

Research on Process Optimization and Marketing Strategy Design of Lentinus Edodes Dietary Fibre Biscuits Based on Consumer Behavior Big Data

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ABSTRACT

With the popularisation of the healthy diet concept, the market demand for functional cookies continues to grow, among which dietary fibre products have attracted much attention because they meet the health needs of modern consumers. As a new type of raw material, Lentinus edodes (shiitake mushrooms) dietary fibre faces the dual challenges of processing adaptability and consumer acceptance while enhancing the nutritional value of the product. The traditional product development model struggles to accurately capture fast-changing market preferences, whereas big data on consumer behaviour provides a new path for insight into demand. Therefore, this paper conducts a systematic study on the process optimization and marketing strategy of mushroom dietary fibre cookies, driven by big data on consumer behaviour, to provide an integrated solution for data-driven product development and precise marketing in the health food industry.

KEYWORDS

Lentinus edodes (shiitake mushrooms); Dietary fibre; Big data on consumer behaviour; Process optimization; Marketing strategy

1 Introduction

The upgrading and transformation of the healthy snack market has pushed the innovation of functional cookies into a new stage, and Lentinus edodes dietary fibre has become the focus of industry attention due to its intestinal regulation and satiety-enhancing properties. However, there are obvious technical bottlenecks in the application of this ingredient in cookies: the fibre component affects the dough's ductility, resulting in moulding difficulties; high-temperature baking is prone to the loss of active substances; and the special flavour may reduce consumer acceptance. Big data analysis of current consumer behaviour reveals key market trends: young consumers refuse to sacrifice taste experience while pursuing health. At the same time, middle-aged and elderly users are more concerned about the efficacy of ingredients and ease of consumption. Online consumer review data suggest that existing high-fibre cookies generally suffer from a rough texture and a lack of flavour harmonization. These findings highlight the limitations of the traditional R&D model and underscore the urgent need to establish a product optimization mechanism based on genuine consumer feedback. This paper aims to provide a replicable innovation paradigm for the health food industry.

2 Consumer preference analysis based on consumer behaviour big data

2.1 Overview of consumer behaviour big data

Consumer Behaviour Big Data is a crucial resource for modern business decision-making, as it comprehensively records various behavioural information about individuals during shopping and product use. There are various sources of data, such as transaction records of online shopping platforms showing the types and frequency of products purchased by consumers, browsing traces in mobile applications reflecting the order of attention to different products, discussions on social media recording real evaluation views, supermarket shopping records reflecting the actual trajectory of purchasing actions, questionnaires providing targeted feedback, and product trial reports containing details of the use of the descriptions—these different forms of information collection complete depiction of consumer preference patterns and decision-making routes. Enterprises use specialized computer systems to process massive data streams and identify key features and regular changes. The core advantage of behavioural data is that it reflects real intentions and habits. When used in conjunction with actual habits, it effectively avoids the problem of one-sided questionnaire response bias. Contemporary retail brands utilize this technological capability to identify target consumer groups and understand their deeper needs, thereby building a stronger foundation of market knowledge. Data collection technologies continue to advance, with smart device sensors capturing offline shopping paths and video analytics systems recording the time spent in front of shelves. These emerging data sources work in tandem with traditional digital footprints to build a comprehensive picture of the consumer. Data processing methods have also evolved from simple statistics to deep learning, uncovering hidden patterns in consumer motivation through advanced pattern recognition. This type of big data system is becoming a core tool for enterprises to understand the market's pulse and accurately match product development with actual demand.

2.2 Consumer demand analysis of lentinus edodes dietary fibre biscuits

The big data analysis reveals the meticulous demand structure of consumers for Lentinus Edodes Dietary Fibre Biscuits. The primary factor of concern is health value, as evidenced by data showing that consumers generally search for information on the importance of dietary fibre in regulating gastrointestinal function, and are particularly keen to discuss healthy snack products with natural ingredients^[1]. Taste acceptance has become a key constraint to development. Online reviews indicate that existing products are often criticized for having fibre that is too granular and lacking a crunchy texture. Some users complain that the special smell of Lentinus edodes interferes with the eating experience. Convenience is also indispensable, as office workers tend to choose styles that are individually packaged in pouches and can be eaten with a handheld device. The labelling of product information, including clear storage conditions and shelf life, has gained greater attention from older consumers. Price-sensitive features show group differences, with students favouring discounted packages and young and middle-aged people willing to pay a reasonable premium for quality products. Packaging design style triggers interest differentiation; a simple environmental protection concept attracts urban white-collar workers, while a cartoon-like, fun shape is more popular with housewives. Special function appeals gradually emerge, and low-sugar formulas are welcomed by people who want to prevent blood sugar problems. Additionally, children's versions often require fortification with vitamins and nutrients.

