



REVIEW ARTICLE

Functional and Novel Foods

Traditional cereals-based foods in North African cuisine: Wheat as the cornerstone

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ABSTRACT

Background: Wheat-based foods occupy a central role in the culinary heritage of North Africa, spanning Morocco, Algeria, Tunisia, Egypt, and Libya. These staple foods have been deeply embedded in the dietary practices and cultural traditions of the regions for centuries, reflecting the rich agricultural and cultural history tied to wheat cultivation.

Aims: This review explores the historical and contemporary significance of wheat as a foundational element of staple dishes in North Africa. The review examines the preparation techniques and cultural significance of diverse wheat-based products, including pasta-type dishes, bread, flatbreads, soups, whole grains, and pastries. Furthermore, the review critically evaluates the interplay between traditional practices and modern trends shaped by globalization, industrial agriculture, and sustainability challenges.

Methods: The study employs a systematic review of scientific literature, historical documents, culinary research, and grey literature. The review incorporates an in-depth analysis of 72 traditional wheat-based products, highlighting their preparation methods and cultural contexts.

Results: The review highlights the pivotal role of wheat-based foods in North African cuisine. Traditional dishes exhibit a rich diversity of textures and flavors, reflecting regional variations and historical influences. However, the increasing prevalence of mass production and standardization, driven by globalization has led to the erosion of traditional practices such as sourdough fermentation, whole grain utilization, and artisanal techniques. The shift towards industrially processed products and homogenized dietary preferences has significantly impacted the preservation of traditional culinary techniques and ingredients.

Conclusions: Despite the pressures of modernization and global influences, traditional wheat-based foods remain an indispensable component of North Africa's culinary heritage. Initiatives to preserve and revitalize traditional practices, including the use of sourdough and whole grains, are essential for safeguarding the cultural richness of North African cuisine and addressing sustainability challenges.

Keywords: Bread, Flatbread, Couscous, Pasta, Globalization, Ethnic Food.

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1 INTRODUCTION

North African countries—namely Morocco, Algeria, Tunisia, Egypt, and Libya—are distinguished by their rich historical and cultural heritage that have profoundly shaped their agricultural and culinary practices (Boronat *et al.*, 2023). The region exhibits diverse climatic conditions that significantly impact cereal cultivation and dietary patterns (Mefleh *et al.*, 2022). Among the cereals cultivated, wheat emerges as the most significant crop, forming the backbone of North African cuisine and occupying a central role in multitude of traditional dishes and staple foods. The Mediterranean climate prevalent in the coastal areas, characterized by its mild, rainy winters and hot, dry summers, provides an optimal environment for wheat cultivation, which is integral

to many traditional North African culinary practices. Wheat-based products, such as couscous, bread, and flatbreads, hold a deep-rooted historical legacy, with origins tracing back to ancient civilizations (Tidiane Sall *et al.*, 2019).

Wheat, particularly durum wheat (*Triticum durum*), is highly valued not only for its adaptability to the arid and semi-arid environments of North Africa but also for its substantial nutritional benefits (de Sousa *et al.*, 2021). Durum wheat is a rich source in carbohydrates, protein, essential vitamins, and minerals, making it a key component of the diet (Aoun & Boukid, 2022b). The high gluten content of wheat renders it particularly suitable for the production of semolina, a coarse flour that is integral to traditional dishes such as couscous, providing sustained energy and essential nutrients (Boukid,

2021a). Durum wheat also boasts a long-standing tradition in bread-making in North Africa. While soft wheat (*Triticum aestivum*) is also utilized in pastry production, its role is comparatively less prominent than that of durum wheat.

Beyond its nutritional and agricultural significance, wheat holds significant cultural value, featuring prominently in social, religious, and ceremonial contexts. The documentation and registration of traditional wheat-based foods are crucial for preserving this cultural heritage and promoting food security (Shafiee *et al.*, 2022). Systematic cataloging and scholarly examination of these foods enable researchers and policymakers to gain a comprehensive understanding of their historical and contemporary significance within regional diets, thereby ensuring the recognition and continuity of traditional practices (Kapelari *et al.*, 2020; Lee, 2018; Soare *et al.*, 2023). Such efforts also contribute to the preservation of culinary diversity and the promotion of sustainable agricultural practices, which are essential for safeguarding food sovereignty and cultural identity (Fontefrancesco & Zocchi, 2020).

Through this detailed exploration, the present review aims to provide a comprehensive analysis of traditional wheat-based foods in North Africa by examining their historical origins, cultural significance, and nutritional contributions to regional diets. Furthermore, it seeks to evaluate the current and future status of these foods, with a particular focus on their role in enhancing food security, promoting sustainability, and shaping the evolving culinary landscape of North Africa.

2 METHODOLOGY

To gather information on traditional wheat-based foods in North Africa, a comprehensive literature search was conducted using prominent scholarly databases, including PubMed, Scopus, and Web of Science. The search strategy utilized keywords such as “traditional wheat”, “North African wheat-based dishes” and “cultural significance of wheat” along with specific food names such as *Couscous*, *Msemen*, *Brik*, and *Harira*. The review prioritized peer-reviewed articles, ethnographic studies, and grey literature published between January 1996 and August 2024, including works in English, Arabic, and French. Inclusion criteria targeted studies on traditional recipes, preparation methods, nutritional profiles, and cultural contexts. Reports from international organizations, government agencies, and local institutions were also consulted to provide insights into wheat cultivation and its significance in food security and culinary traditions. Additionally, grey literature, including reports from the Food and Agriculture Organization (FAO) and the World Health Organization (WHO), was reviewed to obtain data on wheat production, consumption patterns,

and impacts of globalization. Collected data were analyzed and synthesized to evaluate the ingredients, preparation methods, and cultural significance of traditional wheat-based dishes.

3 RELEVANCE OF WHEAT IN THE NORTH AFRICAN REGION

The historical narrative of wheat in North Africa traces back approximately 10,000 years to the Fertile Crescent, where the domestication of tetraploid wheat marked a transformative milestone in human history (de Sousa *et al.*, 2021; Xynias *et al.*, 2020). This period coincided with the emergence of civilization, as human societies transitioned from nomadic hunter-gatherer lifestyles to sedentary agricultural communities. The domestication of wheat was characterized by a process known as the “domestication syndrome” wherein natural selection and early farmers' cultivation techniques led to the development of wheat varieties with advantageous traits, such as non-shattering seeds, larger grains, and reduced seed dormancy (Peng *et al.*, 2011). These adaptations facilitated more efficient harvesting and established wheat as a staple crop for early societies (Beres *et al.*, 2020).

