

INNOVATION MALANG BLACK APPLE

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Abstract

The study focuses on developing innovation in processing Malang Apples through advanced fermentation techniques to create "Black Malang Apple," a novel agricultural product. Utilizing a Research and Development (R&D) approach, the research explores systematic exploration and development of fermented fruit products. The primary motivation stems from the need to enhance the nutritional value of local fruits and create innovative value-added processing methods for agricultural commodities. The fermentation process transforms traditional Malang Apples through a specialized blackening technique, resulting in significant changes to the fruit's characteristics. Comparative analysis revealed that the fermented product demonstrates substantially improved nutritional profiles compared to fresh Malang Apples. The research examined critical aspects such as nutritional content, sensory properties, and potential health benefits. Experimental results highlighted remarkable transformations in the apple's physical and chemical properties. The fermentation method produced notable modifications in shape, taste, and texture, creating a unique food product with enhanced nutritional characteristics. This innovative approach represents a promising avenue for local fruit processing and agricultural product development.

Keywords: black garlic, fermentation, innovation, malang apple, research

Abstrak

Penelitian ini berfokus pada pengembangan inovasi dalam pengolahan Apel Malang melalui teknik fermentasi canggih untuk menciptakan "Apel Malang Hitam," sebuah produk pertanian baru. Dengan menggunakan pendekatan Penelitian dan Pengembangan (R&D), penelitian ini mengeksplorasi secara sistematis pengembangan produk buah fermentasi. Motivasi utama berasal dari kebutuhan untuk meningkatkan nilai gizi buah lokal dan menciptakan metode pengolahan inovatif dengan nilai tambah untuk komoditas pertanian. Proses fermentasi mengubah Apel Malang tradisional melalui teknik penghitaman khusus, menghasilkan perubahan signifikan pada karakteristik buah tersebut. Analisis komparatif mengungkapkan bahwa produk fermentasi menunjukkan profil nutrisi yang jauh lebih baik dibandingkan dengan Apel Malang segar. Penelitian ini meninjau aspek-aspek penting seperti kandungan nutrisi, sifat sensori, dan potensi manfaat kesehatan. Hasil eksperimen menunjukkan transformasi yang luar biasa pada sifat fisik dan kimia apel. Metode fermentasi menghasilkan perubahan signifikan dalam bentuk, rasa, dan tekstur, menciptakan produk makanan unik dengan karakteristik nutrisi yang ditingkatkan. Pendekatan inovatif ini mewakili peluang yang menjanjikan untuk pengolahan buah lokal dan pengembangan produk pertanian.

Kata kunci: bawang hitam, fermentasi, inovasi, apel malang, penelitian

1. BACKGROUND

Malang apples are one of the leading commodities from the Malang area, East Java. These apples are known for their sweet, slightly sour taste and crunchy texture, making them a favorite among local consumers and tourists. However, the use and processing of Malang apples are still limited to fresh products or simple processed products such as juice and chips. This condition causes the added value and market potential of Malang apples to not be optimally utilized.

Fermentation techniques, which have been widely used in food processing to increase nutritional and organoleptic value, offer innovative solutions for developing new products from Malang apples. Black garlic, for example, is the result of fermenting garlic at high temperatures and certain humidity for a certain period of time, which produces products with much higher antioxidant content than fresh garlic. Kim (2014) stated that the fermentation process of black garlic produces new bioactive compounds such as S-allylcysteine, which has strong antioxidant activity and significant health benefits.

Seeing the success of fermentation in producing black garlic, this study adopted a similar fermentation technique to process Malang apples. The goal is to create a new product, namely Black Malang Apple, which not only increases the nutritional content but also offers a unique taste and texture that can attract consumers. Zhang et al. (2015) noted that fermentation can increase the bioactive content in fruits, which is important for health and has high economic added value.