2.3 Forecast of consumption trends based on big data

Dynamic analysis of consumer behaviour data enables enterprises to understand the direction of future demand accurately, and three major trends are gradually emerging. Personalized customized service will arrive, data analysis found that more and more consumers are actively searching for nutritional matching suggestions, expecting products to adjust the proportion of dietary fibre and the combination of trace elements according to individual physical characteristics, and certain special groups, such as athletes and vegetarians, prefer products designed for specific scenarios. This growth in demand indicates that flexible production lines will become a basic configuration requirement. Awareness of eco-environmental responsibility has been strengthened, and data from second-hand trading platforms show that the recirculation rate of goods with environmentally friendly packaging has increased. The amount of discussion in support of biodegradable packaging on social media has doubled. Users' demand for environmental protection has evolved from an optional consideration to a core decision-making element, which requires companies to outline their packaging technology and raw material recycling strategies at an early stage^[2]. The trend of cross-border integration is expanding, social platform data analysis shows that the group of people who are enthusiastic about healthy snacks also like dried fruit and protein bars, and the related consumption behavior strongly suggests that the combination sales model has great value, and the use of Shiitake Dietary Fibre Biscuits to develop diversified product forms such as breakfast combinations and portable light meal sets can win a larger market space.

3 Lentinus edodes dietary fibre cookie process optimization

3.1 Physical properties of lentinus edodes dietary fibre and the effect of addition

Lentinus edodes dietary fibre exhibits unique properties in cookie production, and its physical characteristics have a profound impact on product quality. This light brown powder is highly absorbent and will quickly absorb liquid when making dough^[3]. The fibre structure is porous and forms a skeleton support in baking. The addition of fibres to the formulation can enhance the dietary fibre content of cookies, thereby increasing satiety and slowing down the oxidation of fats and oils, which prolongs shelf life. However, fibrous particles can hinder gluten formation, resulting in reduced dough extensibility and increased processing difficulty. When baking at high temperatures, the fibre polysaccharide produces a special flavour reaction, and some consumers may not adapt to the smell. Fibre texture can easily cause roughness, which needs to be improved by the process. These characteristics necessitate adjustments to process parameters to strike a balance between nutrition and taste.

3.2 The optimal addition ratio and process control of lentinus edodes dietary fibre

Determining the reasonable addition ratio is the core of the process. The amount of added fibre should accurately take into account both the nutritional value and sensory quality. Too little cannot reflect the health benefits, and too much will lead to a too-hard texture. Systematic testing has shown that a specific ratio can meet the fibre supplementation requirements while maintaining the crispness of the cookies. Adjustments are necessary throughout the production process. The raw material pretreatment stage moderately pulverises the fibre to enhance particle uniformity, while the mixing process prioritises blending the fibre and liquid ingredients to improve wetting. Moisture control is especially

critical to increase the amount of water used for compensation, and the moulding process slows down the roll speed to prevent cracking. Baking employs a segmented temperature control strategy, utilizing low temperatures in the early stage to promote moisture diffusion and high temperatures in the later stage to achieve the ideal colour. Natural thickening agents were added to the recipe to enhance the adhesion of the dough, and flavour-modifying substances were used to neutralize the odour of the fibre. Together, these measures ensure the smooth mass production of high-fibre cookies.

3.3 Optimization of the cookie-making process

The entire improvement process was implemented to enhance the characteristics of *Lentinus edodes* fibre. Raw material preparation innovation employs a step-by-step processing method, where the fibre and vegetable oil are mixed and combined into a paste to enhance dispersion. The mixing process is divided into two stages of operation: first, low-speed mixing of dry materials to ensure uniform distribution of fibres, and then medium-speed control of the degree of gluten formation. Optimise equipment parameters to reduce dough extension, adjust mould pressure to minimize breakage, and use intermittent roller pressing to prevent stress accumulation. The baking process is optimised in three dimensions: the front part of the oven maintains humidity to prevent dryness and cracking, the middle part enhances hot air circulation to maintain the heat, and the back part precisely controls the temperature to prevent deformation. The cooling process adopts gradient cooling to maintain crispness. Nitrogen filling technology is used in the packaging process to replace oxygen and maintain a stable composition. These optimisations form a systematic solution that not only retains the nutritional fibre but also meets the standards of commercial cookies.

