1×10^4 CFU/g in halva tahinia, pressed dates, destoned pressed dates and date paste; respectively (Table 1). From Fig. (7), samples from El-Dakahlia Governorate show the highest molds level.

Beside the molds inhibiting raw ingredients, the exposure to the air for long periods of time would increase its content of fungal spores specially when the air is dusty (Bullerman, 1979).

Values of yeasts were 1.3×10^2 , 2.7×10^2 , 1.1×10^3 and 5.1×10^3 CFU/g in halva tahinia, pressed dates, destoned pressed dates and date paste; respectively (Table 1). Samples of pressed dates and destoned pressed dates were found to show the highest

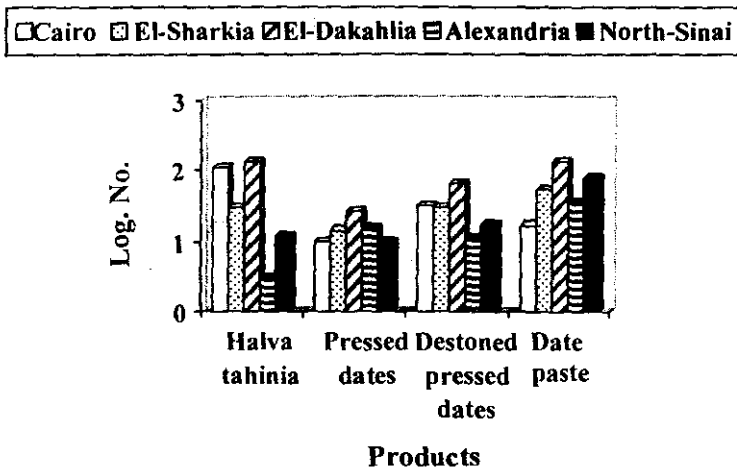


Fig. (5): Coliform group counts in halva tahinia and date products collected from five Egyptian Governorates (in logarithmic scale).

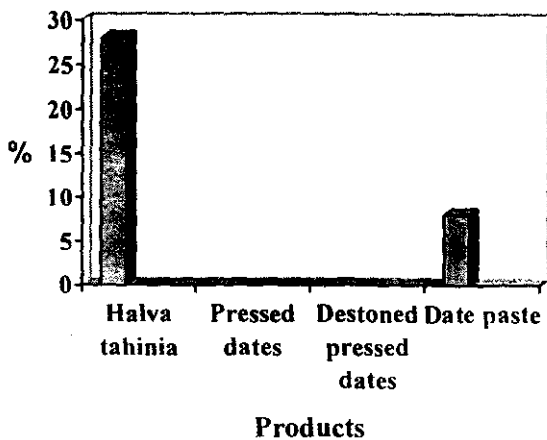


Fig. (6): Percentages of positive samples of fecal coliform in halva tahinia and date products in all of the collected samples.

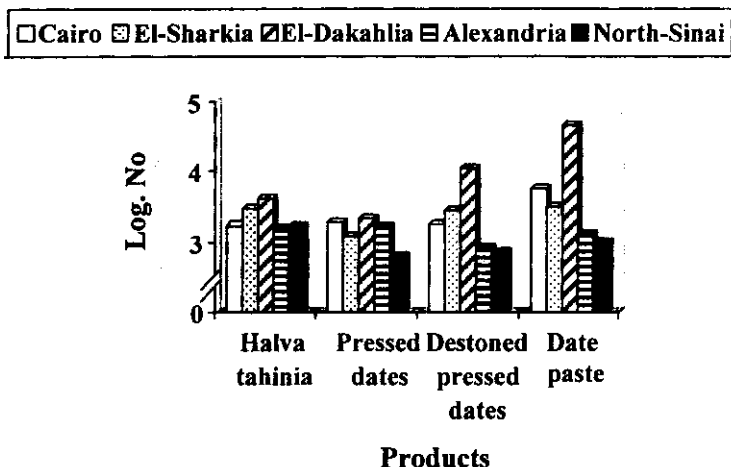


Fig. (7): Molds counts in halva tahinia and date products collected from five Egyptian Governorates (in logarithmic scale).

