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CONSUMER RESPONSE TO NATA DE COCO BEVERAGES WITH NATURAL COLORING FROM BAWANG DAYAK (Eleutherine palmifolia (L.) MERR.)

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Abstract

The use of natural colorants derived from functional plants presents a promising strategy for developing health-oriented food products. This study evaluated consumer responses to nata de coco beverages incorporating natural colorants from Bawang Dayak (Eleutherine palmifolia (L.) Merr.) under the brand name Fresh Up Day. A descriptive survey was conducted involving 358 respondents across various demographic groups, predominantly university students (53.35%), aged 10 to 65+ years. The questionnaire assessed consumer awareness, purchasing behavior, color perception, packaging assessment, pricing sensitivity, and overall satisfaction. Results revealed that 97.77% of respondents were familiar with nata de coco products and 63.97% were aware of Bawang Dayak, with the majority recognizing its antioxidant properties (55.31%). Regarding the Fresh Up Day product, 61.73% of respondents found the natural color sufficiently attractive, and 75.70% agreed that color enhancement increased product appeal. Most respondents rated the packaging (52.33%), product information clarity (57.82%), and volume (62.29%) as adequate. A price point of IDR 5,000 was deemed affordable by 62.01% of respondents, with 43.30% indicating the optimal price range to be IDR 4,001–5,000. Overall, 62.29% of respondents expressed satisfaction after consuming the product. These findings underscore the commercial viability of incorporating Bawang Dayak natural colorants into nata de coco beverages and highlight consumer receptiveness to functional, naturally colored food products.

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Keywords: Consumer response, bawang dayak, beverage, natural colorant, antioxidant

INTRODUCTION

The nata de coco industry has grown substantially in recent decades, driven by increasing consumer interest in functional and refreshing food products. Nata de coco, a cellulose-based biomass produced through bacterial fermentation of coconut water, has long been consumed in Southeast Asia, particularly in Indonesia, as a component in beverages, desserts, and health supplements (Yanti et al., 2017). The product is recognized for its high dietary fiber content, low caloric value, and refreshing texture, making it an attractive option for health-conscious consumers.

Innovation in food coloring has become a central concern in the modern food industry, particularly as consumers increasingly demand cleaner labels, natural ingredients, and functional health benefits embedded in their food choices. The shift from synthetic to natural colorants is aligned with global trends toward minimally processed food products and growing awareness of the potential adverse effects of artificial additives (Putri, 2018). In this context, Bawang Dayak (Eleutherine palmifolia (L.) Merr.) emerges as a highly promising source of natural colorant with additional bioactive properties.

Bawang Dayak is an indigenous plant found predominantly in Borneo, Indonesia, and has been traditionally used by Dayak communities for medicinal purposes over generations. Scientific investigations have validated several of its therapeutic properties. Febrinda et al. (2013) demonstrated that ethanolic extracts of Bawang Dayak bulbs exhibited significantly higher total phenolic content (217.71 mg GAE/g) and flavonoid levels (65.35 mg QE/g) compared to water extracts, along with superior antioxidant and alpha-glucosidase inhibitory activities. In a subsequent in vivo study, Febrinda et al. (2014) confirmed that Bawang Dayak extracts effectively controlled hyperglycemia and reduced diabetes-related complications in alloxan-induced diabetic rats, underscoring its functional value as an antidiabetic agent.

Furthermore, functional beverage development based on Bawang Dayak has been explored by Febrinda et al. (2021), who formulated health drinks using Bawang Dayak bulb as the primary functional ingredient and evaluated both antioxidant activity and consumer preferences. Their findings indicated that Bawang Dayak-based beverages demonstrated good antioxidant properties and were generally accepted by consumers in terms of taste, color, and aroma, suggesting strong potential for commercial development.

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Despite these promising findings, limited research has explored the commercial and consumer-behavioral dimensions of incorporating Bawang Dayak natural colorants specifically in nata de coco beverage products. Consumer acceptance is a critical determinant of product success in the food market, encompassing perceptions of color, taste, packaging, pricing, and information clarity. The aim of this study was therefore to comprehensively assess consumer responses to the Fresh Up Day nata de coco beverage product formulated with Bawang Dayak natural colorant, providing empirical data to guide product development and marketing strategies.