As human populations migrated, wheat followed, spreading across North Africa through two primary routes (Pagani *et al.*, 2015). The first route followed a terrestrial path, originating in Egypt and extending southward into Sudan and Ethiopia, as well as northward into Libya. The second route was maritime, starting from Greece and Crete, and reaching the coastal regions of Libya, Tunisia, Algeria, and Morocco via the Sicilian peninsula (Ben M'Barek *et al.*, 2022). Over time, environmental factors and regional agricultural practices influenced the evolution of tetraploid wheat, resulting in a rich diversity of durum wheat landraces, each uniquely adapted to the local agro-ecological conditions of the Mediterranean Basin (Robbana *et al.*, 2021).

Durum wheat landraces in North Africa developed remarkable resilience to drought, disease, and the region's challenging environmental conditions (Guzmán *et al.*, 2016). This adaptability facilitated the cultivation of wheat varieties suited to low-input farming systems (Soriano *et al.*, 2018). Tunisian landraces exhibited high levels of genetic diversity, reflecting their capacity to thrive under traditional farming systems. However, the introduction of modern, high-yielding cultivars during the Green Revolution of the 1970s gradually replaced these landraces, leading to a reduction in the genetic diversity of durum wheat in the region. Despite these challenges, ongoing efforts to study and conserve the genetic diversity of North African wheat are underway (Xynias *et al.*, 2020). Researchers are employing advanced molecular tools to better understand the genetic population structure of durum wheat landraces (Tidiane Sall *et al.*, 2019).

The ability of durum wheat to produce high-quality semolina has been crucial in developing North African cuisine (Peña *et al.*, 2002). The unique texture and cooking properties of semolina have made it indispensable for creating dishes with distinct textures and flavors. Over time, durum wheat has become deeply embedded in the region's culinary identity, with traditional dishes playing a central role in social and ceremonial gatherings, reflecting its cultural significance (Hammami *et al.*, 2022). Soft wheat (*Triticum aestivum*) has also played a vital role in North African agriculture. Its versatility in producing a wide range of bread products, from flatbreads to leavened loaves, has been fundamental to the region's culinary traditions. Modern soft wheat varieties have been selectively bred to enhance their baking qualities.

Significant variations in wheat production and consumption persist across North Africa. The region currently cultivates durum wheat on approximately 2.9 million hectares, with limited potential for further expansion of the cultivation area (Tidiane Sall *et al.*, 2019). In 2021, Egypt emerged as the leading producer, yielding over 22 million metric tons of cereals, including substantial quantities of wheat (Abdalla *et al.*, 2022). However, Egypt relies heavily on imports to meet its consumption needs, with approximately 50% of its wheat being imported annually (Ayyad *et al.*, 2024). Morocco, the second-largest producer, contributed approximately 10.45 million metric tons of cereals in the same year (Statista, 2022), predominantly wheat and barley (Belmahi *et al.*, 2023). Tunisia produced around 1.3 million metric tons of wheat in 2021 (Statista, 2021), while its consumption

remained stable at 3.15 million metric tons, necessitating substantial imports of both durum and soft wheat to meet domestic demand. Libya's wheat production for the 2022-23 season is forecasted at 100,000 tons, reflecting its heavy reliance on imports due to arid conditions and limited agricultural capacity (CIG, 2022). Algeria, with a population of approximately 44 million, produced an estimated 3.7 million tons of wheat during the same period (CIG, 2022). However, its annual wheat consumption of approximately 11 million tons highlights a substantial reliance on imports to meet local needs. This dependence underscores the urgent need for strategies to enhance domestic wheat production (Abdalla *et al.*, 2022).

4 TRADITIONAL NORTH AFRICAN WHEAT-BASED FOODS

This section provides a detailed exploration of the diverse array of traditional wheat-based foods across the North African region, highlighting their cultural and culinary significance. Each subsection explores specific foods, their preparation methods, cultural relevance, and regional variations.

4.1 Pasta

Traditional pasta varieties in North Africa are characterized by unique preparation techniques and regional variations, contributing to the distinct flavors and textures of the region's cuisine (Table 1).

Table 1: Types of traditional North African pasta.

| Pasta | Country | Wheat ingredient | Description | Reference |
|-----------------|---------------------------|-----------------------|---|---|
| Couscous | North Africa | Semolina | Granules of durum wheat semolina are agglomerated, steamed and/or sun-dried. | (Moumni Abdou <i>et al.</i> , 2019) |
| Tikourbabine | Algeria | Semolina | Semolina dumplings cooked in a spicy red sauce. | (Zaroual <i>et al.</i> , 2019) |
| Berkoukes | Algeria, Morocco, Tunisia | Semolina | Large granules of durum wheat semolina are steamed and dried. | (Zaroual <i>et al.</i> , 2019) |
| M'hamsa | Tunisia, Morocco | Semolina | Small, round granules of durum wheat semolina. | (Oubahli, 2008) |
| Rechta | Algeria | Semolina | Thin, ribbon-like noodles made from wheat flour, rolled out and cut into strips. | (Bouksani, 1982) |
| Nwasser | Tunisia | Semolina, wheat flour | Small square pieces of pasta made from semolina and wheat flour dough, cut into squares, and dried. | (Bouksani, 1982) |
| Dwida (Shareya) | Tunisia, Algeria, Egypt | Semolina | Hand-rolled vermicelli made from durum wheat flour steamed to achieve a light, airy texture. | (Al-Khusaibi, 2019; Haddad <i>et al.</i> , 2021) |
| Chakhchoukha | Algeria | Semolina | Torn or rolled pieces of semolina dough mixed with a tomato-based sauce and simmered. | (Gagaoua & Boudechicha, 2018; Mmereki <i>et al.</i> , 2024) |
| Hlalem | Tunisia | Semolina | Hand rolled, shaped into pieces, and dried in the sun. | (Zaroual <i>et al.</i> , 2019) |
| Aftir Oukessoul | Algeria | Semolina | Pasta dish made by cooking dough sheets in a broth | (Djeha & Noussaiba, 2023) |

Couscous is a staple North African cereal-based dish, originating from Berber communities and made from durum wheat semolina. Its traditional preparation involves mixing semolina with salted water to form granules, which are then sieved into fine, medium, or coarse varieties. Couscous can be sun-dried (*couscous chamsi*) or steamed in a *couscoussier*, resulting in a light and fluffy texture. *Couscous* is typically served with stews made from lamb, chicken, or vegetables, though it can also be prepared as a sweet dish. For instance, *Masfouf* is a sweetened version mixed with butter, sugar, dates, and fermented milk, typically served during Ramadan fasting month, a religious practice for Muslim community. Another sweet variation, *Berzguene*, combines couscous with lamb stew, sugar, and saffron. In Morocco, *Seffat el couscous* is a unique dish that blends savory and sweet flavors, incorporating chicken, onion, sugar, nuts, and cinnamon (Moumni Abdou *et al.*, 2019).

Tikourbaine is a traditional Algerian dish consisting of semolina-based dumplings, either round or oval, cooked in a spicy red sauce. The dumplings are primarily made from wheat semolina, though barley is occasionally used, combined with oil, onions, and a variety of spices (Zaroual *et al.*, 2019).