Innovation in processing Malang apples is expected to increase the added value of local products and open new market opportunities. Luecke (2003) emphasized the importance of innovation in the food industry to increase competitiveness and meet increasingly diverse consumer demand. Thus, this study aims to explore the potential use of fermentation techniques in processing Malang apples and develop new products that are highly nutritious and attractive to consumers.

2. LITERATURE REVIEW

Fermentation is one of the oldest food processing techniques that has been used for thousands of years. This technique involves microorganisms such as bacteria, yeast, and fungi to convert organic components in food ingredients into products with different physical, chemical, and biological properties. The fermentation process not only functions as a preservation method but is also able to increase the nutritional and sensory value of the product. Lee and Paik (2017) explained that fermentation can increase the availability of nutrients such as vitamins, minerals, and antioxidants in food, as well as reduce anti-nutrient components that can inhibit the absorption of important nutrients.

One of the popular fermented products is black garlic, which is produced through the fermentation of garlic at high temperatures and certain humidity for a long period of time. Kim et al. (2014) noted that black garlic contains S-allylcysteine, a compound that has strong antioxidant activity. This compound is produced through the conversion of active components of garlic during the fermentation process, which also reduces the sharp taste and pungent aroma of raw garlic. As a result, black garlic not only has higher health benefits compared to fresh garlic, but also has a unique sweet taste and chewy texture.

The fermentation technique used to produce black garlic has inspired the application of similar methods to fruits, including Malang Apples. Malang Apples are

known to have a hard texture and fresh taste, but their use in the processing industry is still limited to simple products such as juice and chips. Zhang et al. (2015) showed that fermentation can significantly increase the nutritional content of fruits, especially in terms of increasing antioxidant levels and producing new bioactive compounds that are beneficial to health.

In this context, the processing of Malang Apples through fermentation aims to produce a new product with higher added value, namely Black Malang Apple. This innovation is expected to offer a variety of apple products that not only have additional health benefits, but also offer new and attractive taste and texture profiles for consumers. Luecke (2003) emphasized that innovation in food processing is the key to increasing the competitiveness of local products in the global market. Thus, this study focuses on the development of Black Malang Apple products as a form of apple product diversification that can expand the market and increase the economic value of local apples.

3. METHOD

This study uses a Research and Development (R&D) approach to develop innovative products from Black Malang apples. This study employs a comprehensive Research and Development (RnD) approach to systematically investigate and develop innovative Black Malang apple products. The RnD methodology is designed to create, test, and refine novel food processing techniques through a structured and iterative research process. The RnD approach enables a structured, scientific method to transform traditional Malang apples into an innovative, value-added product through systematic research and continuous improvement techniques. This development process involves several key stages:

- **Potential Identification:** The study begins with the identification of existing potential, including the potential of Black Malang apple raw materials to be developed into innovative products.
- **Fermentation Process:** This stage involves the fermentation process of Black Malang apples before being used as the main ingredient in making food products. Fermentation is carried out to improve the taste and nutritional quality of apples.
- **Product Modification Planning:** At this stage, product modification planning is carried out by considering several important aspects such as the type of product to be made, the purpose and benefits of the product, target consumers, the reasons for the importance of making the product, the location of manufacture, and the method of product development.
- **Initial Product Development:** Researchers begin initial trials or rough trials. This stage includes making fermented Black Malang apples and taste tests before being used as the final product.
- **Laboratory Testing:** The product that has been developed is then tested in the laboratory to determine the nutritional content and ensure that the product quality meets the desired standards.

4. RESULTS & DISCUSSION

The Black Malang Apple innovation in this study aims to introduce the fermentation process in the culinary world, especially in Malang apples. The steps used include:

- Fermentation Process: Malang apples are fermented using a certain method to increase nutritional content and change the characteristics of the taste and texture of apples.

