Working method and terminology 2
1st year Licence SNV
University of Bejaia

Example : reading of a scientific article

SAIT-DIB Sabrina MCA à
Université de Bejaia

2023/2024

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Course description

1. Original article

2. Review article

1. Original article

VI. Evaluation of a scientific article

VI.1. Critical reading

N°	Questions asked		Yes	No	Comments
1	Is this article	An original work? A new subject?			
2	Is the title	Suitable for the content?			
3	Is the abstract	informative? Does it contain the main results?			
4	Is the introduction	Sufficient? Informative?			
5	Is the materials and methods section	clear? Appropriate? Ethical?			
6	Are the results	efficient? Satisfactory in terms of statistical analysis? Well presented?			
7	Are the tables	satisfactory? Clear? Necessary? Adequate in number?			
8	Are the figures	satisfactory? Clear / of good quality? Necessary? Adequate in number?			
9	Discussion	Does it include other studies?			

VI. Evaluation of a scientific article

VI.1. Critical reading

N°	Questions asked	
1 0	What is the type of this article? (An original ? A Review?)	
11	List the names of the authors, reviewers, and the editor."	Authors:
12	What is the affiliation of author (x)?"	
13	Identify the name of the main author (Lead author) of the article.	
14	Identify the volume and name of the journal of the article:	
15	Identify the Year of publication of the article	
16	Identify the DOI of the article	
17	Identify the number of pages of the article	

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ORIGINAL ARTICLE

Physicochemical characterization and antioxidant capacity of the extracted oil from date pits and its effect on storage stability of margarine

Ghania Kaanin-Boudraa [1], Fatiha Hamitri-Guerfi [1], Lydia Harfi [1], Ourdia-Nouara Kernou [1*], Fatiha Brahmi [1], Kahina Hardou-Belhocine [1], Samir Hadjal [2], Khodir Madani [1,3]

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ABSTRACT

Background and aims: The present work deals with the valorization of the date kernel oil of Mech-Degla variety by assessment of its physicochemical and antioxidant properties as well as

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Physicochemical characterization and antioxidant capacity of the extracted oil from date pits and its effect on storage stability of margarine

Ghania Kaanin-Boudraa [1], Fatiha Hamitri-Guerfi [1], Lydia Harfi [1], Ourdia-Nouara Kernou [1*], Fatiha Brahmi [1], Kahina Hardou-Belhocine [1], Samir Hadjal [2], Khodir Madani [1, 3]

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ABSTRACT

Background and aims: The present work deals with the valorization of the date kernel oil of Mech-Degla variety by assessment of its physicochemical and antioxidant properties as well as its use in the formulation of margarine. **Methods:** Kernels' oil was extracted using Soxhlet method and its total phenolic (TP), flavonoid and carotenoid contents and DPPH• scavenging activity were estimated using colorimetric assays. After that, this oil was incorporated into margarine. The determined physicochemical parameters were the pH, the salt content, the solid content, the melting point, and the peroxide index. Finally, the elaborated margarine's oxidative stability was evaluated by the Rancimat test. **Results:** The yield of fat in the extracted oil was 9.84 ± 1.45% and the amount of TP, flavonoids and carotenoids were 112.92 ± 26.57 mg gallic acid equivalent /kg of oil, 15.7 ± 0.7 mg quercetin equivalent/kg of oil and 125.534 ± 0.109 mg β-carotene equivalent/kg of oil, respectively. As regards the anti-DPPH effect, the cold and hot date kernel oil extracts exhibited a moderate capacity by reducing 55.91% and 30%of the free radicals, respectively. After that, table enriched margarine has been industrially elaborated at the Cevital agri-food complex by adding 50 and 100 ppm of date kernel oil. Texture of this margarine was plastic and easy to spread, with an acceptable color and a brilliant and homogeneous appearance. At 37 °C, the solid fat content (SFC) index is lower than 6%, which attested that this margarine melts easily in the mouth. The physicochemical characteristics of the formulated product were also assessed and demonstrated that its pH value was 4.2, its peroxide value was 0.32 meq of O_2/Kg of margarine and its melting point was 36.0°C. It was also revealed using the rancimat test that the margarine enriched in date kernel oil proved to be more resistant to oxidation, than the control one. **Conclusions:** Date kernel

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1. Is the Abstract Informative?

 Yes, the abstract is **well-structured** and covers:

Background & aims (valorization of date kernel oil for margarine formulation).

Methods (extraction, antioxidant assays, margarine formulation, and quality tests).

Key results (oil yield, phenolic content, antioxidant activity, margarine properties).

Conclusion (date kernel oil improves oxidative stability without altering margarine quality).

1. Le résumé est-il informatif ?

 Oui, le résumé est **bien structuré** et couvre :

Contexte & objectifs (valorisation de l'huile de noyaux de dattes pour la formulation de margarine).

