



CONSUMER PERCEPTION AND MARKET TRENDS OF RED PIGMENTED RICE: A REVIEW

Omonu, R. U.

Department of Foo Technology Akanu Ibiam Federal Polytechnic, Unwana, Ebonyi State, Nigeria.

omonudile@gmail.com

Adejoh, A. O.

Energy Communication Centre, Jabi, FCT, Nigeria.

adejohaisha572@gmail.com

Edegbo, G. U.

National Biotechnology Development Agency, Abuja, Nigeria.

godwinib18@gmail.com

Abstract

This review delves into the evolving landscape of red pigmented rice, exploring both consumer perception and market trends. Red pigmented rice, known for its unique nutritional profile and cultural significance, is gaining global attention. The analysis reveals a growing consumer interest driven by perceived health benefits and alignment with sustainability trends. Consumers, increasingly prioritising healthier choices, position red pigmented rice as a promising option. However, addressing barriers to adoption and enhancing consumer awareness through targeted educational campaigns emerge as critical strategies for industry stakeholders. On the market front, a global analysis indicates diverse consumption patterns, with Asia leading and showing increasing interest. Key industry players are investing in research and development, collaborating to strengthen the supply chain. The market analysis underscores the potential for expansion, driven by changing consumer preferences and industry innovations. The optimistic future outlook anticipates sustained growth, fueled by increased consumer awareness, innovative product development, and the integration of red pigmented rice into mainstream food products. Overall, the review provides valuable insights, paving the way for strategic initiatives that can contribute to the continued success and acceptance of red pigmented rice on a global scale.

KEYWORDS: Red Pigmented Rice, Consumer, Market trends

1. Introduction

Red pigmented rice serves as a remarkable testament to the extraordinary artistry of nature, captivating the beholder's attention with its vibrant and lustrous hue that emanates from the abundance of anthocyanin compounds it possesses (Thitipramote, *et al.*, 2022). Even before one has the opportunity to indulge their taste buds, this magnificent rice variety already captures the gaze and imagination. Nonetheless, the transformation of this once niche ingredient into a ubiquitous household staple hinges

significantly on the perception it evokes among consumers. Moreover, these rice varieties display functional characteristics that are indispensable for the development of new product formulations (Suric, 2023). It is worth noting that pigmented rice stands out due to its abundant polyphenolic content, which encompasses phenolic acids and flavonoids, both of which play a pivotal role in conferring antioxidant properties to the rice (Thitipramote, *et al.*, 2022).

The marketability of red pigmented rice is influenced by a multitude of diverse factors that can have a significant impact on its overall desirability and commercial viability. Within the food industry, there has been a notable increase in the utilization of pigmented rice grains; however, there remains a dearth of knowledge surrounding the effects of post-harvest processes on the inherent properties of this rice variety (Jatmika *et al.*, 2022). The decisions made by consumers when purchasing red pigmented rice are intricately linked to the effective implementation of the marketing mix strategy by the producers themselves, as this plays a pivotal role in shaping their perceptions and subsequent choices (Rudometova and Kim, 2020). One key driving force behind the escalating demand for pigmented rice stems from the evolving preferences of consumers, particularly their growing inclination towards embracing a healthier lifestyle (Wuryandani *et al.*, 2021). Nevertheless, it is crucial to acknowledge that many farmers exhibit a certain degree of hesitancy when it comes to cultivating pigmented rice due to concerns surrounding lower yields, which presents a significant obstacle to the widespread adoption of this rice variety (Anindita *et al.*, 2019).