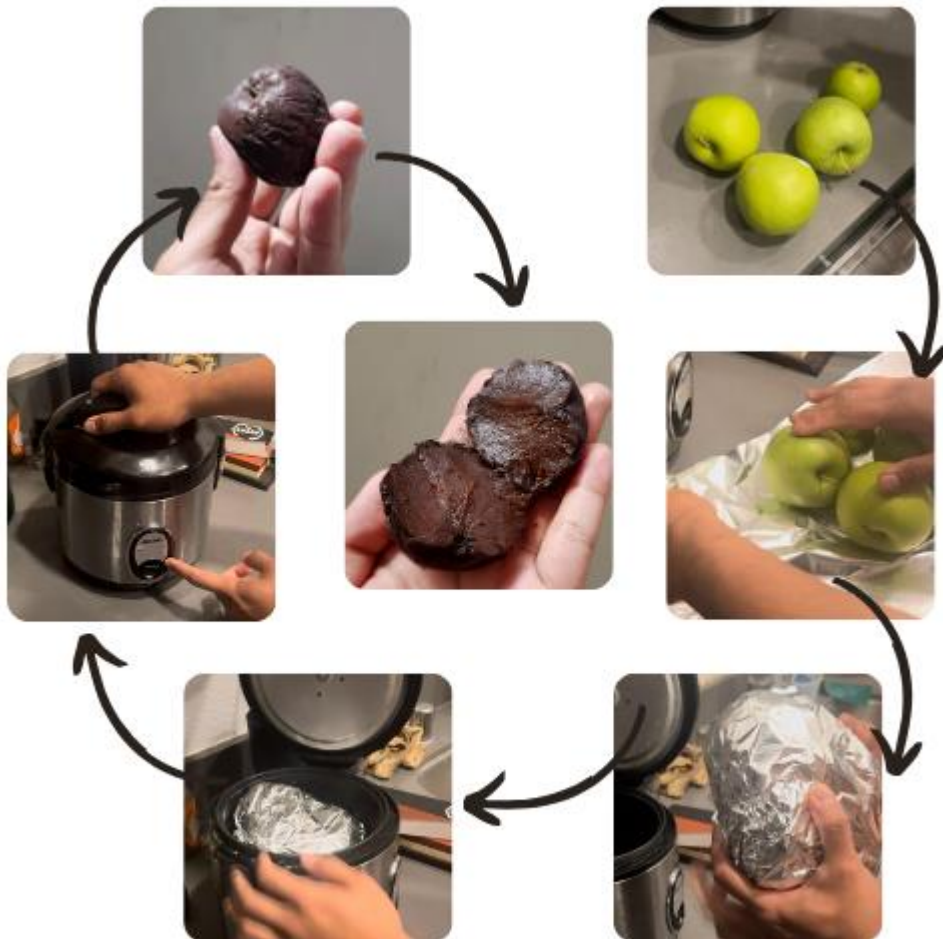


Image 1. fermentation process
Source: Author (2024)

- Laboratory tests were conducted to evaluate the nutritional content of Black Malang Apple. Some of the nutritional parameters measured include Calories, Protein, Carbohydrates, Fat, Iron, Total Sugar, Vitamins and Water Content, Flavonoids, Tannins

The test results showed that Black Malang Apple had a significant increase in nutritional contents compared to regular Malang apples. For example, the flavonoid and tannin content increased after the fermentation process.

No.	Parameter	Metode	Satuan	Hasil
No.	Parameter	Metode	Unit	Result
1.	Kalori	Kalkulasi	kkal	98,56
2.	Protein	Kjeldahl	%	5,65
3.	Lemak	Sovietasi	%	0,60
4.	Karbohidrat	Spektrofotometri	%	17,64
5.	Zat Besi (Fe)	Spektrometri	mg/kg	6,573
6.	Vitamin C	Titrimetri	mg/kg	68,911
7.	Kadar Air	Gravimetri	%	75,64
8.	Total Gula	Spektrofotometri	%	18,81
9.	Tanin	Spektrofotometri	mg/100g	77,77
10.	Flavonoid	Spektrofotometri	mg/100g	54,57
11.	Kadar Abu	Gravimetri	%	0,47