Méthodes (extraction, tests antioxydants, formulation de margarine et tests de qualité).

Résultats clés (rendement en huile, teneur en phénols, activité antioxydante, propriétés de la margarine).

Conclusion (l'huile de noyaux améliore la stabilité oxydative sans altérer la qualité de la margarine).

Does It Contain the Main Results?

 Yes, but some **key details could be emphasized more clearly**:

✔ Oil extraction & composition:

Fat yield (9.84 ± 1.45%).

Phenolics (112.92 mg GAE/kg), flavonoids (15.7 mg QE/kg), carotenoids (125.53 mg β-carotene/kg).

Antioxidant activity: 55.91% (cold oil) vs. 30% (hot oil) DPPH• reduction.

✔ Margarine properties:

Texture: Plastic, spreadable, homogeneous.

Melting behavior: Low SFC (<6% at 37°C), melts easily (MP: 36°C).

Oxidative stability: Enhanced resistance vs. control (Rancimat test).

Minor Missing Details:

Exact **rancimat induction time values** (how much more stable was the enriched margarine?).

Sensory evaluation (was taste affected?).

 Strong Abstract – It contains all **essential results** and is **highly informative**. With minor tweaks (rancimat data, slight condensation), it would be even more impactful.

Résumé solide – Il contient tous les **résultats essentiels** et est **très informatif**. Avec quelques ajustements (données Rancimat, légère condensation), il gagnerait encore en impact.

1. Originality and Novelty of the Work

□ Original Work?

Yes, the study presents **original experimental research** on date pit oil extraction, physicochemical characterization, antioxidant capacity, and its application in margarine stability.

While date pit oil has been studied before, the **specific focus on margarine enrichment** and oxidative stability testing (e.g., Rancimat) adds novelty 810.

□ Travail Original ?

Oui, l'étude présente une **recherche expérimentale originale** sur :

L'extraction d'huile de noyaux de dattes

Sa caractérisation physicochimique

Sa capacité antioxydante

Son application pour améliorer la stabilité de la margarine

Bien que l'huile de noyaux de dattes ait déjà été étudiée, la **valorisation spécifique dans la margarine** et les tests de stabilité oxydative (ex: Rancimat) apportent une **nouveauté** [8,10].

□ New Subject?

Not entirely, as date pit oil has been explored for its antioxidant properties 10. However, the **application in margarine formulation** (especially at industrial scale, as done with Cevital agri-food complex) is less common and provides a fresh perspective 8.

Sujet Nouveau ?

Pas entièrement, car les propriétés antioxydantes de cette huile sont connues [10].

Cependant, son **application industrielle dans la formulation de margarine** (via le complexe agroalimentaire Cevital) est **moins courante** et offre une perspective innovante [8].

2. Does the Abstract Reflect the Title?

The title emphasizes:

Physicochemical characterization of date pit oil.

Antioxidant capacity evaluation.

Impact on margarine storage stability.

Le Résumé Reflète-t-il le Titre ?

Le titre met l'accent sur :

La **caractérisation physicochimique** de l'huile

L'évaluation de sa **capacité antioxydante**

Son **impact sur la stabilité de la margarine**

1 Introduction

The valorization of organic by-products in the food industry has attracted the interest of several researchers for both environmental protection and economic exploitation. For example, some tropical fruits' by-products possess antioxidant activities that retard lipid peroxidation as demonstrated in sunflower oil or food packaging applications [1,2].

The date palm (*Phoenix dactylifera* L.) is a vital plant for desert regions where it constitutes a basis of survival for their populations. The date palm tree produces globally an approximate of 4.8 million tons (dry weight) where 3.6

million tons are produced in the Middle East only as by-products of pruning, regarded as agricultural waste, which are either land filled or incinerated [3-5]. Date palm by-products (leaves, trunk, pits, pedicels, etc.) have various uses for example in the Algerian Saharan regions, pits are used in animal feed [6] and a low-cost agricultural by-product, is a good precursor for production of activated carbon, which is the most popular adsorbent [7].

The volume of date pits (DPs) generated by date processing industries is enormous (represent nearly 30% of the production) and requires special consideration due to the presence of vital bioactive compounds [8].

The date pits, in particular, are used as cattle feed [8, 9] and in traditional medicine for their antimicrobial and antiviral properties [10]. Similarly, several research works are devoted to the valorization of these pits in different forms including activated carbon [11-14], supplement in livestock feed [15], preparation of citric acid and proteins [16].