The development and acceptance of red pigmented rice-based products are influenced by various factors that must be taken into consideration. In the first place, it is important to note that the nutritional and medicinal value of red rice is truly remarkable, as it possesses an array of health-promoting properties such as being an antioxidant, anti-inflammatory, anti-diabetic, and anti-cancer agent (Kothapalli *et al.*, 2023; Suric, 2023). Moreover, the presence of bioactive compounds, including phenols, flavonoids, and antioxidants, in pigmented rice further enhances its health benefits and functional properties, thereby making it highly desirable for the formulation of various products (Wuryandani *et al.*, 2022). Additionally, it is worth mentioning that effective branding strategies that emphasize the unique ingredients and health advantages of pigmented rice have shown to be capable of significantly increasing consumer awareness and loyalty (Rajarajeswari *et al.*, 2022). Finally, it is crucial to recognize the pivotal role that the processing of red rice plays in preserving its bioactive molecules. In this regard, it has been indicated that unprocessed or minimally processed red rice may possess even more superior health benefits when compared to their processed counterparts (Jatmika *et al.*, 2022).

The primary goal of this extensive research review is to thoroughly analyze and merge the complex relationship between how consumers perceive red pigmented rice-based products and the trends in the market. By conducting a detailed examination of existing studies, surveys, market analyses, and case studies, this review aims to clarify the various factors that influence consumers' opinions of red pigmented rice. These factors include sensory experiences, cultural preferences, health considerations, and emerging dietary trends. Moreover, this review aims to break down the current market trends and explain the ever-changing landscape that shapes consumer decisions and demand for products that contain red pigmented rice. By combining these insights, the review strives to provide a comprehensive understanding that can offer valuable implications for the strategic development, positioning, and wider acceptance of red pigmented rice in the global food market.

2.1 Consumer's Perception of Red Pigmented Rice in Terms of Taste, Colour and Texture

Studies have revealed that consumers rated the color, appearance, texture, taste, and overall quality of polished red pigmented rice as strongly preferred. Another study revealed that consumers considered red pigmented rice to be a superior product with a high price and high value, but they also mentioned that the quality of the rice remains inconsistent and it is difficult to serve and combine with other dishes (Wuryandani *et al.*, 2022). Additionally, a study on colored rice found that consumers' emotional responses to colored rice were influenced by the colors presented and the information provided about the health functionality of the rice. Overall, consumers' perceptions of red pigmented rice in terms of color are influenced by factors such as appearance, quality, and the information provided about the rice. The way consumers perceive red pigmented rice, including its taste, colour, and texture, is extremely important in understanding how it is accepted and used in cooking. The taste experience is a key factor that affects consumer preferences (Jatmika *et al.*, 2022). The sensory analysis shows that both raw and

cooked pigmented rice have a high acceptability rate of 70-80% (Wuryandani *et al.*, 2021). Studies have explored the different tastes that consumers pick up when eating red pigmented rice, with some noticing a subtle nutty or earthy flavour. Taste preferences can vary across different cultures, as certain cuisines focus on specific flavor profiles, which affect how people perceive the taste of the rice. Additionally, the way the rice is cooked, whether it is steamed or boiled, plays a crucial role in shaping its flavor and ultimately influencing consumer acceptance (Jatmika *et al.*, 2022).

The vibrant display of color seen in red pigmented rice immediately grabs attention and greatly impacts how consumers perceive it. Studies indicate that color plays a crucial role in food selection, often linked to qualities like freshness, excellence, or even health benefits (Jatmika *et al.*, 2022). The rich shade of red in red pigmented rice can elicit positive connections and enhance its visual appeal. However, cultural nuances and personal preferences also play a role in how people perceive the color of food. Some individuals may view the intense red hue as exotic or enticing, while others may associate it with specific culinary traditions, which can influence whether they accept or reject it (Sudha, *et al.*, 2013).

The texture of red pigmented rice, often overlooked but crucial, significantly contributes to the overall sensory experience. Consumer perception of texture varies widely, with some preferring a softer, more yielding texture while others prefer a firmer, chewier grain (Blandino *et al.*, 2022). Studies on texture perception emphasize its impact on consumer acceptance. The interaction between cooking methods and the resulting texture of the rice plays a pivotal role in shaping consumer preferences (Jatmika *et al.*, 2022). For example, the same rice variety may be perceived differently depending on whether it is cooked to a fluffier or stickier consistency.