Berkoukes is a traditional North African dish popular in Algeria, Morocco, and Tunisia. In Algeria's Aurès region, it is known as *aïch el har bel gueddid* and typically consists of large granules of steamed durum wheat semolina served with a spicy red sauce and salted dried meat (*gueddid*). It is often prepared during celebrations such as Mawlid and Yennayer, and can also be made in broth. In Morocco, it is referred to as *berkoukech*, while in Tunisia, two variations exist: one served in soup and another made from leavened sorghum flour with winter vegetables (Boukid, 2021b; Zaroual *et al.*, 2019).

M'hamsa is a traditional Tunisian dish made from small, round pasta granules of durum wheat. The preparation involves mixing semolina with water to form granules, which are sieved and sun-dried. The granules are then rehydrated, reshaped by hand, and stored. M'hamsa is highly versatile and often cooked with stews of vegetables, meats, and spices (Oubahli, 2008).

Rechta is a traditional Algerian dish featuring thin, ribbon-like noodles made from wheat flour, with roots in Berber cuisine. The dough is mixed with salt and water, rolled thin, and cut into ribbons. After dusting with corn flour, the noodles are slightly dried and typically steamed. Rechta is traditionally served with a spiced chicken and chickpea stew, often prepared for special occasions. It can also be cooked in a rich broth and served as a soup (Bouksani, 1982).

Nwasser, or **Trida** in Algeria, is a traditional Tunisian dish consisting of small square pasta pieces. The dough, prepared from fine semolina, flour, water, oil, and salt is rolled thin,

cut into 1x1 cm squares, and sun dried. *Nwasser mfaura* (steamed Nwasser) is popular, typically served with a meat or chicken stew with vegetables (Bouksani, 1982).

Dwida, referred to as *Gritliya* in Algeria, *Shayera E Seffa* in Morocco, and *Shareya* in Egypt, is a traditional dish made from hand-rolled semolina vermicelli. The dough, composed of durum wheat flour and water, is shaped into thin cords. In Algeria and Tunisia, *Dwida* is commonly used in stews and soups. In Egypt, *Shareya* is featured in *Koshary*, while Moroccan *Shayera E Seffa* is made using coarse *Dwida* (Al-Khusaibi, 2019; Haddad *et al.*, 2021).

Chakhchoukha is a traditional dish from the Chaoui region of Algeria. The name is derived from the Arabic word meaning "to crumble". The dish is prepared by cooking semolina dough in salted water until tender, after which it is torn into bite-sized pieces and mixed with a tomato-based sauce. It is often served with meat, chickpeas, and occasionally vegetables, *Chakhchoukha* holds cultural significance and is commonly prepared during events such as Mouloud, Achoura, and the Amazigh New Year (Gagaoua & Boudechicha, 2018; Mmereki *et al.*, 2024).

Afir oukessoul, also known as *thimegzerth* or *kataà ouarmi*, is a traditional Algerian pasta dish from the Kabylia region. The dish consists of fresh handmade pasta, approximately 20 to 40 cm in length, cooked in a broth made from lamb, seasonal vegetables, legumes, and herbs. The pasta is prepared similarly to *Msemen* and is cooked directly in the broth (Djeha & Noussaiba, 2023).

Hlalem is a traditional Tunisian homemade pasta made from semolina and water. The dough is shaped into rolls and cut into small pieces using a squeezing technique. These pieces are spread on a tray and sun-dried for several days before use (Zaroual *et al.*, 2019).

4.2 Bread, flatbread, filled breads and their derivatives

Bread has been a fundamental part of North African cuisine for centuries, reflecting the region's diverse cultural influences and regional variations (Table 2).

Khobz Eddar is a traditional North African homemade bread made from durum wheat flour, water, yeast, and salt. The dough is kneaded and fermented using sourdough, shaped into rounds, and baked in a traditional clay oven. *Khobz Eddar* is commonly served alongside soups and stews (Moujabbir *et al.*, 2023).

Eish Shamsi, or "sun bread," is a traditional Egyptian bread prepared from wheat flour, water, sourdough, and salt. The dough is left to rise under the sun, enhancing fermentation

Table 2. Traditional North African breads, flatbreads, and filled breads

| Dish | Country | Wheat ingredient | Description | Reference |
|------------------|----------------|--------------------------|--|--|
| Khobz Eddar | North Africa | Semolina | Traditional bread, kneaded and baked; pairs with soups and stews. | (Moujabber <i>et al.</i> , 2023) |
| Eish Shamsi | Egypt | Wheat flour | Sun-leavened bread with a dense texture, traditionally prepared for special occasions. | (Mahmoud & Abou-Arab, 1989) |
| Eish Baladi | Egypt | Wheat flour | Soft, pliable bread used for dipping and sandwiches, baked in conventional ovens. | (Mahmoud & Abou-Arab, 1989) |
| Eish Fino | Egypt | Wheat flour | Soft, elongated baguette-like bread, popular for sandwiches. | (Mahmoud & Abou-Arab, 1989) |
| Eish Tamir | Egypt | Wheat flour | Dense bread is often baked in a communal oven. | (Pasqualone, 2018) |
| Msemen | Morocco | Wheat flour, semolina | Flaky, layered flatbread cooked on a griddle; versatile with both sweet and savory dishes. | (Zaroual <i>et al.</i> , 2019) |
| Mlewi | Tunisia | Wheat flour, semolina | Flaky flatbread made without yeast, cooked on a griddle. | (Mamhoud <i>et al.</i> , 2016; Zaroual <i>et al.</i> , 2019) |
| Kobz Tajine | Algeria | Semolina, wheat flour | Flatbread cooked on a griddle, golden brown and crispy. | (Murphy, 2017) |
| Ghrayef | Libya, Morocco | Wheat flour | The Libyan version is dense and rustic; the Moroccan version is layered and flaky. | (Pasqualone, 2018) |
| Kesra | Algeria | Semolina | Dense flatbread, cooked on a griddle; served with soups or stews. | (Bouksani, 1982) |
| Harcha | North Africa | Semolina | Dense, crusty bread made on a skillet, often served warm with butter or honey. | (Bouksani, 1982) |
| Taguella | Algeria | Wheat flour | Flatbread cooked in hot ashes; imparts a smoky flavor and crispy texture. | (Hammiche & Maiza, 2006) |
| Mathlouaa | Algeria | Fine semolina | Leavened flatbread, traditionally baked on a spiked clay pan (tajine). | (Bouksani, 1982) |
| Maadjouna | Algeria | Fine semolina | Unleavened flatbread made with semolina, water, and salt. | (Bouksani, 1982) |
| Rakhsis | Algeria | Fine semolina | Unleavened flatbread baked on a spiked clay pan. | (Bouksani, 1982) |
| Rziza | Morocco | Wheat flour | Layered flatbread with a flaky, layered texture, cooked on a griddle. | (Pasandi, 2023) |
| Tafarnout | Morocco | Whole wheat flour | Baked on hot river stones, resulting in a lumpy texture and smoky flavor. | (Moujabber <i>et al.</i> , 2023) |
| Feteer Meshaltet | Egypt | Wheat flour | Layered flatbread with a flaky texture; served plain or with sweet/savory fillings. | (Boronat <i>et al.</i> , 2023) |
| Mhajeb | Algeria | Semolina | Stuffed flatbread with spiced filling; cooked on a griddle. | (Bouksani, 1982) |
| Hawawshi | Egypt | Wheat flour | Stuffed bread with spiced meat filling, baked until crispy. | (Hamouda & Abdelrahim, 2022) |
| Mtabga | Tunisia | Semolina, wheat flour | Flatbread filled with spices and lamb fat, cooked under hot sand. | (Mamhoud <i>et al.</i> , 2016) |
| Batbout | Morocco | Wheat flour | Stuffed bread with vegetables and herbs. | (Mamhoud <i>et al.</i> , 2016) |
| Fricassé | Tunisia | Wheat flour | Fried sandwich made from dough filled with various ingredients. | (Kouki <i>et al.</i> , 1989) |
| Brik | Tunisia | Wheat flour | Thin sheet dough wrapped around fillings, fried until crispy. | (Kouki <i>et al.</i> , 1989) |
| Brik Danouni | Tunisia | Wheat flour and semolina | Made with semolina and wheat flour dough and then filled. | (Kouki <i>et al.</i> , 1989) |
| Banadhej | Tunisia | Semolina | Made from medium semolina, filled with minced meat. | (Kouki <i>et al.</i> , 1989) |
| Maghlouga | Algeria | Semolina | Pancake made by layering a filling between two layers of semolina batter. | (Bouksani, 1982) |
| Rfissa | Tunisia | Various flatbreads | Shredded flatbread layered with lentils and chicken or sweetened with milk and dates. | (Saddoud Debbabi <i>et al.</i> , 2024) |
| Terda | Morocco | Bread leftovers | Made by crumbling stale bread into small pieces and simmering it in a broth or sauce. | (Graf, 2015) |
| Lablabi | Tunisia | Bread | Bread soaked in broth, topped with chickpeas, harissa, and other ingredients. | (Lucas, 2023; Zaroual <i>et al.</i> , 2019) |