The characterization of the date pits (*Phoenix dactylifera* L. variety Mech-Degla) revealed their richness in various valuable

Given the remarkable composition of date kernel oil and its high antioxidant capacity we attempted to use it as an alternative natural food additive to a synthetic additive (α-tocopherol) commonly used as an antioxidant in margarines. Thus, *(i)* firstly the physicochemical and antioxidant characteristics of date pits oil were investigated, after that *(ii)* its effect on the oxidative stability of formulated margarine was achieved.

2 Material and Methods

2.1 Sample collection and preparation

The date variety "Mech-Degla Algerian" from Ouargla province (Algeria) was used, it was harvested in 2012. A batch of 50 kg of the whole date fruit was recovered where a random sampling was adopted. The pits were separated from the pulp manually and were then dried at 50 °C for 48 h until dry weight stabilizes. After that, they were crushed manually with a mortar and pestle, then crushed with an electric grinder to obtain a finer granulometry powder (2 mm) which was kept in the refrigerator (4 °C) until analysis [20].

variety Mech-Degla) revealed their richness in various valuable biochemical and mineral substances namely dietary fibers (22.5 – 94%), proteins (2.3 – 6.4%), ash (0.9 – 1.8%), sugars (5 – 6%), fats (7 – 13%), and phenolic compounds (3102 - 4430 mg/100g) [17, 18]. The oil of date pits, variety Khalas is composed of fatty acids (oleic acid: 56.1%, linoleic acid: 11.6%, lauric acid: 8.3%, myristic acid: 6.0%, and other minor fatty acids) [19] and natural antioxidants: polyphenols, sterols, tocopherols and carotenoids [20].

According to Karleskind [21], margarine is defined as a water-in-oil type emulsion that includes two essential phases: a continuous phase (fat phase) and a dispersed phase (water phase).It also contains additives (lecithin, salt, pigments, antioxidants, vitamins, etc.) distributed partly in the fatty and watery phases [22].

Currently the largest market for margarines is concentrated in North America (dominated by the United States and Canada), followed by Europe, Asia Pacific, South America, and Africa [23]. This market is growing mainly in the Middle East and Africa, with a compound annual growth rate of 2.14% from 2016 to 2025 [23].

The inclusion of margarine in this study was supported by the

in the refrigerator (4 °C) until analysis [24].

2.2 Physicochemical characteristics of the date kernels

The morphological characteristics of 12 dates were study. The dimensions of the pits were determined (length and width) using a caliper with a precision of ± 0.1 cm, and their weights using an analytical balance with a precision of ± 0.001 g. Their moisture [25] and fat contents (%) were calculated as reported in [26], respectively [27].

2.3 Extraction and analysis of date pits oil

The extraction of oil was carried out by Soxhlet fat extraction method [28]. Briefly, the dried sample (3 g) was introduced into the Soxhlet extractor and the extraction of the oil with n-hexane (200 mL) was realized during approximately 24 h. Then, the obtained oil was placed in a rotary evaporator to remove all traces of solvent and stored in dark vial.

The evaluated physicochemical and quality parameters of oil were pH, moisture, acidity, acid index, peroxide index [25], iodine index [29], specific absorbance, ultraviolet parameters (K232, K270) [30], and refractive index [31].

injector (SPLIT) for injection of liquids (up to 1 µL). The capillary column was DB 23 of 30 m × 0.32 mm × 0.25 µm. The oven temperature was set at 130 °C, the injector and detector temperature were set at 250 °C. The chromatograms were read in ascending order of number of carbons and unsaturation using "Shimadzu GC solution" for the treatment of the results.

2.4 Phytochemical analysis

2.4.1 Bioactive compounds contents

The total phenolic contents (TPC), of the obtained date pits oil, was determined following the method described by Juntachote et al. [33], using the Folin-Ciocalteu reagent. The absorption of the solution was measured at 760 nm and the results were given as mg equivalent of gallic acid /kg of oil (mg GAE/kg of oil). Total flavonoids content (TFC) was performed by the colorimetric method as described by Kumazawa et al. [34]. The absorbance was read at 430 nm and the results were expressed as mg equivalent of quercetin/kg of oil (mg QE/kg of oil).

Carotenoids' content was determined according to the

(0.60%), lactic acid (0.5 mL/kg) and potassium sorbate (300 mg/kg)) was produced at laboratory scale.

The date pits oil was incorporated in the lipid phase. After obtaining of the two phases, the margarine emulsion was blended together and cooled before being divided into 500 g tray. In parallel, a margarine reference was prepared without date pits oil using the same conditions. The final products were stored at 4 °C.

2.5.1 Physicochemical characterization of margarine

The physicochemical characterization of the formulated margarine was assessed by determining the pH, the solid content [37], the melting point [38] and the peroxide index [39].

