

**“PURPLE CORN (*ZEA MAYS INDURATA*) ICE CREAM
AS AN IMMUNE BOOSTER IN THE PANDEMIC ERA”**

THESIS

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UNIVERSITY
MALANG
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THESIS

**A Thesis Submitted to
Faculty of Medicine and Health Science
Maulana Malik Ibrahim State Islamic University of Malang
In Partial Fulfillment of the Requirements for the Degree of
Bachelor of Medicine (S.Ked)**

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MOTTO

There is no success without effort and prayer

يَا أَيُّهَا الَّذِينَ ءَامَنُوا اصْبِرُوا وَصَابِرُوا وَرَابِطُوا وَاتَّقُوا اللَّهَ لَعَلَّكُمْ تُفْلِحُونَ

“O believers! Patiently endure, persevere, stand on guard, and be mindful of Allah, so you may be successful.” (Q.S. Ali Imran: 200)

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Hereby certifies that the thesis researcher wrote to fulfill the requirement for the Degree of Bachelor of Medicine (S.Ked) entitled "*Purple Corn (Zea Mays Indurata) Ice Cream As An Immune Booster In The Pandemic Era*" is truly her original work. It does not incorporate any materials previously written or published by another person, except those indicated in quotations and bibliography. Due to the fact, she is the only person responsible for the thesis if there is any objection or claim for others.

Batu, November 24th 2023

The Researcher,



Faza Saiqur Rahmah
NIM. 200701110041

DEDICATION

This thesis is dedicated specially to my beloved parents,

Dr. Ir. Herry Kristanto, MM and Ati Atin, S.Pd

also, to my lovely sister,

Ita Istiqomah

Who have given benevolent love, continuous prayers, and magnificent encouragement.

ACKNOWLEDGEMENT

Assalamu'alaikum Wr. Wb.

The greatest gratitude the researcher would like to grant to the one above all of us, the Almighty Allah SWT for answering the prayers, for giving the strength, guidance and blessing so that the researcher is able to finish this thesis. My expectation *shalawat* and *salam* always be presented to our *Prophet Muhammad SAW*, the last messenger of Allah who has save the human's life from destruction to safety namely Islam is the true religion.

This thesis is presented to the Faculty of Medicine and Health Science of Maulana Malik Ibrahim State Islamic University of Malang in partial fulfillment the the requirement for the Degree of Bachelor of Medicine or *Sarjana Kedokteran* (S.Ked).

This thesis would not have been completed or written without the guidance and the help of several individuals who have contributed their valuable assistance in the preparation and completion of this study. I convey my indisputable thanks to:

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Last but not least, I apologize if this thesis is far from perfect. I am ready to accept suggestions and critics that can build and make this thesis even better. Hopefully, this thesis will be useful in the field of research.

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ABSTRACT

The COVID-19 pandemic has had an impact on public health. Immune resistance was a crucial factor in the pandemic era considering all diseases that arise as self-limiting diseases. Food as a source of nutrients had a vital role as an immunomodulator. As an agricultural country with food production commodities that were still massive, agricultural products are needed to develop food innovations, such as purple corn. One of the nutritional contents of purple corn was the flavonoid group in the form of anthocyanin compounds as a source of antioxidants to increase the body's immunity and prevent diseases caused by viruses, fungi, and bacteria, as well as prevent atherosclerosis, gastric damage, cholesterol, obesity, and others. Anthocyanin compounds in purple corn 70 mg/100 grams. Anthocyanins in purple corn are processed into healthy food in ice cream with the product label "Purple Corn Ice Cream". This research aims to help people choose food innovations that can help them increase their immunity in the Covid-19 pandemic era. This ice cream product was formulated and has gone through several tests. The anthocyanin test results showed that the sample contained anthocyanins. The sensory test results stated that this product had a soft texture, milky smell, light purple colour, and sweet taste, so it was accepted and received a positive response from the community. Based on the total questionnaire assessment results, 88% of respondents accepted, it was expected to be a nutritious food innovation, popular with people regardless of age, practical, and durable with the content of flavonoid anthocyanin compounds in purple corn, which can improve the body's immune system during a pandemic.