and resulting in a dense structure. This bread is often served during festivals and special occasions (Mahmoud & Abou-Arab, 1989).

Eish Baladi, another staple in Egyptian bread varieties, is often compared to *Eish Shamsi*. However, unlike the rustic, sun-leavened *Eish Shamsi*, *Eish Baladi* is typically made with refined wheat flour, yielding a softer and more pliable texture. This bread is commonly used for dipping into sauces, accompanying meals, or serving as a base for sandwiches (Mahmoud & Abou-Arab, 1989).

Eish Fino, also known as Egyptian Bread Fino, is a popular Egyptian bread characterized by its soft texture and elongated shape. Made from wheat flour, water, sourdough, and fat, the dough is kneaded, shaped into rolls, and baked until golden. This bread is ideal for sandwiches and ranks second in consumption after *Eish Baladi* (Mahmoud & Abou-Arab, 1989).

Eish Tamir is a traditional Egyptian bread made from a blend of wheat and occasionally barley flour. This bread is denser and more substantial than its counterparts. The dough is often baked in communal ovens, a practice that fosters a strong sense of community. *Eish Tamir* is traditionally served with stews and soups in numerous rural Egyptians households (Pasqualone, 2018).

Msemen is a traditional Moroccan flatbread renowned for its flaky texture (Zaroual *et al.*, 2019). It is made from a dough of wheat flour, semolina, salt, sugar, and yeast, which is rolled into thin sheets, brushed with ghee, and folded to create layers. Cooked on a hot griddle, *Msemen* develops a crispy, golden exterior (Soula *et al.*, 2020).

Mlewi, also known as *Rougag*, is a traditional North African unleavened flatbread. The dough, made from wheat flour, semolina, salt, and water, is kneaded until smooth. After resting, the dough is divided, flattened into thin sheets, and layered with oil. Cooked on a hot griddle, *Mlewi* achieves a golden brown, crispy exterior and a soft, flaky texture through manual folding and layering (Mamhoud *et al.*, 2016; Zaroual *et al.*, 2019).

Kobz Tajine (also known as *Matloub*, or *Khobz Tajine*) is a traditional Algerian flatbread made from semolina or wheat flour. The preparation involves kneading the dough with flour, water, and a small amount of oil or butter to achieve a soft and pliable texture. After resting, the dough is rolled into thin sheets, folded into squares, and then cooked on a hot griddle called *Tajine* until it is golden brown and crispy (Bouksani, 1982).

Ghrayef is a traditional flatbread found in both Libya and Morocco, each with distinct characteristics. In Libya, *Ghrayef* consists of a simple dough made from wheat flour, water, and salt, cooked on a hot griddle or in a clay oven. This results in

denser, chewy bread. In Morocco, *Ghrayef* (or *Rghaif*) is a layered flatbread made from wheat flour (Amhaouche, 2007).

Kesra is a traditional Algerian flatbread made primarily from durum wheat flour or barley, mixed with water, salt, and occasionally sourdough. Cooked on a hot griddle, it has a dense texture and a slightly crisp crust. *Kesra* is typically served with soups or stews (Bouksani, 1982).

Harcha is a North African bread made from semolina and water. The dough is cooked in a skillet, resulting in a dense, crusty texture. Typically served warm, *Harcha* is often accompanied by butter, honey, or cheese (Bouksani, 1982).

Taguella is a traditional flatbread made by the Tuareg people in Algeria. This bread can be made from either wheat flour or millet, and it is cooked in hot ashes, which imparts a unique smoky flavor and a crispy texture. The preparation involves mixing the flour with water to create a dough, which is then shaped into flat rounds and cooked in ashes (Hammiche & Maiza, 2006).

Mathlouaa is a traditional Algerian leavened flatbread made from durum semolina, water, salt, and sourdough. Baked on a clay tajine, it has a light, spongy texture and is commonly eaten during Ramadan (Bouksani, 1982).

Maadjouna is a simple unleavened Algerian flatbread, prepared using fine semolina, water, and salt. The preparation involves kneading, shaping, and baking on a smooth clay pan. The bread has a chewy, dense texture. Similar to *Mathlouaa*, *Maadjouna* has a limited shelf life (Bouksani, 1982).

Rakhsis is an Algerian unleavened flatbread made from fine semolina, fat, water, and salt. Baked on a spiked clay pan, it features a smooth surface and a firm crust with a compact, soft crumb. Thinner than *Mathlouaa*, *Rakhsis* has a longer shelf life and a distinct fat flavor due to its high-fat content (Bouksani, 1982).

