ENRICHMENT PROGRAM REPORT

Comparison of Precision for Oven and Rapid Moisture Analyzer Analysis Methods for Instant-Dried Noodles (GMTK) and Instant-Fried Noodles (GCEPKJ)

STUDY PROGRAM
Food Technology

KEVIN
18010133

Bambang A. W.. (Field Supervisor)
Dasep W., PhD. (EP Supervisor)

INDONESIA INTERNATIONAL INSTITUTE FOR LIFE SCIENCES (i3L)

2023

INTERNSHIP REPORT

Comparison of Precision for Oven and Rapid Moisture Analyzer Analysis Methods for Instant-Dried Noodles (GMTK) and Instant-Fried Noodles (GCEPKJ)

By
Kevin
18010133

Submitted to

i3L – Indonesia International Institute for Life Sciences
School of Life Sciences

in partial fulfillment of the enrichment program for the Bachelor of Science in
Food Technology

Internship Project Supervisor: Dasep Wahidin, PhD.
Internship Project Field Supervisor: Bambang Aji Wismono, Lab Quality Control Supervisor

Jakarta, Indonesia
2022

INSTITUT BIO SCIENTIA INTERNASIONAL INDONESIA

Jl. Pulomas Barat Kav. 88 Jakarta Timur 13210 Indonesia
+6221 295 67888, +6221 295 67899, +6221 296 17296
www.i3l.ac.id

Certificate of Approval

Student	:	Kevin
Cohort	:	2018
Title of final thesis project	:	Perbandingan Presisi Metode Analisis Oven dan Rapid Moisture Analyzer untuk Mie Kering Instan (GMTK) dan Mie Goreng Instan (GCEPKJ) *Comparison of Precision for Oven and Rapid Moisture Analyzer Analysis Methods for Instant-Dried Noodles (GMTK) and Instant-Fried Noodles (GCEPKJ)*

We hereby declare that this final thesis project is from student's own work. The final project/thesis has been read and presented to i3L's Examination Committee. The final project/thesis has been found to be satisfactory and accepted as part of the requirements needed to obtain an i3L bachelor's degree.

Names and signature of examination committee members present:

1	Thesis Supervisor	: Muhammad A.M. B.Sc., M.Sc.	Approved
2	Field Supervisor	: Bambang Aji Wismono	Approved
3	Lead Assessor	: Rayyane M.S.I. S.Si., M.Sc.	Approved

Acknowledged by,

Head of Study Program,

Muhammad Abdurrahman Mas, B.Sc., M.Sc.

This is a form-based authentication form, gaining access to this form is a method of signer validation, therefore, this form does not require a signature.
Scan the QR code to verify the document validity.

COPYRIGHT NOTICE

STATEMENT OF ORIGINALITY

submitted to

Indonesia International Institute for Life Sciences (i3L)

I, Kevin, do herewith declare that the material contained in my thesis entitled:

“Comparison of Precision for Oven and Rapid Moisture Analyzer Analysis Methods for Instant-Dried Noodles (GMTK) and Instant-Fried Noodles (GCEPKJ)”

is original work performed by me under the guidance and advise of my Field and Thesis Advisor,

Bambang Aji Wismono and Dasep Wahidin, PhD. I have read and do understand the definition and information on use of source and citation style published by i3L. By signing this statement I unequivocally assert that the aforementioned thesis conforms to published information.

i3L has my permission to submit and electronic copy of my thesis to a commercial document screening service with my name included. If you check NO, your name will be removed prior to submission of the document for screening.

- [x] ~~Yes~~
- [ ] No

Name of student: Kevin Student ID: 18010133

Study Program: Food Technology

Signature: Date: 28 January 2023

ABSTRACT

Given the importance of moisture content in instant noodle production, the study's goal was to evaluate the precision of both oven and rapid moisture analyzing methods for two products: GMTK and GCEPKJ. GMTK is an instant dried noodle, while GCEPKJ is an instant fried noodle. The data was collected from October to September 2022, and the results for GMTK and GCEPKJ were averaged. The standard deviation is calculated as well. An Independent Sample T-Test is used to determine whether there is a statistically significant difference between the oven and the rapid moisture analysis method. The results showed that GMTK (Rapid Moisture Analyzer: 9.71% and Oven: 9.30%) and GCEPKJ (Rapid Moisture Analyzer: 3.66% and Oven: 3.14%) are below the SNI range. The SNI range for GMTK is below 13%, while for GMTK is below 10%. The Independent Sample T-Test results for GMTK and GCEPKJ revealed a significant moisture content difference. It is also discovered that the Rapid Moisture Analyzer is more precise than the oven method due to its lower standard deviation.

Keywords: Instant Noodle, Rapid Moisture Analyzer, Oven Gravimetric Method, Precision and Accuracy, T-Test

ACKNOWLEDGEMENTS

Praise God for completing the internship on time and within expectations. This report titled "Comparison of Moisture Content for Oven-Dried Noodles (GAGA Mie Telor Kuning A1) and Fried Noodles (GAGA 100 Extra Pedas Kuah Jalapeno) Based on SNI" was created to meet the requirements of the enrichment program. During the internship, the author learned much about managing instant noodles' production and quality control.

On this occasion, the author wishes to thank all of the employees at PT. Jakarana Tama for their warm welcome and assistance during the internship program, whether directly or indirectly. Thank you especially to:

1. Mr. Dasep Wahidin, writer’s internship supervisor, who guided and provided feedback throughout the report's preparation.
2. Mr. Muhammad Abdurrahman Mas, who provided the approval letter for the author to undergo the internship program, guided and provided feedback throughout the internship report preparation.
3. Ms. Maria and Kak Icha, the CSD of Indonesia International Institute for Life Science, who assisted the writer during the report making.
4. Ms. Herlina, Mr. Andriyansah, Mr. Dede Mulyana, and the Human Capital of PT. Jakarana Tama, who provided the internship opportunity to the writer.
5. Mr. Muhammad Ilman Hakim, as QAQC Manager, provided the writer with an internship opportunity.
6. Mr. Bambang Aji Wismono, the lab supervisor and the author’s internship supervisor, who patiently guided and supported the author throughout the internship.
7. The QC field division, including Mr. Edwin, Mr. Satibi, Mr. Nanang, and Kak Siti, who gave the author knowledge about the entire production process at PT. Jakarta Tama.
8. PT. Jakarana Tama's QAQC department, including Mr. Sunarno, Kak Anggit, Kak Adinia, Kak Puji, and Kak Novia, who patiently guided and encouraged the writer during the internship period.
9. Aditama, Zulaekha, and other SMK Negeri 1 Temanggung intern students, who together with the author during the internship.
10. My parents and my brother, who provided me with their unfailing amount of emotional support and unparalleled love.

