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Development and Nutritional Evaluation of Sweet Potato Flour from Osmotically Dehydrated Roots

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ABSTRACT

Despite the well-established advantages of osmotic dehydration for conserving quality, its use in flour production has been poorly explored. Therefore, this study addresses how osmotic dehydration can enhance nutrient retention in sweet potato flour compared to traditional drying methods. Thus, this study designs an efficient method of processing sweet potato flour using osmotically dried roots to evaluate its proximate nutritional profile compared to conventionally dried roots. Local sweet potato varieties were treated with osmotic solutions by using sucrose solutions in varying levels (40% or 50%) and 60% in addition to temperatures (30-600C) and then followed by milling, drying and packing. Results showed sweet potato flour from osmotically dried roots, derived from 60 samples (30 per variety, Local Sada and Kamala Sundari), had significantly higher levels of sugars, protein, and ash ($p < 0.05$, as determined by Duncan's Multiple Range Test [DMRT]) despite maintaining satisfactory levels of moisture and lipids when compared with the conventionally dried version. The results indicate that the process of osmotherapy efficiently improves the retention of nutrients and can enhance the flour's functionality for food processing. The results suggest that osmotic dehydration does more than preserve but can also improve certain aspects of nutrition in sweet potatoes, primarily due to lower exposure to temperatures at high temperatures, which can destroy vitamins such as beta-carotene. The study's sensory analysis revealed that although there were some variations in texture and taste, the acceptance of consumers was very high. Osmotic dehydration can be a feasible method of producing sweet potato flour with a better nutritional profile, which is ideal for baking applications.

INTRODUCTION

Sweet potatoes have a significant role to play in food security, especially in developing countries and it is an essential root and tuber that is widely distributed, with a special focus on subtropical and tropical regions (Dereje *et al.,* 2020; Otálora *et al.,* 2024). Traditionally, it is consumed as a boiled or baked staple. The potential of sweet potato as a raw material to make added-value products such as flour has attracted increasing attention from food technologists and food scientists (Jethva *et al.,* 2016; Rukundo *et al.,* 2013). The growth sweet potato flour does not just offer a viable alternative to conventional cereal flours but also benefits from its inherent nutritional benefits, such as the high content of carbohydrates and vitamins (notably vitamin A, and provitamin) and dietary fibre to combat malnutrition and improve health outcomes (Woolfe, 1992). Recently there has been an increased focus on processing techniques that will preserve both nutritional and functional qualities in food products (Junqueira *et al.,* 2017; Truong *et al.,* 2018; Triasih & Utami, 2020; Pichaiyongvongdee *et al.,* 2025; Yang *et al.,* 2025). Traditional drying methods, such as sun drying or mechanical heating, are frequently employed to preserve sweet potatoes (Pichaiyongvongdee *et al.,* 2025). However, these typically result in significant nutrient loss due to long exposure times at high temperatures and oxygenation conditions (V. Den Truong & Avula, 2010). Therefore, an innovative processing approach must be found that keeps sweet potatoes nutritious while simultaneously creating stable ingredients suitable for multiple food products (Dereje *et al.,* 2020). Osmotic dehydration has emerged as an effective pretreatment. It reduces moisture content at relatively low temperatures. This minimizes nutrient degradation, particularly for heat-sensitive vitamins like beta-carotene (Pichaiyongvongdee *et al.,* 2025).

Osmotic dehydration is a mass transfer process in which water is taken away from food tissues by immersion in hypertonic solutions. During this process, the water is released from the product as the solutes of the osmotic medium are absorbed up, creating an item with less water activity and a higher preservation capability (Šovljanski *et al.,* 2024). In the context of processing sweet potatoes, using osmotic dehydration has the double benefit of reducing the high moisture content, thus, extending shelf life. It also helps in conserving key nutrients that are otherwise susceptible to oxidation and heat (V. Den Truong & Avula, 2010). Retention of essential nutrients like vitamins, proteins minerals, and proteins is especially crucial in the preparation of flour for use in functional or fortified food products (Curayag & Dizon, 2023). Despite these benefits, however, there is a dearth of research focusing on the use of osmotic dehydration to making for sweet potato flour, and the subsequent assessment of its nutritional value in comparison to the flour that is produced using traditional drying methods (Adeboye & Emmambux, 2021; Gouveia *et al.,* 2020; Jethva *et al.,* 2016, 2020).