Rziza, or **Rzat Lkadi**, is a Moroccan layered flatbread. Made by rolling and folding thin dough multiple times, it achieves a flaky texture. Cooked on a hot griddle, *Rziza* has a crisp exterior and a soft, airy interior (Amhaouche, 2007).

Tafarnout is a traditional Moroccan flatbread rooted in Berber culinary practices, especially among the Amazigh in the High Atlas Mountains. Made with whole wheat flour, water, and salt, the dough is baked on small heated river stones over an open fire (Moujabbir *et al.*, 2023).

Feteer Meshaltet is a traditional Egyptian layered flatbread made from wheat flour, water, salt, and oil or butter. The dough is kneaded and folded to form thin layers, and baked until golden, resulting in a crisp exterior and soft interior (Boronat *et al.*, 2023).

Mhajib is a traditional Algerian stuffed flatbread made from semolina dough. The dough, prepared with wheat flour, water, and salt, is rolled out into thin sheets and filled with a mixture of onions, tomatoes, and spices. After filling, the dough is folded and cooked on a griddle, and it is often served as a snack or part of a meal (Bouksani, 1982).

Hawawshi is a traditional Egyptian bread dish made from wheat flour, yeast, water, salt, and occasionally sugar. The dough is kneaded and allowed to rise before being divided into discs. A filling of ground meat (beef or lamb), onions, garlic, and spices is spread on the discs, which are then folded and baked until golden brown (Hamouda & Abdelrahim, 2022).

Mtabga is a traditional Tunisian flatbread made from semolina or a mix of semolina and wheat flour. Filled with spices, harissa, garlic, onions, and lamb fat, the dough is folded and buried in hot sand with embers on top for slow cooking (Mamhoud *et al.*, 2016).

Batbout, or **Mkhamer**, is a traditional Moroccan pita-type bread made from wheat flour, yeast, water, and salt. The dough is rolled into circles and cooked in a pan. Afterward, it is filled with a spiced mixture of vegetables, onions, garlic, and egg (Mamhoud *et al.*, 2016).

Fricassé is a popular Tunisian fried sandwich made from a dough of wheat flour, yeast, water, salt, and sugar. After rising, it's shaped into small pieces and deep-fried. Once fried, the Fricassé is filled with ingredients like boiled potatoes, hard-boiled eggs, olives, capers, and harissa (Kouki *et al.*, 1989).

Warket Brik is a popular Tunisian dish made from a simple flour and water batter spread thinly on a hot pan until pliable. This sheet is used to wrap various fillings, typically a mixture of egg and capers, then folded and fried into a crispy golden exterior. Similar to *Warket Bastilla*, it can also be used for sweet dishes like "samsa" filled with sugar and nuts, or in Moroccan *M'hancha*, which features ground nuts shaped like a snake and baked with syrup (Amhaouche, 2007).

Brik Danouni is a traditional Tunisian dish made from a semolina and wheat flour dough, rolled into a thin sheet, and filled with minced meat, onions, boiled eggs, and spices. Folded into a semi-circle and deep-fried until crispy, it is an appetizer or snack central to Tunisian cuisine (Kouki *et al.*, 1989).

Banadhej is a traditional Tunisian dish like an empanada. Made from medium semolina, yeast, water, and salt, the dough is shaped into pockets or discs. These are filled with minced meat and sometimes other ingredients, then fried until golden and crispy (Kouki *et al.*, 1989).

Maghlouga is a traditional Algerian stuffed semolina pancake. The batter, made from fine semolina, water, and salt, is spread in a heated pan. A filling of minced meat, onions, tomatoes, and spices is added, followed by a second layer of batter to encase the filling (Bouksani, 1982).

Rfissa is a dish composed of layers of shredded flatbread (such as *Msemen*, *Rghayef*, or *Rziza*) combined with lentils and chicken. The flatbread is cooked on a griddle and then layered with a stew of lentils, chicken, and spices. In Tunisia, *Rfissa* takes on a sweet variation, made with shredded *Melewi* mixed with milk, butter, olive oil, sugar, and dates (Saddoud Debbabi *et al.*, 2024).

Terda is a traditional Moroccan dish made from stale bread, particularly in the Baidya region. The stale bread is torn into small pieces and simmered in a broth or sauce, often enriched with vegetables, legumes (mainly lentils), and various spices (Graf, 2015).

Lablabi is a traditional Tunisian street food characterized by its robust and savory profile. The dish involves soaking pieces of bread in a rich broth, commonly derived from chickpea cooking water or bone broth. The broth-soaked bread is then topped with cooked chickpeas, harissa for added spice, boiled eggs, and olive oil (Boukid, 2024; Kouki *et al.*, 1989).

4.3 Whole grain products

Whole grain products hold a significant place in North African cuisine, offering diverse textures and flavors deeply rooted in historical and contemporary practices. **Freekch**, also known as *farik*, is made from green wheat that is cleaned, roasted, and crushed, resulting in a smoky flavor and chewy texture (Majzoobi *et al.*, 2023). It is commonly used in pilafs and soups, notably *chorba frik*, which includes vegetables and sometimes meat, especially during Ramadan (Bouksani, 1982). **Freekch pilaf** combines steamed freekeh with vegetables, meats, and spices. **Bulgur**, another staple, is prepared by precooking, drying, and cracking wheat (Beres *et al.*, 2020).

4.4 Soups

Soups in North African cuisine reflect the region's agricultural heritage and diverse culinary practices. **Harira** is a classic Moroccan and Algerian soup made with wheat flour, *Shayeria* (vermicelli), or bulgur, typically featuring a base of meat, tomatoes, and legumes, thickened with wheat-based products (Amhaouche, 2007). **Hsou**, a traditional Tunisian soup, involves sautéing onions in olive oil, adding spices, tomato paste, and harissa, then simmering with water. Semolina is incorporated to thicken the soup, commonly consumed during Ramadan (Kouki *et al.*, 1989). **Harbel** is a Moroccan soup made from soaked whole wheat grains, milk, and butter, and simmered to create a creamy dish. It is served

as a warming meal during colder months (Amhaouche, 2007).

4.5 Pastries and desserts

Table 3 highlights the incorporation of wheat into these traditional sweets, showcasing the range of techniques and flavor profiles that define North African dessert traditions.

Basbousa is an Egyptian dessert composed of semolina, sugar, and yogurt, baked until golden and subsequently soaked in sugar syrup, resulting in a moist and dense cake (Boronat *et al.*, 2023).

Kalb El Louz is a traditional cake made from semolina and ground almonds, blended with sugar and butter, baked, and then soaked in a honey-orange blossom syrup. It is typically served during festive occasions (Amhaouche, 2007).

Hrissa Hlouwa is a sweet from Tunisia made with semolina, almonds, and honey, cooked in butter, to produce a dense confection characterized by a rich, nutty flavor. It is commonly consumed during celebrations (Kouki *et al.*, 1989).