2.5.2 Oxidative stability of margarine

The elaborated margarine's oxidative stability was evaluated by the Rancimat test [40]. Briefly, 3 g of samples were kept in a tube at 100°C with 10 L/h airflow under thermal breakdown conditions. In the measurement cell, which was filled with

width and length were 0.7 to 2 g, 0.8 to 1.1 cm and 1.8 to 2.8 cm, respectively. A significant difference has been reported between the trees concerning their diameter, weight and length of the kernel, even if the palms considered come from the same exploitation [41]. These differences can be induced by the types of pollen used by the producers [42]. Indeed, the significant effect of pollen on the morphological characters of the almond has been reported by the same author.

3.2 Moisture and fat composition of the date kernel powder

The detailed results regarding the moisture and fat composition of date pits powder are displayed in Table 1.

Table 1. Moisture and fat content of the date kernel powder

Constituents	Average values (% dry weight basis)
Moisture	5.00 ± 0.03
Fat (boiling)	9.84 ± 1.45

may be explained as evidence for the presence of chemical polymorphism due to the influence of environmental and ecological factors [44].

3.3 Date pits Oil quality parameters

The quality parameters of the studied date pits oil are summarized in Table 2.

Table 2. Physicochemical characteristics of the date pits oil

Parameters	Average contents
Iodine index (g iodine /100 g of fat)	53.00 ± 0.19
Acidity (%)	0.37 ± 0.17
UV extinction (%)	K_{232}: 1.528 ± 0.060 K_{270}: 0.381 ± 0.016
Refractive index at 40° C	1.4563 ± 0.0002
Peroxide value (meq O_2 / kg of fat)	3.66 ± 0.68

Table 5. Physicochemical characteristics of the elaborated margarine enriched with date pits oil

Parameters	Contents		
	MF1	MF2	MF3
Humidity (%)	13.85 ± 0.13^{b}	15.00 ± 0.15^{a}	15.06 ± 0.19^{a}
pH of aqueous phase	4.20 ± 0.012^{a}	4.00 ± 0.01^{a}	4.00 ± 0.018^{a}
Meting point (°C)	35.80 ± 0.15^{a}	35.2 ± 0.19^{a}	36.00 ± 0.16^{a}
Peroxide index (Meq O_2/Kg MG)	0.32 ± 0.01^{a}	0.30 ± 0.02^{a}	0.32 ± 0.01^{a}

MF1: Control margarine; MF2: Margarine with 100 ppm of date kernel oil; MF3: Margarine with 50 ppm of date kernel oil.
Each value is the average of three replicates ± standard deviation. In each line, different letters indicate significant difference ($p < 0.05$).

According to Belitz et al. [60], the melting point depends on factors attributed to the structure of triglycerides. It must be fixed in such a way that the margarine is melting in the mouth but also plastic at room temperature to support the mechanical work during spreadability. The results are within the range of melting temperatures of 15 Turkish margarines (33.0 and 36.9 °C) [61].

The first products formed by oxidation are peroxides or hydroperoxides which then evolve into more stable structures: volatile and non-volatile products [62]. The peroxide value is a very useful and sensitive criterion for assessing the early stages of oxidative deterioration [32].

We noticed that the value of the peroxide index is almost the same for the three margarines, it is clearly lower than the standard used by the company which is 10 meq O_2/Kg MG (NE.1.2.98.88) and lower than 5 meq/kg, maximum required by the standards [47].

This preliminary study shows that date pits oils could easily be conserved due to their high oxidative stability.