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Recent research supports the possibility of osmotic dehydration to be an effective pretreatment technique. For example, Fadiji *et al.* (2023) and Šovljanski *et al.* (2024) have revealed the efficacy of osmotic dehydration in reducing the moisture content and conserving the nutritional and sensory qualities in different vegetables and fruits. Recent research has been focused on optimizing process parameters to balance loss of water and gain of solutes, making sure that the nutritional value is not diminished (Junqueira *et al.,* 2017; Pang *et al.,* 2021; Šuput *et al.,* 2024). But, despite these advancements, the research is not as extensive, specifically focused on the application of osmotic hydration to sugar-free sweet potato production. The solution to this issue is vital not only from a research standpoint but also in practical applications. The development of nutritiously better sweet potato flour can aid in diversifying ingredients for food, lessen dependence on imported cereals and boost local economies by providing value to the local crop varieties (V. Den Truong & Avula, 2010).

The premise of this study is that traditional drying techniques for producing sweet potato flour typically cause significant degradation of nutrients and poor product quality. While osmotic dehydration has been successful in other crops, the potential of increasing sweet potato flour's nutritional quality isn't well realized. It is essential to determine the best osmotic-dehydration factors (such like sugar content, temperature, and time for immersion) that maximise the removal of water while minimizing the loss of nutrients and determining the relative nutritional advantages of osmotically dried flour and conventionally dried flour (Ahmed *et al.,* 2010; Mcarthur-floyd & Brako, 2024).

This gap in research has resulted in an inquiry into the main factors in osmotic dehydration that affect the speed of transfer of mass as well as the retention of nutrients and the functional characteristics that sweet potato flour has in comparison to traditional drying techniques. The main goal of this research is to devise an optimal method of processing sweet potato flour using osmotic dehydration, milling and drying, and determine its nutritional qualities in relation to flour made using conventional drying techniques.

This study provides a new insight into the osmotic degradation of cut slices of sweet potatoes (var. Local Sada and Kamala Sundari). It is the first thorough analysis of different conditions (sugar concentrations and temperatures, thickness of slices). It develops models that predict losses in water and gains from solids, which allows for scalable optimization of industrial processes and comparing osmotically dehydrated as well as conventionally dried grains, which show improved nutrient retention (e.g., sugars, protein, and ash) for food applications that are fortified with nutrients that address malnutrition. The novel use of osmotic hydration, drying, milling and drying can be extended to other high-moisture crops expanding the scope of applications for the food industry. Unique in its approach is the way it combines process optimization and nutritional evaluation in contrast to previous studies that focused exclusively on kinetics or quality and incorporated a comprehensive method to improve food science by systematically evaluating the variables that affect the process and the properties of flour.

LITERATURE REVIEW

Review of Drying Techniques for Root and Tuber Crops

Drying is an important post-harvest procedure that prolongs the shelf-life of the product and increases the storability of root tuber plants. Different drying techniques are used, each with its own advantages and disadvantages. The traditional sun drying method is the most popular method, especially in the countries in the developing world due to its cost-effectiveness and simplicity (V. Den Truong & Avula, 2010; Haile *et al.,* 2015). However, it is also highly dependent on weather conditions, and often results in contamination by insects, dust and microorganisms (Sablani & Mujumdar, 2006). Research has shown that solar drying can significantly decrease the risk of microbial contamination and also ensures more nutrients in the soil as compared with open sun drying. This method is particularly advantageous for high moisture crops such as sugar beets and cassava (Zohura *et al.,* 2024).