Baghrir, also known as *Beghrir*, is a traditional Moroccan pancake made from semolina. The batter, prepared with semolina, flour, and yeast, is allowed to ferment, producing a spongy texture with numerous small holes. *Baghrir* is often served for breakfast or as a snack (Neela & Fanta, 2020).

Mbases is a sweet bread from Tunisia, characterized by its soft texture and slightly sweet flavor. The dough is made from semolina, optionally wheat flour, sugar, salt, and olive oil. Then, it is shaped into squares and cooked in a pan until golden brown. *Mbases* is commonly consumed as a dessert or as a breakfast (Kouki *et al.*, 1989).

Madmouja is a traditional Tunisian dessert composed primarily of semolina, butter, and water. The dough is flattened in a mold, cut into squares, and then fried until golden brown. Once fried, the squares are further chopped into smaller pieces and combined with a mixture of nuts, dates, and a syrup, typically made from sugar or honey (Kouki *et al.*, 1989).

Mahkouka is a traditional Tunisian dessert made from semolina, water, oil, and salt. The mixture is placed on a plate and cooked and then rubbed over a sieve to create a fine crumble. This process gives the dish its name, “*mahkouka*” referring to rubbing (Kouki *et al.*, 1989).

Belila is a traditional Egyptian porridge made from whole wheat grains. The wheat grains are boiled until tender, then sweetened with sugar or honey, and flavored with spices like cinnamon. It is often served with milk and garnished with nuts, raisins, or coconut (Kavle *et al.*, 2015).

Kishk, also known as *Keshk Almaz* in Egypt, is a traditional fermented wheat and milk product. The preparation involves cooking wheat grains in water, sun-drying, crushing, and then fermenting with *Laban Zeer*. Before consumption, dried *Kishk* is rehydrated and often incorporated into soups or porridges (Abou-Donia, 2008).

Ghraiba (also spelled “*Ghrayba*” or “*Ghoriba*”) is a traditional North African and Middle Eastern shortbread cookie. These cookies are known for their crumbly texture and are often made with ingredients like wheat flour, sugar, and butter or ghee. *Ghraiba* is typically prepared during special occasions and festivals (Kouki *et al.*, 1989).

Assida also called *Assida bidha* (meaning white porridge) is a traditional porridge commonly consumed in North African countries. Made from wheat flour, the preparation involves cooking wheat flour with water. The porridge is typically served with toppings such as honey, sugar, *Bsissa*, dates, butter and/or olive oil (Kouki *et al.*, 1989).

Bsissa is a traditional North African food, prevalent in Tunisia, Algeria, and Libya, made from roasted wheat and barley flour mixed with lentils, chickpeas, and seeds. This finely milled mixture is spiced with fenugreek, aniseed, and cumin, and can be sweetened with sugar. It can be consumed as a paste with olive oil or honey and served with dates or figs, or diluted with milk or water to create a drink known as *Rowina* (Yahyaoui *et al.*, 2017).

Kaak el Eid is a traditional ring-shaped pastry prepared for Eid celebrations in Tunisia and Algeria. The dough is made from wheat flour, sugar, butter, and eggs, and flavored with orange blossom water, anise, or sometimes sesame seeds. After kneading, the dough is shaped into rings and left to rise before being baked until golden (Kouki *et al.*, 1989).

Hniwnet, also known as Algerian *Kaak* is an Algerian brioche made from a dough of wheat flour, egg, milk, yeast, butter, salt, and sugar. The dough is mixed, proofed, and shaped into small balls with a hole in each. Optionally, these brioches can be filled with dates before baking (Bouksani, 1982).

Kaak Warka is a traditional Tunisian dessert made from wheat flour. This pastry is typically shaped into rings and stuffed with a mixture of finely ground nuts, often almonds or pistachios, combined with sugar and flavored with rose water or orange blossom water (Kouki *et al.*, 1989).

Makroudh is a traditional North African pastry, particularly popular in Tunisia, Algeria, and Morocco. This dessert is made from semolina dough. The dough is filled with a sweet date or almond paste, shaped into diamond or cylindrical forms, and then fried. After cooking, *Makroudh* is often soaked in honey or syrup. This pastry is commonly served on special occasions (Zaroual *et al.*, 2019).