Finally, the author hopes this internship report will provide readers with inspiration and motivation. The writer acknowledges numerous errors in the report. There is still room for improvement, so suggestions for improvements are welcome.

TABLE OF CONTENTS

LIST OF FIGURES, TABLES, AND ILLUSTRATIONS

LIST OF ABBREVIATIONS

AV	Acid Value
FFA	Free Fatty Acid
GCEPKJ	GAGA 100 Extra Pedas Kuah Jalapeno
GMTK	GAGA Mie Telor Kuning A1
POV	Peroxide Value
PP	Phenolphthalein
SNI	Standar Nasional Indonesia

I. INTRODUCTION

1.1. Brief History of the Company

The company's introduction began with Djajadi Djaja, Indomie's co-founder, establishing PT. Jakarana Tama (Oswaldo, 2022). It started as a regional distribution company in Medan on June 20, 1980, based on Notarial Deed No. 107. It later transformed into a food production company in 1988 under the name Michiyo, which changed into GAGA (PT. Jakarana Tama, 2022, a). In 1992, a factory was built in Ciawi, which became operational in 1993, on Jalan Raya Ciawi-Sukabumi Km 2.5 No. 88. The company's layout is displayed in Appendix A.

1.2. Productions of the Company

PT. Jakarana Tama's main products include instant noodles, canned goods, and ready-to-eat sausages, with the noodle product being the most well-known. Among the noodle options are GAGA Mie 100 Hot Series, GAGA Mie Telor Kuning A1, GAGA Mie Gepeng, GAGA Mie Aussie, GAGA Mie 1000 Series, GAGA Bakmi, Arirang Taste Series, and GAGA 100 Cup Series.

The first product, GAGA Mie 100 Hot Series, is a spicy instant noodle with four different levels of spiciness (PT. Jakarana Tama, 2022, b). GAGA 100 Goreng Extra Pedas, GAGA 100 Extra Pedas Goreng Lada Hitam, GAGA 100 Extra Pedas Kuah Jalapeno, GAGA 100 Extra Pedas Goreng Jalapeno, GAGA 100 Extra Pedas Kuah Soto, GAGA 100 Extra Pedas Goreng Chipotle, GAGA 100 Extra Pedas Kuah Habanero, and GAGA 100 Extra Pedas Goreng Habanero are all available as part of the GAGA 100 Group of products. Some products are depicted in Figure 1, while Figure 2 displays GAGA 100 Extra Pedas Kuah Habanero.

Figure 1. GAGA Mie 100 Hot Series Variants. Obtained from (PT. Jakarana Tama, b)

Figure 2. GAGA 100 Extra Pedas Kuah Habanero. Obtained from (itttersel)

GAGA Mie Telor Kuning A1, the second product, is a premium egg noodle with a quick serving time. It only takes 2 minutes, and the noodle is ready to serve in various ways (PT. Jakarana Tama, 2022, b), depicted in Figure 3.

Figure 3. GAGA Mie Telor Kuning A1. Obtained from (PT. Jakarana Tama, b)

The third item is GAGA Mie Gepeng, made with special wheat flour and the finest Indonesian herbs. The four flavor variations are Kuah Soto Cabe Hijau, Kuah Ayam Lada Hitam, Goreng Ayam Lada Hitam, and Goreng Ayam Panggang, displayed in Appendix B.

GAGA Mie Aussie noodle, the fourth variety, is made with Australian wheat and Indonesian spices (PT. Jakarana Tama, 2022, b). Appendix C shows a selection of products, including Mie Instan Goreng Spesial and Mie Instan Kuah Soto Segaar.

The fifth variant is the GAGA Mie 1000 series which has a low price and good quality (PT. Jakarana Tama, 2022, b). The GAGA Mie 1000 series variants are 1000 Rasa Ayam Bawang, 1000 Rasa Kaldu Ayam, 1000 Rasa Soto Mi, and GAGA 1000 Goreng, depicted in Appendix D.

Other items are GAGA Bakmi, GAGA 100 Cup Series, and Arirang Taste Series. Appendix E contains GAGA Bakmi, a premium wheat noodle with a chewy texture. It can be fried or boiled according to the customer's preference (PT. Jakarana Tama, 2022, b). Arirang Taste Series, displayed in Appendix F, are Indonesian-made Korean-style noodles. Arirang Kimchi, Arirang Bim Bim, Arirang Hot, Arirang Kwetiau Sum Sum, Arirang Bihun Curry, Arirang Ayam, Arirang Sum Sum, Arirang Bihun Bulgogi, and Arirang Bihun Beef Galbi are all part of the Arirang Taste Series. GAGA 100 Cup Series is a cup of spicy instant noodles (PT. Jakarana Tama, 2022, b). It is available in two varieties: Cup 100 Extra Pedas Kuah Jalapeno and Cup 100 Extra Pedas Goreng Jalapeno, shown in Appendix G.

1.3. Vision and Mission of the Company

With an ISO 22000:2018 quality management system, PT. Jakarana Tama aspires to become a leading food company and promote food safety. They strive to continuously improve the quality of their human resources, produce quality products that meet market needs, and optimize efficiency and productivity as part of their mission.

