INSIGHTS IN “KHEMISS-TWEIRA” AS A FAMINE PEARL MILLET COPING STRATEGY IN DARFUR STATE, SUDAN


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ABSTRACT

In an effort to intervene in the relentless food shortages during famine periods in Darfur and elsewhere in the country, the Sudanese Government has vested interest in exploiting indigenous food resources that are often given less development attention. The objective of this study was to gain insights in the value and other perceptions associated with, Khemiss-tweira, together with pearl millet (Pennisetum glaucum) as a famine coping food security crop in Darfur, Sudan. The study was conducted in the displacement camps in El-Fasher in North Darfur, with a particular focus on Naivasha markets. The data were collected using a semi-structured questionnaire, on a sample size of 140 respondents. The study found that food was mostly scarce during summer times. The majority of respondents (27.9%) used Khemiss-tweira during the famine time. A large proportion of respondents in El-Fasher (92.1%) were familiar with Khemiss-tweira. The predominate method of preparation Khemiss-tweira was in the sequence of germination-fermentation-baking-drying-adding sugar and salt. The only difference was in the last additions where only peanuts, dates or sesame were the ingredients. The crop could be stored for more than a year without reported deterioration in food value and quality. Khemiss-tweira was commended for high acceptability by majority of the respondents (91.4%).

Key Words: Famine, Khemiss-tweira, pearl millet, Sesame

RÉSUMÉ

Dans un effort pour intervenir dans les pénuries alimentaires incessantes pendant les périodes de famine au Darfour et ailleurs dans le pays, le gouvernement soudanais a tout intérêt à exploiter les ressources alimentaires indigènes qui reçoivent souvent moins d’attention en matière de développement. L’objectif de cette étude était de mieux comprendre la valeur et d’autres perceptions associées au Khemiss-tweira, ainsi qu’au millet perlé (Pennisetum glaucum) en tant que culture de
sécurité alimentaire faisant face à la famine au Darfour, au Soudan. L’étude a été menée dans les camps de déplacés d’El-Fasher au Nord-Darfour, avec un accent particulier sur les marchés de Naivasha. Les données ont été recueillies à l’aide d’un questionnaire semi-structuré, sur un échantillon de 140 répondants. L’étude a révélé que la nourriture était la plupart du temps rare pendant les périodes estivales. La majorité des répondants (27,9%) ont utilisé Khemiss-tweira pendant la période de famine. Une grande partie des personnes interrogées à El-Fasher (92,1%) connaissaient Khemiss-tweira. La méthode prédominante de préparation Khemiss-tweira était dans la séquence de germination-fermentation-cuisson-séchage-ajout de sucre et de sel. La seule différence était dans les derniers ajouts où seuls les cacahuètes, les dattes ou le sésame étaient les ingrédients. La récolte pourrait être stockée pendant plus d’un an sans que l’on signale une détérioration de la valeur et de la qualité des aliments. Khemiss-tweira a été félicité pour sa grande acceptabilité par la majorité des répondants (91,4%).

Mots Clés : Famine, Khemiss-tweira, millet perlé, Sésame

INTRODUCTION

Darfur is renowned for frequent famines, which involves mass starvation and causes extensive morbidity within a specific period of time (De Waal, 2018). This phenomenon is usually accompanied by malnutrition, famine, epidemic and increased mortality (Kelly, 1992). As such, Darfur is one of the most food insecure regions in Sudan. Major contributors to occurrence of famine in Darfur are the weak rural security policies in general, and the short-term concept of relief policies rather than food security policies (Masci, 2002).

As an ameliorative strategy, the Sudanese Government has embarked on leveraging and investing in developing indigenous food mechanisms in order to avert the associated food crises. Khemiss-tweira is one of the indigenous fermented millet foods popularly used during famines in Darfur. Khemiss-Tweira is a food product confined to the region of Darfur, but with scanty scientific documentation to support effective decision making. Nutritionally, Khemiss-Tweira reportedly provides a balanced meal, containing the necessary carbohydrates, proteins, oil, minerals and vitamins (Dirar, 1994). Hence, its name which connotes “five birds”, probably refers to the five ingredients: millet flour, millet malt flour, sesame, sugar and salt. This food is consumed after the addition of pure water to the level of attaining the consistence desired by the consumer.