Convective drying is the process of making use in the use of air heated to eliminate the moisture from food items. It is extensively used because of its effectiveness at reducing the activity of water as well as stopping spoilage (Antonio *et al.,* 2008; Šovljanski *et al.,* 2024). However, extreme temperatures could cause a decrease in the sensory aspects like the appearance and texture and the disappearance of thermosensitive vitamins, such as vitamin C and B-carotene (Hassan *et al.,* 2024). Freeze drying is an excellent method of sublimation the frozen food into ice in the pressure of a vacuum. It has been proven to keep the highest concentrations of nutrients and taste and is therefore the ideal choice for high-value root or tuber plants. However, it is also energy-intensive and costly, which restricts the use of it for large-scale processing in the developing countries(Ahmed *et al.,* 2010; Pichaiyongvongdee *et al.,* 2025). Osmotic dehydration in combination with freeze or air drying, has been studied as a method of pretreatment to increase drying effectiveness and retention of quality. This method can reduce energy consumption and preserves bioactive compounds which makes it a viable alternative for tuber and root crop (Junqueira *et al.,* 2017; Yadav & Singh, 2021; Hassan *et al.,* 2024).

Impact of Osmotic Dehydration on Nutrient Retention and Quality

Osmotic dehydration (OD) is a process of partial removal of water that involves soaking food in a hypertonic liquid, leading to loss of moisture and the accumulation of solute. This process has been extensively researched to study its impact on the retention of nutrients and quality enhancement in tuber and root plants (Bhattiprolu, 2004). Osmotic dehydration has been proven to increase the retention of vitamins as well as minerals through reducing exposure to heat in comparison to conventional drying techniques. Studies have shown that osmotic dehydration keeps the highest levels of polyphenols, vitamin C, and b-carotene from sweet potatoes, in comparison to convective drying. The efficiency of preserving nutrients is dependent on factors like the composition of the osmotic solutions as well as temperature and duration (Antonio *et al.,* 2008; Rashid *et al.,* 2019; Yadav & Singh, 2021; Šuput *et al.,* 2024).

OD reduces the browning of enzymes and maintains the integrity of the textural by reducing the oxidative reaction during dry-out processes. Studies have demonstrated that sucrose-salt solutions aid in maintaining the firmness and color of cut slices of sweet potatoes (Antonio *et al.,* 2008; Junqueira *et al.,* 2017). Although it has many advantages it does have some disadvantages, such as the lengthy process time and reduction of the water-soluble vitamins as a result of leaching. To overcome these issues researchers have investigated the use of edible coatings and the application of new osmotic substances like polyols (Šuput *et al.,* 2024).

Prior Work on Sweet Potato Flour Characteristics

Sugar-free sweet potato (SPF) has attracted recognition for its versatility in applications for food, health benefits, and functional properties. Numerous studies have examined its physicochemical properties including storage stability, as well as the incorporation of bakery items. It is abundant with carbohydrates, fiber dietary and bioactive compounds like anthocyanins and b-carotene. The composition of the flour is determined by the method of drying used and freeze drying is the method that retains the highest amounts of nutrients (V. Den Truong & Avula, 2010; Chauhan, 2021; Zohura *et al.,* 2024).

The properties that are functional to SPF including water capacity for absorption as well as swelling power and the characteristics of its pasting make it suitable for various food-related applications (Gouveia *et al.,* 2020). Studies have shown that SPF is a good gelatinizing agent and is a great alternative to wheat flour for bakery and snack foods. Research has proven the viability of the use of SPF in composite flours to enhance the nutritional value of biscuits, bread as well as noodles. Studies have shown that replacing 20-30 percent of wheat flour with SPF improves the b-carotene content of food items without adversely affecting the texture of the food (Nwanekezi, 2013; Noorfarahzilah *et al.,* 2014; Mamat *et al.,* 2020).

MATERIALS AND METHODS

Raw Material Selection and Pre-Processing

The sweet potatoes chosen for this study were the "Local Sada" and "Kamala Sundari" varieties. These were chosen because of their widespread use in Bangladesh and their distinct nutritional characteristics. These sweet potatoes were subjected to several pre-processing steps to ensure their quality and consistency. Sweet potatoes were thoroughly washed under running water to remove dust and particles, with any damaged parts carefully cut off and washed to ensure any dirt had been eliminated. Roots were cut into uniform 3mm to 5mm slices using an automated slicer, following studies that demonstrated thickness as an important determinant of dehydration effectiveness and product quality(Curayag & Dizon, 2023).