KEMENTERIAN PENDIDIKAN, KEBUDAYAAN,
RISET DAN TEKNOLOGI
UPT-LABORATORIUM ANALITIK
Gedung Laboratorium Terpadu Lantai 1
Jalan Kampus Bukit Jimbaran Bali

LAPORAN HASIL PENGUJIAN
Testing Report
No.: 173/JUN.14.24/UPTLA/2023

Pemilik : Gerry Morell
User :
Alamat : Jl. Persada No. 14, Kerobokan Kelod
Address :
Tanggal Penerimaan : 21 Agustus 2023
Date of receipt :
ID Sampel : Black Apple
Sample ID :
Jenis Sampel : Padatan
Kind of Sample :

DATA PENGUJIAN
Testing Data
- Tanggal : 21 Agustus – 22 September 2023
- Lokasi : Laboratorium Analitik Universitas Udayana
- Kondisi ruangan :
o Suhu : (20± 2) °C
o Kelembaban : (60±10) %

HASIL
Results

Bukit Jimbaran, 3 Oktober 2023
Kepala Laboratorium Analitik
Universitas Udayana
Gusti Ayu Kunti Sri Panca Dewi
NIP.:196409031991032002

Laporan hasil pengujian ini merupakan dokumen asli dan dituang untuk digunakan tempo perestijian tertulis dari
UPT Laboratorium Analitik Universitas Udayana
1 dari 1

Image 2 Black Malang Apple nutritional content results
Source: Test Results Report UPT Laboratorium Analitik (2023)

- Comparison with Black Garlic: The nutritional content of Black Malang Apple is compared with Black Garlic and Malang Apple, which is used as a control variable in this study. The following table presents a comparison of the nutritional content between Black Garlic and Black Malang Apple based on laboratory test results.

Table 1. Comparison of the nutritional value of Black Malang Apple with Black Garlic, and Malang Apple

No	Nutrient Content	Black Garlic	Black Apple	Apel Malang
1.	Calories	219 kkal	98,56 kkal	48 kkal
2.	Protein	14.2 gr	5,65 gr	0,27 gr
3.	Fat	0,3 gr	0,6 gr	0,13 gr
4.	Carbohydrate	39,8 gr	17,64 gr	12,76 gr
5.	Iron	2.1 mg	0,65 mg	0,07 gr
6.	Vitamin C	4,3 mg	6,8 mg	5 mg
7.	Total Sugar	24 gr	18 gr	10 gr
8.	Water Content	33 gr	75 gr	86, 67 gr
9.	Flavonoid	1,976 (µg)	77,77 mg	37,11 mg
10.	Tanin	55,31 mg	54,57 mg	45,7 mg

Source: Test Results Report UPT Laboratorium Analitik (2023)

From the table, the flavonoid and tannin content in Black Malang Apple is higher than that of Black Garlic and Malang apple. This shows that the fermentation process in Malang apples not only increases nutritional value but also adds better health benefits compared to Black Garlic.

5. CONCLUSION

This research successfully developed an innovative Black Malang Apple product through a structured fermentation process. The findings highlight several key aspects. First, the fermentation process significantly alters the nutritional content, texture, and taste of Malang apples, demonstrating its potential as a method to enhance the added value of local agricultural products. Laboratory tests revealed that the fermented Black

Malang Apple has higher antioxidant levels and other beneficial nutritional components compared to ordinary Malang apples. A comparison with Black Garlic shows that while both products have distinct nutritional advantages, Black Malang Apple offers an appealing alternative for consumers seeking diverse fermented products with health benefits. Additionally, this innovation presents substantial commercial potential, as it opens up opportunities for the development of marketable products at both local and international levels. The rising consumer interest in healthy and innovative food products further supports the promising prospects for Black Malang Apple. Thus, this study provides a significant contribution in the field of food technology and shows that innovation in local agricultural products such as Malang apples can increase added value and provide better health benefits. It is expected that this study can be a basis for further development and commercialization of Black Malang Apple products.

6. REFERENCES

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