The usefulness and attractiveness of this food acts as an incentive to justify its widespread production in the country (Dirar, 1993). It is widely eaten in Western Sudan by travelers, boarding school pupils, soldiers and rural workers. There is little information on socio-economic aspects of using Khemiss-tweira during famine and non-famine times, acceptability by Darfur’s people and it role as food is little investigated. The objective of this study was to gain insights in the value and other perceptions associated with, Khemiss-tweira, together with pearl millet (Pennisetum glaucum) as a famine coping food security crop in Darfur, Sudan.

METHODOLOGY

The study was conducted at locality of El-Fasher (13.61667°N 25.35°E), in five units, namely El-fashir Large Market, Um Dafsu Market, Livestock Market, Naivasha Market and Zamzam Camp Market. Staff of the Association of Women Development Networks in El-Fasher, as well as the Ministry of Agriculture, and El-Fashir University were used as key informants.

The data were collected with the aid of a semi-structured questionnaire through one-on-one interviews; using a sample of 140
individuals, including women, using official lists obtained from local authorities. The sample size was determined using random sampling, because the population frame was unknown. The data collected were analysed statistically using descriptive statistics. The Statistical Package for Social Scientists version 22, was used for all the analyses.

RESULTS AND DISCUSSION

Seasonal availability of food. Table 1 presents the profile of foods availability in Darfur based on rainy seasons. A total of 82.1% of respondents asserted that the rainy seasons were characterised by abundant food supply throughout the Sudan. This observations agrees with results from elsewhere that the rainy season is a period of plenty of food both in arid and semi-arid conditions (FAO, 2021). This result, however, appeared to contradict that of Salih et al. (2017) who reported that the rainy season was a period of difficulty for the internally displaced people (IDP) in Darfur to obtain food for their households. This contradiction could be due to the difficulties of aid reaching the IDP camps in autumn due to poor road conditions, rather than seasonal food scarcity.

Table 2 shows the distribution of respondents based on seasonal food scarcity in Darfur, Sudan. It is clear that the rainy season is the bounty period for food supply in Darfur; while the summer season marks the climax for food scarcity in the region. Other seasonal periods are equally seldomly affected by food scarcity. Therefore, summer periods are the best target periods for investing in Khemiss-tweira in Darfur.

Knowledge of Khemiss-tweira. Most respondents in El fasher (92.1%) knew Khemiss-tweira as a vital crop for the dry period in Darfur region (Table 3). This conforms to Dirar’s (1993) observation that Khemiss-Tweira is a food product confined to the region of Darfur in Sudan. Whether this is a true reflection of the situation prevailing elsewhere in Sudan, needs further investigations. The modest lack of knowledge expressed by some respondents (7.9%) (Table 4) could be due to the cosmopolitan nature of urban residents, who are characterised by a diversity of cultures and feeding habits, owing to relatively better incomes than their rural counterparts. Food in urban areas is generally plentiful and available in a variety of forms ranging from fresh to prepared to packaged (Mahmoud, 2009; CSIS, 2020).

Table 5 shows the ranking of ease of preparation of Khemiss-tweira in Darfur, Sudan. Majority of the respondents (74.3%) agreed that Khemiss-tweira was easy to prepare, thus offering a good entry point for expansion use of this famine food. However, this observation appears to be mismatched

Table 1. Distribution of respondents according to food abundance periods in Darfur, Sudan

<table>
<thead>
<tr>
<th>Time</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter</td>
<td>11</td>
<td>7.9</td>
</tr>
<tr>
<td>Rainy season</td>
<td>115</td>
<td>82.1</td>
</tr>
<tr>
<td>Summer</td>
<td>1</td>
<td>0.7</td>
</tr>
<tr>
<td>Winter/rainy season</td>
<td>8</td>
<td>5.7</td>
</tr>
<tr>
<td>Missing data</td>
<td>5</td>
<td>3.6</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 2. Seasonal distribution of food scarcity in Darfur, Sudan