Keywords: Pandemic, Immune, Anthocyanin, Purple Corn, *Zea mays indurata*, Ice Cream

CHAPTER I

INTRODUCTION

1.1 Background

Nowadays, The Corona Virus Disease nineteen (COVID-19) pandemic has overwhelmed healthcare systems around the world, especially in Indonesia. This situation appears to be a crisis for the country and requires the government to manage the pandemic as soon as possible before it worsens. Instead, the government of Indonesia and many countries worldwide have taken steps to solve the impact of COVID-19 by creating sequence policies such as local lockdown and imploring people to do healthy lifestyle, physical distancing, using a mask, take a vaccine, and so forth. Nevertheless, COVID-19 is an infectious disease caused by a virus called SARS-CoV-2, and just like other infectious diseases, COVID-19 is classified into a self- limiting disease that is typically not affected by any treatment and tends to persist. How long our body would take to recover from the COVID-19 is depending on how strong our immunity is and whether we have any serious health condition or not. That is why we need an immunomodulator intake as an immune booster to fight against the virus (Hidayah et al., 2014). Immunomodulator are substance that can modulate (alter or affect) the body's immune system in an average direction (Praworo, 2011).

One of the best ways to increase immunity and help to make it stronger is with some particular food. Certain nutrients in foods are vital in maintaining our health and boosting the immune system, such as flavonoids (Devagaran and

Diantini, 2012). Purple corn contains high amounts of anthocyanin flavonoids, which is 70mg/100gram (PT. Advanta Seeds Indonesia, 2019). As an agrarian country, purple corn is one of the commodities cultivated quite massively in Indonesia, especially in the last decade. However, the utilization of purple corn into innovative food products, efficacious, and high selling value's products is still relatively rare. The population of purple corn in Indonesia is not as much as yellow and white corn, but the nutritional content is much higher than other genotypes (Nursa'adah et al., 2017). Purple corn contains anthocyanin, an antioxidant to boost the immune system, prevent atherosclerosis, disease blockage of blood vessels, lose the stomach to damage, inhibit tumour cells, improve eye vision ability, and serve as anti-inflammatory compounds that protect the brain from violence (Nursa'adah et al., 2017). The research results from Pamandungan and Ogie (2017) also reinforce that purple corn with a high anthocyanin content acts as an antioxidant compound in improving immunity and prevents several diseases such as cancer, cholesterol, and coronary heart.

The nutritional content of purple corn needs to be innovated through food work to introduce purple corn as an alternative intake rich in efficacy, especially as an immunomodulator. This innovative food can be applied in products favoured by most society: children, adolescents, and adults, one of them is ice cream. Referring to the current research results, the consumption of ice cream continues to increase every year and make ice cream the most favourite food in all circles (Sianipar et al., 2016). Departing from above, we are interested in creating a food innovation in purple corn-based ice cream as a

processed food that can be consumed to increase immunity during the COVID-19 pandemic.

CHAPTER II

RESEARCH METHODS

2.1 Research Design

In conducting this research, qualitative research is applied because qualitative research can investigate the participant's opinion about a social phenomenon. According to Sauro (2015), Qualitative research can be classified into five types. Those are ethnography, narrative, phenomenological, grounded theory, and case study. In this study, case study qualitative research was applied. Qualitative research is used to investigate and understand a problem and phenomenon by collecting various kinds of information, which are then processed to obtain a solution so that the problems revealed can be resolve.

This research is conduct in each of the researcher's house and Chemistry Laboratory, Pharmacy, Faculty of Medicine and Health Science, Maulana Malik Ibrahim State Islamic University Malang, on 20 July-25 August due to the pandemic COVID-19.

2.2 Research Variables

Independent variables in this research are purple corn, while the dependent variables are anthocyanin, HCl reagent and NaOH 2M.

2.3 Research Sample

The total panellist needed to try “Purple Corn Ice Cream” are 50 males and females of various ages, based in Malang, East Java, Indo. Panellist are randomly selected.

2.4 Tools and Materials

The ice cream ingredients were purple corn, fresh milk, water, sweetened milk, sugar, whip cream powder, vanilla extract, and SP. All ingredients except purple corn were bought from mini market. Purple corn is obtained from agricultural land owned by PT. Advanta Seeds Indonesia in Papar Village, Kediri City, East Java Province, Indonesia. The tools used in making ice cream include mixer, blender, knife, freezer, pan, basin, strainer, stoves, and ice cream package. While the tools for the anthocyanin test were test tubes, bunsen, pipette, measuring glass, and beaker glass.