1.4. Description of the Department

The company has several divisions to ensure the smoothness and success of production, and the structure ensures that responsibility flows from top to bottom. Appendix H lists the divisions as Operational Director, Administrative Operator, Personal and General Affairs (PGA), Assistant Factory, Production, Technician, Quality Assurance and Quality Control (QAQC), Research and Development, and Production Plan and Inventory Control (PPIC) or Warehouse Department.

Being in the Quality Control field, the daily task is to ensure that all production steps, raw materials, and products adhere to the standard. The duties include moisture content, ash content, AV, POV, FFA, gluten, pH, salt content, total acid, microbiological, and organoleptic analysis. The QAQC department's detailed tasks will be explained in Chapter 2.

II. INTERNSHIP ACTIVITIES

2.1. Working Conditions in PT. Jakarana Tama

PT. Jakarana Tama works a typical 40-hour week. The work is divided into two shifts, 07.00 - 16.00 and 16.00 - 01.00, or three shifts, 7.00 - 15.00, 15.00 - 23.00, and 23.00 - 07.00. There are instances when there is only one shift from 07.00 to 16.00. QC intern at PT. Jakarana Tama only works one shift from 07.00 to 16.00. A signature is used to validate attendance.

2.2. Internship Task

As mentioned previously, the analysis conducted by the QC department includes moisture content, ash content, AV, fat content, POV, FFA, gluten, pH, salt content, total acid, microbiological, and organoleptic analysis. The analysis is conducted daily during the internship program.

2.2.1. Moisture Content

The first task of the QC intern is moisture analysis. It is done for raw materials and existing noodle samples. The moisture content is determined using either a Rapid Moisture Analyzer or an oven. In the aluminum dish, five grams of samples are measured for the Rapid Moisture Analyzer method. As for the oven method, there are two different methods for solid and liquid samples. For solids, three to five grams of sample are placed in the evaporating dish and evaporated in the oven at 105°C for three hours. For liquids, three to five grams of the sample are placed in the evaporating dish and vaporized in the oven at 105°C for 30 minutes. The sample is then inserted into a desiccator for 30 minutes. The calculation is shown in Figure 4, in which w stands for weight in grams.

$$\frac{w_{sample} - w_{result}}{w_{sample}} \times 100\%$$

Figure 4. Moisture Content Calculation

2.2.2. Ash Content

The third task is to measure ash content. It is carried out for both raw materials and existing samples. Three grams of sample are placed in an evaporating dish and measured. The sample is then burned for 4 hours at 800°C. The calculation for ash content is depicted in Figure 5 which w stands for weight in grams.

$$\frac{w_{result}}{w_{sample}} \times 100\%$$

Figure 5. Ash Content Calculation

2.2.3. Acid Value

The next task is the AV, determined by diluting the oil of the fried noodle sample into petroleum ether. The Erlenmeyer flask is then weighed, the solids are separated from the liquid inside with filter paper, and the liquid is heated in a water bath until only oil remains in the solution. The Erlenmeyer flask is then placed in an oven at 105°C for 15 minutes to evaporate any solvent in the solution. The solution is weighed, and 50 mL of anhydrous alcohol is added. After that, the Erlenmeyer flask is covered with aluminum foil and heated until the mixture bubbles. The heated mixture is cooled and titrated with 0.1 N NaOH as the titrant and 3-5 drops of 1% PP as the indicator. The solution is titrated until it becomes bright pink. The AV will be calculated based on the Figure 6 equation, in which V stands for volume in ml, N stands for normality, and w stands for weight in grams.

$$\frac{(V_{titrant} - V_{blank})}{w_{sample}} \times 40 \times N_{titrant}$$

Figure 6. Acid Value Calculation

2.2.4. Fat Content

The following task is to analyze the fat content, usually for instant fried noodles and sausage samples. For a noodle sample, the sample is measured by weighing the boiling flask. 3 g of the sample is measured and folded on filter paper. The folded paper containing the sample is placed in a condenser. After that, the condenser is connected to the boiling flask, and 60-80 ml of petroleum ether is added. The apparatus is then connected to a water supply, and the flask is heated at 65°C for 3 hours. After extraction, the solution is evaporated for 3 hours inside the oven. The boiling flask is cooled and then weighed.

In the case of the sausage sample, it is first digested in 20 ml HCl in a water bath for 2 hours. The sample is then filtered using filter paper. Hot water is then used to neutralize the solids. The sample is evaporated in the oven for 2 hours after the remaining solids are neutralized. The extraction process will be the following process. The fat content is calculated based on the Figure 7 equation, where w stands for weight in grams.

$$\frac{w_{result}}{w_{sample}} \times 100\%$$

Figure 7. Fat Content Calculation

2.2.5. Gluten Content

Next is the gluten content analysis, usually for flour samples, done by measuring 10 g of the sample and adding 6 ml of 2% NaCl solution. The sample is mixed until it thickens. After 15 minutes, the dough is immersed in water and washed until only wet gluten remains, as indicated by clear water during the washing process. The wet gluten is weighed. The wet gluten is dried for 3 hours. After drying, the dry gluten is weighed. The calculation is shown in Figure 8, in which w stands for weight in grams, and m_c stands for moisture content.

$$\frac{w_{gluten}}{w_{sample}} \times \frac{86}{(100 - m_c)} \times 100\%$$

Figure 8. Gluten Content Calculation

2.2.6. Peroxide Value

Afterward, the POV is measured by weighing 5-6 g of the sample into an Erlenmeyer flask. The solution is given 30 ml of POV solution (3 acetic acid:2 chloroform). Concentrated KI is added into the solution and the solution is sealed for 2 minutes in a dark environment. The solution is added with free-oxygen water obtained by boiling aquadest. Titrate the solution with sodium thiosulfate as the titrant, using 5-6 drops of 1% starch as an indicator. When the indicator is inserted, a black cloud appears in the solution. By adding the sodium thiosulfate, the solution will slowly turn clear. The titration is complete when the solution becomes clear. The POV will be calculated based on the Figure 9 formula, in which V stands for volume in ml, N stands for normality, and w stands for weight in grams.