<table>
<thead>
<tr>
<th>Time</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter</td>
<td>5</td>
<td>3.6</td>
</tr>
<tr>
<td>Rainy season</td>
<td>6</td>
<td>4.3</td>
</tr>
<tr>
<td>Summer</td>
<td>117</td>
<td>83.6</td>
</tr>
<tr>
<td>Summer/rainy season</td>
<td>6</td>
<td>4.3</td>
</tr>
<tr>
<td>Summer/ Winter</td>
<td>4</td>
<td>2.9</td>
</tr>
<tr>
<td>No answer</td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100</td>
</tr>
</tbody>
</table>
TABLE 3. Respondents’ distribution according to food types used during the famine in Darfur, Sudan

<table>
<thead>
<tr>
<th>Type of food</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stored millet</td>
<td>11</td>
<td>7.9</td>
</tr>
<tr>
<td>Khemiss-tweira</td>
<td>39</td>
<td>27.9</td>
</tr>
<tr>
<td>Dry porridge</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Stored crops</td>
<td>31</td>
<td>22.1</td>
</tr>
<tr>
<td>Government wheat</td>
<td>1</td>
<td>0.7</td>
</tr>
<tr>
<td>Dried food</td>
<td>35</td>
<td>25</td>
</tr>
<tr>
<td>Corape and elmakhit</td>
<td>5</td>
<td>3.6</td>
</tr>
<tr>
<td>Watermelon seeds</td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td>Lentil, rice and pasta (aid food)</td>
<td>6</td>
<td>4.3</td>
</tr>
<tr>
<td>Missing data</td>
<td>3</td>
<td>2.1</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100</td>
</tr>
</tbody>
</table>

TABLE 4. Respondents distribution according to the knowledge of Khemiss-tweira in Darfur, Sudan

<table>
<thead>
<tr>
<th>Known</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>129</td>
<td>92.1</td>
</tr>
<tr>
<td>No</td>
<td>11</td>
<td>7.9</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100.0</td>
</tr>
</tbody>
</table>

TABLE 5. Respondents distribution according to ease of preparation of Khemiss-tweira in Darfur, Sudan

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easily prepare by anyone</td>
<td>104</td>
<td>74.3</td>
</tr>
<tr>
<td>Only prepare by specific individual</td>
<td>24</td>
<td>17.1</td>
</tr>
<tr>
<td>I do not know</td>
<td>12</td>
<td>8.6</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100.0</td>
</tr>
</tbody>
</table>

with the method of preparation (Table 6), which was rather lengthy; comprising of at least five steps (germination/fermentation/baking/drying/adding sugar and salt). The respondents’ favourable opinion about the ease of preparation might be because the process was considered a routine that is executed without empirical assessment of the amount of labour required for the overall preparation process. This could be partly to blame for the negative response given by some respondents to the question about the ease of preparation.
question. It is, therefore, imperative that an assessment of the ease of food preparation from *Khemiss-tweira* is done in order to revisit and justify some steps technically and economically.

The food preparation sequence was similar in all options, except at the tail end of the sequence in which majority of respondents added peanuts, dates or sesame. On the other hand, the minority (12.9%) added sesame only, and 14.3% added peanuts only. This result was in line with that of Ali (2000), who intimated that *Khemiss-tweira* could be prepared by adding either sesame or peanuts. The value of adding extra ingredients to *Khemiss-tweira* preparation needs further investigation since the action has potential for increasing the energy used and overall cost of production.

**Duration of fermentation.** Table 7 shows the distribution of respondents against time taken to ferment *Khemiss-tweira* during its food preparation in Darfur, Sudan. The majority of respondents (40.7%) intimated that fermentation period of *Khemiss-tweira* was in the range of 12-24 hours. Ali (2000) also noted that *Khemiss-tweira* fermented was done up to 24 hours. On the other hand, other respondents (25.7%) intimated fermentation periods of less than 12 hours. The latter observation is in line with that of Dirar (1993), who reported that *Khemiss-tweira* was fermented for up to 12 hours. Reasons for the differences in range of fermentation periods were not divulged in each case; hence it may be necessary to justify these time differences in terms of food nutritional quality of the product (Khetarpaul and Chauhan, 1989).