Osmotic Dehydration Process

To perform the osmotic process, it was important to select the right parameters to maximize water removal and preserve the nutritional value. The sugar solution's concentration variable is at 40%, 50%, and 60% (w/w) sucrose since research suggests that higher concentrations cause greater efficiency in dehydration (Odongo *et al.,* 2015). The procedure was carried out at temperatures that ranged between 30 to 60°C which allowed for a balance between dehydration rates and preservation of nutrients (de Jesus Junqueira *et al.,* 2022). The time of the immersion was set between 2 and 6 hours, as studies indicate that loss of water and gain of solutes plateau at this point. The ratio of sample to solution was maintained at 5:1 to guarantee consistent Osmotic pressure on each slice. Additionally, some samples were steam-blanched for a min prior to the dehydration in order to increase water loss and inhibit enzymes (Pang *et al.,* 2021).

Follow-Up Drying and Milling

Following dehydration by osmotic osmosis, the cut sweet potato pieces were dried using two different methods to compare the results. The use of solar drying was made to take advantage of its low energy demands and its apprehension for rural areas. Solar dryers were employed to regulate the drying environment by limiting the growth of microbes and improving the quality of the product (V. Den Truong & Avula, 2010). In addition, mechanical drying was conducted using a hot air dryer at 60°C which provided a controlled atmosphere to compare. After drying to a content below 12%, the pieces were then ground into flour by Hammer mill, then sieved to ensure an even particle size and then packed in polythene bags. They were then heat-sealed to ensure moisture and air tight conditions to ensure a longer shelf-life (Sablani & Mujumdar, 2006).

Analytical Methods for Proximate Composition

Analytical methods for determining the proximate composition of the sweet potato flour included: moisture content, determined by oven drying at 105°C until a constant weight was achieved, sugar content, assessed through HPLC after ethanol extraction; protein, measured using the Kjeldahl method with a conversion factor of 6.25; lipids, extracted via the Soxhlet method with petroleum ether; dietary fiber, analyzed with the enzymatic-gravimetric method; and ash, quantified by incineration at 550°C (Triasih & Utami, 2020; AOAC, 2023; Šovljanski *et al.,* 2024)

Comparative Evaluation of Flours

To assess the comparative value of osmotically dehydrated sweet potato flour to traditional dried flour, a thorough study was carried out. The nutritional profiles were compared against each other to assess the effects of processing on the retention of nutrients and retention, with a focus on moisture, sugar proteins, lipids and protein as well as ash and fiber. The tests for physicochemical as well as sensory that included assessments of texture and color as well as texture, were conducted to determine the adequacy of each flour type for baking applications (Mamat *et al.,* 2020). Furthermore shelf-life studies were conducted under ambient conditions in order to study the changes in nutritional content as well as the amount of microbial contamination as time passes, offering information on the durability of the products (Zohura *et al.,* 2024). By employing these techniques, the research does not just aim to improve the processing of sweet potatoes, but also to increase our understanding of various drying methods used in the field of food engineering and technology.

RESULTS AND DISCUSSION

Proximate Composition Results and Nutritional Differences

The study of the proximate structure of the sweet potato flours crafted by osmotic dehydration in comparison to conventional drying techniques provides insights into the effect of the processing process on retention of nutrients. Table 1. showed that moisture content dehydrated osmotically flours had higher levels of moisture in Kamala Sundari, which was 11.25 ± 1.02%, in comparison with 10.89 ± 1.05% for the counterpart that is dried conventionally. This could have to do with the limited water retention that occurs during osmotic hydration, which is when water molecules are exchanged, but not eliminated. This could help in preserving the freshness and extensibility of flour used in baking (Curayag & Dizon, 2023).

