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Review

Traditional Fermented Dairy Products in Southern Mediterranean Countries: From Tradition to Innovation

Marina Mefleh [1,*], Amira M. Galal Darwish [2,3], Priti Mudgil [4], Sajid Maqsood [4,5] and Fatma Boukid [6,*]

1 Department of Soil, Plant and Food Science (Di.S.S.P.A.), University of Bari Aldo Moro, 70126 Bari, Italy
2 Food Industry Technology Program, Faculty of Industrial and Energy Technology, Borg El Arab Technological University, Alexandria 23714, Egypt
3 Department of Food Technology, Arid Lands Cultivation Research Institute (ALCRI), City of Scientific Research and Technological Application (SRTA-City), Alexandria 21934, Egypt
4 Food Science Department, College of Agriculture and Veterinary Medicine, United Arab Emirates University, Al-Ain 15551, United Arab Emirates
5 Zayed Center for Health Science, United Arab Emirates University, Al-Ain 15551, United Arab Emirates
6 ClonBio Group, Ltd., Dublin D02 XE61, Ireland
* Correspondence: marina.mefleh@uniba.it (M.M.); fboukid@clonbioeng.com (F.B.)

Abstract: Fermented dairy products have been essential elements in the diet of Southern Mediterranean countries for centuries. This review aims to provide an overview of the traditional fermented products in Southern Mediterranean countries, with a focus on fermented dairy products, and to discuss innovative strategies to make improved versions of these traditional products. A large variety of fermented dairy products were reviewed, showing high diversity, depending on the used raw materials, starter cultures, and preparation procedures. Traditionally, dairy products were fermented using spontaneous fermentation, back-slopping, and/or the addition of rennet. Compared with commercial products, traditional products are characterized by peculiar organoleptic features owing to the indigenous microflora. The main limitation of traditional products is preservation as most products were consumed fresh. In addition to drying, brine or oil was used to extend the product shelf life but resulted in high salt/fat products. Several studies suggested alternative ingredients/processing to make revised products with new flavors, improved nutritional quality, and a longer shelf life. There is still plenty of room for more research to obtain a better understanding of the indigenous microflora and on quality improvement and standardization to reach a wider market.

Keywords: yogurt; cheese; butter; traditional food; spontaneous fermentation; back-slopping; innovation

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1. Introduction

Southern Mediterranean countries, especially the neighboring countries, share the same dietary habits and food culture [1]. Milk has a symbolic value of life and fertility in the lives of people residing there [2]. In fact, the Middle East has a rich portfolio of traditional dairy products as they were among the first countries to start animal domestication [3,4]. Milk is a highly perishable product, and thus, fermented dairy products represent important sources of energy and nutrients in a time of crisis because of their long shelf lives. Fermentation is one of the oldest food preservation techniques [5]. The traditional methods of making fermented foods have been passed down through generations. Although fermented products have been essential parts of the diet in the region for centuries, scientific knowledge and studies on some traditional fermented milk products is still limited.

Traditional fermented milk products are known for their peculiar organoleptic features, nutritional value, and therapeutic properties [6–8]. In the MENA region, there is a wide variety of artisanal dairy products, and their denomination and manufacturing processes differ between regions [9]. These products also differ in their taste and their consistency,

and they can be categorized into drinkable yogurt, spoonable yogurt, butter, and cheese (Appendix A). These products are made by fermenting raw milk at room temperature by using spontaneous fermentation, back-slopping fermentation, or a specific starter and/or rennet addition [10,11]. Fermentation is a simple process that does not require intensive labor; it extends shelf life and improves organoleptic features [12]. Traditional fermented products contain natural complex microbial communities that have various beneficial effects [11]. Fermentation imparts health benefits in association with the presence of probiotic bacteria (*Lactobacillus*, *Bifidobacterium*, *Streptococcus*, *Leuconostoc*, *Propionibacterium*, *Bacillus*, and *Enterococcus*) and their derived products with health benefits, such fatty acids, amino acids, minerals, and vitamins [6,10]. Fermented dairy products are generally considered microbiologically safe because they have a pH lower than 4.5 [13]. Below that level, the growth of most micro-organisms is inhibited [14].

Several traditional products are gaining interest because of their preferred sensory attributes as well as their health promoting benefits, and thus, they are industrialized and commercialized worldwide. Nevertheless, the use of modern processing and commercial starter cultures to recreate the authentic taste and flavor is challenging. Thus, further understanding and improvements in the traditional fermentation methods would contribute to finding safer and better standards while preserving the original flavor. In this context, this review aims to document the most popular traditional fermented dairy products (listed in Table 1) originating from Algeria, Egypt, Libya, Morocco, Tunisia, Lebanon, Syria, and Palestine. Each section intends to explain the indigenous raw ingredients, preparation techniques, and characteristics of these traditional products. Moreover, innovative approaches currently being implemented to introduce improved versions of these traditional products are also discussed.

Table 1. List of traditional fermented dairy products by countries [1–4,8,15].

Countries	Drinking Yogurt	Spoonable Yogurt	Butter	Cheese
Algeria	Lben, Raib	-	Smen/Dhan	Bouhezza, Klila, Jben, Takammart. Aoules, Chnina (Mechouna), Madghissa, Igounanes
Egypt	Laban Raib	Labaneh, Zabady, Kishk	Samna	Jebna adima (Mish), jebna barimili, jebna balady, arish (Karish), astanbouli, Ras/Rumy/Romi, Domiati
Libya	Lben, Raib	-	Zebda, Smen	Jben
Morocco	Lben, Raib		Zebda, Smen	Jben, Taklilt, Chefchaouen
Tunisia	Lben, Raib	-	Zebda, Smen	Jben, Rigouta, Testouri
Lebanon	Laban	Labneh, Kishk akhdar (green Kishk)		Serdaleh, darfiyeh, Nabulsi, Halloumi, Akkawi, Balady cheese, Jebneh khadra (or shencklish), arisheh, majdouleh, mshalshleh, Halawet el jeben,
Syria	Lban			Balady, Akkawi, charkassiyea, jebna haloum jebna arabia, jebna baytha, majdouleh, chelel, Sürke (Shanklish), cresse cheese
Palestine	Laban	Labneh, Kishk		Nabulsi, Majdouleh, Mish

2. Traditional Dairy Fermentation Methods

Dairy products from spontaneous milk fermentation have been produced and consumed for thousands of years [9,16]. Spontaneous fermentation consists of the "natural" fermentation of raw milk for hours to days at room temperature. This fermentation is mediated by indigenous microflora, especially lactic acid bacteria and exogenous microorganisms (contamination) [17]. Even though the fermentation process was studied for years, the naturally occurring bacteria had not yet been fully deciphered until now. Spontaneously fermented milk products can serve as a model system for investigating microbial ecology and evolutionary adaptations [11]. However, the main concerns over natural milk fermentation are associated with the high initial contamination [18], the inadequate hygiene conditions during the artisanal process [5,19], and the absence of any thermal treatment [9,20].

Back-slopping is another "natural" fermentation process that consists of adding a small quantity of old fermented product (yogurt or cheese) as a fermentate into a fresh raw ingredient [21]. The repetition of the identical back-slopping fermentation process stabilizes the microbial community and standardizes the quality and safety of the final product [11,22].

Traditionally, dried abomasa were used to coagulate the milk. At the end of the 19th century, the industrial production of rennet substituted the use of dried abomasum. Commercial rennet (chymosin) is an enzyme extracted from the gastric juices of calf and adult cattle stomachs [23,24]. Rennet contains mainly proteolytic enzymes, and proteolysis is an important part of cheese ripening [25]. Consequently, several types of cheese have special sensory characteristics that are attributed to the type of rennet used [9]. The increase demand for rennet lead to the production of rennet from other sources such as cattle, micro-organisms (e.g., *Rhizomucor miehei*, *Rhizomucor pussillus*, *Kluyveromyces marxianus var. lactis*, and *Escherichia coli K-12*), and plants (e.g., *Calotropis procera* and *Cynara cardunculus*) [23].

3. An Overview of the Traditional Fermented Milks

Fermented milk products are important staples in Southern Mediterranean countries (Table 2). They are produced using milk from cows, goats, ewes, sheep, camels, or buffalo, depending on the country's livestock farming [26]. According to their consistency, two categories might be identified, i.e., drinkable yogurt and spoonable yogurt.

Table 2. Main features of traditionally fermented dairy milks.

Types	Products	Common Name	Description	Main Starters	References
Drinkable	Spontaneously Fermented Milk	Raib/Laban Rayeb	Raib is a spontaneously fermented milk.	*Streptococcus termophilus*, *Lactococci*, *leuconostocs*, and *Lactobacillus*	[27,28]
	Buttermilk	Lben in Morocco and Algeria, leben in Tunisia, Iraqi and Laban khad in Egypt	Lben is a buttermilk resulting from the churning of naturally fermented milk	*Lactococcus lactis* ssp. *lactis*, *Lactococcus lactis* ssp. *lactis* biovar *diacetylactis*, *Lactococcus lactis* ssp. *cremoris*, and *Lactobacillus plantarum*	[29]
	Back-slopping fermented milk	Laban, Laban Zabady	Laban is fermented using old (previous) fermentate	*Streptococcus termophilus*, *Leuconostoc lactis*, and *Lactobacillus acidophilis*	[26,30,31]
Spoonable	Fresh/Dried Fermented milk and Cereals	Kishk, keshek, kushk, Kishk Matrouh	Kishk is made with fermented milk and cereals	*Streptococcus termophilus* and *Lactobacillus acidophilis*	[32,33]
	Concentrated Fermented Milk	Labneh, Labaneh, shaneenah, Anbaris,	Labneh is made by draining Laban or Laban Zabady until reaching a creamy texture	*Streptococcus termophilus*, *Leuconostoc lactis*, and *Lactobacillus acidophilis*	[34–36]

3.1. Drinking Yogurt

Spontaneously fermented milk, Raib or Rayeb, is produced in many Southern Mediterranean countries [37,38]. Traditionally, raw cow's, goat's, buffalo's, camel's, or ewe's milks or mixture of milks are spontaneously fermented at room temperature until coagulation [27,28]. Fermentation has been associated with bacteria (e.g., *Lactococcus lactis* and *Leuconostoc mesenteroides*) and yeast (e.g., *Saccharomyces* and *Candida*) naturally occurring in raw milks [39,40]. These micro-organisms are responsible for milk acidification, texture change, and aromatization [39]. They are natural probiotics providing several health benefits, such as improving immune system, the blood lipidic profile, and intestinal health [41]. Fermented milk could be consumed directly after fermentation or after manually skimming the fermented product [42]. Industrially, fresh milk is pasteurized (72 °C) to reduce/eliminate pathogens [43]. Then, commercial starters and/or rennet are added to coagulate the pasteurized milk (after cooling) [39]. A ready-to-use starter (*Streptococcus termophilus*, *Lactococci*, *leuconostocs*, or *Lactobacillus*) is not available, because

of the complexity and high biodiversity of the naturally occurring enzymes and micro-organisms [44]. Industrial fermentation results in organoleptic characteristics, including texture, flavor, and taste different from those of the conventional products. This is due to heat treatment (pasteurization) inactivating indigenous milk enzymes that play a pivotal role in the traditional flavor development [27,41].

Buttermilk ("Lben" in Morocco and Algeria, "leben" in Tunisia, and "Iraqi" or "Laban Khad" in Egypt) is made through the spontaneous fermentation of raw milk at room temperature (24–72 h) until coagulation [45]. The spontaneously fermented milk is churned to separate nonbutter fraction from the butter [46]. Lactic bacteria identified in traditional buttermilk belong to *Lactococcus lactis*, *Leuconostoc mesenteroides*, and *Lactobaccillus plantarum* species. The key aromatic compounds are mainly butanoic acid, acetoin, and hexanoic acid [47]. Even though buttermilk is generally considered safe for consumption, pathogenic micro-organisms (e.g., *Escerichia coli*, *Salmonella enteritidis* and *Staphylococcus aureus*) have been detected [15]. Industrially, whole, skimmed, or partially skimmed milk is pasteurized and then fermented using commercial starters, i.e., *Lactococcus lactis lactis*, *Lactococcus lactis diacetylactis*, and *Lactococcus cremoris* [15,21]. Despite the efforts implemented to imitate the organoleptic properties of traditional products, consumers still prefer traditional products because artisanal starters enable a typical flavor (fresh and sour taste) and texture that cannot be reached with the commercial starters. Traditional Lben is characterized by higher protein, lactose, and mineral contents but a lower fat content and acidity than industrial Lben. When traditional Lben was used as an old fermentate instead of commercial starters to make industrial Lben, the resulting fermented milk had a firmer texture and improved taste and mouthfeel [15]. The weak texture of industrial products could be overcome by using thickeners such as starches [48].

Laban in Lebanon or Laban Zabady in Egypt is a spoonable yogurt obtained by back-slopping fermentation. A small quantity of old Laban is used as a starter and added to pasteurized milk (from a cow, goat, sheep, buffalo, or camel). Micro-organisms identified in Laban are *Streptococcus termophilus*, *Leuconostoc lactis*, and *Lactobacillus acidophilis* [30]. The industrial production of Laban is carried out using lactic acid bacteria fermentation (*Streptococcus thermophillus* and *Lactobacillus bulgaricus*) at 40–45 °C [31]. Industrialization enabled achieving the constant and standard metabolic starter performance and rheological properties of yogurt. However, consumers prefer the traditional product because of its peculiar taste and flavor [30,31]. Laban is characterized by 1% titratable acidity and a pH of 4.0 [30]). Compared with milk, Laban is a probiotic product with lower cholesterol, fat and protein contents, and higher minerals and vitamins than raw milk [26,49,50].

