



Hedonic Evaluation of Red Ginger Extract Gummy Candy as an Innovative Approach to Prevent Stunting in Children Under Five

Heni Heryani¹, Davit Nugraha², Lusi Lestari¹, Siti Rahmah Kurnia Ramdan², Anna Yusuf²

¹Department of Midwifery, STIKes Muhammadiyah Ciamis, Ciamis, Indonesia

²Department of Pharmacy, STIKes Muhammadiyah Ciamis, Ciamis, Indonesia

Correspondence author: Heni Heryani

Email: heryaniheni05@gmail.com

Address: Jl. K.H Ahmad Dahlan No. 20 Ciamis, Jawa Barat, 46211, 082128937723

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ABSTRACT

Introduction: Stunting can have long-term impacts on children's health and development. Preventing stunting in children under five requires a comprehensive approach, including adequate and balanced nutritional intake. One of the natural ingredients commonly used in traditional medicine is red ginger (*Zingiber officinale* var. *rubrum*), which contains phytochemical compounds, vitamins, minerals, and fiber beneficial for maintaining vascular and digestive health. Gummy candy formulations have the advantage of high acceptability and appeal, particularly for children who find it difficult to consume medicine.

Objective: This study aims to determine the level of preference for gummy candy made with red ginger extract as a strategy to prevent stunting in children under five.

Method: The study employed an experimental design using a sensory hedonic test. The inclusion criteria included mothers with toddlers. A total of 20 participants were selected using an incidental sampling technique.

Result: The findings indicated that participants showed a high level of preference for red ginger extract gummy candy. On average, the gummy candy was rated as highly appealing in terms of appearance, taste, aroma, and texture.

Conclusion: Red ginger extract gummy candy has significant potential to be well-accepted by children under five. Further improvements are recommended, particularly in enhancing the gummy candy's appearance and incorporating more varied shapes to increase its appeal.

Keywords: hedonic test, gummy candy, red ginger, stunting

Introduction

Stunting remains a significant nutritional problem, characterized by a chronic malnutrition process that negatively impacts children's growth, development, and lifelong productivity. According to UNICEF data in 2020, 149.2 million children were stunted globally (Desi Fajar Susanti, 2022; De Onis & Branca, 2016; UNICEF, 2021; Heryani et al., 2023; Nshimyiryo et al., 2019). Addressing stunting in children under five requires a comprehensive approach, including adequate and balanced nutritional intake.

One natural ingredient with a long history of use in traditional medicine is red ginger (*Zingiber officinale* Roscoe). Red ginger contains various phytochemical compounds such as gingerol, shogaol, zingerone, and essential oils. It also provides vitamins and minerals, including vitamin C, vitamin K, calcium, and magnesium, along with fiber beneficial for vascular and digestive health. Red ginger is known for its anti-inflammatory, antioxidant, and immune-boosting properties, making it a safe and effective herbal remedy with minimal side effects (Keino et al., 2014; Beal et al., 2018; Mashhadi et al., 2013; Ratri et al., 2022).

Additionally, red ginger (*Zingiber officinale* var *Rubrum*) contains fragrant essential oils that stimulate digestive glands, which can enhance appetite and improve digestion. Its active compounds strengthen the stomach, optimize enzyme performance, and improve oxidative stability when included in diets (Rofia Nurfadillah et al., 2023; Ariyanti et al., 2023; Zoidis et al., 2014; Nurhayu et al., 2021).

Studies have demonstrated red ginger's potential to prevent stunting in children under five. One study reported that regular consumption of red ginger extract could enhance linear growth and reduce stunting risk. Another study from 2018 found that red ginger improved food intake and nutritional status among children, with effective doses ranging from 0.5 to 1.2 grams daily (Rahayu S., 2020; Sudarsono, 2018).

Gummy candy, a preparation involving hydrocolloid components such as gelatin, gum, or pectin, is a widely favored product with a clear appearance and chewy texture. Gummy candy made with fruit juice or water appeals to diverse groups due to its sweet taste, practicality, and high acceptance among children, making it an effective medium for pediatric compliance (Rashati et al., 2021; Zulaini et al., 2022; Nisa et al., 2022).

Formulating red ginger extract into gummy candy combines its health benefits with an enjoyable form that is easy to consume. However, masking the spicy taste of red ginger requires sweeteners. Key gummy candy ingredients include gelling agents, water, sugar, sweeteners, and flavors. The manufacturing process involves heating the gummy base with other ingredients at 80°C, ensuring the desired chewiness and easy-to-chew texture (Rashati et al., 2021; Mierza et al., 2023).