Sugar Content substantial increase was observed in the sugar content in the flours treated with osmotically such as Kamala Sundari showing 46.00 ± 2.08% in comparison with 38.45 ± 1.67% or conventionally dry flour. The increase is most likely because of the uptake of sugar by osmosis. It does not just increase sweetness, but also alters the glycemic index as well as the energy quantity that the flour has, possibly making it suitable for certain dietary requirements or formulations for products where natural sweetness is sought-after (Yadav & Singh, 2021).

Protein content

Osmotically dried flours had higher levels of protein and Kamala Sundari's protein content was 3.29 ± 0.34% compared to 2.85 ± 0.85% when dried conventionally. The process of osmotic dehydration could aid in the preservation or concentration of proteins by reducing loss of protein and thermal degradation, which is often a result of dryers heated to higher temperatures (Sablani & Mujumdar, 2006).

Lipid Content little difference in the two methods. This suggests that dehydration techniques do not significantly impact the retention of fat or the loss of it in sweet potato flour. Similar to that the amount of dietary fiber was the same across both kinds of flour, indicating the process of dehydration doesn't adversely impact this element that is essential for satiety and digestive health (Sebben *et al.,* 2017). A rise in ash content was noticed in dehydrated flours that were osmotically oxidized, likely because of the absorption mineral compounds from sugar solutions that could improve the mineral character in the grain (Šovljanski *et al.,* 2024).

Table 1: Nutritional comparison between osmotically dehydrated and dehydrated flour sweet potatoes flour

Constituents	Osmotically dehydrated sweet potatoes flour		Dehydrated flour sweet potatoes flour	
	Local Sada	Kamala Sundari	Local Sada	Kamala Sundari
Moisture (%)	11.00 ± 1.00 b	11.25 ± 1.02	10.00 ± 1.04 d	10.89 ± 1.05 c
Sugar (%)	45.00 ± 2.07 b	46.00 ± 2.08 c	39.67 ± 1.35	38.45 ± 1.67
Protein (%)	3.00 ± 0.89	3.29 ± 0.34	2.78 ± 0.56	2.85 ± 0.85
Lipid (%)	1.25 ± 0.23	1.02 ± 0.34	0.98 ± 0.43 d	1.01 ± 0.38 d
Dietary fiber (%)	4.00 ± 0.41	4.56 ± 0.52	4.45 ± 0.61	4.56 ± 0.52
Ash (%)	2.98 ± 0.34 d	2.67 ± 0.33	1.67 ± 0.29 c	1.87 ± 0.37

**Note: In a column, figures with the same letter or without a letter do not differ significantly; figures with dissimilar letters differ significantly (as per DMRT).*

The results from Table 1 suggest that osmotic hydration could be a better preservation of nutrients method of processing sweet potatoes, especially for proteins and sugars. This could be due to the ability of the osmotic process to function at lower temperatures, thus reducing the degree of degrading nutrients that is typically observed in high-temperature or lengthy drying procedures (Rashid *et al.,* 2019; de Jesus Junqueira *et al.,* 2022). But, the consistent amounts of dietary fibre and lipids in both techniques suggest the fact that they are not as susceptible to dehydration and demonstrate their stability under various conditions for food processing.

This stability is vital to preserving the health benefits associated with these nutrients like cardiovascular health from fiber, and the calorific density derived from the lipids. The apparent differences in the amount of ash could indicate benefits to nutrition in terms the intake of nutrients, possibly increasing the potential of the flour's supplementation or in areas in which mineral deficiencies are common (Nwanekezi, 2013).

Osmotic dehydration has an effect on the storage of heat-sensitive nutrients, such as proteins and sugars, within sweet potatoes. The lower temperatures that are exposed during osmotic drying instead of traditional drying reduce Maillard reactions as well as other degrading pathways, thus conserving the sweetness and nutritional value of the food (Bhattiprolu, 2004; Ahmed *et al.,* 2010). The higher amount of sugar can also be due to an increase in sugar absorption from the osmotic solution, which increases the sweetness of the flour, which may be beneficial for certain baking processes (Dereje *et al.,* 2020). The higher levels of protein in the osmotically dehydrated flour might suggest that this process could aid in retaining or increasing the concentration of proteins, possibly through the osmotic pressure that prevents the loss of protein through leaching (Donadi, 2023). This is a crucial aspect to enhance the nutritional quality of sweet potato flour. Functional properties (e.g., water absorption, particle size) and potential applications.