2.5 Ice Cream Formulation

The first step in making ice cream was to peel and wash purple corn with clean water. Then the purple corn was blended with fresh milk and sweetened condensed milk until smooth. Next, the mixture was filtered and boiled until thicked. Next, the mixture cooled at room temperature. After the mixture cooled, it was mixed by adding whip cream and SP using a mixer for 10 minutes. Put the mixture in the freezer at a temperature of 1 C for 24 hours. Then remove the ice cream mixture from the freezer and mix again for 5 minutes until the mixture becomes smooth. Put the ice cream mixture into the package. Finally, put the ice cream into the freezer until frozen.

2.6 Organoleptic Test

The organoleptic test is a how-to test using the senses of humans as the primary tool for measurement receptivity to the product (Ningrum et al., 2017). The senses used in assessing the nature of senses are the senses sight, touch,

smell, and taste. Panelists were asked to explain purple corn and ice cream products' organoleptic (texture, color, smell, and flavor).

2.7 Hedonic Test

The hedonic test is used to measure the level of preference for a product. This preference is called the hedonic scale. Panelist shows their level of preference for each sample by choosing the category in accordance (Ningrum et al., 2017). Panellists used in the hedonic test was an untrained panellist of 50 people in the Malang area. Panellists were chosen randomly and came from various age groups. A sensory test was carried out using the questionnaire Google Form. Parameter tested in the form of texture, colour, aroma, taste, and total acceptance. The panellist's hedonic test scores started from (immensely dislike) to 5 (very much like).

2.8 Anthocyanin Test

Anthocyanin test used to determine the anthocyanin content in purple corn and product "Purple Corn Ice cream." Firstly, the sample was heated with 2M HCl for 2 minutes using a temperature of 100 °C, the colour of the sample was observed. If the red colour in the sample does not change (constant), it indicates a positive of anthocyanins. In the second step, the sample was mix by adding 2M NaOH dropwise. When the red colour changes to green blue and fades slowly, it indicates a positive of anthocyanins (Lestario et al., 2011).

CHAPTER III
RESULT AND DISCUSSION

3.1 Organoleptic Test Result

The organoleptic test is used to examine the physical appearance of the raw material for purple corn and ice cream products, including texture, smell, color, and taste. The organoleptic results can be seen in the Table 3.1 and 3.2.

Table 3.1 Purple corn organoleptic test results

Parameter	Result
Texture	Hard seeds
Smells	No Smell
colors	Blackish Purple
Flavor	Tasteless

Table 3.2 Purple corn ice cream organoleptic test results

Parameter	Result
Texture	Hard seeds
Smells	No Smell
colors	Blackish Purple
Flavor	Tasteless



Figure 3.1 Purple corn ice cream and purple corn

3.2 Hedonic Test Result

The hedonic test was used to check the panelist's preferences regarding ice cream products. The population in this hedonic test is men and women who live in the Malang area with an age range from toddlers (3 years) to old adults (44 years), total 50 panelists. The percentage of male panelists is 62%, and the percentage of female panelists is 38%. Data on the number of panelists by age and sexual identity can be seen in the Figure 3.2 and 3.3.