3.2. Spoonable Yogurt

Labneh or Shaneenah is a sour and creamy product heavily consumed in the Mediterranean region (Lebanon, Egypt, Jordan, and Syria) [34–36] and commercialized worldwide. It is obtained by draining Laban or Zabady by using a cheesecloth at room temperature until obtaining the desired solid texture. Labneh is characterized by high-protein (double the content of Laban) and probiotic micro-organisms (more concentrated in viable lactic acid bacteria than yogurt) contents and low-lactose content [51]. Moreover, it has a fat content of 9–11% (if full-fat yogurt is used), a moisture content of around 75%, a pH of around 4.5 and a shelf life of 7 to 10 days [35]. A unique version of Lebanese Labneh, known as Labneh Anbaris, Labnet el-jarra, and Serdaleh, was produced mainly in the rural areas. It is obtained by spontaneously fermenting the milk of a goat, a sheep, or a mix of them with 5% coarse salt for two weeks [52]. Fermentation takes place in specific earthenware jars with holes designed for continuous whey drainage. Jars are refilled with fresh milk at around 30 °C every 5–7 days until the jars are full. Fresh Labneh Anbaris has a firm texture, white color, and high acidic content (pH 3.76) [53]. It is consumed fresh or shaped into small balls and conserved in glass jars filled with olive oil for up to one year. Labneh Anbaris is currently available in the global market as pots of cheese balls covered with oil and preserved at 4–6 °C.

Kishk is widely consumed in Lebanon, Jordan, Egypt, Palestine, and Syria [32]. It is known by different names: keshek, Kishk (Lebanon), kushk, or Kishk Matrouh (Egypt). Kishk is prepared by mixing cereal such as burghul (crushed and parboiled wheat), wheat, or barley with fermented milk (Laban (Lebanon) or buttermilk (Egypt)] from cow, sheep or goat milk in a ratio of (1:1–1:4) and salt (3%) [32,33,54]). The fermentation could take a few days (2 to 7 days) at room temperature, with a daily addition of fermented milk to keep the fermentation active. The obtained paste is kneaded, shaped into balls, and consumed fresh or preserved in glass jars filled with olive oil. Kishk balls also could be sundried, rubbed by hand, or ground (industrially) to obtain Kishk flour with a long shelf life (1 to 2 years) [33]. Kishk flour is characterized by a fat content of 8–10%, low moisture content (10–15%), pungent acidic taste, and low pH (3.80–4.80) [32,55]. Kishk flour is traditionally used as an ingredient to make nutritionally balanced (high in protein and fiber) soups [33].

4. Traditional Butter

Butter is one of the oldest dairy products and is one of the main sources of fat and energy [56]. In North African and Middle East countries, traditional butter (Zebda or Zebda baladi) is produced by churning the spontaneously fermented milk to separate the butter from the buttermilk (Lben) [37,57]. Churning breaks the oil-in-water emulsion, leading to aqueous phase separation and the formation of water-in-oil emulsion. This product is characterized by a strong diacetyl flavor (depending on the source of milk) and savory taste, which is appreciated by consumers [57]. Aldehyde and ketone compounds are characteristics of cow milk butter; acid and terpene are characteristics of sheep butter; and ester, alcohol, and sulfur compounds are characteristics of goat butter [58]. Traditional products have a limited shelf life and need to be consumed within a few days. Prolonged storage inducea a deterioration of odor, color, taste, and nutritional quality due to lipolysis and oxidation [59]. Contaminated raw materials can favor the growth of pathogens such as *L. monocytogenes* [60]. Industrial butter is widely produced and consumed around the world, directly or as an ingredient in processed foods [56]. After pasteurization, the milk is skimmed to separate the cream from the milk. The collected cream is standardized at 40% fat and a pH of 6.6 and pasteurized. This cream is physically matured, acidified (at pH 5.2), and then churned. After separating the buttermilk, the butter is washed, salted, and processed to reach the desirable consistency [61].

Ghee, also Smen/Dhan in North Africa, Samn Baladi in Egypt, or Samneh in Lebanon, is a fermented butter made from raw whole milk (cow, goat, or buffalo milk either alone or as a mixture) [62,63]. *Lactococcus*, *Lactobacillus*, and *Leuconostoc* are the main microflora involved in ghee fermentation [64]. There are two variants of ghee: rancid butter and butter oil [65,66]. Rancid butter is obtained through the maturation (1–12 months) of raw salted butter (8–10%) made from spontaneously fermented milk [67,68]. This product is highly aromatic and used to improve the taste of many traditional dishes and medicines [63,64,69]. On the other hand, butter oil is produced by heating traditional butter to separate fat from milk serum [57]. Before maturation (1 month to 7 years), several ingredients, including salt, coarse semolina, and herbs, can be added for flavoring and/or preservation purposes [70]. However, lipolysis and oxidation during prolonged storage can reduce the nutritional and organoleptic qualities and induce the rancidity of butter oil [71].

5. An Overview of Traditional Cheeses

The cheese repertoire of Southern Mediterranean countries is rich and contains a wide variety of products, from fresh to hard types (Table 3).

5.1. Soft Cheese

Chnina (also Mechouna, Michouna) is a soft fresh cheese from Algeria (Tébessa area) made using back-slopping fermentation. Fresh goat milk is mixed with buttermilk (at a 1:2 ratio pf buttermilk to milk) and salt. The mixture is heated until coagulation. The recovered

curd is drained overnight to completely remove the whey. This cheese has a pH of 5.85 and short shelf life (up to 6 days) [72].

Table 3. Traditional cheeses.

Types	Products	Description	Starter Culture	References
Soft	Chnina	Fresh cheese with short shelf life	Back-slopping fermentation	[72]
	Testouri	Fresh and brined cheese	Rennet	[73]
	Rigouta	Fresh cheese with short shelf life	Spontaneous fermentation of whey	[74]
	Jben	Fresh, white cheese, slightly salty and sour	Spontaneous fermentation, plant coagulating enzymes and/or rennet	[75,76]
	Chefchaouen	Fresh cheese	Rennet	[77]
	Arish, kariesh	Fresh light cheese	Natural acid coagulation	[34]
	Madghissa	Processed cheese with yellow color, and elastic texture	Back-slopping using fresh Klila	[78,79]
	Domiati	Ripened and light-brown cheese	Spontaneous fermentation	[80]
	Mish	Ripened and/or fresh cheese	back-slopping using fresh Karish or old Mish	[81,82]
	Bouhezza	Ripened and spreadable cheese flavors are slightly salty, spicy, and acidic	Spontaneous fermentation	[83,84]
Semihard	Halloumi	Semihard to hard white brined cheese	Rennet	[85]
	Akkawi	White brined cheese	Rennet	[86]
	Nabulsi	White brined cheese	Rennet	[87]
	Mshalshe	Stretched-curd brined cheese	Rennet	[81,82]
	Darfiyeh	Dried and ripened cheese	Spontaneous fermentation	[88]
	Shankleesh	Fresh and/or dry aged cheese	Spontaneous fermentation	[3]
Hard	Klila	Fresh and/or dry white cheese	Spontaneous fermentation	[89]
	Takkamart	Dry brown cheese	Abomasum	[78]
	Aoules	Dry cheese	Spontaneous fermentation	[83]
	Taklilt	Dry cheese	Spontaneous fermentation	
	Roumy, Rumi, Ras	Hard aged cheese	Spontaneous fermentation	[34]

Testouri is a fresh soft cheese made from goat and sheep milk, and it is traditionally consumed in Tunisia [73]. This white cheese is a product obtained after milk coagulation (with rennet) and draining (for whey removal). The curd is kept in brine for flavor improvement and preservation [90]. This cheese is reported to have probiotic effect (conferring health benefits) owing to the presence of *E. faecalis OB14* and *OB15* [91].

Rigouta is a fresh soft cheese from Tunisia (region of Béja) and is made by the spontaneous fermentation of whey at room temperatures for 1–2 days. *Lactococcus lactis* and *Enterococcus faecalisare* are the key micro-organisms in Rigouta fermentation [74]. Fermented whey is then heated for protein coagulation [92]. The curd is drained to obtain fresh cheese, which has a short shelf life (2–3 days) [93,94]. The industrial version of Rigouta in Tunisia is commercialized as "Ricotta", which has similar process to Italian Ricotta, which is produced by heating whey protein (and milk or cream milk to increase the yield), adding citric acid to induce coagulation, draining, and packaging [95]. The resulting product is characterized by 70–80% moisture, 10–25% fat and 8–10% protein, a pH ranging from 6.10 to 6.80, and a shelf life of 3 weeks at 4 °C [96]. *Enterococcus faecalisare* is the key microorganism in Rigouta fermentation [74].

Jben, Djben, or Jebena Balady is a soft white cheese traditionally made in the North African and Middle Eastern countries, such as Egypt and Lebanon [45,97]. Jben is produced from spontaneously fermented raw sheep milk or goat milk at ambient temperature for 1 (summer season) to 3 (winter season) days [97]. Fermentation can be accelerated through the addition of coagulating enzymes (e.g., cardosins and cyprosins) from plants (e.g., cardoon, artichoke, or pumpkin) or rennet [75,76]. The main strains occurring in traditional Jben belonged to the genera *Lactobacillus*, *Lactococcus*, *Leuconostoc*, and *Enterococcus*. In total, 16 species were identified: *Lactobacillus plantarum*, *Lactobacillus rhamnosus*,

Lactobacillus paracasei, *Lactobacillus brevis*, *Lactobacillus buchneri*, *Lac-tococcus lactis*, *Lactococcus garvieae*, *Lactococcus raffinolactis*, *Leuconos-toc pseudomesenteroides*, *Leuconostoc mesenteroides*, *Leuconostoc citreum*, *Eterococcus durans*, *Enterococcus faecalis*, *Enterococcus faecium*, *Enterococcus saccharominimus*, and *Streptococcus* [98]. This cheese is flavored with plant extracts, spices, and herbs (e.g., garlic and thyme added after draining and salting) [99]. Jben can be stored for up to 7 days at a cool temperature before being served. This cheese has a pH of 4.1 and is characterized by 62.5% moisture, 16.5% fat, 15.8% crude protein, 4.1% lactose, and 1.04% titratable acidity [98,100]. At an industrial level, the fermentation of pasteurized milk is conducted using rennet and acidifying agents [99].

Chefchaouen is a fresh goat's cheese from the province of Chefchaouni (Morocco) [77]. The cheese is traditionally made from whole raw milk, rennet, and salt. Prior to consumption, this cheese is washed to remove the excess salt used for preservation. Industrially, milk is pasteurized and fermented using starter cultures and synthetic animal rennet, with the exclusion of salting to produce a French-style cheese. This cheese is still sold in local shops and supermarkets in North Morocco [77].

Karish, kariesh, or kareish is a soft cheese made from skimmed milk (cow or buffalo) or traditional yogurt (e.g., Laban, Rayeb, or Laban khad). Karish is prepared by draining and pressing the skimmed yogurt (Laban) in a tied cheesecloth for 1 (summer season) to 3 (winter season) days. The obtained cheese is cut into pieces, salted, and kept in a cheesecloth for hours for complete whey elimination [34].

Madghissa or Imdeghest is a processed cheese from the Chaouia region (Algeria) [79]. Fresh Klila (a hard cheese) is used as fermentate, mixed with salt and fresh milk and heated until the protein coagulates. After cooling and draining the whey, the cheese obtained is characterized by a salty taste, a yellow color, and an elastic texture [78].

Domiati is a soft ripened or fresh Egyptian cheese [80]. Salted cow or buffalo milk is spontaneously fermented for 2–3 h [34,101]. The obtained curd is molded, drained (12 to 24 h), pressed, and cut into blocks. Fresh Domiati has a pH of 6, which could favor microbial spoilage [80]. For longer preservation, this cheese can be stored in salted whey for 4 to 8 months. For the aging process to take place, cheese is wrapped in wax paper and stored in wooden or steel molds for a year. Aged Domiati cheese has a pungent taste and a light-brown color.

Mish is a soft and ripened Egyptian cheese prepared by covering small pieces of Karish cheese with milk (whole or skimmed) or buttermilk and salt (10%), and it continues to maturate in earthenware pots for 1 year [34]. Pots are closed with mud paste and stored in warm conditions (or it can be exposed to the sun). In some cases, old Mish could be added as a natural starter to accelerate the fermentation. Flavoring ingredients such as food byproducts from sesame oil or butter oil production and/or spices (e.g., red, hot, green, or black peppers, anis, and/or fennel) could be added. Mish is characterized by a strong flavor [102].

Bouhezza is a traditional soft and ripened cheese from Algeria (the region of Chaouia) [103]. Traditionally, this cheese is made from goat's, sheep's, or cow's milk or a mixture of them [78,79]. Before cheese making, buttermilk is kept for 12 to 24 h in a goatskin bag to remove skin features (odor/taste) [103,104]. Then, salt and buttermilk are poured, mixed, and left to maturate for 2 to 3 months, until they have reached the desired texture [79,83]. Bouhezza is acidic (pH 4) and contains 13% protein and 13% fat [83,84]. The main lactic acid bacteria identified in Bouhezza are *Enterococcus faecalis*, *E. faecium*, and *Lactobacillus paracasei* ssp. *Paracase* [83,104]. Currently, traditional Bouhezza is limited to some regions and commercialized in small local markets.