THEORETICAL REVIEW

Nata De Coco: Production and Consumer Market

Nata de coco is biosynthesized through the fermentation of coconut water by Acetobacter xylinum, a bacterium that produces extracellular cellulose fibers forming a gel-like, translucent white layer. The product contains dietary fiber that contributes to digestive health, and its low sugar content makes it appealing in light of growing nutritional consciousness among consumers (Mandasari et al., 2018). In the Indonesian market, nata de coco is predominantly sold in the form of beverages and is widely distributed through minimarkets and supermarket chains.

Consumer motivations for purchasing nata de coco beverages are multifaceted, ranging from refreshment and taste satisfaction to health considerations. Packaging, brand visibility, pricing, and product information all play significant roles in shaping purchase decisions. Studies on food consumer behavior in Indonesia indicate that visual cues such as color and packaging design are among the primary factors influencing product selection at the point of purchase (Maurerha, 2015).

Bawang Dayak as Natural Colorant and Functional Ingredient

Bawang Dayak (Eleutherine palmifolia (L.) Merr.) is characterized by its distinctive reddish-pink bulb, which contains a rich array of bioactive compounds including naphthoquinones, flavonoids, phenolics, and alkaloids. These compounds confer multiple pharmacological activities including antioxidant, antidiabetic, anti-inflammatory, and antimicrobial effects (Febrinda et al., 2013). The reddish pigments derived from the bulb can serve as a natural food colorant, imparting an attractive hue to food products while simultaneously delivering health-promoting phytochemicals.

The use of Bawang Dayak extracts in food product development is gaining momentum. Research has demonstrated its applicability as a functional additive in

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various food matrices. Febrinda et al. (2021) evaluated functional drink formulations containing Bawang Dayak and found that consumers responded positively to the sensory attributes of the beverages, particularly to the characteristic color and aroma derived from the plant extract. In another application, Anggarkasih et al. (2023) incorporated Eleutherine palmifolia extract as a coating on tilapia nuggets, demonstrating improvements in color appearance and antioxidant value.

Consumer Behavior in Functional Beverage Markets

Consumer acceptance of functional food products is influenced by a complex interplay of factors including sensory attributes, health perception, price sensitivity, and brand trust. Color is particularly impactful: research in food psychology consistently shows that color is the first sensory attribute evaluated by consumers and significantly affects expectations of flavor, freshness, and nutritional quality (Putri, 2018). For beverages, natural colors derived from plant sources are increasingly perceived as markers of quality and authenticity.

Pricing strategies for functional beverages must balance production costs with consumer willingness to pay. In the Indonesian market, price sensitivity varies significantly by demographic group, with younger consumers and students exhibiting higher sensitivity to price points while placing value on novelty and health claims. Studies on consumer segments in functional food markets indicate that clear product information and transparent labeling positively influence purchase intentions, especially among educated consumers (Maurerha, 2015).

RESEARCH METHODS

Study Design and Sampling

This research employed a descriptive survey approach to assess consumer perceptions and responses toward the Fresh Up Day nata de coco beverage with Bawang Dayak natural colorant. A non-probability purposive sampling technique was utilized (Mukhlis et al., 2024; Mubarokah et al., 2024; Marliyah et al., 2025; Ogari et al., 2026), targeting individuals who had been exposed to or who consumed nata de coco products. The survey was distributed via online platforms to maximize geographic coverage and demographic diversity.

A total of 358 respondents completed the questionnaire during the study period. The respondent profile included a broad age range from 10 to 65 years and above, with university students constituting the majority (53.35%) of participants. Other represented

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groups included high school students, working professionals, and entrepreneurs, ensuring a diverse cross-section of potential nata de coco consumers.

Instrument and Variables

The data collection instrument was a structured questionnaire comprising multiple-choice and Likert-type scale questions organized into seven thematic sections: (1) respondent demographics; (2) general awareness and consumption patterns of nata de coco; (3) purchasing behavior and information sources; (4) awareness and knowledge of Bawang Dayak; (5) product-specific evaluation of Fresh Up Day regarding color, packaging, product information, and volume; (6) price acceptability; and (7) taste and overall satisfaction.