Understanding taste, colour, and texture is crucial for interpreting consumer behavior and directing product development (Susmitha *et al.*, 2022). Difficulties arise in matching these perceptions to consumer expectations, as preferences can be varied and impacted by different cultural, social, and individual factors. Nevertheless, these challenges offer chances for innovation and diversification of products (Wang, 2022). By utilizing knowledge about taste, color, and texture preferences, manufacturers can customize products to meet consumer desires, thereby improving their acceptance and marketability.

In summary, the intricate interaction between taste, color, and texture sensations has a substantial impact on the extent to which consumers embrace red pigmented rice. Knowledge gained from comprehending these sensory elements not only illuminates consumer tendencies but also provides invaluable direction for developing products, devising marketing strategies, and effectively incorporating red pigmented rice into various culinary environments (Wuryandani *et al.*, 2021).

2.2 Market Trend of Red Pigmented Rice

The evolving dynamics of the food industry can be better understood by examining the market trends surrounding red pigmented rice and its related products (Kothapalli *et al.*, 2023). By analyzing the current market trends, one can gain a comprehensive understanding of how red pigmented rice fits into the broader market landscape and its potential (Ramos *et al.*, 2022). In recent years, there has been a notable shift in the food industry towards catering to health-conscious consumers and meeting the growing demand for natural and functional foods (Suric, 2023; Wuryandani *et al.*, 2022).

Red rice with a reddish hue, which is famous for its high nutritional value and ability to fight against harmful substances in the body, fits perfectly with these rapidly growing market trends (Paiva *et al.*, 2014). As people place a higher emphasis on their health and well-being when making food choices, there has been a significant increase in the demand for natural, minimally processed foods that provide inherent health benefits (Mbanjo *et al.*, 2020). Red rice, which gets its natural colour from anthocyanins and contains a variety of essential nutrients, stands out as an attractive choice within this movement towards wholesome, nutrient-packed foods (Heneghan *et al.*, 2012).

The increasing need for functional foods, which provide extra health advantages beyond essential nourishment, enhances the market potential for red pigmented rice (Sapna *et al.*, 2023). Research that showcases the potential health benefits linked to this type of rice, such as its ability to fight against harmful substances in the body and reduce inflammation, resonates with the growing interest among consumers in functional foods (Estuti *et al.*, 2018). This alignment positions red pigmented rice as a promising option for inclusion in products that cater to health-conscious individuals who seek functional benefits from their dietary choices (Arai, 1996).

Furthermore, the escalating consciousness among consumers regarding the correlation between one's diet and overall well-being acts as a propelling factor behind the inclination towards natural and functional foods (Alauddina *et al.*, 2017). The inclusion of red pigmented rice, owing to its inherent nutritional benefits and potential to contribute to a well-balanced and wholesome diet, aligns perfectly with this burgeoning awareness. Moreover, its versatility in a multitude of culinary applications, spanning from traditional dishes to innovative recipes, further bolsters its integration into the prevailing market trends that favor natural and functional foods (Annur *et al.*, 2020).

As the incessant progression of market tendencies persists, comprehending the resonance of red pigmented rice amidst the backdrop of these tendencies imparts invaluable insights for food manufacturers, retailers, and marketers (Sapna *et al.*, 2023). By capitalizing on the burgeoning demand for natural, functional, and health-oriented comestibles, strategic positioning and innovative product advancement that accentuate the nutritional and functional merits of red pigmented rice possess the potential to propel its market presence and acceptance among discerning consumers who seek both gustatory satisfaction and holistic well-being in their dietary selections (Wuryandani *et al.*, 2018).