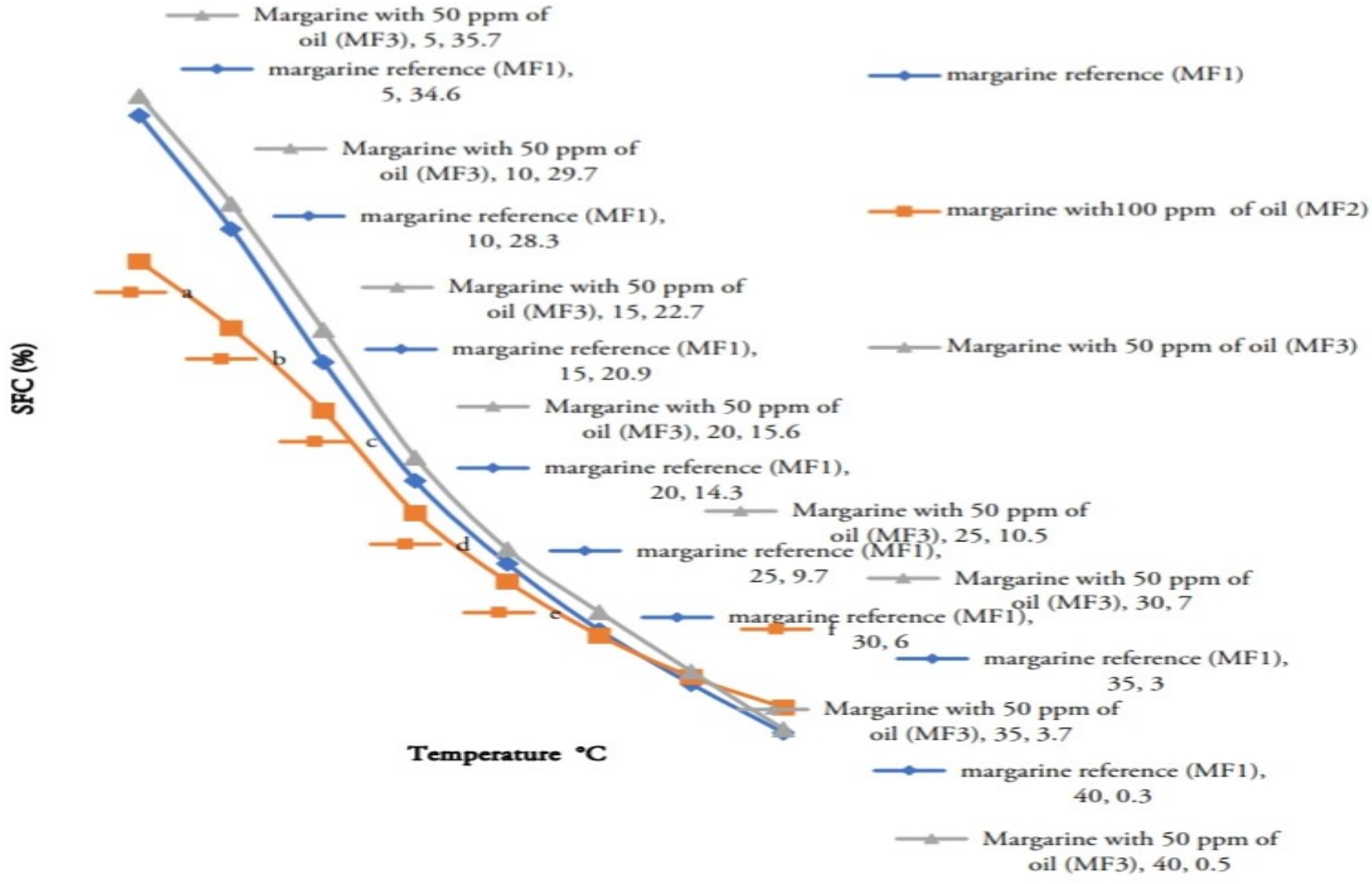

Figure 1. Solids' content (SFC) of margarines enriched with date pits oil.

Means with different letters were significantly different ($p < 0.05$); Values represent the mean ± standard deviation; $n = 3$.

3.9 Rancimat test

Lipid oxidation of foods is a growing problem in food processing. The Rancimat test can predict the oxidative stability of the oil as well as its shelf life [67]. To estimate the stability or susceptibility of margarine to oxidation, the samples were subjected to an accelerated oxidation test (Rancimat). The results of the analysis of the MF1, MF2 and MF3 samples are shown in Figure 2. They are presented in the form of graphs (parabolic function) representing the induction time as a function of the conductivity.

According to the results obtained in Figure 2, the induction time of the control margarine (MF1) is 17.67 hours followed by margarine enriched with 100 ppm of date pits oil (MF2) with a rate of 19.90 hours and finally margarine enriched with 50 ppm of date pits oil (MF3) with a value of 22.56 hours.

According to Arain et al. [68], this oxidative phenomenon is explained by the fact that the volatile degradation products are trapped in the distilled water, thus increasing the conductivity. The induction period is determined from the inflection point of the conductivity curve [40]. Accelerated oxidability tests on Rancimat were thus carried out at