4 Marketing strategy design of *lentinus edodes* dietary fibre biscuits

4.1 Core competitiveness of *lentinus edodes* dietary fibre biscuits

The key to this cookie's unique advantage in the market competition lies in the successful fusion of health value and delicious experience. Through innovative technology, the rough taste of Shiitake Dietary Fibre has been significantly improved, and the cookies maintain a crispy texture while retaining the natural nutrients of the raw materials. The scientific ratio ensures that each serving meets one-third of an adult's daily dietary fibre requirement without causing gastrointestinal discomfort. Flavour blending technology skillfully combines the unique flavour of *Lentinus edodes* with the aroma of grains to create a fresh and natural taste experience. The product is designed to accurately match various consumption scenarios, featuring small, portable packs for office workers to replenish energy on the go, affordable packs for families to meet their home needs, and packs fortified with calcium, iron, zinc, and other essential elements for children's growth. The environmentally friendly biodegradable packaging material not only responds to the concept of sustainable development, but also effectively locks the freshness of the product. The low-temperature baking process maximises the preservation of the active ingredients of *Lentinus edodes*, giving the product a health value that cannot be replicated by ordinary cookies. These core qualities together build up the product differentiation advantage, so that consumers can enjoy the fun of snacking while gaining practical health benefits, and truly realise the consumer commitment of "no burden of deliciousness" [4].

4.2 Precision marketing and personalised advertising based on big data

The intelligent marketing system built on consumer behavior data has become the core engine of product marketing. The system builds a refined consumer profile by deeply analyzing users' shopping tracks and content preferences. For young people who pay attention to figure management, advertisements emphasizing low-calorie features are pushed on sports social platforms; for middle-aged and old-aged users who are concerned about their health, the scientific principle of regulating the intestinal tract of the product is demonstrated on medical information websites. The ads are dynamically personalized, with new mothers receiving content highlighting children's nutritional formulas and office workers seeing portable solutions for office scenarios. The timing of the placement was intelligently optimized, with breakfast solutions displayed on subway screens during peak commuting hours, and family sharing pack promotions pushed through cell phones before dinner. The most innovative feature is the user participation mechanism, which automatically triggers the issuance of exclusive coupons after consumers share their consumption experience on social platforms, forming a closed loop of "sharing - rewarding - spreading again". This data-driven precision reach greatly improves marketing efficiency and ensures that product information is effectively delivered to the most promising target groups.

4.3 Sales channel selection and optimization

Constructing a synergistic online and offline omni-channel sales network is a key strategy for product market

coverage. The main position of online layout of integrated e-commerce platforms and vertical health malls, flagship store set up "light meal replacement" and "family health" exclusive partition to facilitate accurate purchase. The social e-commerce channel focuses on cooperation with nutritionists and fitness experts in the live broadcasting room, so as to enhance the credibility of the product through professional endorsement. The offline channel adopts a layered penetration strategy, with high-end supermarkets setting up tasting experience zones to strengthen product awareness, and community pharmacies and health products forming joint display cabinets to realize scenario-based sales. The channel operation implements a dynamic optimization mechanism, with an intelligent replenishment system that predicts and deploys inventory based on real-time sales data, effectively avoiding out-of-stocks or backlogs. Innovative combination sales model is introduced, matching cookies and fruit and flower tea into afternoon tea sets to enhance the unit price. The member service system builds in-depth connection, scanning the QR code of the package to get personalized dietary advice, and the consumption points can be exchanged for new product trial qualification. This three-dimensional channel layout ensures that consumers can conveniently access the products in all kinds of life scenarios, forming a seamless consumption closed loop.

5 Conclusion

This study constructed an innovative development model of Lentinus edodes dietary fibre cookies through the systematic integration of consumer behavior big data analysis, process optimization and marketing strategy design. The core results show that the precise balance between consumers' health needs and taste experience is the key to product success, and the process innovation effectively solves the problem of roughness and flavor coordination caused by the addition of fibre; the big data-driven marketing system realizes the precise docking from the production end to the consumption end, and the personalized recommendation and omni-channel layout significantly improves the market response efficiency. Future industrial upgrading needs to continue to deepen the work in three areas: establishing a dynamic consumer demand tracking mechanism to maintain the vitality of product iteration, developing low-temperature processing technology to maximize the retention of functional ingredient activity, and building a blockchain-based raw material traceability system to enhance consumer trust.

About the Author

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