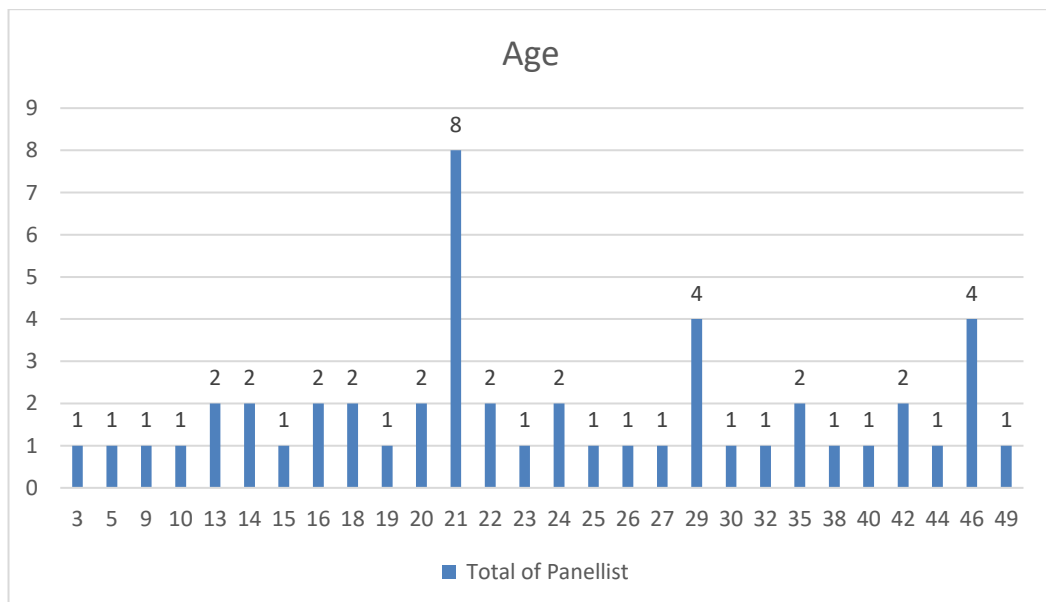


Figure 3.2 Age of panelist

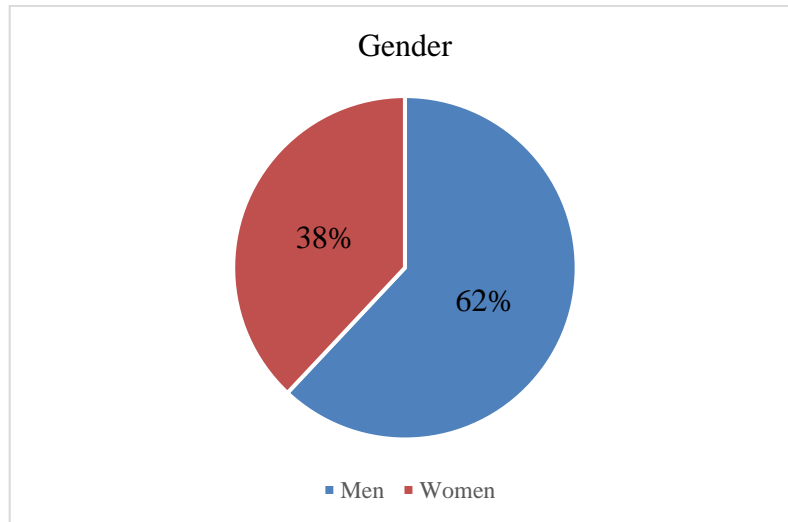


Figure 3.3 Gender of panelist

Parameters tested in the hedonic test include texture, colour, smell, taste, and overall assessment of ice cream. Parameters were assessed using a score of 1-5 (very dislike-very much like) with a total of 50 panellists from various age groups through the google form media. The results of the hedonic test can be seen in the Table 3.3.

Table 3.3 Hedonic test results

Questions	1	2	3	4	5
Texture of the product	0 (0%)	1 (2,2%)	5 (10%)	21 (42%)	23 (46%)
Color of the product	0 (0%)	2 (4%)	8 (16%)	17 (34%)	23 (46%)
Smell of the product	0 (0%)	1 (2,2%)	9 (18%)	18 (36%)	22 (44%)
Taste of the product	1 (2%)	2 (4%)	17 (34%)	15 (30%)	15 (30%)
Rate of the product	0 (0%)	0 (0%)	6 (12%)	23 (46%)	21 (42%)