**Storage of *Khemiss-tweira*.** The majority of respondents (42.9%) indicated that *Khemiss-tweira* was stored for a duration of less than 3 months under Darfur conditions (Table 8). This result in line with the results of Dirar (1993), who did not recommend storage of the crop beyond three months owing to development of rancidity caused by oil which the crop contains. Nevertheless, 32.9% of
TABLE 7. Respondents distribution according to the duration of fermentation of *Khemiss-tweira* in Darfur, Sudan

<table>
<thead>
<tr>
<th>Duration of fermentation (hrs.)</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 12</td>
<td>36</td>
<td>25.7</td>
</tr>
<tr>
<td>12-24 hours</td>
<td>57</td>
<td>40.7</td>
</tr>
<tr>
<td>More than 24 hours</td>
<td>1</td>
<td>0.7</td>
</tr>
<tr>
<td>Missing data</td>
<td>46</td>
<td>32.9</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100.0</td>
</tr>
</tbody>
</table>

TABLE 8. Respondents distribution according to storage duration of *Khemiss-tweira* in Darfur, Sudan

<table>
<thead>
<tr>
<th>Storage duration</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 3 months</td>
<td>60</td>
<td>42.9</td>
</tr>
<tr>
<td>3 - 12 month</td>
<td>46</td>
<td>32.9</td>
</tr>
<tr>
<td>More than year</td>
<td>12</td>
<td>8.6</td>
</tr>
<tr>
<td>I do not know</td>
<td>22</td>
<td>15.7</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100.0</td>
</tr>
</tbody>
</table>

TABLE 9. Respondents distribution according to general acceptability of *Khemiss-tweira* in Darfur, Sudan

<table>
<thead>
<tr>
<th>Acceptability</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceptable</td>
<td>128</td>
<td>91.4</td>
</tr>
<tr>
<td>Unacceptable</td>
<td>12</td>
<td>8.6</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Respondents alluded to a storage period of 3-12 months. Issues related to storage conditions of *Khemiss-tweira* and its consequences on food quality have received non-traceable research attention thus far in Darfur. This knowledge blur could be a recipe for latent maladies attributed to invisible quality deterioration arising from inappropriate storage conditions associated with this famine crop. Fermentation is necessary mainly for food preservation, flavour development and for enhancement of nutritional quality of raw products (Saleh *et al.* 2013). When pearl millet is turned into flour, the resulting powder is noted as having poor keeping quality, especially under conditions of moderately high moisture and oxygen exposure (Abdelrahman *et al*., 1983; Chaudhary and Kapoor, 1984).

Acceptability of *Khemiss-tweira*. *Khemiss-tweira* was highly acceptable to the majority of respondents (91.4%) in Darfur (Table 9). This is rather surprising considering the cosmopolitan nature of urban areas and IDP camps. On the other hand, it underscores the importance of this crop as a food security crop in Darfur; and therefore justifies its targeted research and development attention to avert the frequent food crises in the region. Issues of acceptability are linked with crop species and probably storage and fermentation conditions of pearl millet. Hence, a more comprehensive study targeting sensory analysis may be necessary, in order to further entrench this as a food security crop of the Darfur region.

**CONCLUSION**

*Khemiss-tweira*, made from fermentation of pearl millet, is a food source of growing significance during famine periods in Darfur of the Sudan. It is consumed by both city dwellers and IDP populations, with its acceptability rated high across both populations. Its preparations, which comprise of a sequence of elaborate steps may be a hindrance to its full exploitation; thus requiring further exploration. Furthermore, its storage and fermentation periods require optimisation studies to obviate extended energy and labour requirements as well as latent deterioration in food quality.
ACKNOWLEDGEMENT

The authors acknowledge the support of the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) for funding the study through the Transforming African Agricultural Universities to meaningfully contribute to Africa’s growth and development (TAGDev) funded by the MasterCard Foundation. The funding was received through a project titled “Improvement of Indigenous Coping Strategies of Famine-stricken in Darfur States, Sudan”, grant number: RU/2018/CARP+/07C.

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