$$\frac{(V_{titrant} - V_{blank})}{w_{sample}} \times 1000 \times N_{titrant}$$

Figure 9. Peroxide Value Calculation

2.2.7. Free Fatty Acid

Following the POV measurement is the FFA measurement. FFA is measured by weighing 10-11 g of the sample inside an Erlenmeyer flask and adding it to 50 ml of isopropanol. The flask is sealed with aluminum foil and placed in a water bath to boil. The solution is titrated with 0.1 N NaOH as the titrant, using 3-5 drops of 1% PP as the indicator. The FFA will be calculated based on the Figure 10 formula, in which V stands for volume in ml, N stands for normality, and w stands for weight in grams.

$$\frac{(V_{titrant} - V_{blank})}{w_{sample} \times 1000} \times 256 \times N_{titrant} \times 100\%$$

Figure 10. Free Fatty Acid Calculation

2.2.8. Salt Content

After that, the next task is to measure salt content, usually for salts and soy sauce, by measuring 0.5 g of a sample inside an Erlenmeyer flask and diluting the sample in 100 ml of distilled water. 3-5 drops of 5% potassium chromate are added as the indicator, and the solution is titrated with 0.1 N silver nitrate until it turns brick red. The salt content is calculated in the Figure 11 equation, in which V stands for volume in ml, N stands for normality, and w stands for weight in mg.

$$\frac{(V_{titrant} - V_{blank})}{w_{sample}} \times 58.45 \times N_{titrant}$$

Figure 11. Salt Content Calculation

2.2.9. pH

Some samples necessitated the determination of pH. The measurement of liquids is straightforward. For solids, 1 g of a solid is diluted in 100 ml of distilled water to determine its pH. The probe is then cleaned and immersed in the solution. The measurement of liquids is straightforward, done by immersing the probe directly in the liquid.

2.2.10. Total Acid

As for the total acid, the total acid can be calculated by dissolving 0.5 g of the sample in 100 ml of water. Next, a 0.1 N NaOH titration is performed on the sample using 3-5 drops of 1% PP as the indicator. Figure 12 depicts the formula of total acid, in which V stands for volume in ml, N stands for normality, and w stands for weight in mg.

$$\frac{V_{titrant}}{w_{sample}} \times N_{titrant} \times 60 \quad .$$

Figure 12. Total Acid Calculation

2.2.11. Microbiological Analysis

Furthermore, microbiological analysis is conducted in PT. Jakarana Tama, two microbiological analyses are performed: Plate Count Agar (PCA) and Potato Dextrose Agar. 8.8 g of PCA powder is diluted in 500 mL of distilled water to prepare PCA. PDA is made by diluting 19.5 g of powder in 500 ml of distilled water and adding 7 ml of 10% tartaric acid to the solution. In terms of the sample, 5 grams are diluted in 45 ml of distilled water for one dilution factor. For the second dilution factor, 5 mL of the solution is diluted in 45 mL of distilled water. After that, 1 ml of the diluted sample is placed in the Petri dish and covered with agar. The sample is inverted and incubated in the oven for 1-2 days at 37°C after the agar has cooled. After that, the colonies are counted and multiplied by the dilution factor.

2.2.12. Sensory Analysis

Lastly, visual, texture, taste, and smell are all part of the organoleptic analysis. The duo trio test is the most common sensory method. The duo trio test, which employs a reference, determines the differences between the two samples (Purcell, 2017)

2.3. Comparison between the Theory and Practice

Based on the daily tasks performed at PT. Jakarana Tama, the writer, learned how to analyze food products throughout production. Although most laboratory skills were applied during the internship, working in virtual and real lab environments differs. For example, pouring a hydrochloric acid solution into a beaker is typically done directly in a virtual lab. Because hydrochloric acid is corrosive, strict safety precautions must be taken while pouring the sample.

Another example is the microbiological analysis procedure and duration. Some steps, such as cleaning the table with alcohol and washing hands before switching samples, could be skipped in a virtual lab. These can cause contamination in a practical lab environment. The time spent for sample incubation in the virtual lab could also be avoided, whereas, in the practical lab, the sample must be incubated for 1-2 days.

2.4. Difficulties During Internship Program

Problems such as remembering the protocol for each analysis are encountered during the internship. To solve the problem, the author frequently asks the QC Lab Assistant for the protocol. Thus, the writer can slowly remember the protocol. Another problem encountered during the internship is that the author cannot use the lab equipment. Therefore, the author frequently asks the lab supervisor for guidance on using the lab equipment. The internship runs smoothly by maintaining a positive attitude toward the lab assistant.

III. PROJECT DESCRIPTION

3.1. Introduction

Noodles are an everyday staple in many cultures and come in various shapes and sizes. While long, thin strips are the most common shape, many noodles are cut into waves, helices, tubes, strings, or shells or folded over and cut into other shapes. Fresh raw noodles, dried noodles, parboiled noodles, frozen noodles, steamed noodles, and instant noodles are some of the various types of noodles (Wieser et al., 2020).

Instant noodles are the most popular because they require the least amount of preparation. Instant noodles are divided into two types based on the method used to remove moisture: instant dried noodles and instant fried noodles (Gulia et al., 2014). Instant dry noodles, based on SNI 8217:2015, are products made from wheat flour as the primary raw material, with or without the addition of permitted food additives, that are mixed, stirred, sheeted, slit, steamed, cut, and fried or dried. Unlike instant dried noodles, instant fried noodles are products made from the primary raw material of wheat flour, with or without additions of other permitted food ingredients and food additives, steamed, dried by frying, seasoned, and ready to consume after being cooked or boiled using boiling water or deep hot water for a short time. GAGA Mie Telor Kuning A1 is an example of an instant-dried noodle, and GAGA 100 Extra Pedas Kuah Jalapeno is an example of an instant-fried noodle.