Table 3. Traditional North African pastries and desserts

| Dessert | Country | Wheat ingredient | Description | Reference |
|---------------------|------------------------------|--------------------------|---|--|
| Basbousa | Egypt | Semolina | Sweet semolina cake baked until golden and soaked in syrup. | (Boronat <i>et al.</i> , 2023) |
| Kalb El Louz | Tunisia, Algeria | Semolina | Semolina and almond cake soaked in honey and orange blossom water. | (Amhaouche, 2007) |
| Hrissa Hlouwa | Tunisia | Semolina | Made from semolina, almonds, and honey | (Kouki <i>et al.</i> , 1989) |
| Baghrir | Morocco | Semolina | Spongy pancakes with numerous small holes. | (Neela & Fanta, 2020) |
| Mbases | Tunisia | Semolina | Soft, slightly sweet bread. | (Kouki <i>et al.</i> , 1989) |
| Madmouja | Tunisia | Semolina | Dessert is made from semolina dough that is fried, cut into squares, and mixed with nuts, dates, and syrup. | (Kouki <i>et al.</i> , 1989) |
| Mahkouka | Tunisia | Semolina | Dessert made from semolina crumbled. | (Kouki <i>et al.</i> , 1989) |
| Belila | Egypt | Whole grains | Creamy porridge made with wheat grains and sweetened with sugar or honey. | (Kavle <i>et al.</i> , 2015; Hassan, 2004) |
| Kishk | Egypt | Flour | Fermented pudding is used in soups or porridge. | (Abou-Donia, 2008) |
| Ghraiba | North Africa | Wheat flour, | Crumbly shortbread cookies, sometimes flavored with spices or nuts. | (Kouki <i>et al.</i> , 1989) |
| Assida | North Africa | Wheat flour | Creamy porridge made from wheat flour. | (Kouki <i>et al.</i> , 1989) |
| Bsissa | North Africa | Wheat grains | Made from roasted wheat and barley flour mixed with lentils, chickpeas, seeds, and spices. | (Yahyaoui <i>et al.</i> , 2017) |
| Kaak el Eid | North Africa | Wheat flour | Ring-shaped pastry made from wheat flour. | (Kouki <i>et al.</i> , 1989) |
| Hniwnet | Algeria | Wheat flour | Sweet brioche made with wheat flour, egg, sugar, salt, and milk. | (Bouksani, 1982) |
| Kaak Warka | Tunisia | Wheat flour | Ring-shaped pastries stuffed with sweet nut mixtures. | (Kouki <i>et al.</i> , 1989) |
| Makroudth | North Africa | Semolina | Semolina dough filled with sweet date or almond paste. | (Zaroual <i>et al.</i> , 2019) |
| Baklewa | Middle East/ North Africa | Wheat flour | Layered pastry with finely chopped nuts and honey syrup. | (Amhaouche, 2007) |
| Zalabia | North Africa | Wheat flour | Fried dough shaped into spirals or rings, soaked in sweet syrup. | (Kouki <i>et al.</i> , 1989) |
| Mkharek | Tunisia | Wheat flour | Fried pastries soaked in honey or syrup. | (Kouki <i>et al.</i> , 1989) |
| Yoyo | Tunisia | Wheat flour | Small doughnuts made with wheat flour, fried, and dipped. | (Kouki <i>et al.</i> , 1989) |
| Sbiaat Laaroussa | Algeria | Wheat flour | Doughnuts shaped like fingers. | (Bouksani, 1982) |
| Sablet | Tunisia | Wheat flour | Buttery cookies with a crumbly texture. | (Kouki <i>et al.</i> , 1989) |
| Bachkoutou | North Africa | Wheat flour | Sweet pastry shaped into patterns. | (Kouki <i>et al.</i> , 1989) |
| Zouza | Tunisia | Wheat flour | Walnut-shaped pastries with various fillings. | (Kouki <i>et al.</i> , 1989) |
| Atayaf | Egypt | Wheat flour | Stuffed pancakes filled with sweet mixtures, folded and fried. | (Said <i>et al.</i> , 2022) |
| Tcharek | Algeria | Wheat flour | Filled pastry made with flour, butter, and sugar | (Bouksani, 1982) |
| Tamina | Algeria | Semolina | Semolina cake is made from semolina, butter, and honey. | (Saadoudi <i>et al.</i> , 2024) |
| Brâdj | Algeria | Semolina | Pastry made with semolina combined dates and nuts. | (Bouksani, 1982) |
| Garn El Ghazal | North Africa | Semolina, wheat flour | Filled pastry made from almonds, sugar, and orange blossom | (Elyakouti, 2023) |
| Ftayer | North Africa | Wheat flour | Fried dough until golden and typically consumed with honey or sugar. | (Elyakouti, 2023) |
| Sfinj | Morocco | Wheat flour | Doughnuts shaped by hand into rings and deep-fried | (Berriane, 2021) |
| Bambalouni | Tunisia | Wheat flour | Street food like doughnuts | (Kouki <i>et al.</i> , 1989) |
| Bouchiar | Morocco | Wheat flour | Pancakes, made with a thin dough cooked on a griddle. | (Elyakouti, 2023) |
| Chebakia | Morocco | Wheat flour | Pastry made by shaping dough into intricate patterns, frying and then coating. | (Barakat <i>et al.</i> , 2020) |
| Wethnin El Kathi | Tunisia | Wheat flour | Pastry shaped into spiral strips, fried, and coated with honey, syrup, or powdered sugar. | (Kouki <i>et al.</i> , 1989) |
| Sellou (Sfouf) | Morocco | Roasted semolina | Dessert made by roasting semolina and nuts. | (Elyakouti, 2023) |

Baklewa, or *Baklava*, is a pastry popular in many Middle Eastern and North African countries. It consists of layers of thin, flaky phyllo dough brushed with butter and filled with finely chopped nuts like almonds, pistachios, or walnuts. After

baking, it is drizzled with syrup made from honey, sugar, and lemon juice, and is traditionally served during celebrations and festive occasions (Amhaouche, 2007).

Zalabia, also known as *Zlabia*, is a fried dough dessert made from wheat flour, sugar, and yeast (Chentli *et al.*, 2013). The dough is piped into hot oil in circular or spiral shapes, fried until crispy, and then soaked in a sugar syrup flavored with rose water or saffron. *Zalabia* is especially popular during Ramadan and other festive occasions (Kouki *et al.*, 1989).

Mkharek is a traditional Tunisian sweet pastry, especially popular in Beja during Ramadan and special occasions. Made from wheat flour, yeast, and water, the dough is soft and pliable. It is shaped into rings or twists, fried until golden, and then soaked in honey or sugar syrup (Kouki *et al.*, 1989).

Yoyo is a traditional Tunisian dessert. It is made from a simple dough of wheat flour, eggs, sugar, and yeast. After shaping into small rings or balls, it is deep-fried until golden and crisp. *Yoyo* is dipped in sugar syrup and consumed as breakfast or dessert (Kouki *et al.*, 1989).

Sbiaat Laaroussa is a traditional Algerian doughnut, named “the bride’s fingers” due to its finger-like shape. The dough, made from wheat flour, oil, salt, egg, and blossom water, is shaped into fingers, fried, and then coated with sugar or honey. This pastry is commonly served with coffee or tea (Bouksani, 1982).

Sablier is a traditional Tunisian cookie made from wheat flour, egg, butter, and sugar. The dough is mixed, rolled out, and cut into various shapes before baking. After baking, *Sablier* cookies are assembled by sandwiching two cookies together with a layer of jam. *Sablier* cookies are typically consumed with tea or coffee and are a staple at celebrations and gatherings (Kouki *et al.*, 1989).

Bachkoutou is a traditional North African biscuit made from wheat flour, butter, egg, and sugar, and often flavored with orange blossom water or vanilla. The dough is typically extruded or shaped into small patterns. *Bachkoutou* is habitually consumed during festive occasions and gatherings (Kouki *et al.*, 1989).

Zouza is a traditional Tunisian walnut-shaped cookie made from wheat flour, sugar, and butter. The dough is shaped into small, round, or oval pieces using molds, baked, and filled with sweet fillings like nuts or chocolate. *Zouza* is commonly served as a dessert during special occasions and celebrations (Kouki *et al.*, 1989).

Atayaf, also known as *Atayef* or *Qatayef*, is a traditional Middle Eastern dessert widely served during the month of Ramadan and other festive occasions in Egypt. It consists of small, stuffed pancakes or dumplings that are typically filled with a sweet mixture of nuts, cheese, or sweetened cream (Said *et al.*, 2022).

Tcharek, or “*Tcharek Ellouz*” is a North African pastry popular in Algeria and Tunisia. Made from a dough of flour, butter,

and sugar, it is filled with ground almonds and occasionally flavored with orange blossom water. Shaped into crescents or diamonds, the pastries are baked until golden and glazed with egg yolk. They are typically served during festive occasions like Eid (Bouksani, 1982).

Tamina, or “semolina cake”, is a traditional North African dessert made from semolina, butter, and honey, often enriched with ground almonds and flavored with spices such as cinnamon or cardamom. It is typically served warm or at room temperature during special occasions and celebrations (Saadoudi *et al.*, 2024).

Brâdj is a traditional Algerian dessert made from roasted semolina mixed with finely chopped dates and nuts. The mixture is combined with melted butter and often sweetened with honey, then molded into small, bite-sized pieces or squares. This sweet treat is usually served during festive occasions and celebrations (Bouksani, 1982).