Based on the test results for filling out the question number 1 questionnaire, one panelist did not like it, five panelists were neutral, 21 panelists liked it, and 23 panelists liked the texture of the product "Purple Corn Ice Cream." The results of filling out the number 2 questionnaire, two panelists do not like it, eight panelists are neutral, 17 panelists like it, and 23 panelists like the color of the product "Purple Corn Ice Cream." The results of filling out the number 3 questionnaire show that one panelist does not like, nine panelists are neutral, 18 panelists like, and 22 panelists like the smell of the product "Purple Corn Ice Cream." The results of filling out the number 4 questionnaire show that one panelist strongly dislikes it, two panelists do not like it, 17 are neutral, 15 panelists like it, and 15 panelists like the taste of the product "Purple Corn Ice Cream." The processed product from purple corn "Purple Corn Ice Cream" has good organoleptic (texture, color, smell, and taste) to enjoy it by various ages, from children to old adults. Based on the results of filling out questionnaire number 5, there are six neutral panelists, 23 panelists like, and 21 panelists who like the product "Purple Corn Ice Cream" as a whole. It proves that the processed purple corn product "Purple Corn Ice Cream" has received a positive response from the wider community and has great potential to be developed as a food innovation beneficial to health, especially as an immune booster during the COVID-19 pandemic.

3.3 Anthocyanin Test Result

Anthocyanin test was conducted to determine the secondary metabolite compounds of anthocyanin in purple corn. The anthocyanin test was carried out

using a phytochemical screening method. The samples tested were purple corn powder and ice cream products. anthocyanin test results can be seen in the Figure 3.4.

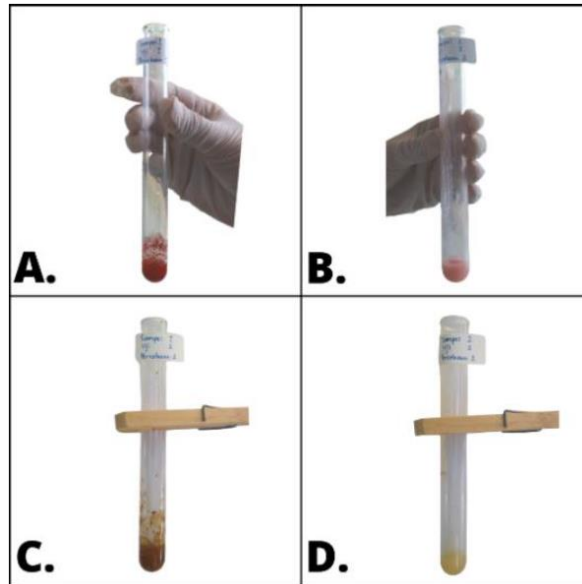


Figure 3.4 Anthocyanin test 1 of purple corn sample (a), Anthocyanin test 1 of Purple Corn ice cream sample (b), Anthocyanin test 2 of purple corn sample (c), Anthocyanin test 2 of Purple Corn ice cream sample (d)

Based on the anthocyanin content test results using the phytochemical screening method, purple corn taken from the cultivation of the Malang area was positive for anthocyanin. This positive result was indicated by the samples' colour changing (a and b) from purple to red on the heating reaction and the 2M HCl reagent. Meanwhile, the addition of 2M NaOH (c and d) has a positive result indicated by a change in the colour of the sample from purple to green. However, there is a difference in the positive results in the purple corn sample and the ice cream product. The ice cream product had a lighter cheerful colour than the purple corn sample caused by reduced levels of anthocyanins while

making ice cream products. Although the content of anthocyanin compounds in purple corn is quite large, processing treatments such as heating can reduce anthocyanin content in processed products. The heating result is the loss of some nutrients, especially labile ones such as ascorbic acid, anthocyanins, and beta-carotene (Budiarto, 1991).

Anthocyanins are natural dyes belonging to the flavonoid group with three carbon atoms bonded by an oxygen atom to connect two benzene aromatic rings (C₆H₆) in the main structure. As a bioactive compound, the arrangement of conjugated double bonds in the anthocyanin structure makes anthocyanins function as natural antioxidant compounds in humans (Barrowclough, 2015). Anthocyanins can scavenge various types of reactive oxygen- derived free radicals, such as hydroxyl (OH^{*}), peroxy (ROO^{*}), and single oxygen (O₂^{*}) (Azima et al., 2014). These free radicals in the body are formed by pro-oxidative enzyme systems, lipid oxidation, irradiation, inflammation, smoking, nicotine, other chemicals, and air pollution.