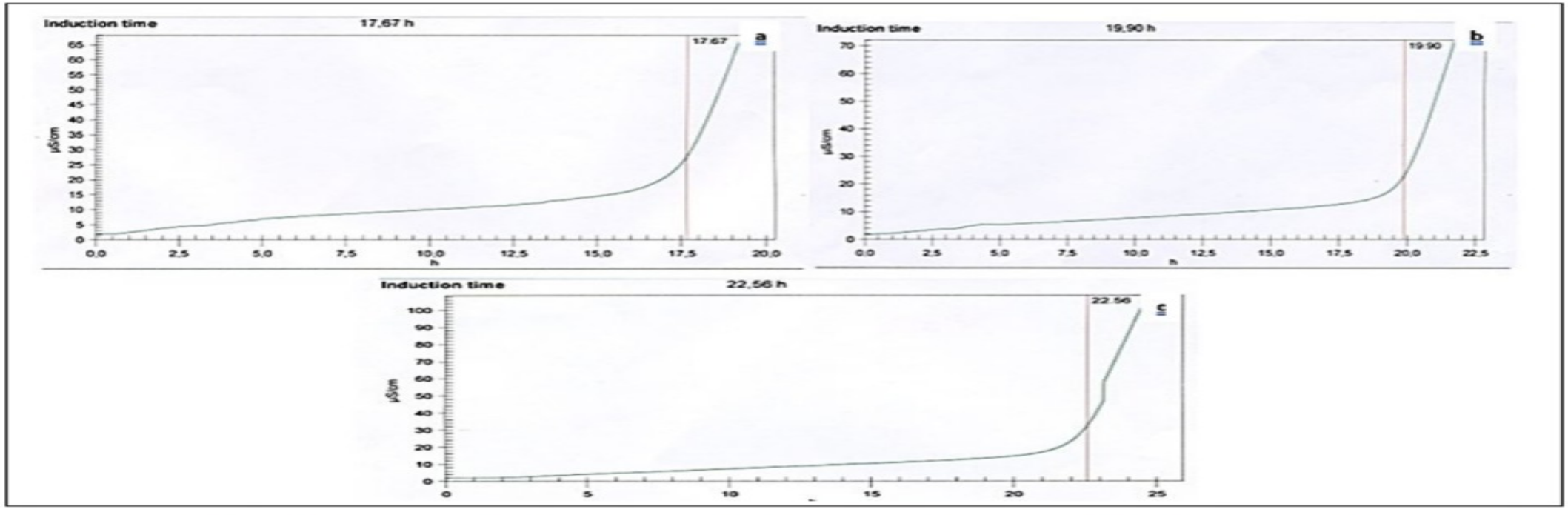

Figure 2. Oxidative stability curve in the Rancimat test of a) MF1 (control), b) MF2 (produced margarine with 100 ppm date kernel oil and c) MF3 (produced margarine with 50 ppm date kernel oil.

N°	Questions asked	
1 0	What is the type of this article? (An original ? A Review?)	**ORIGINAL ARTICLE**
11	List the names of the authors, reviewers, and the editor."	**Authors**: Ghania Kaanin-Boudraa 1 , Fatiha Hamitri-Guerfi 1 , Lydia Harfi 1, Ourdia-Nouara Kernou 1* , Fatiha Brahmi 1 , Kahina Hardou-Belhocine 1 , Samir Hadjal 2 , Khodir Madani **Reviewrs:** Dr. Hayat Bourekoua - Dr. Sara Jribi **Editor:** Pr. Meghit Boumediene Khaled
12	What is the affiliation of author (2)?"	**2:** Cévital spa, nouveau quai, port de Bejaia, Bejaia, Algeria. samir.hadjal@cevital.com
13	Identify the name of the main author (Lead author) of the article	Ghania Kaanin-Boudraa
14	Identify the volume and name of the journal of the article:	**Journal:** Nor. Afr. J. Food Nutr. Res **Volume:** 7
15	Identify the Year of submission of the article	July 03, 2023
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18	Identify the number of pages of the article	54 – 67
19	Identify the Title of the article	Physicochemical characterization and antioxidant capacity of the extracted oil from date pits and its effect on storage stability of margarine
20	Identify the Corresponding author of the article	Ourdia-Nouara Kernou, ourdia.kernou@univ-bejaia.dz ,

2. Review article

OPEN ACCESS Freely available online

Journal of Food: Microbiology, Safety & Hygiene

Review Article

Impact of Thermal and Non-Thermal Pasteurization on the Microbial Inactivation of Fruit Juice: Review

Belbahi Amine[1], Amir Nadir[2], Kernou Ourdia Nouara[3*], Amir Tahi Akila[3] , Kerdouche Kamelia[3], Kaanin Boudraa Ghania[3], Bedjaoui Kenza[3], Guemouni Sara[3], Djerroud Mohellebi Naima[3], Debbou Iouknane Nedjima[4], Boulekbache Lila[3], Madani Khodir[3,5]

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The title

"Impact of Thermal and Non-Thermal Pasteurization on the Microbial Inactivation of Fruit Juice: Review" clearly indicates that this is a **literature review** rather than an original experimental study.

•**New Topic?** Not necessarily, as fruit juice pasteurization methods have already been extensively studied. However, a review can provide an **updated comparative analysis** or a **critical synthesis** of recent advancements.

•**Original Work?** If the review offers a **new perspective**, a **meta-analysis**, or an **in-depth evaluation of limitations**, it can still provide an original contribution despite its format.

Le titre "Impact of Thermal and Non-Thermal Pasteurization on the Microbial Inactivation of Fruit Juice: Review" indique clairement qu'il s'agit d'une **revue de littérature** (review) et non d'une étude expérimentale originale.