Objective

This study aims to determine the level of preference for gummy candy made with red ginger extract as a strategy to prevent stunting in children under five.

Method

This research method is experimental. This study uses the sensory hedonic test, which is a test of a person's level of liking for a product consumed. The population in this study was mothers of toddlers whose toddlers were given gummy candy extract of red ginger extract, with a total of 20 people. The selection of respondents was aimed at toddlers who used incidental techniques. Each respondent received a red ginger extract gummy candy by filling

out an informed consent sheet and an assessment sheet. The assessment of the sample in conducting the hedonic test by providing a questionnaire on the level of preference with the attributes of appearance, aroma, taste, and texture. The assessment scale used is as follows:

Table 1. Hedonic Test Scale on Red Ginger Extract Gummy Candy

| Scale | Favorability Level |
|-------|--------------------|
| 2 | Interesting |
| 1 | Quite Interesting |
| 0 | Not Interesting |

Result

The results of the sensory hedonic test on the gummy candy of red ginger extract follow:

Table 2. The Sensory Hedonic Test on Gummy Candy Red Ginger Extract

| Indicators | Not Interesting | Quite Interesting | Interesting |
|---|-----------------|-------------------|-------------|
| Appearance of Gummy Candy Red Ginger Extract | | | |
| Color | 45% | 50% | 5% |
| Shape | 0% | 60% | 40% |
| Size | 0% | 60% | 40% |
| Average | 15% | 57% | 28% |
| The aroma of Gummy Candy Red Ginger Extract | | | |
| Ginger Aroma | 0% | 30% | 70% |
| Other Aroma | 0% | 10% | 90% |
| Average | 0% | 20% | 80% |
| Taste of Gummy Candy Red Ginger Extract | | | |
| Ginger Flavor | 0% | 35% | 65% |
| Sweetness | 0% | 45% | 55% |
| Other Flavors | 0% | 25% | 75% |
| Average | 0% | 35% | 65% |
| Texture of Gummy Candy Red Ginger Extract | | | |
| Soft | 0% | 50% | 50% |
| Supple | 0% | 55% | 45% |
| Other | 0% | 70% | 30% |
| Average | 0% | 58% | 42% |

Table 2 above shows that the average respondent perceives the appearance of red ginger extract gummy candy is quite interesting. And a small part perceives that in terms of color, it is not attractive. The Aroma of Gummy Candy the average respondent stated that they liked the aroma of gummy candy with red ginger extract, which was 80%. Taste of Gummy Candy shows that the average respondent likes the taste of the red ginger extract gummy candy, which is 65% is interesting. And Texture of Gummy Candy Red Ginger Extract shows that is mostly stated to be quite attractive.

Table. 3. Whole of Gummy Candy Red Ginger Extract

| Indicators | Dislike | Like |
|--|---------|------|
| The child likes gummy candy | 0% | 100% |
| Will give the red ginger gummy candy to the child again. | 0% | 100% |

Based on Table 3, most respondents liked and would give the gummy candy to their toddlers.

Discussion

Data from sensory hedonic tests conducted on ginger gummy candy show that the visual aspect of the product's appearance still needs to be improved to make it more attractive. Sensory hedonic tests are carried out to assess the attractiveness of ginger candy gummies in terms of appearance or visuals. The results show that the color of gummy candy is still a fundamental concern. As many as 45% of respondents considered the color of gummy candy to be not interesting, while 50% considered it quite interesting, and only 5% considered it interesting. This shows that the color of the gummy candy needs to be improved to make it more interesting. The shape and size of gummy candy received a more positive response. None of the respondents rated the shape of the gummy candy as unattractive, 60% rated it quite interesting, and 40% rated it as interesting. The size of ginger gummy candy was 60% of respondents considered quite attractive and 40% considered it interesting. Data shows that the appearance of ginger candy gummies still needs to be improved, especially in terms of color to increase visual appeal.

Sensory hedonic tests for ginger candy gummy scents showed positive results. Respondents gave a good assessment of the aroma of ginger and other aromas contained in gummy candy. The results of the test data showed, that 0% of respondents considered the aroma of ginger to be not interesting, 30% considered it quite interesting, and 70% considered it interesting. These results show that the aroma of ginger is well received by respondents. The result of other scent data was that 0% of respondents considered other scents not interesting, 10% considered them quite interesting, and 90% considered them interesting. Other scents contained in gummy candy received a very positive response from respondents. Overall, the data from the aroma or smell aspect showed that the smell of ginger gummy candy, both ginger and other scents, was considered attractive by respondents. This shows that the gummy candy aroma formulation has succeeded in creating the desired scent.