5.2. Semihard Cheese

Haloumi is a semihard to hard white cheese highly consumed in some Mediterranean countries (Lebanon, Syria, and Jordan). According to the Cypriot standards [85], traditional Halloumi is prepared by the coagulation of a mix of ovine milks with rennet. The obtained curd is pressed and cut into blocks while the whey is heated to eliminate the solubilized

proteins. The blocks of curds are cooked in the whey for 1 h then drained, salted, sprinkled with dry mint, pressed, and folded in half. Halloumi is stored in brine (11–12% salt) for almost 40 days before its consumption [105]. Halloumi can be consumed fresh, grilled, or fried. It is characterized by an elastic and compact texture when it is fresh and by good melting and stretching properties when heated. It has a salt content of 3%, fat content of 43% (dry matter), and moisture content of 46% [106,107].

Akkawi is a semihard cheese popular in the Middle East, Persian Gulf, and North African countries [86]. It is produced from the coagulation of bovine or ovine milk or a mix of them, using rennet. The curd obtained is molded and pressed well to drain all the whey, cut into blocks, and pressed for 1 h [81]. Industrially, starter culture and then rennet are added to milk at 35 °C after its pasteurization. Akkawi cheese is preserved in brine (10% salt) at 4 °C. It has a fat content of 21.6%, protein content of 22.5%, and moisture content of 51% [108].

Nabulsi is a semihard cheese high in salt and made traditionally from the coagulation of sheep or goat milk or a mix of them, using rennet. Today, cow milk could also be used. After coagulation, the obtained curd is cut, drained in a cheese cloth, and pressed. The cheese is salted and stored overnight in brine (18 to 21% salt). After 24 h, the cheese is cooked in the boiled brine for 5 to 10 min, cooled, and stored in a brine of 15% salt [108,109]. The shelf life of Nabulsi cheese is about 6 to 12 months [108].

Mshalshe or Shelal cheese is a stretched-curd cheese consumed in Lebanon and Syria. The preparation of Shelal consists of coagulating the milk using rennet, leaving the curd aside to acidify and then stretching and tearing down the curd to form strands for braiding. Mshalshe cheese is characterized by a pH of 5.2 and is traditionally stored in brine [81,82].

Darfieh is a very old semihard and dry Lebanese cheese produced from the spontaneous fermentation of raw goat milk. The curd obtained is stirred, shaped manually into balls, salted, and then sundried. The dried balls are cut and left aside for longer than 12 h, before being conserved in goatskin bag (after being cleaned and salted) for aging [88].

Shanklish is a dry, semihard, and mold-ripened cheese consumed in Lebanon. It is prepared using whole or skimmed traditional yogurt (e.g., Laban) from ewe, goat, or cow milk. Laban is heated until the protein coagulates. Then, the curd (Quareesh el Laban) is drained in a cheesecloth, salted (10%), shaped into balls, and sundried for 3 days [3]. Dried cheese is left to age in earthenware jars for weeks at room temperatures. During aging, yeast and molds (including *Debaryomyces hanseni* and *Penicillum*) cover the cheese with green spots, which are sometimes washed at the end of the fermentation process. Aged Shanklish is sprinkled with dry herbs and spices (thyme, chili, and/or cumin) and can be consumed fresh or stored in glass jars and covered with olive oil for 1 to 2 years. Shanklish has a pH around 4 and an astringent and piquant taste. It is high in protein (33%) and low in fat (2%) [3].

5.3. Hard Cheese

Klila is the most popular hard cheese in the Chaouia region (Algeria) [83,89]. Raw milk from goat, sheep, or cow is spontaneously fermented until coagulation and then churned. The buttermilk fraction is heated (up to 75 °C) to favor whey separation from the curd [89,110]. The curd is drained to recover fresh cheese [89]. This cheese can be consumed fresh or dried (sundried), for a shelf-life extension of up to 2 years. This artisanal manufacturing process is still applied in different Algerian regions [110]. Dry Klila can be rehydrated (using milk or water) and mixed with cereal flours [111]. Klila is characterized by high-protein content and low-salt and -fat contents, and it is consequently recommended to people with metabolic diseases such as diabetes or high cholesterol levels [111,112].

Takemmart is an Algerian dry hard cheese with a flattened shape and brown color. It is obtained by the fermentation of milk using the rennet of young goat's stomach (abomasum). After coagulation, the curd is recovered, kneaded, and placed on a mat covered with fennel for flavoring. The mats are then sundried for 2 days and then kept in the shade until the cheese hardens. The cheese can undergo maturation for 1 month [78].

Aoules or Ioulsân is a dry cheese from Algeria (Ahaggar region) [83]. Aoules is obtained by moderate heating of buttermilk until the protein precipitates (like Klila) [113]. The precipitate is strained in a straw basket, and the curd is kneaded in a small quantity, shaped in cylinders (2 cm thick, 6–8 cm diameter), and then sundried, milled, and stored [114]. In a similar way, Taklilt is a dry Moroccan cheese made primary from camel's milk. The fermented milk is heated until coagulation and then drained. The curd obtained is shaped into balls and dried in the sun.

Ras or Roumy is an Egyptian aged hard cheese produced by the spontaneous fermentation of cow or buffalo milk or a mix of them. The obtained curd is stirred, heated, salted, molded, and drained in a cheesecloth. A manual (traditionally) or mechanical (industrially) pressure is applied to hasten the whey drainage. The obtained cheese is stored in brine (20% salt) and then drained and dry salted for 2 months on wood shelves [34]. Each side of the cheese wheel is salted separately many times. Ras cheese contains viable probiotic bacteria and has a strong and pungent taste [115,116]. Concerns about the contamination risks of the wet wood shelves (absorbing the cheese water) have been raised and investigated by many authors [116,117].

6. Innovative Strategies for Enhancing the Quality and Safety of Traditional Fermented Dairy Products

6.1. Increasing and Unifying Quality Parameters

Ultrafiltration was used to standardize the fat content (5%) of goat milk–based Halloumi type cheese [118]. This technique increased protein retention, meltability, and free-oil release. When the fat level was increased above 2 g/100 g, organoleptic attributes, especially texture, and overall acceptance of Halloumi cheese were significantly improved [118]. Adding 2% of oats to ultrafiltered low-fat Labneh improved the sensory and nutritional qualities (protein and fiber), increased probiotic bacteria, and extended the product shelf life [119]. Moreover, Labneh products were found free from coliform throughout the storage period.

Lactobacilli have received increasing attention as probiotics and improvers of shelf-life and sensorial properties [120–122]. Lactic acid bacteria (*Lactobacillus plantarum* and *Enterococcus faecium*) with antimicrobial activity against *Staphylococcus aureus* were effective in protecting Domiati cheese during 8 weeks of storage (at 6 °C) and improving the organoleptic properties, proteolysis, and lipolysis [123]. Darwish et al. [124] isolated 268 lactic acid bacteria from native Egyptian camel, sheep, goat, buffalo, and cow milks. Among these strains, *L. lactis* subsp. *cremoris (KM746)*, *L. lactis* subsp. *lactis (KM721)*, *Lb. plantarum (KP623)*, *Lb. delbrueckii* subsp. *lactis (KP654)*, and *Enterococcus feacium (KT712*) were used as starter cultures to enhance the safety and organoleptic properties (taste, spreadability, and the overall texture) of Karish cheese products [125,126]. The addition of probiotic bacteria to Labneh decreased the fungi and psychrophilic bacterial counts [119,127]. The incorporation of encapsulated *Lactobacillus acidophilus* (5% and 10% of capsules) to butter increased the viability of probiotic micro-organisms without hindering their sensory acceptance [56].

Low fat, reduced fat, and reduced trans-fat are nutrition claims of relevance for health-conscious consumers. Exopolysaccharide-producing probiotic *Lactobacillus plantarum* isolated from camel milk was used for making low-fat Akkawi cheese [128]. The resulting cheese showed improved radical scavenging rates (determined by DPPH and ABTS), ACE-inhibition activity, and antiproliferation activity during the prolonged storage period. It was also reported that the partial substitution of 30% of cow milk with camel milk to make low-fat Akkawi improved the rheological properties during the storage period [129]. Low-fat Halloumi was made by using modified maize starch as a fat replacer [130]. The addition of modified starch to cow milk improved the sensorial properties, yield, and protein content. In addition, it decreased the fermentation time, pH, total solids, fat, ash, and total volatile fatty acids, as well as total bacterial count and lipolytic bacteria [130]. Sesame seeds (0–6%) used as fat replacers increased total solid, fat, and acidity but

decreased the protein and ash contents in Labneh [131]. The replacement of 50% of milk fat with wheat germ oil encapsulated in natural casein micelles enhanced the physicochemical and sensorial characteristics of Labneh [132]. The partial substitution of milk fat with jojoba oil reduced the trans-fat and cholesterol contents and improved the sensorial properties of Domiati cheese [133]. The intake of Kishk enriched with a mix of pomegranate seed oil and/or gum Arabic improved plasma high-density lipoprotein cholesterol, blood glucose, plasma dyslipidemia, and urea [134].

The reduced salt/sodium approach is a major trend in the food industry [135,136]. Several traditional cheeses are salted or preserved in brine for flavoring and preservation. This might negatively impact their acceptability by consumers having health issues and requiring a diet low in salt or looking to reduce salt intake as a part of a healthier lifestyle. It was reported that high sodium intake is associated with increased risk of hypertension, kidney stones, and cardiovascular diseases [137–139]. Therefore, numerous studies have investigated the replacement of NaCl with KCl in traditional cheeses such as Halloumi and Nabulsi [87,108,128,129]. Overall, the partial substitution of NaCl with KCl did not impact the chemical composition, textural profile, or organoleptic features of fresh cheese during their storage [108]. However, it affected the microbial growth, such as that of *Streptococcus thermophilus*, *Lactobacillus casei*, and *Lactobacillus acidophilus*, and it increased the proteolytic activity during storage [87,108]. The effect of different salting methods (dry and brine) on the chemical and textural characteristics of ovine Halloumi was assessed [105]. It was concluded that dry salting Halloumi cheese for 1 day increased the minerals (calcium, phosphorus, magnesium, and potassium) and reduced the hardness and fracturability compared with those made with brine [105].

There is an increased demand for protein-enriched foods because of their association with several health benefits to the human body. Protein enrichment using whey proteins and micellar casein (1% and 2%) improved the nutritional profile and overall economic efficiency of artisanal Shanklish. Moreover, this addition induced an increase in firmness and cheese yield [3].

The addition of plant ingredients and extracts is not new, but the increased awareness of their health benefits is attracting plenty of attention. Extracts from lemon peel were found to improve Labneh flavor, texture, appearance, and shelf life. This is due to the antioxidant and antimicrobial potential of lemon extracts [140]. Adding moringa at 2% to Halloumi cheese, Labneh, and buttermilk increased the content of iron; protein; calcium; vitamins C, B1, B2, and B3; and protein digestibility and extended their shelf life without impacting the organoleptic properties [141–143]. Purslane enriched Kishk improved the mineral and protein contents [144]. A probiotic Labneh was made with broccoli florets paste (up to 5%) and *Lactobacillus casei* and had improved nutritional properties and shelf life [145]. Adding artichoke powder at 1% to Labneh favored probiotic bacteria growth without hampering the final quality of the product [146]. Cichorium and bromelain extracts enhanced the nutritional and organoleptic properties of Domiati cheese [147]. Sweet pepper extract increased the organoleptic properties of Domiati cheese [127]. Fresh Labneh enriched with antioxidative compounds from pepper extracts encapsulated in alginate beads improved sensorial properties and antioxidant content [148]. Adding Spirulina to Labneh increased the viability of probiotic micro-organisms as well as protein, dietary fiber, antioxidant activity, vitamins (B1, B9, and B12), and minerals (Fe, Zn, K, and Mg) [149]. Essential oils were reported for their bioactive activities, which are beneficial for food preservation [150–152]. Adding thyme essential oils (200 mg/kg) to traditional Kishk increased its antioxidant activity (40.69%) compared with the control (31.54%) and decreased the coliform bacteria, yeast, and mold counts [153]. Kishk enriched with *Teucrium polium* essential oils showed reduced *Escherichia coli* during the cold storage period [154]. Propolis, ginger, and thyme oils reduced pH and inhibited molds, yeasts, and *Escherichia coli* while preserving the organoleptic properties of Domiati cheese up to 2 months [155]. The fortified Labneh with different concentrations (0.1, 0.2, and 0.3%) of thyme oil nanoemulsion was stable up to 6 weeks [156]. This is due to the bactericide properties of thyme oil. The

addition of cinnamon, eucalyptus, and wheat germ oils (600 µL/kg) to Labneh showed slight changes in quality (pH, acidity, total solids, and dry matter) and extended the shelf life (up to 6 weeks at 5 °C). However, Labneh made with cinnamon and eucalyptus oils were the most accepted [157].

Since 2015, interest in pulses as functional food has increased since the FAO's declaring it the year of pulses [158]. They were subsequently promoted for their health benefits and suitability for special diets, such as gluten-free and plant-based dairy alternatives [159,160]. Innovative Kishk was prepared by replacing bulgur by 25% and 50% of broken faba bean seeds (byproduct). The revised Kishk made with 50% faba had improved amino acids and an improve mineral profile, without hindering its nutritional, microbiological, and sensory qualities [161]. Sweet lupine powder (2%) improved the nutritional and organoleptic properties of Labneh [162].