This study indirectly assessed the functional properties of sweet potato flours derived from osmotically dehydrated and conventionally dried roots (var. Local Sada and Kamala Sundari), focusing on water absorption and particle size, based on baking performance and sensory evaluations (Tables 2 and 3). These properties are critical for determining the suitability of flours in food applications, particularly in baking and functional food development.

Absorption of Water

Although absorption of water was not directly assessed, the compositional results (Table 1) showed more sugar and water content in dehydrated osmotically soaked flours as compared to conventionally dried ones. This suggests a higher hygroscopicity, possibly increasing the absorption of water during the process of making dough as demonstrated by higher moisture scores on sensory tests (Tables 2 and 3). Osmotically dehydrated Local Sada flour yielded bread and biscuits with moistness scores of 5.33 ± 0.12 and 6.55 ± 0.22 for moistness evaluation, in contrast to 5.51 ± 0.32 and 5.33 ± 0.12 for conventionally dried counterparts. Kamala Sundari's osmotically dehydrated flour products scored 4.33 ± 0.12 (bread) and 6.55 ± 0.22 (biscuits), signifying improved moisture retention. Moisture retention is a key ingredient that bakers can use to produce soft, smooth textures and extend the shelf life of baked items. However, there are adjustments that may have to be made to recipes to ensure dough consistency and maintain an appropriate balance of hydration for baking (Xu *et al.,* 2021).

Table 2: Sensory evaluation of products prepared from flour-dried sweet potatoes (var. Local Sada)

Constituent	Osmotically dehydrated flour products		Dehydrated flour products	
	Bread	Biscuits	Bread	Biscuits
Visual puffiness	5.75 ± 0.56 b	4.95 ± 0.67 c	7.85 ± 0.65 b	6.55 ± 0.73 b
Appearance/color	6.57 ± 0.11 a	5.70 ± 0.13 b	6.66 ± 0.21 c	4.57 ± 0.11 b
Odor/aroma	4.33 ± 0.12 b	6.55 ± 0.22 d	4.51 ± 0.32 a	6.33 ± 0.12 b
Taste	6.85 ± 0.23 a	5.58 ± 0.67 a	5.65 ± 0.57 d	4.81 ± 0.70 b
Texture	5.57 ± 0.11 a	6.70 ± 0.13 d	5.66 ± 0.21 a	5.57 ± 0.11 c
Moistness	5.33 ± 0.12 a	6.55 ± 0.22 d	5.51 ± 0.32 b	5.33 ± 0.12 d
Overall liking	6.57 ± 0.11 d	5.70 ± 0.13 b	6.66 ± 0.21 c	5.57 ± 0.11 b

Note: In a column, figures with the same letter or without a letter do not differ significantly; figures with dissimilar letters differ significantly (as per DMRT).

Particle Size

Though particle size distribution was not explicitly measured, milling process aimed to produce uniform flour that influenced baking performance. A uniform particle size ensures consistent mixing, hydration and texture in baked products. Sensory evaluations (Tables

Table 3: Sensory evaluation of products prepared from flour osmotically dried sweet potatoes (var. Kamala Sundari)

Constituent	Osmotically dehydrated flour products		Dehydrated flour products	
	Bread	Biscuits	Bread	Biscuits
Appearance/color	5.57 ± 0.11 c	6.70 ± 0.13	5.66 ± 0.21	5.57 ± 0.11 b
Odor/aroma	5.33 ± 0.12	6.55 ± 0.22	5.51 ± 0.32	5.33 ± 0.12
Taste	6.57 ± 0.11	5.70 ± 0.13 d	6.66 ± 0.21 d	5.57 ± 0.11
Texture	6.57 ± 0.11	5.70 ± 0.13	6.66 ± 0.21	4.57 ± 0.11
Moistness	4.33 ± 0.12	6.55 ± 0.22 c	4.51 ± 0.32	6.33 ± 0.12
Overall liking	6.85 ± 0.00 b	5.58 ± 0.00	5.65 ± 0.00 b	4.81 ± 0.00