Wheat flour is the main ingredient of instant noodles. Thus, the preferences for color, texture, and eating quality of noodles vary significantly across countries; therefore, wheat flour specifications do as well. The flour should be solid and extensible enough to withstand sheeting. Superior starch properties are also required in high-quality flour (Gulia et al., 2014). Starch properties that play a role in the production of instant noodles are amylose, amylopectin, and damaged starch. Amylopectin is the cause of swelling, and amylose is the cause of swelling restraint (Fredriksson et al., 1998). Damaged starch, defined as the portion of kernel starch broken during wheat milling, causes excessive surface swelling, poor noodle color, and high cooking loss (Gulia et al., 2014).

Water is another necessary ingredient for both noodle making and the formation of gluten, which offers the viscoelastic properties required for noodle processing. The amount of water essential for noodle processing is optimized to hydrate the flour and develop a uniform dough sheet. Protein content, protein quality, damaged starch, and other physicochemical characteristics of flour all influence noodle water absorption. The recommended water absorption level for noodle processing is approximately 30- 38% based on flour weight. The level of water uptake has a significant impact on the amount of work required in processing as well as color. Textural characteristics declined rapidly as water absorption increased (Gulia et al., 2014).

Noodle salt, another ingredient, is responsible for gluten's strengthening and tightening effect. It improves sheeting properties, enhances flavor, shortens cooking time, provides a softer but more elastic texture, and inhibits enzyme activity and microorganism growth. Typically, 1-3% of the flour weight of salt is added to the noodle (Gulia et al., 2014).

Alkaline salt, one type of noodle salt, can be used or combined with other salts depending on local preferences. Sodium and potassium carbonates are the most commonly used alkaline salts. Some countries also use alkaline reagents such as sodium hydroxide and bicarbonates. The distinctive yellow color associated with adding alkaline salts to common wheat used for noodle preparation is caused by endogenous flavonoids undergoing a chromophoric shift, or turning yellow, in the presence of alkali (Gulia et al., 2014).

Next, preservatives such as polyphosphates and antioxidants are added to improve the final quality of the noodles. Polyphosphate, as a chelating agent, prevents fresh noodles from discoloring and alters the properties of the dough. An antioxidant in noodles prevents oxidative rancidity and thus increases shelf life (Gulia et al., 2014).

Lastly, texturing agents such as hydrocolloids and emulsifiers are added to the noodle. During cooking, a hydrocolloid changes the texture and better rehydrates the noodles. Emulsifiers prevent retrogradation, improve texture and structure, and improve the cooking quality of noodles.

Instant noodle processing typically includes mixing, resting, sheeting, slitting, steaming, cutting, and frying or drying. Figure 13 depicts the flowchart for the production of instant noodles. The first step in making noodles is to combine flour, water, and salt or alkaline salt (kansui) to form a crumbly mixture. In the noodle industry, two types of mixers are commonly used: horizontal and vertical. After mixing, the dough is rested for 10-30 minutes with slow mixing (5-10 rpm). The dough is then transferred to a hopper made up of two pairs of horizontal rolls that rotate in opposite directions. Further dough sheeting is accomplished by passing the dough through four to six pairs of rollers with decreasing roller gaps to reduce the dough's thickness while developing a gluten network (Hou et al., 2010).

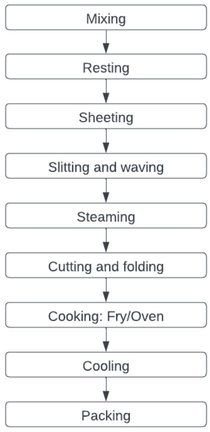


Figure 13. Processing line of Instant Dried Noodles/Instant Fried Noodles. Obtained from (Hou et al., 2010)

The noodle is slit. Noodle slitting is done with a pair of calibration rolls, a slitter, and a waver. After slitting, the noodle is steamed for 2-3 minutes in a tunnel steaming unit (Hou et al., 2010). After that, the steamed noodle is cut and folded into the desired shape and size. After being cut, the noodle is either fried for instant noodles or baked for dried noodles. The cooking time was usually around 2-3 minutes. The noodle block is cooled after cooking (Hou et al., 2010). Before packing, the noodle block is cooled to avoid water vapor trapped inside the packaging.

The moisture content is reduced to a safe limit during cooking, such as oven and frying, which means that if the moisture content is higher than the standard, the noodle block is susceptible to microbial contamination. Frying the noodles in oil reduces the moisture content to about 2-5%, whereas instant-dried noodles have a moisture content of 8-12% (Gulia et al., 2014).

Moisture content can also affect food properties like texture. Other critical aspects include legal and labeling requirements, yield determination, and ensuring an adequate drying process (Cole-Palmer, 2021). Thus, measuring the moisture content of instant noodles is required to meet the standard. It is also critical to measure the moisture content of the noodles before production because instant noodles block needs a good color and properties while being easy to cook. The noodle must also be dry enough to be free of microbial contamination.

Given the importance of moisture content analysis, a moisture analysis method must be precise and accurate. Moisture analysis is performed using two methods at PT. Jakarana Tama: the Rapid Moisture Analyzer method and the oven method. The oven method is the SNI-recommended method for moisture analysis. As a result, the question will be whether the Rapid Moisture Analyzer method is as precise as the oven method for both GMTK and GCEPKJ. The standard deviation and Independent Sample T-Test are used to assess the precision of each moisture analysis method.

Precision and accuracy are two different measures of observational error. Precision refers to how close the measurements are to each other. Accuracy measures how close the given data sets are to the actual value.

3.1.1. Methodology and Scope of the Internship

For the methodology, the GMTK and GCEPKJ noodles were first ground into a powder. The oven and Rapid Moisture Analyzer were used to calculate the moisture content. The Rapid Moisture Analyzers used were the Radwag MAC 50/1 (Figure 14), Radwag MAC 50/1.R (Figure 15), and KERN MLB 50-3 (Figure 16). Each sample of noodles weighed 5 grams for the Rapid Moisture Analyzer, and the device automatically calculated the moisture level. The temperature that is set in each moisture analyzer is 105°C.