The sensory hedonic test for the gummy candy flavor of red ginger extract showed positive results, with the majority of respondents liking the taste of red ginger and the sweetness contained in the gummy candy. The taste of red ginger with the result 35% considered it quite interesting, and 65% considered it interesting. These results show that the taste of ginger is well-received by respondents. Furthermore, sweetness with the 45% considered it quite interesting, and 55% considered it interesting. The sweetness in gummy candy also received a very good response from respondents. As well as other flavors 25% considered it quite interesting, and 75% considered it interesting. Other flavors contained in gummy candy received a very positive response from respondents. The data shows that the taste of red ginger, sweetness, and other flavors is considered interesting by respondents. This shows that the gummy candy flavor formulation is acceptable.

Sensory hedonic tests for the texture of ginger candy gummy showed excellent results, with the majority of respondents liking the soft, chewy texture and other texture aspects contained in red ginger extract gummy candy. Data for soft textures 50% rated it quite attractive, and 50% rated it attractive. These results show that the soft texture is well received by the respondents. From the elasticity, 55% of respondents considered it quite attractive, and 45% considered it interesting. The chewy texture of gummy candy also received a positive response from respondents. Other aspects of texture are considered quite attractive, and 30% consider them attractive. Other aspects of the texture contained in gummy candy received a very positive response from respondents. The results of the data for the overall texture aspect showed that the texture of the gummy candy of red ginger extract, both soft, chewy, and other texture aspects, was considered attractive by the respondents. This indicates that the gummy candy texture formulation is preferred.

The results of the sensory hedonic test of ginger gummy candy in toddlers as a whole showed very positive results. Data shows that 100% of toddlers like red ginger extract gummy candy and 100% of toddlers are willing to eat it again. This is a strong indication that red ginger gummy candy has great potential to be accepted and liked by target consumers, namely children under five. The results are very positive and become a strong basis for the development of this gummy candy product. The product, red ginger gummy candy has the potential to be an effective solution to prevent stunting in children under five. For the development of this ginger gummy candy product, it must be ensured that this product is safe, effective, and attractive for toddlers.

The research findings offer a solution to the public's aversion to fruits and vegetables, which remains a significant issue. This challenge can be addressed through innovative approaches, such as transforming fruits and vegetables into more appealing forms, like gummy candy (Khairunnisa et al., 2024; Eryani et al., 2023).

The market potential for nutrition and pharmaceutical products, commonly referred to as nutraceuticals, is substantial. The growth rate of the nutraceutical market is rapid, exceeding 20% annually. Nutraceuticals are derived from organic materials without the addition of harmful chemicals and are designed to meet daily nutritional requirements (Agustin et al., 2019; Sachdeva et al., 2020; Aronson, 2017; Maurya et al., 2021).

Conclusion

Sensory hedonic tests show that red ginger extract gummy candy has great potential to be accepted by children under five years. The visual aspect of the gummy candy color is less attractive, but the shape and size are very good. The aroma of ginger and other aromas contained in gummy candy is considered interesting, as well as the taste of ginger, sweetness, and other flavors. The soft, chewy texture and other aspects of texture are also loved by toddlers. Overall, toddlers love red ginger gummy candy and are willing to eat it again.

Conflict of interest

The researchers stated that there is no conflict of interest related to the implementation and publication of the results of this research. The entire research process, from planning, data collection, analysis, to report preparation, was carried out independently without any influence or pressure from any third party. A commitment to research ethics is upheld throughout the research process, ensuring transparency, accuracy and honesty in reporting results. Respondents' participation was voluntary with informed consent, and their

confidentiality and privacy were maintained in accordance with applicable research ethics standards. With this statement, researchers hope that the research results can be trusted and used as a valid reference for the development of science and health practices related to ethnomedicine and reproductive health.

Ethical consideration

This research has received ethical approval from the Health Research Ethic Commission of the STIKes Muhammadiyah Ciamis number 056/KEPK-STIKESMUCIS/X/2024.

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Authors' contribution

Each author makes an equal contribution to all parts of the research. All authors have reviewed and approved the final draft critically and are responsible for the index and similarity of the manuscript.

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