6.2. Processing for Enhanced Safety

For commercial dairy products, milk pasteurization is required. Thermal treatments negatively affect the natural microflora of the milk and reduce the organoleptic features of dairy products. However, it was reported that the use of cultured pasteurized milk enhanced the organoleptic properties of ripened Domiati cheese [163]. Adding 0.1% potassium sorbate to cultured pasteurized milk acted as an efficient preservative for cheese during maturation [163]. Combining pasteurization (65 °C, 30 min), the addition of calcium chloride (0.015%), and the pressing (prepress for 20 min at 0.2 MPa and then press for 40 min at 0.6 MPa) improved the yield and quality of Halloumi cheese [164].

The use of a magnetic field, a nonthermal treatment, drastically inhibited the growth of spore-forming bacteria, yeasts, and molds in Halloumi cheese while preserving the traditional flavor and texture [165]. Likewise, using gamma irradiation on Syrian dried Kishk preserved the nutritional composition, texture, and color and reduced pathogens. However, it negatively affected the total acidity, flavor, and taste [166]. Irradiation was also used as a pretreatment of *Lactobacillus casei* prior to milk fermentation during the process of making Labneh. This photo-dissimulating treatment improved the probiotic effect of bacteria and antioxidant and proteolytic activities and enhanced the flavor, texture, and stability of Labneh during storage [36].

6.3. Functional Edible Coatings and Packaging

Food packaging plays a key role in food protection, nutrient stability, quality preservation, and marketability [167]. Edible coatings and films are gaining a lot of interest because of their dual role in protecting food from the surrounding environment and delivering bioactive compounds and probiotics in food systems [168,169]. Edible film made from mozzarella cheese whey was found effective in preserving the quality of Halloumi cheese at room temperature for 9 days [170]. The microbial species contaminating Halloumi cheese were also significantly reduced using chitosan coating with or without lysozyme or natamycin, and consequently, the shelf life increased by more than 5 days compared with brined cheese (5% and 10% salt). Remarkably, the sensory properties of cheese were not affected by coating [171]. This suggests that coating could replace the use of brine without sacrificing the typical taste and flavor of traditional cheese. Nanotechnology was also used to make films with nanoparticles that interact with the food materials to improve/preserve the organoleptic features, freshness, and stability [172,173]. Fayed et al. [174] showed that wrapping Egyptian Ras cheese with cellulose sheets fortified with natamycin-loaded alginate nanoparticles reduced the growth of *A. flavus* and aflatoxin without hindering the traditional taste, color, flavor, and overall appearance of Ras cheese [174]. Youssef et al. [165] found that coating mixtures of chitosan/polyvinyl alcohol/glycerol and titanium dioxide nanoparticles protected Ras cheese from mold growth and reduced weight losses during ripening [165]. Modified atmosphere packaging was reported to preserve Domiati cheese's peculiar volatile profile during storage and prolong the product shelf life compared with other conventional storage methods (passive packaging and vacuum) [80].

Overall, innovative strategies focused on overcoming the main limitations of traditional products: standardization and preservation. These approaches showed different levels of success (Table 4). There is still plenty of room for innovations to find the right balance between the traditional know-how to maintain the peculiar taste and flavor and the use of novel technologies to improve the nutritional profile and productivity.

Table 4. Innovative strategies for improving dairy fermented products.

Product	Treatments	Results	References
Halloumi cheese	Ultrafiltration	-Increase in protein retention -Increase in the meltability and free oil	[118]
Labneh	Ultrafiltration and addition of 2% oat	-Improvement of sensory parameters, nutritional quality and shelf life -Increase in probiotic bacteria	[119]
Domiati cheese	Addition of *Lactobacillus plantarum* and *Enterococcus faecium*	-Prevention against Staphylococcus aureus -Improvement of the organoleptic properties, proteolysis and lipolysis	[123]
Karish cheese	Addition of *L. lactis* subsp. *cremoris (KM746)*, *L. lactis* subsp. *lactis* (KM721), *L. plantarum* (KP623), and *L. delbrueckii* subsp. *lactis* (KP654), *Enterococcus faecium* (KT712)	-Improvement of the sensorial parameters and safety against pathogens	[124]
Labneh	Addition of probiotic bacteria	-Decrease in the fungi and psychrophili counts	[119,127]
Butter	Addition of encapsulated *Lactobacillus acidophilus* (5 and 10%)	-Increase in probiotic micro-organisms	[56]
Akawi cheese	Addition of *Lactobacillus Plantarum* and partial substitution (30%) of cow milk with camel milk	-Improvement in scavenging rates, ACE-inhibition activity, antiproliferation activity and shelf life -Improvement in the rheological properties	[128,129]
Halloumi cheese	Addition of modified maize starch as a fat replacer	-Decrease in fermentation time, pH, total solids, fat, ash, and total volatile fatty acids, and total bacterial count -Improvement of sensorial properties, yield, and protein content	[130]
Labneh	Addition of sesame seeds (0–6%) as a fat replacer	-Increase in total solid, fat, and acidity -Decrease in the protein and ash contents	[131]
Labneh	Substitution of 50% of milk fat with wheat germ oil encapsulated in natural casein micelles	-Improvement of physicochemical and sensorial properties	[132]
Domiati cheese	Partial substitution of milk fat with jojoba oil	-Decrease in trans-fat and cholesterol -Improvement of the sensorial properties	[133]
Kish	Addition of a mix of pomegranate seed oil and/or gum Arabic	-Improvement of plasma high-density lipoprotein cholesterol, blood glucose, plasma dyslipidemia, and urea parameters	[134]
Halloumi and Nabulsi cheeses	Substitution of NaCl with KCl	-No effect on the chemical and sensorial properties	[125,126]
Halloumi cheese	Dry salting for 24 h	-Increase in the calcium, phosphorus, magnesium, and potassium contents -Reduction in the hardness and fracturability	[105]
Shanklish cheese	Addition of whey proteins and micellar casein (1 and 2%)	-Improvement of the nutritional profile, and overall economic efficiency -Increase in the firmness and cheese yield	[3]
Labneh	Addition of lemon peel extracts	-Improvement of the flavor, texture, appearance, and shelf life	[140]
Halloumi cheese, Labneh and buttermilk	Addition of moringa (2%)	-Increase in iron, protein, calcium, vitamins (C, B1, B2, and B3), protein digestibility, and shelf life	[141–143]
Kishk	Addition of purslane	-Increase in mineral and protein contents	[144]
Labneh	Addition of *Lactobacillus casei* and broccoli paste (5%)	-Increase in the viability of probiotic bacteria -Improvement of the nutritional properties and shelf life	[145]

Table 4. *Cont.*

Product	Treatments	Results	References
Labneh	Addition of artichoke powder	-Increase in the viability of probiotic bacteria	[146]
Domiati cheese	Addition of Cichorium and bromelain extracts	-Improvement of nutritional and organoleptic properties	[147]
Domiati cheese	Addition of sweet pepper extract	-Improvement of organoleptic properties	[127]
Labneh	Addition of pepper extract encapsulated in alginate beads	-Improvement of antioxidant and organoleptic properties	[148]
Labneh	Addition of spirulina	-Increase in the viability of probiotic bacteria, protein, dietary fiber, antioxidant activity, vitamins (B1, B9, and B12), and minerals (Fe, Zn, K, and Mg)	[149]
Kishk	Addition of thyme oil (200 mg/kg)	-Increase in antioxidant activity -Decrease in coliform bacteria, yeast, and mold counts	[153]
Kishk	Addition of *Teucrium polium* oils	-Decrease in *Escherichia coli* -Decrease in pH	[154]
Domiati cheese	Addition of Propolis, ginger and thyme oils	-Inhibition of molds, yeasts and *Escherichia coli* -Extension of the shelf life up to 2 months	[155]
Labneh	Addition of thyme oil nanoemulsion (0.1, 0.2 and 0.3%)	-Increase in the shelf life up to 6 weeks	[156]
Labneh	Addition of cinnamon, eucalyptus, and wheat germ essential oils (600 µL/kg)	-Increase in the shelf life up to 6 weeks -Labneh made with cinnamon and eucalyptus were better accepted	[157]
Kishk	Partial substitution (25 and 50%) of bulgur with faba beans	-Improvement of the amino acids profile	[161]
Labneh	Addition of sweet lupine powder (2%)	-Improvement of the nutritional and organoleptic properties	[162]
Domiati cheese	Use of culture pasteurized milk + 0.1% potassium sorbate	-Improvement of the organoleptic properties and safety	[163]
Halloumi cheese	Pasteurization (65 °C, 30 min), addition of calcium chloride (0.015%), and prepress (20 min at 0.2 MPa and then press for 40 min at 0.6 Mpa)	-Improvement of the yield and overall quality of the cheese	[164]
Halloumi cheese	Use of magnetic field	-Inhibition of the growth of spore-forming bacteria, yeasts, and molds	[165]
Kishk	Gamma irradiation	-Decrease of pathogens, total acidity, flavor, and taste	[166]
Labneh	Irradiation of the milk before fermentation	-Improvement of probiotic bacteria growth, antioxidant, proteolytic activities, flavor, texture, and stability during storage	[36]
Halloumi cheese	Edible coating using mozzarella cheese whey	-Preservation of the cheese quality for 9 days	[170]
Halloumi cheese	Edible coating using chitosan with or without lysozyme or natamycin	-Increase in the shelf life by 5 days	[171]
Ras cheese	Edible coating using cellulose sheets fortified with natamycin-loaded alginate nanoparticles	-Reduction of *A. flavus* and *aflatoxin* growth	[174]
Ras cheese	Edible coating using chitosan/polyvinyl alcohol/glycerol and titanium dioxide nanoparticles	-Inhibition of mold growth -Reduction of weight losses during ripening	[175]
Domiati cheese	Modified atmosphere packaging	-Improvement of the shelf life	[80]

7. Future Trends of Traditional Fermented Dairy Products

Traditional dairy products are mainly homemade products; only few of them are currently marketed worldwide. The renewed interest in traditional products might be due to consumer demand for diversification. Therefore, there is room to develop new products with improved flavor profiles while relying on traditional products. The use of indigenous microflora and traditional know-how could offer a modern twist to make a new range of products. The recovery, enhancement, and valorization of the microbial ecosystems

of old dairy products at risk of extinction could support the diversification. This would attract consumers looking for "authentic" products with a story that they can relate to. Moreover, this could follow what is happening in the market of cereal products, including the renewed interest in ancient grains and flatbreads.

For the wider commercialization of traditional dairy products, the use of innovative technologies and formulations can help in overcoming safety and standardization issues. In terms of safety, raw milk and traditional preparation methods lack quality control and thus do not meet current safety regulations. Milk pasteurization can improve hygienic qualities, yet it negatively impacted the natural microflora presented in raw milk. Still, there are no commercial starters imitating those naturally occurring micro-organisms in traditional fermented products. Given that health-conscious consumers keep looking for low-fat, low-salt, and high-protein products, most of traditional products were preserved using salt and oil drying. Taking advantage of modern technologies would support avoiding salting and oiling. Innovative formulation also suggested new ingredients to reduce salt and fat and increase the protein content to deliver improved nutritional quality while preserving the authentic organoleptic features of traditional products. E-commerce currently contributes into marketing several traditional fermented products, such as Halloumi, Nabulsi, and Labneh, to reach a wider market. Adequate marketing strategies such as storytelling would benefit the spread of Southern Mediterranean products around the world.

8. Conclusions

Traditional fermented products are heritage food with a long history of use. Passing this know-how through generations contributed into the preservation of the organoleptic quality and authenticity of fermented products. Thus, the protection of the gastronomic heritage is deemed necessary. Product registration and certification could contribute to setting strict criteria for the quality and the geographical origin of the product, its production, and its formulation. This would protect and give more value to the traditional fermented dairy products in the global market.

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Appendix A

Table A1. Fermented Dairy Products in Middle eastern countries.

Fermented Milks		Cheese	
Product	**Country**	**Product**	**Country**
Ayran	Turkey	Akkawi	Lebanon, Syria, Palestine, Jordan
Doogh	Iran	Aushari	Iraq
Goubasha	Sudan	Baladi	Egypt, Syria
Kishk	Lebanon	Chami	Syria
Laban Zeer	Egypt	Charkassiyea	Syria
Laban Kerbah		Domiati	Egypt
Laban Khad	Lebanon	Halloumi	Lebanon, Syria, Palestine, Jordan
Labneh	Lebanon	Jibne Baida	Egypt, Lebanon, Syria, Palestine, Jordan

Table A1. *Cont.*

Fermented Milks		Cheese	
Product	**Country**	**Product**	**Country**
Shanina (yogurt beverage)	Jordan	Jibneh Arabieh	Egypt, Lebanon, Syria, Palestine, Jordan
Smoked Liban (Sheep)	Iraq	Jibneh mshallaleh	Syria
Zabady	Egypt	Karish	Egypt, Lebanon
		Kenafa	Palestine, Egypt
		Majdoule (Majdouli)	Lebanon, Syria
		Mish Cheese	Egypt
		Nabulsi Cheese	Lebanon, Syria, Palestine, Jordan
		Shanklish (Sürke)	Lebanon
		Shelal	Syria
		Testouri	Tunsia
		Turkomani	Syria
		Tallaga cheese	Egypt
		Kashta (Clotted Cream)	Egypt, Lebanon, Syria, Palestine, Jordan

Table A2. Fermented Dairy Products in African countries.