Antioxidants from anthocyanins have benefits in preventing various degenerative diseases, such as cardiovascular diseases, such as atherosclerosis, by inhibiting and reducing cholesterol levels in the blood caused by LDL oxidation (Wallace, 2011). The anthocyanin acylation process can increase antioxidant activity (Sari et al., 2015). Research says that anthocyanin is a valuable antioxidant to protect the body from free radical attacks and boost the immune system, prevent atherosclerosis, disease blockage of blood vessels, lose the stomach from damage, inhibit tumour cells, improve eye vision ability,

and serve as anti-inflammatory compounds that protect the brain from violence (Nursa'adah et al., 2017).

According to laboratory results conducted by PT Advanta Seeds, the anthocyanin content in purple corn is 70 mg/100 gram, which means that in the total ice cream formulation, which is 500 grams of purple corn, there are 350 mg anthocyanins. This amount is quite large, so it has the potential to be processed into pagan products amid the urgency of the COVID-19 pandemic.

In addition, anthocyanins have high anti-viral, anti-fungal, and anti-bacterial activities (Hidayah et al., 2014; Saira and Kamran, 2017). Several types of flavonoids, such as anthocyanins, are thought to have biological activity in inhibiting several coronavirus proteins or preventing lung inflammation and cytokine storms which are severe consequences of SARS-CoV-2 infection (Tutunchi et al., 2020). Because it has many benefits, the flavonoid anthocyanin compounds contained in purple corn have the potential to be used to improve the body's immune system during the COVID-19 pandemic.

CHAPTER IV

CONCLUSION

Purple corn and "*Purple Corn Ice Cream*" products were positive for anthocyanins in test 1 (HCl) and test 2 (NaOH) indicated by the samples' colour changing from purple to red on the heating reaction with 2M of HCl reagent. Meanwhile, the addition of 2M NaOH has a positive result indicated by a change in the colour of the sample from purple to green. In addition, "*Purple Corn Ice Cream*" products received a positive response from the public that can be seen from the total acceptance of ice cream by 88% of panelist.

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KEPUTUSAN
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UNIVERSITAS ISLAM NEGERI MAULANA MALIK IBRAHIM MALANG
Nomor : 0928/FKIK/08/2022

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MEMUTUSKAN

MENETAPKAN : **PEMBERIAN PENGHARGAAN KEPADA MAHASISWA BERPRESTASI SEBAGAI PENGGANTI KARYA TULIS ILMIAH/SKRIPSI**

KESATU : Memberikan Penghargaan kepada mahasiswa sebagai peraih juara pertama, kedua dan ketiga pada Lomba Karya Ilmiah tingkat Nasional serta Kompetisi Internasional bagi mahasiswa yang namanya tercantum dalam lampiran Surat Keputusan ini.;

KEDUA : Penghargaan yang diberikan berupa pembebasan kepada Mahasiswa dari kewajiban akademis pembuatan Karya Ilmiah Tugas Akhir dan memberikan nilai prestasi akademis A pada Karya Tulis Ilmiah Tugas Akhir tersebut, dengan tetap berkewajiban menyerahkan naskah karya ilmiah yang diikuti oleh masing-masing Mahasiswa.

KETIGA : Keputusan ini berlaku sejak tanggal ditetapkan apabila terdapat kekeliruan dalam penetapannya akan diadakan perbaikan sebagaimana mestinya.

Ditetapkan di : Batu
Pada Tanggal : 15 Agustus 2022

Dekan,



Yuyan Yueniwati PW.

Tembusan :

1. Rektor (sebagai laporan);
2. Wakil Rektor Bidang Kemahasiswaan;
3. Kepala Biro AAKK;
4. Kepala Pusat Persputakaan UIN Malang;
5. Arsiparis.




Lampiran I : Keputusan Dekan Fakultas Kedokteran dan Ilmu Kesehatan
Universitas Islam Negeri Maulana Malik Ibrahim Malang
Nomor : 0928/FKIK/08/2022
Tanggal : 15 Agustus 2022

**DAFTAR PENERIMA PENGHARGAAN MAHASISWA BERPRESTASI
FAKULTAS KEDOKTERAN DAN ILMU KESEHATAN
UNIVERSITAS ISLAM NEGERI MAULANA MALIK IBRAHIM MALANG**

NO	NAMA MAHASISWA	NIM	PRODI	PRESTASI
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Pada Tanggal : 15 Agustus 2022



DISUSUN DAN DIPROSES SESUAI KETENTUAN PERUNDANG-UNDANGAN	
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