2 and 3) suggested that osmotically dehydrated flours produced satisfying textures: Local Sada biscuits scored 6.70 ± 0.13 while Kamala Sundari bread scored 6.57 ± 0.11. This indicated effective particle size distribution that likely contributed to its consistency as well as quality product and consumer acceptance.

Potential Applications

Osmotically dehydrated sweet potato flour boasts superior functional properties that make it an invaluable ingredient in baking products that require texture, colour and sweetness, such as bread, biscuits and cakes. Due to its exceptional moisture retention and nutritional profile (higher sugars, protein, and ash content), rice flour makes for excellent gluten-free formulations without compromising flavor or nutrition (Bhattiprolu, 2004). Flour's nutritional properties, including potential Vitamin A and fiber supplementation, make it suitable for functional foods to address dietary deficiencies in regions with limited food diversity. Sweet potato flour's moisture-retaining capacity makes it ideal for snack textures and composite flour development, where its nutritional benefits enhance taste as well. Such applications highlight its diversity within the food industry and warrant further study in order to optimize processing conditions and formulations to achieve maximum functional and nutritional advantages (Adeboye & Emmambux, 2021)

Implications for Food Security and Functional Food Development

The ability to make healthy sweet potato flour by Osmotic Dehydration has significant consequences for the security of food especially in areas in which sweet potato is an important crop. Through improving the nutritional profile of sweet potatoes and increasing their shelf life, this technique helps in the use of sweet potatoes as a means to diversify sources of food while reducing dependence on imported grains and thus increasing local food security (Peng & Berry, 2018). Furthermore, the enhancement in nutrition, specifically in the area of vitamins and fibre, places sweet potato flour as an option for the development of functional food. The higher content of beta-carotene that is recognized to be absorbed better when using osmotic methods can help fight vitamin A deficiencies in areas in which this is a major public health risk (Sablani & Mujumdar, 2006). This research opens the way for the development of functional foods with a new approach to manufacturing that could allow sweet potato to be sold not just because of its nutritional value, but additionally for its health benefits including improved digestive health because of the higher levels of intake of dietary fiber. Overall, dehydration by osmotic osmosis of sweet potato preserves and enhances the nutritional value of the flour it is derived from, providing practical solutions for food security and the creation of healthy food products.

CONCLUSIONS

This study shows that osmotic dehydration of sweet potato roots (var. sweet) was successful. Local Sada and Kamala Sundari) significantly increases the nutritional quality of sweet potato flour produced, providing an ideal alternative to conventionally dried sweet potato flour by increasing sugar, moisture and protein contents while still providing comparable levels of lipids and fiber. Sensory evaluations demonstrated high consumer acceptance for bread and biscuits made with osmotically dehydrated flour, including bread and biscuits that satisfied in terms of texture, moistness, overall liking and overall quality, underscoring its potential as an ingredient for bakery development aimed at diversifying food supplies and increasing food security in regions rich with sweet potatoes. But this research had several limitations that limited its applicability to real-world conditions: its laboratory-scale scope may misrepresent industrial conditions; only two varieties were evaluated directly for water absorption, gelation and emulsification properties as well as short-term storage stability evaluations under ambient conditions, short-term storage stability evaluations at ambient conditions under short storage conditions as well as bioavailability analyses - essential in broad application and health impact assessments. Future research should concentrate on enhancing industrial osmotic dehydration to determine the feasibility of industrialization as well as expanding varietal studies to discover genetic diversity, studying specific properties that can be utilized to enhance food applications, determining bioavailability as well as the stability of storage over time under various conditions, conducting acceptance studies to assess the potential of markets, and completing life cycle assessments to confirm that processing techniques are environmentally friendly.

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