Types	Products	Country	Description
Fermented Milks	Aguat	Ethopia	Fermented acidic whey
	Amabere amaruranu	Southwestern Kenya	Fermented Milk with grain-like appearance
	amacunda	Rwanda	Buttermilk
	Arera	Ethopia	Defatted sour milk or Buttermilk
	biruni	Sudan	Aged fermented milk
	Ergo	Zimbabwe, Ethopia	Natural fermented milk
	Fene	Mali	Fermented camel, goat, or cow milk
	Gariss	Sudan	Fermented camel milk
	Gubasha	Sudan	Diluted rob
	Ititu	Ethopia	Concentrated fermented milk,
	kindirmu	Cameroon	Fermented cow milk with thick consistency
	Ikivuguto	Rwanada	Fermented cow milk
	Kule naoto	Kenya	Fermented milk from Zebu, cow or camel
	kush-kush	Sudan	Fermented whey from Rob
	Kwerionik	Eastern Uganda	Fermented milk
	Leben/Lben	Tunisia/Morocco	Fermented cow milk
	Mabisi	Zambia	Traditional fermented milk
	Madila	Botswana	Fermented cow and goat milk flavored with fruit juice
	Mafi or Amasi	Namibia, South Africa	Traditional fermented milk
	Masse	Mozambique	Unsweetened curdled milk
	Maziwalala or MALA	East Africa	Traditional fermented milk
	Mursik	Kenya	Traditional fermented milk
	Nunu	Nigeria, Ghana	Fermented raw cow's milk
	Nyamie	Ghana	Naturally fermented milk
	Omashikawa	Namibia	Naturally Fermented Zebu buttermilk
	Pendidam	Cameroon	Semi-liquid fermented product from cow's milk
	Rob	Sudan	Fermented cow milk
	Sethemi	South Africa	Fermented cow milk
	Sombana	Burkina Faso	Fermented cow milk
	Suusac	Kenya, Somalia, Ethiopia, Sudan	Fermented camel milk
	urubu	Bururndi	Fermented cow milk
	Pokot ash yogurt (also known as mala ya kienyeji or kamabele kambou)	Kenya	Cattle breeds and zebu or goat fermented milk

Table A2. *Cont.*

Types	Products	Country	Description
	Mutandabota	Zimbabwe	Mixed cow/goat milk with dry baobab fruit pulp (acidic)
	Amasi or mukaka wakakora or zifa)	South Africa, Lesotho, Zimbabwe	Fermented yogurt/cottage cheese
Cheese	Aoules	Algeria	Dry cheese from goat
	Ayib	Ethopia	Cottage cheese
	bouhezza	Algeria	Ripened cheese
	gibna bayda and gibna mudaffara	Sudan	White cheese
	klila	Algeria	Traditional cheese
	tchoukou	Niger	Ripened cheese from sheep, goat, and cow
	Touaregh	Mali	Hard cheese from made from cow, goat milk, or both
	Wagasi or Wagashi or Amo or Wara or Gasaru	Benin, Ghana	Soft cheese
	Wara	Nigeria, Togo	Soft cheese
	Wara-Kishi or warankasi or wagashi or waragashi or woagashi)	Nigeria, Benin, and northern Togo	Cheese
Other dairy products	Kimuri	Rwanda	Butter
	Nitir kibe	Ethopia	Ghee

References

1. Mohsen, H.; Sacre, Y.; Hanna-Wakim, L.; Hoteit, M. Nutrition and Food Literacy in the MENA Region: A Review to Inform Nutrition Research and Policy Makers. *Int. J. Environ. Res. Public Health* **2022**, *19*, 10190. [CrossRef] [PubMed]
2. Sraïri, M.T.; Benyoucef, M.T.; Kraiem, K. The dairy chains in North Africa (Algeria, Morocco and Tunisia): From self sufficiency options to food dependency? *SpringerPlus* **2013**, *2*, 162. [CrossRef] [PubMed]
3. Nehme, L.; Salameh, C.; Tabet, E.; Nehme, M.; Hosri, C. Innovative improvement of Shanklish cheese production in Lebanon. *Int. Dairy J.* **2018**, *90*, 23–27. [CrossRef]
4. Kaaki, D.; Baghdadi, O.K.; Najm, N.; Olabi, A. Preference mapping of commercial Labneh (strained yogurt) products in the Lebanese market. *J. Dairy Sci.* **2012**, *95*, 521–532. [CrossRef]
5. Skowron, K.; Budzyńska, A.; Grudlewska-Buda, K.; Wiktorczyk-Kapischke, N.; Andrzejewska, M.; Wałecka-Zacharska, E.; Gospodarek-Komkowska, E. Two Faces of Fermented Foods—The Benefits and Threats of Its Consumption. *Front. Microbiol.* **2022**, *13*, 679. [CrossRef]
6. Melini, F.; Melini, V.; Luziatelli, F.; Ficca, A.G.; Ruzzi, M. Health-Promoting Components in Fermented Foods: An Up-to-Date Systematic Review. *Nutrients* **2019**, *11*, 1189. [CrossRef]
7. Zinno, P.; Calabrese, F.M.; Schifano, E.; Sorino, P.; Di Cagno, R.; Gobbetti, M.; Parente, E.; De Angelis, M.; Devirgiliis, C. FDF-DB: A Database of Traditional Fermented Dairy Foods and Their Associated Microbiota. *Nutrients* **2022**, *14*, 4581. [CrossRef]
8. El Kinany, K.; Deoula, M.; Hatime, Z.; Bennani, B.; El Rhazi, K. Dairy Products and Colorectal Cancer in Middle Eastern and North African Countries: A Systematic Review. *BMC Cancer* **2018**, *18*, 233. [CrossRef]
9. Yu, Z.; Peng, C.; Kwok, L.-Y.; Zhang, H. The Bacterial Diversity of Spontaneously Fermented Dairy Products Collected in Northeast Asia. *Foods* **2021**, *10*, 2321. [CrossRef]
10. Muhialdin, B.J.; Filimonau, V.; Qasem, J.M.; Ibrahim, S.A.; Algboory, H.L. Traditional fermented foods and beverages in Iraq and their potential for large-scale commercialization. *J. Ethn. Foods* **2022**, *9*, 18. [CrossRef]
11. Groenenboom, A.E.; Parker, M.E.; De Vries, A.; De Groot, S.; Zobrist, S.; Mansen, K.; Milani, P.; Kort, R.; Smid, E.J.; Schoustra, S.E. Bacterial community dynamics in lait caillé, a traditional product of spontaneous fermentation from Senegal. *PLoS ONE* **2019**, *14*, e0215658. [CrossRef] [PubMed]
12. Tafa, K.D.; Asfaw, W.A. Role of microbial dynamics in the fermentation process of Ethiopia traditional food: Kocho. *Cogent Food Agric.* **2020**, *6*, 1840007. [CrossRef]
13. Schoustra, S.; van der Zon, C.; Groenenboom, A.; Moonga, H.B.; Shindano, J.; Smid, E.J.; Hazeleger, W. Microbiological safety of traditionally processed fermented foods based on raw milk, the case of Mabisi from Zambia. *LWT* **2022**, *171*, 113997. [CrossRef]
14. Dimidi, E.; Cox, S.R.; Rossi, M.; Whelan, K. Fermented Foods: Definitions and Characteristics, Impact on the Gut Microbiota and Effects on Gastrointestinal Health and Disease. *Nutrients* **2019**, *11*, 1806. [CrossRef] [PubMed]
15. Samet-Bali, O.; Ennouri, M.; Dhouib, A.; Attia, H. Characterisation of typical Tunisian fermented milk: Leben. *Afr. J. Microbiol. Res.* **2012**, *6*, 2169–2175. [CrossRef]

16. Peng, C.; Sun, Z.; Sun, Y.; Ma, T.; Li, W.; Zhang, H. Characterization and association of bacterial communities and nonvolatile components in spontaneously fermented cow milk at different geographical distances. *J. Dairy Sci.* **2021**, *104*, 2594–2605. [CrossRef]
17. Mwangi, L.W.; Matofari, J.W.; Muliro, P.S.; Bebe, B.O. Hygienic assessment of spontaneously fermented raw camel milk (suusa) along the informal value chain in Kenya. *Int. J. Food Contam.* **2016**, *3*, 169. [CrossRef]
18. Capozzi, V.; Fragasso, M.; Romaniello, R.; Berbegal, C.; Russo, P.; Spano, G. Spontaneous Food Fermentations and Potential Risks for Human Health. *Fermentation* **2017**, *3*, 49. [CrossRef]
19. García-Díez, J.; Saraiva, C. Use of Starter Cultures in Foods from Animal Origin to Improve Their Safety. *Int. J. Environ. Res. Public Health* **2021**, *18*, 2544. [CrossRef]
20. Shrivastava, N.; Ananthanarayan, L. Use of the backslopping method for accelerated and nutritionally enriched *idli* fermentation. *J. Sci. Food Agric.* **2014**, *95*, 2081–2087. [CrossRef]
21. Moonga, H.B.; Schoustra, S.E.; Linnemann, A.R.; Kuntashula, E.; Shindano, J.; Smid, E.J. The art of mabisi production: A traditional fermented milk. *PLoS ONE* **2019**, *14*, e0213541. [CrossRef] [PubMed]
22. Wirawati, C.U.; Sudarwanto, M.B.; Lukman, D.W.; Wientarsih, I.; Srihanto, E.A. Diversity of lactic acid bacteria in dadih produced by either back-slopping or spontaneous fermentation from two different regions of West Sumatra, Indonesia. *Vet. World* **2019**, *12*, 823–829. [CrossRef] [PubMed]
23. Oštarić, F.; Antunac, N.; Cubric-Curik, V.; Curik, I.; Jurić, S.; Kazazić, S.; Kiš, M.; Vinceković, M.; Zdolec, N.; Špoljarić, J.; et al. Challenging Sustainable and Innovative Technologies in Cheese Production: A Review. *Processes* **2022**, *10*, 529. [CrossRef]
24. EFSA Panel on Food Contact Materials, Enzymes and Processing Aids (CEP); Lambré, C.; Baviera, J.M.B.; Bolognesi, C.; Cocconcelli, P.S.; Crebelli, R.; Gott, D.M.; Grob, K.; Lampi, E.; Mengelers, M.; et al. Safety evaluation of the food enzyme containing chymosin and pepsin from the abomasum of suckling lambs. *EFSA J.* **2022**, *20*, e07005. [CrossRef]
25. Zheng, X.; Shi, X.; Wang, B. A Review on the General Cheese Processing Technology, Flavor Biochemical Pathways and the Influence of Yeasts in Cheese. *Front. Microbiol.* **2021**, *12*, 703284. [CrossRef]
26. Alhamdan, A.M.; Al Juhaimi, F.Y.; Hassan, B.H.; Ehmed, K.A.; Ahmed, I.A.M. Physicochemical, Microbiological, and Sensorial Quality Attributes of a Fermented Milk Drink (Laban) Fortified with Date Syrup (Dibs) during Cold Storage. *Foods* **2021**, *10*, 3157. [CrossRef]
27. Samet-Bali, O.; Bellila, A.; Ayadi, M.-A.; Marzouk, B.; Attia, H. A comparison of the physicochemical, microbiological and aromatic composition of Traditional and Industrial Leben in Tunisia. *Int. J. Dairy Technol.* **2010**, *63*, 98–104. [CrossRef]
28. Mattiello, S.; Caroprese, M.; Matteo, C.G.; Fortina, R.; Martini, A.; Martini, M.; Parisi, G.; Russo, C.; Zecchini, M.; ASPA Commission "Animal Productions in Development Cooperation Projects". Typical dairy products in Africa from local animal resources. *Ital. J. Anim. Sci.* **2017**, *17*, 740–754. [CrossRef]
29. Guizani, N.; Kasapis, S.; Al-Ruzeiki, M. Microbial, chemical and rheological properties of laban (cultured milk). *Int. J. Food Sci. Technol.* **2001**, *36*, 199–205. [CrossRef]
30. Baroudi, A.; Collins, E. Microorganisms and Characteristics of Laban. *J. Dairy Sci.* **1976**, *59*, 200–202. [CrossRef]
31. Mayssoun, Z.; Nadine, N. Influence of production processes in quality of fermented milk "Laban" in Lebanon. *Health* **2010**, *2*, 381–389. [CrossRef]
32. Chedid, M.; Tawk, S.T.; Chalak, A.; Karam, S.; Hamadeh, S.K. The Lebanese Kishk: A Traditional Dairy Product in a Changing Local Food System. *J. Food Res.* **2018**, *7*, 16. [CrossRef]
33. Salameh, C.; Scher, J.; Petit, J.; Gaiani, C.; Hosri, C.; Banon, S. Physico-chemical and rheological properties of Lebanese kishk powder, a dried fermented milk-cereal mixture. *Powder Technol.* **2016**, *292*, 307–313. [CrossRef]
34. Abou-Donia, S.A. Origin, History and Manufacturing Process of Egyptian Dairy Products: An Overview. *J. Food Sci. Technol.* **2008**, *5*, 51–62.
35. Al-Kadamany, E.; Toufeili, I.; Khattar, M.; Abou-Jawdeh, Y.; Harakeh, S.; Haddad, T. Determination of Shelf Life of Concentrated Yogurt (Labneh) Produced by In-Bag Straining of Set Yogurt using Hazard Analysis. *J. Dairy Sci.* **2002**, *85*, 1023–1030. [CrossRef] [PubMed]
36. Elshaghabee, F.M.F.; El-Hussein, A.; Mohamed, M.S.M. Enhancement of Labneh Quality by Laser-Induced Modulation of *Lactocaseibacillus casei* NRRL B-1922. *Fermentation* **2022**, *8*, 132. [CrossRef]
37. Benkirane, G.; Ananou, S.; Dumas, E.; Ghnimi, S.; Gharsallaoui, A. Moroccan Traditional Fermented Dairy Products: Current Processing Practices and Physicochemical and Microbiological Properties—A Review. *J. Microbiol. Biotechnol. Food Sci.* **2022**, *12*, e5636. [CrossRef]
38. Abou-Dobara, M.I.; Ismail, M.M.; Refat, N.M. Preparation of Functional Fermented Dairy Product Containing High Levels of Omega-6, Omega-9, Antioxidants Activity and Probiotic. *Diabetes Manag.* **2017**, *7*, 306–318.
39. Bendimerad, N.; Kihal, M.; Berthier, F. Isolation, identification, and technological characterization of wild leuconostocs and lactococci for traditional Raib type milk fermentation. *Dairy Sci. Technol.* **2012**, *92*, 249–264. [CrossRef]
40. Teneva-Angelova, T.; Balabanova, T.; Boyanova, P.; Beshkova, D. Traditional Balkan fermented milk products. *Eng. Life Sci.* **2018**, *18*, 807–819. [CrossRef]
41. Debbah, H.; Gliguem, H.; Saleh, A.B. Effect of Milk Pre-Treatments on Chemical Composition, and Sensory Quality of Traditional Fermented Milk, Rayeb. *J. New Sci.* **2018**, *56*, 3653–3659.