2.3 Factors Affecting Consumer's Choice of Red Pigmented Rice Consumption

Understanding the myriad factors that shape consumers' decision-making processes with regard to red pigmented rice is of paramount importance in formulating effective marketing strategies and determining optimal product positioning within the food industry (Sirimuangmoon, 2013). Numerous crucial elements exert a significant impact on consumer choices when it comes to embracing this particular rice variant. Cultural preferences emerge as a prominent driver of consumers' decisions in relation to food. Red pigmented rice may hold great cultural significance in specific regions or cuisines, thereby influencing the acceptance or rejection of this grain among distinct demographic groups (Suhda *et al.*, 2013). By delving into the manner in which diverse cultures perceive and integrate rice into their culinary traditions, valuable insights can be gleaned regarding the potential acceptance of products based on red pigmented rice within various cultural contexts (Wuryandani *et al.*, 2018).

Health consciousness develops as a major factor influencing consumer decisions. As consumers become more conscious of the link between diet and health, they seek out nutrient-dense, functional foods (Jati *et al.*, 2022). Red pigmented rice, known for its antioxidant characteristics and potential health advantages, is appealing to health-conscious consumers looking to supplement their diet with naturally beneficial ingredients (Melini, and Acquistucci, 2017). Analysing how health issues influence customer behaviour allows for more targeted message and positioning efforts (Blandino *et al.*, 2022).

Dietary trends, which are frequently impacted by global health movements and lifestyle changes, also play an important role in driving consumer behavior (Sudha *et al.*, 2013). As dietary habits change, there is a trend towards embracing whole grains and different food options. Red tinted rice, with its nutritional benefits and culinary diversity, fits into these trends, appealing to consumers looking for alternatives to traditional rice kinds (Nuringtyas and Ismoyowati, 2018).

In addition to these fundamental characteristics, marketing methods have a substantial impact on customer decision-making. Effective marketing may form perceptions, generate demand, and influence purchasing decisions (Jamtika *et al.*, 2022). Strategies emphasising the distinctive characteristics, health benefits, and culinary potential of red pigmented rice can positively influence consumer views. For example, talking about rice's history, nutritional benefits, and position in traditional cuisines can elicit emotional responses and increase consumer interest (Ramos *et al.*, 2022).

Furthermore, packaging, labelling, and advertising initiatives emphasising the inherent benefits of red pigmented rice can have a substantial impact on customer decisions (Wuryandani *et al.*, 2021). Using marketing methods that emphasise authenticity, naturalness, and health benefits is consistent with the preferences of health-conscious consumers who value transparency and quality in their food choices.

Cultural preferences, health consciousness, dietary trends, and effective marketing methods all contribute to the complicated tapestry that affects consumer choices for red pigmented rice. An in-depth analysis of these aspects enables the development of focused marketing strategies that appeal to customer tastes, increasing market acceptance and appreciation for red pigmented rice-based products.

The pricing of pigmented rice has a huge impact on the global market. The increased price of pigmented rice relative to white rice creates an opportunity to boost farmer welfare (Wuryandani *et al.*, 2021). However, the quality of pigmented rice remains variable, making it difficult to serve and pair with other foods (Lee and Valera, 2016). Despite this, 83% of buyers believe pigmented rice is a

quality product with high value. Price volatility in the global rice market is impacted by importer and exporter trade policies, which might provide short-term export opportunities for countries such as the United States (Jamora, 2014). Changes in global rice prices have an impact not only on domestic rice market price levels, but also on conditional variances. The interconnectivity of rice markets causes a large spillover of price shocks throughout the region. Trade costs in the international rice trade have risen in recent years, resulting in slower price transmission and some decoupling of domestic and foreign markets (Jamora, 2014).

2.4 Case Studies and Success Stories

Exploring case studies and success stories of goods or brands that have successfully included red pigmented rice provides vital insights into the aspects that contribute to their success in the competitive food market.