Figure 14. Radwag MAC 50/1 Moisture Analyzer. Obtained from (getMedOnline)

Figure 15. Radwag MAC 50/1.R Moisture Analyzer. Obtained from (Radwag)

Figure 16. KERN MLB 50-3 Moisture Analyzer. Obtained from (Sigma-Aldrich)

Regarding the oven technique, the Memmert UF55 Oven, depicted in Figure 17, or Memmert U40 Oven, shown in Figure 18, was utilized. 3 g of the sample was measured in the evaporating dish, which was then weighed. The sample was then dried in an oven for 3 hours at 105°C. The sample is then inserted into a desiccator for 30 minutes. The moisture content can be calculated by deducting the final weight from the sample weight and dividing the result by the original weight multiplied by 100, similar to Figure 4.

Figure 17. Memmert UF55 Oven. Obtained from (OneStop Laboratory)

Figure 18. Memmert U40 Oven. Obtained from (Gemini BV, 2019)

Each Rapid Moisture Analyzer and oven data set for GMTK and GCEPKJ are gathered over a month, from October 2022 to September 2022. Each method for each product is averaged and analyzed for the standard deviation. For each method for each set of products, an Independent Sample T-Test is conducted to see whether there is a significant difference between the two moisture analysis methods.

3.1.2. Objective and Hypothesis

The project's goal was to compare the precision of the oven method and the Rapid Moisture Analyzer method for GMTK and GCEPKJ. There are two sets of hypotheses:

1. For GMTK:
   H_0: The precision of the oven and Rapid Moisture Analyzer methods are similar for GMTK.
   H_1: The precision of the oven and Rapid Moisture Analyzer methods differ significantly for GMTK.
2. For GCEPKJ:
   H_0: The precision of the oven and Rapid Moisture Analyzer methods is similar for GCEPKJ.
   H_1: The precision of the oven and Rapid Moisture Analyzer is significantly different for GCEPKJ.

3.2. Result

During the internship program, two noodle products, GMTK and GCEPKJ, were tested for moisture content using an oven and a Rapid Moisture Analyzer for over a month. More than 30 data were gathered from each method and each product, illustrated in Appendix I and Appendix J. Table 1 displays the average and standard deviation for each method for each product and the Independent Sample T-Test comparing the results of each method for each product.

Table 1. Average, Standard Deviation, and T-test for Each Product and Each Method

Product	Method	Average	Standard Deviation	T-test
GMTK	Rapid Moisture Analyzer	9.71	0.69	< 0.05
	Oven	9.30	0.85	
GCEPKJ	Rapid Moisture Analyzer	3.66	0.35	< 0.05
	Oven	3.14	0.49	

Figures 19 and 20 show each product's standard range and average moisture content for both methods. The oven method yields 9.71 on average for GMTK, while the Rapid Moisture Analyzer yields 9.30. The oven method yields 3.66 on average for GCEPKJ, while the Rapid Moisture Analyzer yields 3.14. The average moisture content was all within the standard range, with GMTK using SNI 8217:2015 (Appendix K) and GCEPKJ using SNI 3551:2018 (Appendix L).

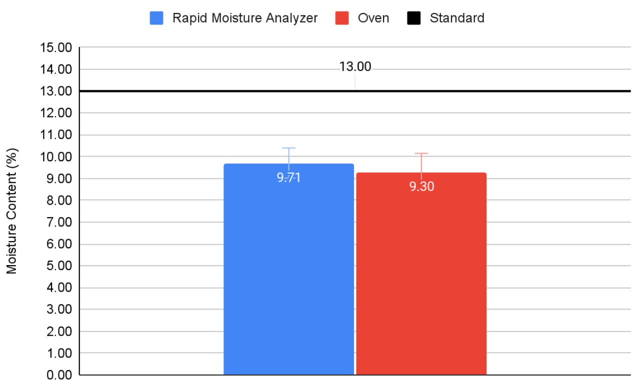


Figure 19. Comparison of Oven Method and Rapid Moisture Analyzer Method for GMTK based on SNI

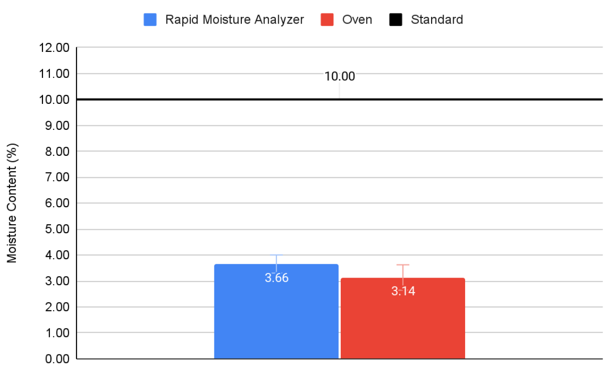


Figure 20. Comparison of Oven Method and Rapid Moisture Analyzer Method for GCEPKJ based on SNI

According to the results, the Rapid Moisture Analyzer method has a lower standard deviation than the oven method (0.69 < 0.85 and 0.35 < 0.49). A lower standard deviation indicates that the data is clustered around the mean. There is also a significant difference between each product's oven and the Rapid Moisture Analyzer methods.

3.3. Discussion

The oven method is commonly used for analysis because it has a simple procedure, can determine the moisture content of large sample volumes, and can simultaneously estimate the moisture content of several samples. However, this method is prone to error since handling and calculation are involved (Arezou et al., 2020). Not to mention that there are two different sets of ovens in PT. Jakarana Tama, which has different calibrations, causes the data to be more spread out.

In the case of a Rapid Moisture Analyzer, measurements are quick, and handling is simple. The Rapid Moisture Analyzer does not necessitate any calculations. As a result, the possibility of errors is reduced, displayed by a lower standard deviation.

The high difference in values could be due to the oven method's difficulty in removing all water, temperature variations in the oven due to position or sample weight variations (Nollet et al., 2009), or the Rapid Moisture Analyzer can evaporate more than just moisture, resulting in higher moisture content results, as demonstrated by the significant difference during the Independent Sample T-Test testing (Arezou et al., 2020).