42. Leksir, C.; Boudalia, S.; Moujahed, N.; Chemmam, M. Traditional dairy products in Algeria: Case of Klila cheese. *J. Ethn. Foods* **2019**, *6*, 7. [CrossRef]
43. Abd El Gawad, I.A.; Abd El Fatah, A.M.; Al Rubayyi, K.A. Identification and Characterization of Dominant Lactic Acid Bacteria Isolated from Traditional Rayeb Milk in Egypt. *J. Am. Sci.* **2010**, *6*, 728–735.
44. Abozead, R.; Kheadr, E.; Safwat, N.; Salam, S.; Dabour, N. Technological characterization and molecular identification of defined protective starter cultures for fermentation of traditional Rayeb made from camel's milk. *Food Bioeng.* **2022**, *1*, 159–170. [CrossRef]
45. Benkerroum, N.; Tamime, A. Technology transfer of some Moroccan traditional dairy products (lben, jben and smen) to small industrial scale. *Food Microbiol.* **2004**, *21*, 399–413. [CrossRef]
46. Ghosh, T.; Beniwal, A.; Semwal, A.; Navani, N.K. Mechanistic Insights Into Probiotic Properties of Lactic Acid Bacteria Associated With Ethnic Fermented Dairy Products. *Front. Microbiol.* **2019**, *10*, 502. [CrossRef]
47. Sarhir, S.T.; Amanpour, A.; Bouseta, A.; Selli, S. Key odorants of a Moroccan fermented milk product "Lben" using aroma extract dilution analysis. *J. Food Sci. Technol.* **2019**, *56*, 3836–3845. [CrossRef]
48. Mkadem, W.; Belguith, K.; Semmar, N.; Zid, M.B.; ElHatmi, H.; Boudhrioua, N. Effect of process parameters on quality attributes of Lben: Correlation between physicochemical and sensory properties. *LWT* **2021**, *155*, 112987. [CrossRef]
49. Chammas, G.I.; Saliba, R.; Corrieu, G.; Béal, C. Characterisation of lactic acid bacteria isolated from fermented milk "laban". *Int. J. Food Microbiol.* **2006**, *110*, 52–61. [CrossRef]
50. Junaid, M.; Inayat, S.; Gulzar, N.; Khalique, A.; Younas, U.; Shahzad, F.; Iqbal, Z.M.; Rajab, M. Effect of different fat levels on physicochemical, sensory and microbiological attributes of fermented laban milk. *J. Appl. Anim. Res.* **2021**, *49*, 523–529. [CrossRef]
51. Yamani, M.I.; Abu-Jaber, M.M. Yeast Flora of Labaneh Produced by In-Bag Straining of Cow Milk Set Yogurt. *J. Dairy Sci.* **1994**, *77*, 3558–3564. [CrossRef]
52. Abiad, M.G.; Ajjour, C.; Kassaify, Z.; Iskandar, C.F.; Hamzeh, R.; Hassan, H.F. Preliminary physiological, phenotypic, and probiotic characterization of *Lactobacillus* strains isolated from Anbaris-traditional Lebanese fermented dairy product. *Int. J. Food Prop.* **2022**, *25*, 1266–1278. [CrossRef]
53. Dimassi, O.; Iskandarani, Y.; Afram, M.; Akiki, R.; Rached, M. Production and physicochemical properties of labneh anbaris, a traditional fermented cheese like product, in Lebanon. *Int. J. Environ. Agric. Biotechnol.* **2020**, *5*, 509–516. [CrossRef]
54. Abou-Zeid, N.A. Review of Egyptian Cereal-Based Fermented Product (Kishk). *Int. J. Agric. Innov. Res.* **2016**, *4*, 600–609.
55. El-Razik, M.M.A.; Hassan, M.F.Y.; Gadallah, M.G.E. Implementation of HACCP Plan for the Production of Egyptian Kishk (A Traditional Fermented Cereal-Milk Mixture). *Food Nutr. Sci.* **2016**, *7*, 1262–1275. [CrossRef]
56. Da Silva, M.N.; Tagliapietra, B.L.; Pivetta, F.P.; Richards, N.S.P.D.S. Nutritional, functional and sensory profile of added butter from *Lactobacillus acidophilus* encapsulated and hyposodium salt. *LWT* **2022**, *161*, 113385. [CrossRef]
57. Samet-Bali, O.; Ayadi, M.; Attia, H. Traditional Tunisian butter: Physicochemical and microbial characteristics and storage stability of the oil fraction. *LWT* **2009**, *42*, 899–905. [CrossRef]
58. Tahmas-Kahyaoğlu, D.; Cakmakci, S.; Hayaloglu, A.A. Changes during storage in volatile compounds of butter produced using cow, sheep or goat's milk. *Small Rumin. Res.* **2022**, *211*, 106691. [CrossRef]
59. Abid, Y.; Azabou, S.; Jridi, M.; Khemakhem, I.; Bouaziz, M.; Attia, H. Storage stability of traditional Tunisian butter enriched with antioxidant extract from tomato processing by-products. *Food Chem.* **2017**, *233*, 476–482. [CrossRef]
60. Adamczewski, K.; Staniewski, B.; Kowalik, J. The applicability of predictive microbiology tools for analysing *Listeria monocytogenes* contamination in butter produced by the traditional batch churning method. *Int. Dairy J.* **2022**, *132*, 105400. [CrossRef]
61. Hurtaud, C.; Faucon, F.; Couvreur, S.; Peyraud, J.-L. Linear relationship between increasing amounts of extruded linseed in dairy cow diet and milk fatty acid composition and butter properties. *J. Dairy Sci.* **2010**, *93*, 1429–1443. [CrossRef] [PubMed]
62. Labtar, A.; Delorme, C.; Renault, P. Occurrence, isolation and DNA identification of Streptococcus thermophilus involved in Algerian traditional butter 'Smen'. *Afr. J. Biotechnol.* **2011**, *10*, 17251–17257. [CrossRef]
63. Iradukunda, C.; Aida, W.M.W.; Ouafi, A.T.; Barkouch, Y.; Boussaid, A. Aroma profile of a traditionally fermented butter (smen). *J. Dairy Res.* **2018**, *85*, 114–120. [CrossRef] [PubMed]
64. Idoui, T.; Karam, N.-E. Lactic acid bacteria from Jijel's traditional butter: Isolation, identification and major technological traits. *Grasas Aceites* **2008**, *59*, 361–367. [CrossRef]
65. Boussekine, R.; Bekhouche, F.; Debaets, S.; Thierry, A.; Maillard, M.B.; Falentin, H.; Pawtowski, A.; Barkat, M.; Coton, M.; Mounier, J. Deciphering the Microbiota and Volatile Profiles of Algerian Smen, a Traditional Fermented Butter. *Microorganisms* **2022**, *10*, 736. [CrossRef]
66. Bettache, G.; Fatma, A.; Miloud, H.; Mebrouk, K. Isolation and Identification of Lactic Acid Bacteria from Dhan, A Traditional Butter and Their Major Technological Traits. *World J. Dairy Food Sci.* **2012**, *17*, 480–488. [CrossRef]
67. Sarhir, S.T.; Amanpour, A.; Bouseta, A.; Selli, S. Fingerprint of aroma-active compounds and odor activity values in a traditional Moroccan fermented butter "Smen" using GC–MS–Olfactometry. *J. Food Compos. Anal.* **2020**, *96*, 103761. [CrossRef]
68. Fguiri, I.; Ziadi, M.; Atigui, M.; Ayeb, N.; Arroum, S.; Assadi, M.; Khorchani, T. Isolation and characterisation of lactic acid bacteria strains from raw camel milk for potential use in the production of fermented Tunisian dairy products. *Int. J. Dairy Technol.* **2016**, *69*, 103–113. [CrossRef]
69. Triqui, R.; Guth, H. Potent odorants in "Smen", a traditional fermented butter product. *Eur. Food Res. Technol.* **2001**, *212*, 292–295. [CrossRef]

70. Boussekine, R.; Merabti, R.; Barkat, M.; Becila, F.-Z.; Belhoula, N.; Mounier, J.; Bekhouche, F. Traditional Fermented Butter Smen/Dhan: Current Knowledge, Production and Consumption in Algeria. *J. Food Res.* **2020**, *9*, 71. [CrossRef]
71. Özkanlı, O.; Kaya, A. Storage stability of butter oils produced from sheep's non-pasteurized and pasteurized milk. *Food Chem.* **2007**, *100*, 1026–1031. [CrossRef]
72. Derouiche, M.; Zidoune, M. Characterization of a Traditional Michouna Cheese from the Region of Tébessa, Algeria. *Livest. Res. Rural. Dev.* **2015**, *27*, 229.
73. Mahmoudi, I.; Telmoudi, A.; Chouaibi, M.; Hassouna, M. In vitro assessment of health-promoting benefits of sheep 'Testouri' cheese. *Acta Aliment.* **2021**, *50*, 54–64. [CrossRef]
74. Baccouri, O.; Boukerb, A.M.; Nilly, F.; Cambronel, M.; Smaali, I.; Feuilloley, M.G.J.; Abidi, F.; Connil, N. Draft Genome Sequence of Enterococcus faecalis Strain OB15, a Probiotic Strain Recently Isolated from Tunisian Rigouta Cheese. *Microbiol. Resour. Announc.* **2020**, *9*, e01433-19. [CrossRef]
75. Fox, P.F.; Guinee, T.P.; Cogan, T.M.; McSweeney, P.L.H. Processed Cheese and Substitute/Imitation Cheese Products. In *Fundamentals of Cheese Science*; Springer: Boston, MA, USA, 2017; pp. 589–627.
76. Benkerroum, N.; Oubel, H.; Zahar, M.; Dlia, S.; Filali-Maltouf, A. Isolation of a bacteriocin-producing *Lactococcus lactis* subsp. lactis and application to control *Listeria monocytogenes* in Moroccan jben. *J. Appl. Microbiol.* **2000**, *89*, 960–968. [CrossRef]
77. Mariani, M.; Casabianca, F.; Cerdan, C.; Peri, I. Protecting Food Cultural Biodiversity: From Theory to Practice. Challenging the Geographical Indications and the Slow Food Models. *Sustainability* **2021**, *13*, 5265. [CrossRef]
78. Zitoun, O.A.; Benatallah, L.; Ghennam, E.; Zidoune, M.N. Manufacture and Characteristics of the Traditional Algerian Ripened Bouhezza Cheese. *J. Food Agric. Environ.* **2011**, *9*, 96–100.
79. Medjoudj, H.; Aouar, L.; Zidoune, M.N.; Hayaloglu, A.A. Proteolysis, microbiology, volatiles and sensory evaluation of Algerian traditional cheese *Bouhezza* made using goat's raw milk. *Int. J. Food Prop.* **2017**, *20*, S3246–S3265. [CrossRef]
80. Atallah, A.A.; Ismail, E.A.; Yehia, H.M.; Elkhadragy, M.F.; Khater, E.-S.G. Proteolytic Development and Volatile Compounds Profile of Domiati Cheese under Modified Atmosphere Packaging. *Fermentation* **2022**, *8*, 358. [CrossRef]
81. Jaoude, D.A.; Olabi, A.; Najm, N.E.O.; Malek, A.; Saadeh, C.; Baydoun, E.; Toufeili, I. Chemical composition, mineral content and cholesterol levels of some regular and reduced-fat white brined cheeses and strained yogurt (Labneh). *Dairy Sci. Technol.* **2010**, *90*, 699–706. [CrossRef]
82. Toufeili, I.; Özer, B. Brined Cheeses from the Middle East and Turkey. In *Brined Cheeses*; Blackwell Science Ltd.: Hoboken, NJ, USA, 2007; pp. 188–210.
83. Boudalia, S.; Boudebbouz, A.; Gueroui, Y.; Bousbia, A.; Benada, M.; Leksir, C.; Boukaabene, Z.; Saihi, A.; Touaimia, H.; Aït-Kaddour, A.; et al. Characterization of traditional Algerian cheese "Bouhezza" prepared with raw cow, goat and sheep milks. *Food Sci. Technol.* **2020**, *40*, 528–537. [CrossRef]
84. Medjoudj, H.; Aouar, L.; Derouiche, M.; Choiset, Y.; Haertlé, T.; Chobert, J.-M.; Zidoune, M.N.; Hayaloglu, A.A. Physicochemical, microbiological characterization and proteolysis of Algerian traditionalBouhezzacheese prepared from goat's raw milk. *Anal. Lett.* **2019**, *53*, 905–921. [CrossRef]
85. Papademas, P.; Robinson, R.K. A comparison of the chemical, microbiological and sensory characteristics of bovine and ovine Halloumi cheese. *Int. Dairy J.* **2000**, *10*, 761–768. [CrossRef]
86. Tamime, A. (Ed.) *Brined Cheeses*; Blackwell Publishing: Oxford, UK, 2006.
87. Ayyash, M.; Shah, N. The effect of substituting NaCl with KCl on Nabulsi cheese: Chemical composition, total viable count, and texture profile. *J. Dairy Sci.* **2011**, *94*, 2741–2751. [CrossRef]
88. Serhan, M.; Linder, M.; Hosri, C.; Fanni, J. Changes in proteolysis and volatile fraction during ripening of Darfiyeh, a Lebanese artisanal raw goat's milk cheese. *Small Rumin. Res.* **2010**, *90*, 75–82. [CrossRef]
89. Benamara, R.N.; Gemelas, L.; Ibri, K.; Moussa-Boudjemaa, B.; Demarigny, Y. Sensory, microbiological and physico-chemical characterization of Klila, a traditional cheese made in the south-west of Algeria. *Afr. J. Microbiol. Res.* **2016**, *10*, 1728–1738. [CrossRef]
90. Ghamgui, H.; Bouaziz, F.; Frikha, F.; Châari, F.; Ellouze-Chaâbouni, S. Production and characterization of soft Sardaigne-type cheese by using almond gum as a functional additive. *Food Sci. Nutr.* **2021**, *9*, 2032–2041. [CrossRef]
91. Baccouri, O.; Boukerb, A.M.; Farhat, L.B.; Zébré, A.; Zimmermann, K.; Domann, E.; Cambronel, M.; Barreau, M.; Maillot, O.; Rincé, I.; et al. Probiotic Potential and Safety Evaluation of Enterococcus faecalis OB14 and OB15, Isolated From Traditional Tunisian Testouri Cheese and Rigouta, Using Physiological and Genomic Analysis. *Front. Microbiol.* **2019**, *10*, 881. [CrossRef]
92. Benkerroum, N. Traditional Fermented Foods of North African Countries: Technology and Food Safety Challenges With Regard to Microbiological Risks. *Compr. Rev. Food Sci. Food Saf.* **2013**, *12*, 54–89. [CrossRef]
93. Ricciardi, E.F.; Lacivita, V.; Conte, A.; Chiaravalle, E.; Zambrini, A.V.; Del Nobile, M.A. X-ray irradiation as a valid technique to prolong food shelf life: The case of ricotta cheese. *Int. Dairy J.* **2019**, *99*, 104547. [CrossRef]
94. Ricciardi, E.F.; Pedros-Garrido, S.; Papoutsis, K.; Lyng, J.G.; Conte, A.; Del Nobile, M.A. Novel Technologies for Preserving Ricotta Cheese: Effects of Ultraviolet and Near-Ultraviolet–Visible Light. *Foods* **2020**, *9*, 580. [CrossRef] [PubMed]
95. Lucey, J.A. Acid- and Acid/Heat Coagulated Cheese. In *Encyclopedia of Dairy Sciences*, 3rd ed.; Academic Press: Cambridge, MA, USA, 2022; pp. 6–14. [CrossRef]