Case studies show how red pigmented rice-based products have acquired traction and achieved significant success. These success stories could range from ready-to-cook meals to healthier snacks, demonstrating the versatility of red pigmented rice in a variety of food applications (Bladino *et al.*, 2022). The analysis of these cases reveals the primary contributing aspects that fueled their success.

Pigmented rice has gained popularity due to its high concentration of bioactive chemicals and health advantages. It contains vitamins, minerals, fibre, and phytochemicals that have positive effects (Wuryandani *et al.*, 2022). Consumer demands for healthier lifestyles are driving up demand for coloured rice (SuRic, 2023). Consumers consider coloured rice to be a superior product with high value, although its quality is uneven (Wuryandani *et al.*, 2022). Pigmented rice offers functional qualities that are necessary for product formulation (Wijayanti *et al.*, 2021). It has been linked to numerous health advantages, including the prevention of hypertension, gluten-related problems, and heart disease, as well as anti-diabetic, antioxidant, anti-inflammatory, and anti-cancer qualities (Pradipta *et al.*, 2021). To attract customers, organic pigmented rice should be promoted with an emphasis on its environmental and health benefits. The physicochemical, functional, and antioxidant features of pigmented red rice varieties make them appropriate for the creation of a variety of health-promoting products.

3.1 Key Players and Stakeholders in the Production of Red Pigmented Rice

Red pigmented rice is grown in many places of the world, including South East Asia, Africa, and the Philippines (Sati and Singh, 2019). Red pigmented rice consumption in India is limited to the country's northeast (Goigoi *et al.*, 2020). Indonesia is also a rich source of pigmented rice, with varieties such as Woyalaka black rice, Manggarai, Toraja, Cempo Ireng, and red rice of Aek Sibundong and Baubau being grown (Shinta *et al.*, 2014). The genetic diversity of pigmented rice accessions in the Philippines was examined, and it was discovered that the most genetically diverse accessions were from the Cordillera Administrative Region, Davao, and Caraga. The study also found a tight link between pigmented rice accessions from Taiwan and the Philippines, lending support to the notion of Austronesian southern spread from Taiwan to the Philippines (Mbanjo *et al.*, 2019).

The red pigmented rice market is now undergoing significant market trends and dynamics. Pigmented rice, including red rice, is becoming increasingly popular due to its low glycemic index and great nutritional value (Anindita *et al.*, 2019). However, farmers have obstacles in marketing their produce (Sati and Singh, 2018). To overcome this, growers could target health-conscious consumers and explore rebranding their products (Wuryandani *et al.*, 2018). The usage of red pigmented rice in the food business is also growing, but little is known about how post-harvest treatment affects its qualities (Ramos *et al.*, 2022). To preserve red rice's technical qualities and phenolic compounds, drying temperatures below 60°C are advised. In general, the red pigmented rice market is being driven by rising consumer desire for better food options, as well as awareness of pigmented rice's nutritional benefits.

Red rice production is now popular to specific regions of the world, including South East Asia and parts of Africa (Sati and Singh, 2018). Several procedures and technologies are being explored to purify and extract the natural edible pigment from red rice, including solvent extraction, ultrasonic countercurrent leaching, and filtration (Deng *et al.* 2013). Red rice pigments are prepared by extracting a phosphoric acid solution, processing filter liquor with specific chitosan for flocculation and clarity, and acylation

with tartaric and ferulic acids. Red-pigmented rice offers several bioactive chemicals, such as gallic acid, protocatechuic acid, and cyanidin-3-O-glucoside, which have potential health advantages, including anti-tumor, anti-inflammatory, and anti-diabetic actions (Samyori *et al.*, 2017). The value chain study of pigmented rice reveals that numerous actors are involved, including farmers, farmer organisations, distributors, and retailers, with varying profit margins and farmer shares in the value chains (Anindita *et al.* 2019).

3.2 Prospects for Red Pigmented Rice

The future picture for red pigmented rice is one of sustained expansion, driven by factors such as improved consumer awareness, new product development, and expanded market access. The inclusion of red pigmented rice in mainstream food products, combined with effective marketing methods emphasising its nutritional benefits, is expected to increase consumer acceptance and promote market expansion.