Nouveau sujet ? Pas nécessairement, car les méthodes de pasteurisation des jus de fruits ont déjà été largement étudiées. Cependant, une revue peut apporter une **analyse comparative actualisée** ou une **synthèse critique** des dernières avancées.

Travail original ? Si la revue propose une **nouvelle perspective**, une **méta-analyse**, ou une **évaluation approfondie des limites**, elle peut apporter une contribution originale malgré son format.

ABSTRACT

Because of their exceptional qualities and high nutritional content, fruit and vegetable juices are an indispensable component of a healthy diet. The juices must first go through the process of pasteurization, which is the fundamental step in ensuring their quality, safety, and longevity. Although heat pasteurization is the most frequent approach for rendering bacteria inactive, it results in a number of unwanted side effects that contribute to a decline in the juice's overall quality. As a result, a number of non-thermal techniques of pasteurization have been devised, each of which assures the juice's safety while causing very minimal modifications to the juice's qualities. Yet, the high cost of installation and operation presented by these systems is the primary barrier that prevents their widespread use in industrial settings. Methods of non-thermal pasteurization, such as membrane filtration, pulsed electric field, ultraviolet, and sonication treatments, are discussed in this article. Other non-thermal pasteurization techniques are also discussed.

Keywords: Fruit juice; Pasteurization; Membrane filtration; Ultraviolet exposure; Pulsed electric field; Sonication treatment; Microbial inactivation

Your abstract is **informative** in terms of outlining the importance of non-thermal pasteurization methods and their advantages over traditional heat pasteurization. However, it **does not explicitly mention the main results** of the study—such as which non-thermal method was most effective, how microbial inactivation was measured, or any comparative findings between techniques.

Votre résumé est informatif car il souligne l'importance des méthodes de pasteurisation non thermiques et leurs avantages par rapport à la pasteurisation thermique traditionnelle. Cependant, il ne mentionne pas explicitement les principaux résultats de l'étude, tels que :

- Quelle méthode non thermique s'est avérée la plus efficace ?
- Comment l'inactivation microbienne a-t-elle été mesurée ?
- Quelles sont les conclusions comparatives entre les différentes techniques ?

Strengths:

✔ Clearly states the **problem** (thermal pasteurization reduces juice quality).

✔ Introduces **alternative solutions** (non-thermal methods).

✔ Highlights a **key limitation** (high cost of non-thermal techniques).

Points forts :

✔ Présente clairement le problème (la pasteurisation thermique altère la qualité du jus).

✔ Introduit des solutions alternatives (méthodes non thermiques).

✔ Met en lumière une limitation majeure (coût élevé des techniques non thermiques).

What's Missing?

- **Main results** (e.g., which method achieved the highest microbial reduction?).
- **Quantitative findings** (e.g., log reductions in bacteria, effects on juice quality).
- **Comparative analysis** (e.g., PEF vs. UV vs. sonication performance).

Ce qui manque :

- **Résultats principaux** (par exemple, quelle méthode a permis la meilleure réduction microbienne ?).
- **Données quantitatives** (telles que la réduction en log des bactéries, l'impact sur la qualité du jus).
- **Analyse comparative** (par exemple, performance des méthodes PEF vs UV vs sonication).

INTRODUCTION

Fruit juices are the most popular drinks and make up a big part of the food industry's market. This is because they have a unique mix of physical and chemical properties that make them natural and healthy [1]. These low-calorie foods, which are packed with nutrients and bioactive substances like proteins, carbohydrates, polyphenols, enzymes, minerals, fibers, and antioxidants, vitamins, can fit into today's hectic lifestyle [2]. Most acidic fruits are perishable because their high water activity promotes microbial and metabolic activities that ruin them. In addition to sanitary procedures, several treatments are applied during processing and/or storage to prevent the growth of undesirable bacteria. Fruit juices come in a wide range and are a vital source of complex nutrients for good health. Both foodborne pathogens and microorganisms that cause spoilage can grow well in the presence of these nutrients. *Salmonella*, *Cryptosporidium*, *Listeria monocytogenes*, and *Escherichia coli* are all relevant pathogens for procedures intended to regulate the efficacy of disinfection treatments, depending on the type of juice [3]. Thermal pasteurization and the natural acidity of fruit juices are used in treatment methods. The final product's overall quality might be impacted by unfavorable biochemical and nutritional changes brought on by the heat application. To maximize bacterial inactivation and minimize nutrient loss during thermal pasteurization, there have been several attempts to alter

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parameters, including processing time and temperature [4,5]. As a result of the variants' unsuccessful validation, the majority of these methods cannot be applied in the workplace [6].