As previously stated, all the noodles meet the specifications, implying that all potential sources of error were eliminated during the manufacturing process. Mixing, stirring, sheeting, slitting, steaming, cutting, frying or drying, cooling, and packaging steps in producing instant noodles. Water is required during the mixing step to allow the gluten to form. As a result, the amount of water added during the mixing process directly impacts the noodle's moisture content. The more water added, the higher the moisture content of the final instant noodle. Water is used in the steaming process, which makes the noodles prone to high moisture content if the steaming is prolonged.

Higher temperatures and longer times in the frying process have lower moisture content because they have a higher evaporation rate, while longer times allow it to dry even more. As a result, the frying process directly impacts the final moisture content of instant noodles.

3.4. Conclusion and recommendation

The moisture content of GMTK and GCEPKJ samples was determined over a month using the oven method and a Rapid Moisture Analyzer. The two methods differed significantly, with the Rapid Moisture Analyzer having a lower standard deviation for both products. Thus, the result is consistent with the alternative hypothesis, which states that the precision of oven and Rapid Moisture Analyzer methods for GMTK and GCEPKJ are significantly different. As a result, the project's goal of comparing the precision of the oven method and the Rapid Moisture Analyzer method for GMTK and GCEPKJ has been accomplished.

However, the outcome may have flaws because four Rapid Moisture Analyzers and two ovens were used during the research. Because moisture content is essential in the instant noodle quality control field, it is suggested that for future projects, one moisture analyzer and one oven be used in the methodology. Also, the author recommends making duplicates for the analysis. Another research will be finding the oven method's optimal temperature and adequate time. For the time being, the author recommends using rapid moisture analyzers for both GMTK and GCEPKJ because they have a lower standard deviation than the oven method. Based on the statistical analysis (standard deviation), it is proven that the Rapid Moisture Analyzer is more precise compared to the oven method.

IV. SELF-REFLECTION

As I sit here reflecting on the entire internship program, this internship program has been a tremendous journey for me. I was a student during a pandemic, so my laboratory experience is limited. Throughout this internship, I had many experiences with laboratory skills. I remembered the first time I handled a desiccator and how I mishandled it. The lab assistant then demonstrated proper desiccator handling to me.

During the internship program, I have the opportunity to demonstrate my most vital skills. I am a hard worker. Because of this skill, I can complete the task assigned to me by the supervisor quickly. I am also a quick learner, as evidenced by my ability to correct mistakes the next day.

I was having difficulty communicating with the workers, mainly since they usually spoke Javanese and I spoke Indonesian. I remember the first time I barely talk to people during my internship. However, I recall the Bright session, particularly the part about public speaking. This Bright session specifically gave me the confidence to speak with the worker.

It is also worth noting that my i3L laboratory skills aided my internship program. It helped me because it provided theoretical knowledge of chemical analysis. I can explain the theory behind lab analysis, the importance of lab analysis, and what happens if lab analysis is ignored. Although I have no direct impact on the company, I believe this internship report will impact the company, especially given the importance of moisture analysis.

Overall, I had a great time during my internship. I cannot express how grateful I am to the employees of PT. Jakarana Tama. This internship program has taught me valuable new knowledge I can apply in my future career.

V. CONCLUSION & RECOMMENDATION

During the internship, the student learned various skills, including chemical analysis and the preparation of instant noodles. The student received various ideas from various people at the organization and from interacting with other interns from SMK Negeri 1 Temanggung, significantly contributing to the student's knowledge and experience. Finally, the author benefited greatly because the author could put theoretical knowledge from the university into practice through the numerous activities/tasks/assignments assigned to the author.

Regarding company recommendations, facilities such as the air conditioning unit in the laboratory should be repaired. Also, because most of the equipment is old, it is necessary to update it, such as computers. The author also would recommend doing more placements in terms of internship placement since many students can miss the experience if they fail to get placement.

In terms of the university, the university should assist students in securing internship positions related to their respective university programs to make the search for internship placement easier. I3l should also continue with the internship program because it helps prepare students for future careers and allows them to put their theoretical knowledge learned in class into practice. It also aids in the development of students' understanding of work ethics, job demands, responsibilities, and opportunities.

REFERENCES

Arezou, R., Maria, P., & Mehrdad, R. (2020). Assessment of soil moisture content measurement methods: Conventional laboratory oven versus halogen moisture analyzer. *Journal of Soil and Water Science*, *4*(1). https://doi.org/10.36959/624/440

Cole-Palmer. (2021). *Why Is Food Moisture Content Important*. Retrieved October 31, 2022, from https://www.coleparmer.com/tech-article/why-food-moisture-content-is-important

Fredriksson, H., Silverio, J., Andersson, R., Eliasson, A.-C., & Åman, P. (1998). The influence of amylose and amylopectin characteristics on gelatinization and retrogradation properties of different starches. *Carbohydrate Polymers*, *35*(3-4), 119–134. https://doi.org/10.1016/s0144-8617(97)00247-6

Gemini BV. (2019). *Memmert U40 Oven*. Gemini BV. Retrieved December 18, 2022, from https://www.geminibv.com/labware/memmert-u40-oven-2/

getMedOnline. (n.d.). *Radwag balances and Scales*. getMedOnline.com - Online Medical and Laboratory Product Supplier. Retrieved December 18, 2022, from https://www.getmedonline.com/radwag-balances-and-scales.html

Gulia, N., Dhaka, V., & Khatkar, B. S. (2014). Instant noodles: Processing, quality, and nutritional aspects. *Critical Reviews in Food Science and Nutrition*, *54*(10), 1386–1399. https://doi.org/10.1080/10408398.2011.638227

ittterself. (n.d.). *Jual Terbaik Gaga 100 mie goreng kuah extra pedas habanero di lapak ittterself*. Bukalapak. Retrieved December 18, 2022, from https://www.bukalapak.com/p/food/makanan/2l8jml7-jual-terbaik-gaga-100-mie-goreng-kuah-extra-pedas-habanero

Nollet, L. M. L., Toldrá F., & Park, Y. W. (2009). Moisture and Water Activity. In *Handbook of Processed Meats and Poultry Analysis* (pp. 35–67). CRC Press.