96. Pala, C.; Scarano, C.; Venusti, M.; Sardo, D.; Casti, D.; Cossu, F.; Lamon, S.; Spanu, V.; Ibba, M.; Marras, M.; et al. Shelf life evaluation of ricotta fresca sheep cheese in modified atmosphere packaging. *Ital. J. Food Saf.* **2016**, *5*, 134–139. [CrossRef] [PubMed]
97. Tadjine, D.; Boudalia, S.; Bousbia, A.; Gueroui, Y.; Symeon, G.; Boudechiche, L.M.; Tadjine, A.; Chemmam, M. Milk heat treatment affects microbial characteristics of cows' and goats' "Jben" traditional fresh cheeses. *Food Sci. Technol.* **2021**, *41*, 136–143. [CrossRef]
98. Ouadghiri, M.; Amar, M.; Vancanneyt, M.; Swings, J. Biodiversity of lactic acid bacteria in Moroccan soft white cheese (Jben). *FEMS Microbiol. Lett.* **2005**, *251*, 267–271. [CrossRef] [PubMed]
99. Benheddi, W.; Hellal, A. Technological characterization and sensory evaluation of a traditional Algerian fresh cheese clotted with *Cynara cardunculus* L. flowers and lactic acid bacteria. *J. Food Sci. Technol.* **2019**, *56*, 3431–3438. [CrossRef]
100. Hayaloglu, A. Chapter 39—Cheese Varieties Ripened under Brine. In *Cheese*; Academic Press: Cambridge, MA, USA, 2017; pp. 997–1040.
101. Hammam, A.; Elfaruk, M.S.; Ahmed, M.E.; Sunkesula, V. Characteristics and Technological Aspects of the Egyptian Cheeses. *Int. J. Curr. Microbiol. Appl. Sci.* **2020**, *9*, 3338–3354. [CrossRef]
102. Abd El, R.A.E.M.; Ali, M.E.S.E.S.; Abdelkhalek, A. Correspondence Prevalence and Characterization of Some Pathogenic Bacteria in Fermented Milk Products and Mish Cheese in Dakahalia Governorate, Egypt. *J. Adv. Vet. Res.* **2022**, *12*, 446–450.
103. Zitoun, O.A.; Pediliggieri, C.; Benatallah, L.; Lortal, S.; Licitra, G.; Zidoune, M.N.; Carpino, S. Bouhezza, a Traditional Algerian Raw Milk Cheese, Made and Ripened in Goatskin Bags. *J. Food Agric. Environ.* **2012**, *10*, 289–295.
104. Senoussi, A.; Rapisarda, T.; Schadt, I.; Chenchouni, H.; Saoudi, Z.; Senoussi, S.; Zitoun, O.A.; Zidoune, M.N.; Carpino, S. Formation and dynamics of aroma compounds during manufacturing-ripening of Bouhezza goat cheese. *Int. Dairy J.* **2022**, *129*, 105349. [CrossRef]
105. Kaminarides, S.; Moschopoulou, E.; Karali, F. Influence of Salting Method on the Chemical and Texture Characteristics of Ovine Halloumi Cheese. *Foods* **2019**, *8*, 232. [CrossRef]
106. Lteif, L.; Olabi, A.; Baghdadi, O.K.; Toufeili, I. The characterization of the physicochemical and sensory properties of full-fat, reduced-fat, and low-fat ovine and bovine Halloumi. *J. Dairy Sci.* **2009**, *92*, 4135–4145. [CrossRef] [PubMed]
107. Papademas, P.; Robinson, R.K. Halloumi cheese: The product and its characteristics. *Int. J. Dairy Technol.* **1998**, *51*, 98–103. [CrossRef]
108. Ayyash, M.; Sherkat, F.; Shah, N. The effect of NaCl substitution with KCl on Akawi cheese: Chemical composition, proteolysis, angiotensin-converting enzyme-inhibitory activity, probiotic survival, texture profile, and sensory properties. *J. Dairy Sci.* **2012**, *95*, 4747–4759. [CrossRef] [PubMed]
109. Al-Ismail, K.M.; Humied, M.A. Effect of Processing and Storage of Brined White (Nabulsi) Cheese on Fat and Cholesterol Oxidation. *J. Sci. Food Agric.* **2003**, *83*, 39–43. [CrossRef]
110. Benlahcen, K.; Mahamedi, A.E.; Djellid, Y.; Sadeki, I.F.; Kihal, M. Microbiological Characterization of Algerian Traditional Cheese "Klila". *J. Purity Util. React. Environ.* **2017**, *6*, 1–9.
111. Benamara, R.N.; Benahmed, M.; Ibri, K.; Boudjemaa, B.M.; Demarigny, Y. Algerian extra hard cheese of Klila: A review on the production method, and microbial, organoleptic, and nutritional properties. *J. Ethn. Foods* **2022**, *9*, 41. [CrossRef]
112. Leksir, C.; Chemmam, M. Contribution on the Characterization of Klila, a Traditional Cheese in East of Algeria. *Livest. Res. Rural Dev.* **2015**, *27*, 83.
113. Nyamakwere, F.; Esposito, G.; Dzama, K.; Raffrenato, E. A review of artisanal cheese making: An African perspective. *South Afr. J. Anim. Sci.* **2021**, *51*, 296–309. [CrossRef]
114. Mattiello, S.; Caroprese, M.; Crovetto, G.M.; Fortina, R.; Martini, A.; Martini, M.; Parisi, G.; Russo, C.; Severini, C.; Zecchini, M.; et al. Typical edible non-dairy animal products in Africa from local animal resources. *Ital. J. Anim. Sci.* **2017**, *17*, 202–217. [CrossRef]
115. Abd-Elmonem, M.A.; Tammam, A.; El-Desoki, W.I.; Zohri, A.-N.A.; Moneeb, A.H.M. Improving The Properties of the Egyptian Ras Cheese with Adding Some Probiotic *Lactobacillus* spp. *Assiut J. Agric. Sci.* **2022**, *53*, 12–30. [CrossRef]
116. El-Fadaly, H.M.; El-Kadi, S.M.; Hamad, M.N.; Habib, A.A. Isolation and identification of Egyptian Ras cheese (Romy) contaminating fungi during ripening period. *J. Microbiol. Res.* **2015**, *5*, 1–10. [CrossRef]
117. Elramly, M.; Leboudy, A.; Ansary, M. Mycological Evaluation of Egyptian Ras Cheese with Special Reference to Mycotoxins. *Alex. J. Vet. Sci.* **2019**, *63*, 33. [CrossRef]
118. Deshwal, G.K.; Ameta, R.; Sharma, H.; Singh, A.K.; Panjagari, N.R.; Baria, B. Effect of ultrafiltration and fat content on chemical, functional, textural and sensory characteristics of goat milk-based Halloumi type cheese. *LWT* **2020**, *126*, 109341. [CrossRef]
119. Khider, M.; Nasr, N.M.; Atallah, K.M.; Metry, W.A. Functional UF-low and full-fat Labneh supplemented with Oats (*Avena sativa* L.) powder and probiotic bacteria. *J. Umm Al-Qura Univ. Appl. Sci.* **2022**, 1–12. [CrossRef]
120. Kumari, M.; Patel, H.K.; Kokkiligadda, A.; Bhushan, B.; Tomar, S. Characterization of probiotic lactobacilli and development of fermented soymilk with improved technological properties. *LWT* **2022**, *154*, 112827. [CrossRef]
121. Francavilla, R.; De Angelis, M.; Rizzello, C.G.; Cavallo, N.; Bello, F.D.; Gobbetti, M. Selected Probiotic Lactobacilli Have the Capacity To Hydrolyze Gluten Peptides during Simulated Gastrointestinal Digestion. *Appl. Environ. Microbiol.* **2017**, *83*, e00376-17. [CrossRef]
122. Mefleh, M.; Summo, C.; Faccia, M.; Caponio, F.; Pasqualone, A. Legume-Based Dairy Substitutes: From Traditional Food to Recent Findings. In *Reference Module in Food Science*; Elsevier: Amsterdam, The Netherlands, 2023. [CrossRef]