Garn El Ghazal, or *Kaab El Ghazal*, is a traditional North African pastry made from fine semolina (in Morocco and Tunisia) or wheat flour (in Egypt), mixed with butter, salt, water, and orange blossom water. It is filled with finely ground almonds and sugar, and typically served during festive occasions such as Eid (Elyakouti, 2023).

Ftayer is a traditional Moroccan fried dough made from a simple wheat flour-based dough that is stretched thin and fried in oil. The dough is typically prepared with water, salt, and yeast, resulting in a crispy exterior and soft interior. It is commonly served as a breakfast item or snack (Elyakouti, 2023).

Sfinj is a Moroccan doughnut made from yeast-leavened wheat flour dough. The dough is shaped into rings and deep-fried, resulting in a crispy exterior and soft, chewy interior. Commonly consumed as a breakfast item or snack, *Sfinj* is often dusted with sugar or drizzled with honey (Berriane, 2021).

Bambalouni is a Tunisian fried doughnut made from yeast-leavened wheat flour dough. Shaped into discs and deep-fried until golden, it is coated in sugar and served as a sweet snack or breakfast item (Kouki *et al.*, 1989).

Bouchiar is a Moroccan pancake made from wheat flour, water, and salt. The dough is rolled thin and cooked on a hot griddle until it becomes slightly crispy yet soft. Typically served with butter and honey, *Bouchiar* is a light, airy option for breakfast or a snack (Elyakouti, 2023).

Chebakia is a traditional Moroccan pastry made from a dough of wheat flour, sesame seeds, honey, and spices like cinnamon and anise. The dough is rolled out, cut into strips, and shaped into flower-like patterns before being deep-fried (Barakat *et al.*, 2020).

Wethnin El Kathi is a traditional Tunisian pastry. The name translates to “Judge's ears” in Arabic, and it is made from a dough comprising flour, eggs, oil, orange flower water, sugar, and salt. The dough is rolled into strips, fried in hot oil, and shaped by rolling around a fork, fried and coated with honey or syrup or powdered sugar (Kouki *et al.*, 1989).

Sellou, also known as *Sfouf*, is a traditional Moroccan dessert made from a blend of roasted semolina, almonds, and sesame seeds. *Sellou* is often served during Ramadan or other special occasions (Chaachouay & Zidane, 2022).

5 GLOBAL INFLUENCE AND COMMERCIALIZATION

Modernization and globalization have significantly influenced the production, processing, and consumption of traditional wheat-based foods in North Africa (Zhu *et al.*, 2023). Advances in processing technology have shifted from stone ground to industrial milling, transforming traditional products (Boronat *et al.*, 2023). The rise of pre-packaged, ready-to-eat cereals has altered consumption patterns, often compromising the quality and traditional flavors that are integral to their cultural significance (Boukid *et al.*, 2022b). For instance, sourdough fermentation, historically prevalent in traditional baking, has been largely replaced by commercial yeast, despite research highlighting its health benefits, such as improved gut health (Gobbetti *et al.*, 2020). Similarly, while whole-grain flours were traditionally favored, modernization has led to a preference for refined flours due to their longer shelf life, significantly reducing the nutritional value of bread (Boukid & Rosell, 2022a). This industrialization has resulted in the standardization of bread production, diminishing the diversity of traditional breads. The French baguette has become one of the most consumed types in the region, reflecting a shift towards Western-influenced dietary choices, particularly among younger generations. Urbanization and changing lifestyles have further accelerated the transition toward convenience foods, often at the expense of traditional staples (da Rocha *et al.*, 2023). While globalization has diversified dietary choices, it has also influenced traditional food practices, highlighting the broader impact on regional food cultures (Hu *et al.*, 2025).

Wheat remains a major ingredient in the baking industry, with thousands of tons consumed annually across Africa in the production of bread, pasta, biscuits, and pastries (Reardon *et al.*, 2021). Factors such as the availability of affordable food products, a wide variety of options, and the convenience of baked goods are driving market growth (Belmahi *et al.*, 2023). The increasing preference for baked products, such as French baguettes, cakes, and pastries, reflects changing lifestyles and the rise of health-conscious consumer trends (da Rocha *et al.*, 2023). Efforts to partially substitute wheat flour with other

cereals, legumes, or tuber flours have been explored; however, composite flours typically require at least 70% wheat flour to achieve satisfactory leavening, especially for bread (Garba *et al.*, 2023). Balancing the preservation of traditional practices with modernization will be essential for sustaining the industry and ensuring that traditional wheat-based products remain competitive and relevant (McElhatton & Issi, 2016).

Preserving traditional wheat-based foods is essential for safeguarding cultural heritage and food diversity. Dishes such as *couscous*, *harira*, and various traditional bread types reflect deep historical and cultural practices (Boukid, 2024; Majzoubi *et al.*, 2023). Efforts to document and support these foods include recording traditional recipes and promoting the consumption of traditional wheat-based dishes (Zaroual *et al.*, 2019). These initiatives contribute to **Sustainable Development Goal SDG 12 (Responsible Consumption and Production)** by encouraging sustainable food practices and minimizing food waste through the promotion of culturally significant and nutritionally balanced diets. Additionally, preserving traditional wheat-based foods supports cultural diversity and enhances community identity, aligning with **SDG 11 (Sustainable Cities and Communities)**. These foods can also play a role in sustainable tourism, providing economic opportunities for local communities. Social media platforms offer an additional tool for reaching younger generations, introducing these culturally significant dishes to broader audiences and fostering appreciation for traditional culinary practices (Boukid, 2024).

6 CONCLUSIONS

Traditional wheat foods are fundamental to North African diets, serving as a cornerstone of the region's culinary heritage. This review has explored a comprehensive range of products, detailing their ingredients, preparation methods, and cultural significance. These dishes not only reflect the region's rich culinary heritage but also highlight the adaptability of wheat in meeting both historical and contemporary dietary needs. The integration of traditional wheat-based foods into contemporary diets demonstrates their ongoing role in addressing nutritional needs while preserving cultural heritage.

However, advances in food processing technologies and shifting consumption patterns impacted the texture, taste, nutritional quality, and cultural essence of these foods. The transition from traditional methods to industrial processes, the rise of convenience foods, and the influence of global dietary trends have introduced new dynamics that affect both the production and consumption of traditional wheat-based foods. To sustain traditional wheat-based food systems, it is essential to strike a balance between modernization and the preservation of cultural practices. Efforts to integrate

traditional knowledge with innovative approaches can enhance food security, promote sustainable agricultural practices, and ensure the continued relevance of these foods in contemporary diets.

Building on the insights from this review, a subsequent analysis will focus on further significant cereals, including barley, rice, corn, and sorghum. This will provide a comprehensive overview of traditional cereal-based foods in the North African region.

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