In order to pasteurize food, a number of non-thermal techniques have been developed, including Ultra Violet (UV) exposure [7-9], high-voltage Pulsed Electric Fields (PEF) [10-12], membrane filtration[13,14], high hydrostatic pressure [15,16], and sonication[17-19]. These technologies have the benefit of preserving food's "fresh-like" qualities while also saving time and energy. The processing of fruit juices, particularly apple juice, has made extensive use of membrane filtration techniques [20]. PEF, which has already been used in an industrial setting, is among the most innovative non-thermal technologies [21]. When treating liquid food, it can inactivate microorganisms [22] and enzymes [23] with a relatively small temperature increase, resulting in a minimal loss of nutrients and minor quality changes. Another non-thermal pasteurization method that is frequently used in food preservation is UV exposure. The DNA of microorganisms can absorb short-wave UV light, which prevents cells from replicating [24].

LITERATURE REVIEW

This article reviews both thermal and non-thermal pasteurization methods for microbial inactivation, including PEF, membrane

pasteurization aims to kill pathogens and significantly lower the amount of spoiling microorganisms [27]. Conventional thermal pasteurization may be categorized into High-Temperature/Short-Time (HTST) and Low Temperature/Long-Time (LTLT) procedures. Whereas fruit juices are subjected to HTST pasteurization, which is done at temperatures of about 72°C with holding periods of 15 s and higher, LTLT pasteurization entails heating a meal at around 63°C for no less than 30 min. Both procedures may damage the taste, color, flavor, and nutritional content of meals [28].

Table 1 provides an overview of current research on the impact of heat pasteurization on the microbiological inactivation of fruit juices. Several fruit liquids were subjected to HTST pasteurization at temperatures ranging from 72°C to 108°C, with treatments lasting always one minute or less. Higher temperatures were more effective in preventing bacterial development, but they also caused a greater drop in the amount of phenolic chemicals in the juice. Other elements, such as the product complexity and microorganisms, may also have an impact on the effectiveness of HTST therapy. In less complicated single juices, HTST pasteurization performs much better than on more intricate/viscous juice products. For instance, a 15-second HTST treatment at 72°C led to a 6.0 log reduction in the number of native microorganisms in apple juice [29]; but only a

Conclusion

Non-thermal methods (PEF, UV, membrane filtration) better preserve juice quality than heat pasteurization while ensuring microbial safety. However, high costs and technical challenges hinder widespread industrial use. Future work should focus on improving cost-effectiveness and scalability of these technologies.

Les méthodes non thermiques (PEF, UV, filtration membranaire) préservent mieux les qualités nutritionnelles des jus que la pasteurisation thermique, tout en assurant une inactivation microbienne efficace. Cependant, leur coût élevé et leur complexité limitent encore leur adoption industrielle. Des recherches futures devront optimiser leur rentabilité et leur applicabilité à grande échelle.

N°	Questions asked	
1 0	What is the type of this article? (An original ? A Review?)	**Review Article**
11	List the names of the authors, reviewers, and the editor."	**Authors**: Belbahi Amine1, Amir Nadir2, Kernou Ourdia Nouara3*, Amir Tahi Akila3 , Kerdouche Kamelia3, Kaanin Boudraa Ghania3, Bedjaoui Kenza3, Guemouni Sara3, Djerroud Mohellebi Naima3, Debbou Iouknane Nedjima4, Boulekbache Lila3, Madani Khodir3 **Reviewrs:** NOT mentionned
12	What is the affiliation of author (2)?"	2Département de Microbiologie, Université de Bejaia, Route de Targa-Ouzemour, Bejaia, 06000, Algeria;
13	Identify the name of the main author (Lead author) of the article	Belbahi Amine
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20	Identify the Corresponding author of the article	Kernou Ourdia Nouara,: ourdia.kernou@univ-bejaia.dz

VI. Evaluation of a scientific article

VI.1. Critical reading

N°	Questions asked		Yes	No	Comments
1	Is this article	An original work? A new subject?			
2	Is the title	Suitable for the content?			
3	Is the abstract	informative? Does it contain the main results?			
4	Is the introduction	Sufficient? Informative?			
5	Is the materials and methods section	clear? Appropriate? Ethical?			
6	Are the results	efficient? Satisfactory in terms of statistical analysis? Well presented?			
7	Are the tables	satisfactory? Clear? Necessary? Adequate in number?			
8	Are the figures	satisfactory? Clear / of good quality? Necessary? Adequate in number?			
9	Discussion	Does it include other studies?			

VI. Evaluation of a scientific article

VI.1. Critical reading

N°	Questions asked	
1 0	What is the type of this article? (An original ? A Review?)	
11	List the names of the authors, reviewers, and the editor."	Authors:
12	What is the affiliation of author (x)?"	
13	Identify the name of the main author (Lead author) of the article.	
14	Identify the volume and name of the journal of the article:	
15	Identify the Year of publication of the article	
16	Identify the DOI of the article	
17	Identify the number of pages of the article	