123. Khalil, N.; Kheadr, E.; El-Ziney, M.; Dabour, N. *Lactobacillus plantarum* protective cultures to improve safety and quality of wheyless Domiati-like cheese. *J. Food Process. Preserv.* **2022**, *46*, e16416. [CrossRef]
124. Darwish, A.M.G.; Allam, M.G.; Ayad, E.H. Physicochemical profile and Lactic Acid Bacteria genera inhabit Egyptian raw camel, sheep, goat, buffalo and cow. *Microb. Biosyst.* **2018**, *3*, 12–24. [CrossRef]
125. Allam, M.G.; Darwish, A.M.; Ayad, E.H.; Shokery, E.S.; Darwish, S.M. Lactococcus species for conventional Karish cheese conservation. *LWT* **2017**, *79*, 625–631. [CrossRef]
126. Darwish, A.; Allam, M.; Ayad, E.; Shokery, E.; Mashaly, R.; Darwish, S. In vivo Evaluation of Safety and Probiotic Traits of Isolated Enterococcus feacium Strain KT712. *Res. J. Microbiol.* **2016**, *11*, 169–177. [CrossRef]
127. Kamaly, K.M.K.; Kebary, K.M.K.; Badawi, R.M.; Gaafar, A.M.A. Characteristics of green pepper-treated probiotic domiati cheese. *Menoufia J. Food Dairy Sci.* **2018**, *3*, 39–49. [CrossRef]
128. AL Dhaheri, A.; Al-Hemeiri, R.; Kizhakkayil, J.; Al-Nabulsi, A.; Abushelaibi, A.; Shah, N.P.; Ayyash, M. Health-promoting benefits of low-fat akawi cheese made by exopolysaccharide-producing probiotic *Lactobacillus plantarum* isolated from camel milk. *J. Dairy Sci.* **2017**, *100*, 7771–7779. [CrossRef] [PubMed]
129. Abdalla, A.; Abu-Jdayil, B.; AlMadhani, S.; Hamed, F.; Kamal-Eldin, A.; Huppertz, T.; Ayyash, M. Low-fat akawi cheese made from bovine-camel milk blends: Rheological properties and microstructural characteristics. *J. Dairy Sci.* **2022**, *105*, 4843–4856. [CrossRef]
130. Basiony, M.; Hassabo, R. Composition and Quality of Low-Fat Halloumi Cheese Made Using Modified Starch as a Fat Replacer. *Starch-Stärke* **2021**, *74*, 2100211. [CrossRef]
131. Aly, A.A.; Refaey, M.M.; Hameed, A.M.; Sayqal, A.; Abdella, S.A.; Mohamed, A.S.; Hassan, M.A.A.; Ismail, H.A. Effect of addition sesame seeds powder with different ratio on microstructural and some properties of low fat Labneh. *Arab. J. Chem.* **2020**, *13*, 7572–7582. [CrossRef]
132. Solim, T.N.; Far, A.F.; Abdel-Hady, H.; El-Hossien, M. Preparation and Properties Nano-encapsulated Wheat Germ Oil and its Use in the Manufacture of Functional Labneh Cheese. *Pak. J. Biol. Sci.* **2019**, *22*, 318–326. [CrossRef]
133. Ali, R.F.; El-Anany, A.M.; Mousa, H.M. The effect of partially or totally replacing milk fat by jojoba oil in Domiati cheese production on some nutritional and quality properties. *Nutr. Food Sci.* **2020**, *51*, 191–204. [CrossRef]
134. Al-Okbi, S.Y.; El Ghani, S.A.; Elbakry, H.; Mabrok, H.; Nasr, S.; Desouky, H.; Mahmoud, K. Kishk Sa′eedi as a potential functional food for management of metabolic syndrome: A study of the possible interaction with pomegranate seed oil and/or gum Arabic. *J. Herbmed Pharmacol.* **2021**, *10*, 319–330. [CrossRef]
135. Kloss, L.; Meyer, J.D.; Graeve, L.; Vetter, W. Sodium intake and its reduction by food reformulation in the European Union—A review. *NFS J.* **2015**, *1*, 9–19. [CrossRef]
136. Gobbetti, M.; De Angelis, M.; Di Cagno, R.; Calasso, M.; Archetti, G.; Rizzello, C.G. Novel insights on the functional/nutritional features of the sourdough fermentation. *Int. J. Food Microbiol.* **2018**, *302*, 103–113. [CrossRef]
137. Webster, J.; Trieu, K.; Dunford, E.; Hawkes, C. Target Salt 2025: A Global Overview of National Programs to Encourage the Food Industry to Reduce Salt in Foods. *Nutrients* **2014**, *6*, 3274–3287. [CrossRef] [PubMed]
138. Nghiem, N.; Blakely, T.; Cobiac, L.J.; Cleghorn, C.L.; Wilson, N. The health gains and cost savings of dietary salt reduction interventions, with equity and age distributional aspects. *BMC Public Health* **2016**, *16*, 423. [CrossRef]
139. Komnenov, D.; Levanovich, P.E.; Rossi, N.F. Hypertension Associated with Fructose and High Salt: Renal and Sympathetic Mechanisms. *Nutrients* **2019**, *11*, 569. [CrossRef] [PubMed]
140. El-Kholany, E.A.; El-Deeb, A.M.; Elsheikh, D.M. Impact of lemon peel extract utilization on the biological values of Labneh during storage. *Egypt. J. Agric. Res.* **2022**, *100*, 555–569. [CrossRef]
141. Elgaml, N.B.; Moussa, M.A.; Saleh, A.E. Impact of adding moringa oleifera on the quality and properties of halloumi cheese. *Egypt. J. Agric. Res.* **2018**, *96*, 687–701. [CrossRef]
142. Abdullahi, M.; Zainab, F.; Pedavoah, M.; Bashir, U.; Sumayya, U.; Ibrahim, A. Evaluating the suitability of Adansonia digitata fruit pulp for the production of yoghurt. *Int. J. Biol. Chem. Sci.* **2014**, *8*, 508. [CrossRef]
143. Nadeem, M.; Javid, A.; Abdullah, M.; Arif, A.M.; Mahmood, T. Improving Nutritional Value of Butter Milk by Blending with Dry Leaves of Moringa oleifera. *Pak. J. Nutr.* **2012**, *11*, 812–816. [CrossRef]
144. Salman, K.H.; Mahmoud, E.A.; Abd-Alla, A.A. Preparing Untraditional Kishk Formula with Purslane as Natural Source of Bioactive Compounds. *J. Food Dairy Sci.* **2020**, *11*, 299–305. [CrossRef]
145. El-Montaleb, H.S.A.; Abbas, K.A.-E.; Mwaheb, M.A.; Hamdy, S.M. Production and characteristic quality of probiotic Labneh cheese supplemented with broccoli florets. *Br. Food J.* **2021**, *124*, 3666–3679. [CrossRef]
146. Bakr, A.S.T.; Elkot, W.F. Impact of Using Jerusalem Artichoke Tubers Powder and Probiotic Strains on some Properties of Labneh. *J. Food Technol. Nutr. Sci.* **2021**, *3*, 1–7. [CrossRef]
147. Abdeldaiem, A.M. Improvement of Domiati cheese properties using cichorium and bromelain extracts. *Egypt. J. Dairy Sci.* **2022**. [CrossRef]
148. Balabanova, T.; Petkova, N.; Ivanova, M.; Panayotov, N. Design of Labneh cheese fortified with alginate-encapsulated pepper (*Capsicum annuum*) extracts. *Emir. J. Food Agric.* **2020**, *32*, 559–566. [CrossRef]
149. Ebid, W.M.A.; Ali, G.S.; Elewa, N.A.H. Impact of Spirulina platensis on physicochemical, antioxidant, microbiological and sensory properties of functional labneh. *Discov. Food* **2022**, *2*, 29. [CrossRef]

150. Marchetti, L.; Andrés, S.C.; Califano, A.N. Physicochemical, Microbiological and Oxidative Changes During Refrigerated Storage of n-3 PUFA Enriched Cooked Meat Sausages with Partial NaCl Substitution. *J. Food Process. Preserv.* **2016**, *41*, e12920. [CrossRef]
151. Hao, Y.; Chu, Y.; Zhang, M.; Shi, W.; Chen, Y.; Li, D.; Li, L. Preparation of functional degradable antibacterial film and application in fresh-keeping of grass carp. *J. Agric. Food Res.* **2022**, *9*, 100341. [CrossRef]
152. Sharma, D.; Dhanjal, D.; Mittal, B. Development of Edible Biofilm Containing Cinnamon to Control Food-Borne Pathogen. *J. Appl. Pharm. Sci.* **2017**, *7*, 160–164. [CrossRef]
153. Salman, E.A.M.K.H. Utilization of Cinnamon, Clove and Thyme Essential Oils as Antimicrobial and Bioactive Compounds in Kishk Manufacturing. *Suez Canal Univ. J. Food Sci.* **2020**, *7*, 43–54. [CrossRef]
154. Sadrizadeh, N.; Khezri, S.; Dehghan, P.; Mahmoudi, R. Antibacterial Effect of Teucrium polium Essential Oil and *Lactobacillus casei* Probiotic on Escherichia coli O157:H7 in Kishk. *Appl. Food Biotechnol.* **2018**, *5*, 131–140. [CrossRef]
155. Saleh, K.A.H.; Khalil, O.S.F. Extension Shelf Life of Domiati Cheese Made by Using Some of Natural Preservatives. *Assiut J. Agric. Sci.* **2019**, *50*, 33368. [CrossRef]
156. El-Sayed, S.M.; El-Sayed, H.S. Antimicrobial nanoemulsion formulation based on thyme (*Thymus vulgaris*) essential oil for UF labneh preservation. *J. Mater. Res. Technol.* **2020**, *10*, 1029–1041. [CrossRef]
157. Al-Rimawi, F.; Alayoubi, M.; Elama, C.; Jazzar, M.; Çakıcı, A. Use of cinnamon, wheat germ, and eucalyptus oils to improve quality and shelf life of concentrated yogurt (Labneh). *Cogent Food Agric.* **2020**, *6*, 1807810. [CrossRef]
158. Boukid, F.; Zannini, E.; Carini, E.; Vittadini, E. Pulses for bread fortification: A necessity or a choice? *Trends Food Sci. Technol.* **2019**, *88*, 416–428. [CrossRef]
159. Mefleh, M.; Faccia, M.; Natrella, G.; De Angelis, D.; Pasqualone, A.; Caponio, F.; Summo, C. Development and Chemical-Sensory Characterization of Chickpeas-Based Beverages Fermented with Selected Starters. *Foods* **2022**, *11*, 3578. [CrossRef] [PubMed]
160. Mefleh, M.; Pasqualone, A.; Caponio, F.; de Angelis, D.; Natrella, G.; Summo, C.; Faccia, M. Spreadable Plant-Based Cheese Analogue with Dry-Fractioned Pea Protein and Inulin–Olive Oil Emulsion-Filled Gel. *J. Sci. Food Agric.* **2022**, *102*, 5478–5487. [CrossRef]
161. Ferweez, H.; Ibrahim, F.; Metwalli, A.; Mohran, M.; Tammam, A.A.; Ismail, H.; Farag, A. Increasing of Nutritional and Added Values of Functional Kishk by Replacing Burghul with Broken Seeds of Faba Bean (*Vicia faba* L.) as Innovative Dairy Product. *New Val. J. Agric. Sci.* **2021**, *1*, 76–88. [CrossRef]
162. Elkot, W.F.; Khalil, O.S.F. Physicochemical, textural, microbiological and sensory properties of low-fat bio-Labneh using sweet lupine powder and *Bifidobacterium longum* ATCC 15707. *J. Food Process. Preserv.* **2022**, *46*, e16311. [CrossRef]
163. Awaad, S.S.; Moawad, A.A.; Sallam, S.; Abdel-Salam, A.B. Effect of Some Improving Processing Techniques on the Microbiological and Sensory Quality of Domiati Cheese. *Egypt. J. Chem.* **2022**. [CrossRef]
164. Zhao, S.; Leng, Y.; Xiao, G.; Jiang, S.; Xie, Q.; Zhang, L.; Han, X. Effects of Pasteurization Method, Calcium Chloride and Squeeze Pressure on the Yield and Quality of Bovine Halloumi Cheese. *Sci. Technol. Food Sci.* **2019**, *40*, 32–38.
165. Zieliński, M.; Zielińska, M.; Cydzik-Kwiatkowska, A.; Rusanowska, P.; Dębowski, M. Effect of static magnetic field on microbial community during anaerobic digestion. *Bioresour. Technol.* **2020**, *323*, 124600. [CrossRef]
166. Al-Bachir, M. Physicochemical Properties of Syrian Dried Kishk as Affected by Gamma Irradiation. *J. Stress Physiol. Biochem.* **2022**, *18*, 32–41.
167. Pascall, M.A.; DeAngelo, K.; Richards, J.; Arensberg, M.B. Role and Importance of Functional Food Packaging in Specialized Products for Vulnerable Populations: Implications for Innovation and Policy Development for Sustainability. *Foods* **2022**, *11*, 3043. [CrossRef] [PubMed]
168. Kraśniewska, K.; Galus, S.; Gniewosz, M. Biopolymers-Based Materials Containing Silver Nanoparticles as Active Packaging for Food Applications–A Review. *Int. J. Mol. Sci.* **2020**, *21*, 698. [CrossRef] [PubMed]
169. Fan, Y.; Yang, J.; Duan, A.; Li, X. Pectin/sodium alginate/xanthan gum edible composite films as the fresh-cut package. *Int. J. Biol. Macromol.* **2021**, *181*, 1003–1009. [CrossRef] [PubMed]
170. Hendrasty, H.K.; Rahayu, W.T.; Marsudi, F. Effectiveness of Edible Film from Mozarella Cheese Whey on Physical and Chemical Properties of "Halloumi" Cheese and "Mozarella" Cheese Stored at Room Temperature. *Appl. Agroecotechnol. J.* **2022**, *3*, 229–237.
171. Mehyar, G.F.; Al Nabulsi, A.A.; Saleh, M.; Olaimat, A.N.; Holley, R.A. Effects of chitosan coating containing lysozyme or natamycin on shelf-life, microbial quality, and sensory properties of Halloumi cheese brined in normal and reduced salt solutions. *J. Food Process. Preserv.* **2017**, *42*, e13324. [CrossRef]
172. Lamri, M.; Bhattacharya, T.; Boukid, F.; Chentir, I.; Dib, A.L.; Das, D.; Djenane, D.; Gagaoua, M. Nanotechnology as a Processing and Packaging Tool to Improve Meat Quality and Safety. *Foods* **2021**, *10*, 2633. [CrossRef]
173. Babapour, H.; Jalali, H.; Nafchi, A.M. The synergistic effects of zinc oxide nanoparticles and fennel essential oil on physicochemical, mechanical, and antibacterial properties of potato starch films. *Food Sci. Nutr.* **2021**, *9*, 3893–3905. [CrossRef]
174. Fayed, A.; Elsayed, H.; Ali, T. Packaging fortified with Natamycin nanoparticles for hindering the growth of toxigenic Aspergillus flavus and aflatoxin production in Romy cheese. *J. Adv. Vet. Anim. Res.* **2021**, *8*, 58–63. [CrossRef]
175. Youssef, A.M.; Assem, F.M.; Abdel-Aziz, M.E.; Elaaser, M.; Ibrahim, O.A.; Mahmoud, M.; Abd El-Salam, M.H. Development of bionanocomposite materials and its use in coating of Ras cheese. *Food Chem.* **2019**, *270*, 467–475. [CrossRef]