Color attractiveness, packaging quality, and product information clarity were each assessed on a three-point rating scale (insufficient, adequate, attractive/clear). Price acceptability was evaluated by asking respondents to rate the proposed price of IDR 5,000 and to indicate their preferred price range. Satisfaction was measured using a five-point scale, and responses were aggregated and analyzed as percentage distributions.

Data Analysis

Collected data were processed and analyzed using descriptive statistics, with frequencies and percentage distributions calculated for each questionnaire item. Results were organized into thematic tables and interpreted in the context of consumer behavior theory and existing literature on functional food acceptance.

RESULTS AND DISCUSSION

Respondent Profile and General Nata De Coco Awareness

Of the 358 total respondents, 53.35% were university students, followed by high school students, working professionals, and other occupation groups. The age distribution spanned from 10 to 65 years and above, indicating broad generational representation. The overwhelming majority of respondents (97.77%) indicated familiarity with nata de coco products, reflecting the product's well-established market presence in Indonesia. Among the product forms of nata de coco encountered by respondents, beverages were the most commonly purchased (39.66%), followed by dessert and jelly formats, confirming the dominance of the liquid product category in consumer markets.

The primary motivation for consuming nata de coco beverages was refreshment (53.63%), consistent with the product's well-known sensory characteristics. A majority of

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respondents (40.78%) consumed nata de coco beverages once per month, suggesting occasional rather than habitual consumption. The most influential information source for nata de coco was electronic media advertising, particularly television and radio (52.23%), while the most common purchase location was minimarkets (59.50%), indicating the importance of convenient retail distribution channels.

Table 1. Respondent Profile and Nata De Coco Consumption Patterns

Variable	Most Common Response	Percentage (%)
Occupation	University Student	53.35
Nata De Coco Awareness	Aware	97.77
Most Purchased Form	Beverage	39.66
Consumption Motivation	Refreshment	53.63
Consumption Frequency	Once per month	40.78
Information Source	Electronic media (TV/Radio)	52.23
Purchase Location	Minimarket	59.50

Color Perception and Importance of Natural Coloring

When asked about the color of nata de coco products commonly found in the market, 70.95% of respondents identified the characteristic white-translucent color as most prevalent. This finding aligns with the traditional appearance of nata de coco, which derives its white color from the cellulose matrix produced during fermentation. The introduction of Bawang Dayak-derived natural color thus represents a meaningful visual departure from the conventional product format.

The importance of color as a product attribute was affirmed by 59.78% of respondents, who rated color influence on nata de coco beverages as "very important." Moreover, 75.70% indicated that color enhancement can increase product attractiveness, strongly validating the strategic rationale of using Bawang Dayak natural colorant in the Fresh Up Day formulation. These findings align with established food marketing principles suggesting that visual cues are the primary point of consumer evaluation at the moment of purchase.

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Consumer Awareness and Knowledge of Bawang Dayak

A substantial proportion of respondents (63.97%) reported awareness of Bawang Dayak as a plant with medicinal or functional properties. Among those familiar with the plant, 55.31% identified its antioxidant function as the primary known benefit. This level of consumer awareness is significant from a marketing perspective, as it suggests that positioning Fresh Up Day as a product with natural antioxidant benefits may resonate well with a majority of the target market. The

antioxidant capacity of Bawang Dayak is well-documented scientifically: Febrinda et al. (2013) reported that the ethanolic extract of Bawang Dayak bulbs demonstrated potent DPPH free-radical scavenging activity with an IC50 of 112 ppm, while its flavonoid content of 65.35 mg QE/g substantially exceeded that of many commonly studied antioxidant botanicals.

The relatively high general awareness of Bawang Dayak among the sampled population is noteworthy, particularly given that the plant is predominantly associated with Kalimantan (Borneo) indigenous communities. This awareness likely reflects growing national interest in local functional plants and herbal medicines, as well as media exposure to traditional Indonesian botanical remedies. Febrinda et al. (2021) similarly noted that consumer familiarity with Bawang Dayak-based functional drinks positively influenced their willingness to try such products.

Product Evaluation: Fresh Up Day Nata De Coco Beverage

Consumer evaluations of the Fresh Up Day product across multiple attributes are summarized in Table 2. With regard to packaging, 52.33% of respondents rated the packaging as adequate (cukup), while a significant portion also found it attractive, suggesting that packaging refinement could further enhance market performance. Product information clarity was rated as adequate by 57.82% of respondents, indicating that while informational content is minimally satisfactory, there is room for improvement in communicating health benefits, ingredient origins, and usage guidance.