The future of red pigmented rice seems optimistic, with a growing global market driven by shifting consumer preferences and industrial advancements. The trend towards healthier and more sustainable food options, along with intentional initiatives by industry actors, places red pigmented rice as a crucial player in the emerging landscape of functional foods. As customers prioritise well-being and sustainability, the market for red pigmented rice is expected to rise steadily in the coming years.

4.1 Conclusions

In conclusion, an examination of consumer perceptions and industry trends for red coloured rice reveals a landscape rich in prospects and developing dynamics. The study of consumer attitudes revealed an increasing awareness of red pigmented rice, with discriminating consumers recognising its distinct nutritional benefits. Preferences for healthier and more sustainable food options, combined with the growing popularity of plant-based diets, make red pigmented rice an appealing option for a varied and expanding consumer base.

Despite the good trends, obstacles such as low knowledge in some areas and misconceptions regarding preparation and flavour remain. Overcoming these limitations would necessitate targeted educational activities and clever marketing campaigns that highlight the flexibility and flavour of red pigmented rice.

On the market front, the worldwide analysis highlights the potential for significant growth, with diverse consumption patterns across geographies. The sector is seeing more coordination among key actors, resulting in a more integrated supply chain with constant quality and availability. The emphasis on research and development demonstrates a dedication to innovation and the development of new, appealing red tinted rice products.

Thinking ahead, the future appears promising. Projected trends point to a continuous upward trajectory, fuelled by factors such as increased customer awareness, new product development, and a larger market footprint. The incorporation of red pigmented rice into popular food products is expected to appeal to customers, resulting in increased acceptance and adoption.

In essence, red pigmented rice combines nutrition, cultural importance, and environmental sustainability. As the globe moves towards more conscientious food choices, red tinted rice emerges not just as a culinary treat but also as a symbol of a forward-thinking, health-conscious, and environmentally responsible food sector. The journey ahead entails tackling obstacles, capitalising on opportunities, and working together to positively evolve consumer preferences and market trends in the field of red pigmented rice.

Recommendations

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Based on the insights acquired from the review of consumer perceptions and industry trends related to red pigmented rice, the following recommendations are made:

- i. Launch focused educational initiatives to promote the nutritional benefits, culinary variety, and simplicity of using red pigmented rice in diverse meals. Collaborations with dietitians, chefs, and influencers could be used to highlight the product's unique features and debunk any misconceptions.
- ii. Implement strategic marketing campaigns to promote the health advantages and sustainability of red pigmented rice. Highlight its role in promoting a plant-based diet and its ability to help with environmental conservation, appealing to consumers who value both personal well-being and environmentally conscientious decisions.
- iii. Encourage continued innovation in the red pigmented rice sector. This could entail working with food makers to develop novel and convenient red pigmented rice-based goods that fit into current lives, such as ready-to-eat meals, snacks, or value-added items. Packaging and presentation innovations can also help to increase market appeal.
- iv. Encourage coordination among major industry actors, agricultural producers, and retail partners to strengthen the supply chain. Collaboration can streamline production, distribution, and marketing procedures, resulting in a constant and high-quality supply of red pigmented rice to satisfy rising demand.
- v. Market Expansion Strategies: Prioritize regions with untapped potential for red rice consumption. Tailor marketing efforts to regional preferences and cultural circumstances, resulting in greater global adoption of red pigmented rice.
- vi. Invest in continuing research and development to discover nutritional advantages, create new red rice varieties, and improve farming techniques. This will help to sustain the competitiveness of red pigmented rice in an ever-changing food business.

Collaborate on industry advocacy initiatives to standardise quality measures, certifications, and labelling for red pigmented rice products. This can increase consumer trust and improve the overall credibility of the red pigmented rice business.

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