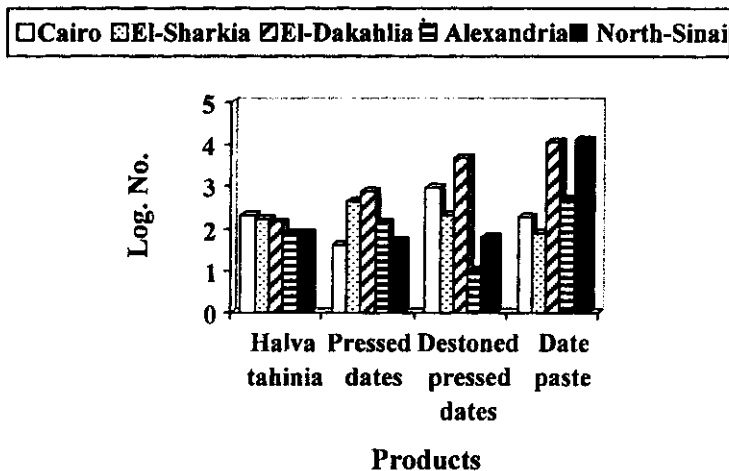


Fig. (8): Yeasts counts in halva tahinia and date products collected from five Egyptian Governorates (in logarithmic scale).

yeast counts in El-Dakahlia Governorate while halva tahinia and date paste from Cairo and North-Sinai Governorates contained the highest counts (Fig. 8).

The limiting factors of yeasts in halva tahinia might be due to low a_w and/or the occurrence of saponins which is known to have a fungicidal action.

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دراسات ميكروبيولوجية على الحلاوة الطحينية والعجوة فى مصر.

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أجريت الدراسة على خمسين عينة من كل من الحلاوة الطحينية و العجوة المكبوسة و العجوة منزوعة النوى و العجوة المفرومة (عجينة البلج) بإجمالى ٢٠٠ عينة تم جمعها من خمس محافظات مصرية هى (القاهرة و الشرقية و الدقهلية و الإسكندرية و شمال سيناء).

كان متوسط العد الكلى للبكتريا الهوائية و البكتريا المنتجة للجراثيم و *Bacillus cereus* و *Staphylococcus aureus* و بكتريا القولون و الفطريات و الخمائر فى الخمس محافظات مجتمعة كما يلى:

- فى الحلاوة الطحينية: $1.0 \times 10^{6,8}$ و 1.0×10^4 و $1.0 \times 10^{2,5}$ و $1.0 \times 10^4,1$ و $1.0 \times 10^{5,9}$ و $1.0 \times 10^{2,4}$ و $1.0 \times 10^{1,3}$ خلية/جرام، على التوالى.
- فى العجوة المكبوسة: $1.0 \times 10^{3,6}$ و $1.0 \times 10^{1,8}$ و $1.0 \times 10^{1,8}$ و $1.0 \times 10^{1,1}$ و $1.0 \times 10^{1,5}$ و $1.0 \times 10^{1,5}$ و $1.0 \times 10^{2,7}$ خلية/جرام، على التوالى.
- فى العجوة منزوعة النوى: $1.0 \times 10^{1,4}$ و $1.0 \times 10^{5,2}$ و 1.0×10^3 و $1.0 \times 10^{3,6}$ و $1.0 \times 10^{3,1}$ و $1.0 \times 10^{3,5}$ و $1.0 \times 10^{1,1}$ خلية/جرام، على التوالى.
- فى العجوة المفرومة (عجينة البلج): $1.0 \times 10^{3,8}$ و $1.0 \times 10^{5,6}$ و $1.0 \times 10^{5,6}$ و $1.0 \times 10^{3,7}$ و $1.0 \times 10^{6,4}$ و $1.0 \times 10^{1,1}$ و $1.0 \times 10^{5,1}$ خلية/جرام، على التوالى.

بينما كانت العينات كلها خالية من *Salmonella spp.* و *Shigella spp.* و

Yersinia enterocolitica و *Clostridium perfringens*.

احتوت الحلاوة الطحينية على عدد قليل من الخمائر و قد يرجع ذلك إلى تواجد مادة السابونين الموجودة في عرق الحلاوة وهي مادة مثبطة لنمو الميكروبات.

كانت العجوة المفرومة (عجينة البلح) اكثر منتجات البلح من حيث أعداد الميكروبات، في حين كانت العجوة المكبوسة هي الأقل في العد الميكروبي والسبب في ذلك قد يكون نتيجة لتعرض الأولى لعمليات تصنيع اكثر مما يتيح الفرصة للتلوث العرضي (عملية الفرغ).