The product volume was considered adequate by 62.29% of respondents, aligning with typical beverage portion expectations in the Indonesian ready-to-drink market. With respect to color attractiveness—the central innovation of the Fresh Up Day product—61.73% of respondents rated the Bawang Dayak-infused color as adequately attractive (cukup menarik), while 50.00% gave a positive overall rating for the color's visual appeal. These responses indicate moderate consumer acceptance of the natural coloring, with

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potential for improvement through optimization of the colorant concentration or formulation to achieve a more vibrant and consistent hue.

Table 2. Consumer Evaluation of Fresh Up Day Nata De Coco Beverage Attributes

Product Attribute	Dominant Consumer Rating	Percentage (%)
Packaging Appearance	Adequate	52.33
Product Information Clarity	Adequate	57.82
Product Volume	Adequate	62.29
Color Attractiveness (visual)	Adequately Attractive	61.73
Overall Color Appeal Rating	Adequate	50.00
Taste Quality	Adequately Palatable	55.59
Overall Satisfaction	Satisfied	62.29

Pricing Analysis and Consumer Willingness to Pay

Price is a critical determinant of consumer purchase decisions, particularly in the competitive Indonesian ready-to-drink beverage market. The proposed retail price of IDR 5,000 for Fresh Up Day was rated as affordable by the majority of respondents (62.01%), a positive signal for the product's market entry strategy. When asked about their preferred price range, 43.30% indicated that IDR 4,001–5,000 represented the most acceptable pricing bracket, closely followed by other ranges. This convergence of perceived affordability and preferred range around the IDR 5,000 price point suggests that the current pricing strategy is appropriately calibrated to market expectations.

These findings are consistent with general consumer behavior patterns in the Indonesian beverage market, where convenience products priced between IDR 3,000–7,000 occupy the mass-market segment and attract the widest consumer base, including the student demographic that constitutes the majority of the present sample. The alignment between the proposed price and consumer willingness to pay augurs well for the commercial viability of Fresh Up Day.

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Taste Perception and Overall Satisfaction

Taste evaluation indicated that 55.59% of respondents rated the product as adequately palatable (cukup enak), a moderate positive outcome for a newly introduced product with a distinctive natural coloring and flavor profile. Taste satisfaction in novel functional food products is often constrained by consumer unfamiliarity with the sensory characteristics of functional ingredients, and incremental improvement of taste profiles through formulation adjustments may further enhance consumer acceptance (Febrinda et al., 2021).

Overall satisfaction with Fresh Up Day was reported by 62.29% of respondents, representing the primary metric of consumer acceptance. This level of satisfaction in a product trial context is encouraging and suggests a viable foundation for continued product refinement and market development. The correlation between color acceptance, taste satisfaction, and overall satisfaction underscores the importance of a holistic sensory experience in driving consumer approval of the product.

CONCLUSION

This study provides comprehensive empirical evidence of consumer responses to the Fresh Up Day nata de coco beverage incorporating natural colorant derived from Bawang Dayak (Eleutherine palmifolia (L.) Merr.). Key findings indicate that 63.97% of respondents were aware of Bawang Dayak and recognized its antioxidant benefits, providing a favorable consumer knowledge base for marketing this functional ingredient. The majority of respondents viewed color as an important product attribute, with 75.70% affirming that color enhancement increases product attractiveness.

Consumer evaluations of the Fresh Up Day product across packaging, information, volume, color, taste, and price dimensions were predominantly in the "adequate" range, indicating baseline market acceptance while identifying clear opportunities for product improvement. The proposed price of IDR 5,000 was deemed affordable by 62.01% of respondents, and overall satisfaction was reported by 62.29% of the sample. Collectively, these results indicate that the Fresh Up Day product holds commercial promise and can be further developed through sensory optimization, enhanced packaging design, and stronger communication of its functional health benefits derived from Bawang Dayak natural colorant.

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Recommendations

Future research should explore sensory evaluation under controlled conditions, shelf-life studies, and targeted consumer segmentation analyses to develop more refined market penetration strategies. Further investigation of optimal Bawang Dayak colorant concentrations to maximize both visual appeal and bioactive content in the beverage matrix is also recommended.

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