OneStop Laboratory. (n.d.). *Jual Memmert UF55 oven lab 53 L UF 55 universal oven drying oven di Lapak OneStop Laboratory*. Bukalapak. Retrieved December 18, 2022, from https://www.bukalapak.com/p/industrial/peralatan-medis-laboratori/f9f9uv-jual-memmert-uf55-oven-lab-53-l-uf-55-universal-oven-drying-oven

Oswaldo, I. G. (2022). *5 Pengusaha Mi Instan Terkaya di RI, Ada yang Hartanya Tembus Rp 126 T.* detikfinance. Retrieved October 12, 2022, from https://finance.detik.com/berita-ekonomi-bisnis/d-6226633/5-pengusaha-mi-instan-terkaya-di-ri-ada-yang-hartanya-tembus-rp-126-t

Purcell, S. (2017). Duo-trio. *Discrimination Testing in Sensory Science*, 197–207. https://doi.org/10.1016/b978-0-08-101009-9.00010-1

PT. Jakarana Tama. (n.d.-a). *Company profile*. GAGAFOOD. Retrieved October 12, 2022, from https://gagafood.co.id/company-profile/

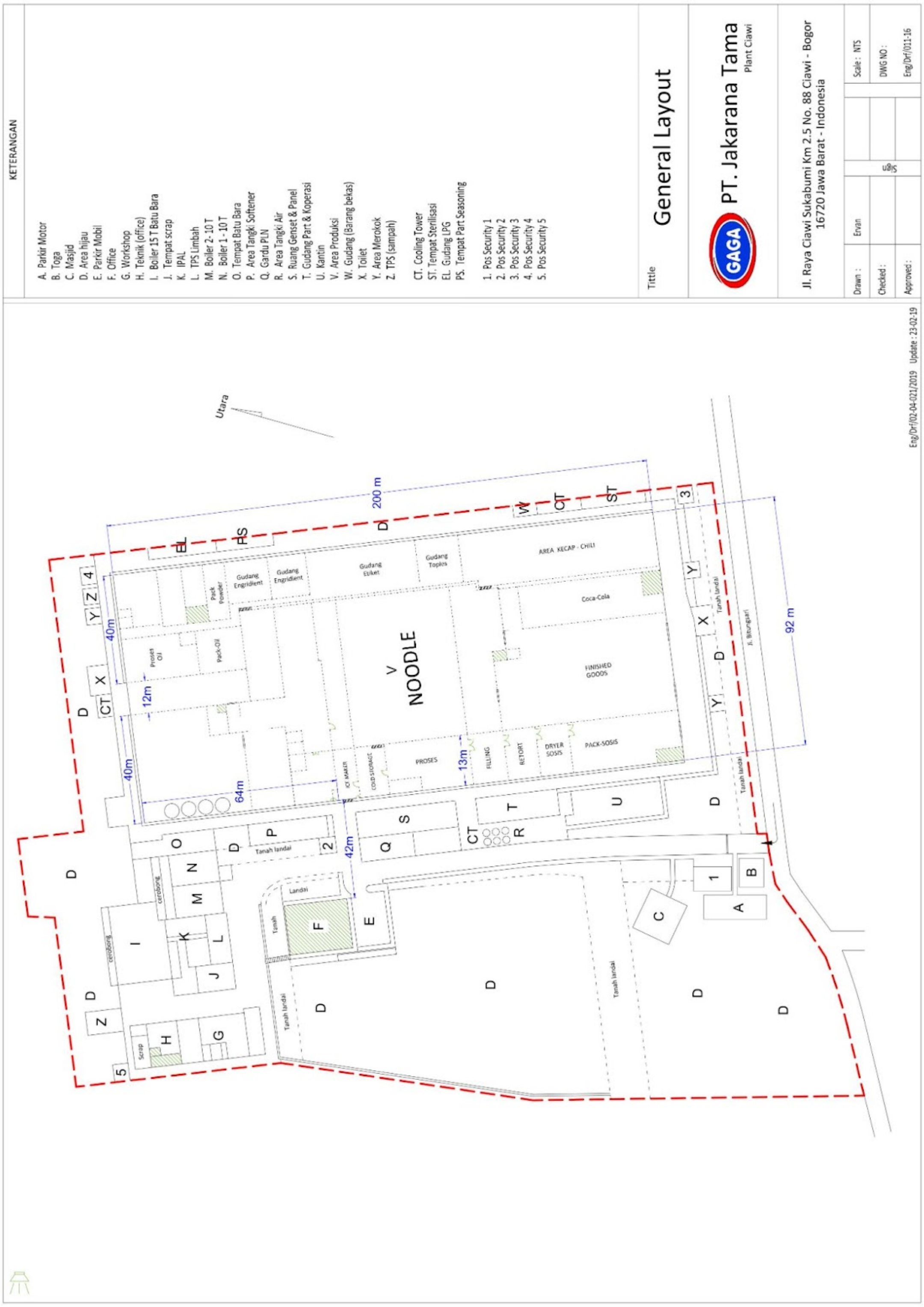
PT. Jakarana Tama. (n.d.-b). *Products*. GAGAFOOD. Retrieved October 19, 2022, from https://gagafood.co.id/products/

Radwag. (n.d.). *Ma 50/1.R moisture analyzer*. Radwag Balances and Scales. Retrieved December 18, 2022, from https://radwag.com/en/ma-50-1-r-moisture-analyzer,w1,FDP,101-103-108-103

rifsta. (n.d.). *Mie korea Arirang All variant*. Shopee. Retrieved December 18, 2022, from https://shopee.co.id/Mie-korea-Arirang-All-variant-i.80668057.1481990884

Sigma-Aldrich. (n.d.). *Kern MLB 50-3 moisture analyzer*. Sigma-Aldrich. Retrieved December 18, 2022, from https://www.sigmaaldrich.com/ID/en/product/sigma/z663115

APPENDICES



Appendix A. Factory Layout of PT. Jakarana Tama

Appendix B. GAGA Mie Gepeng Variants. Obtained from (PT. Jakarana Tama, b)

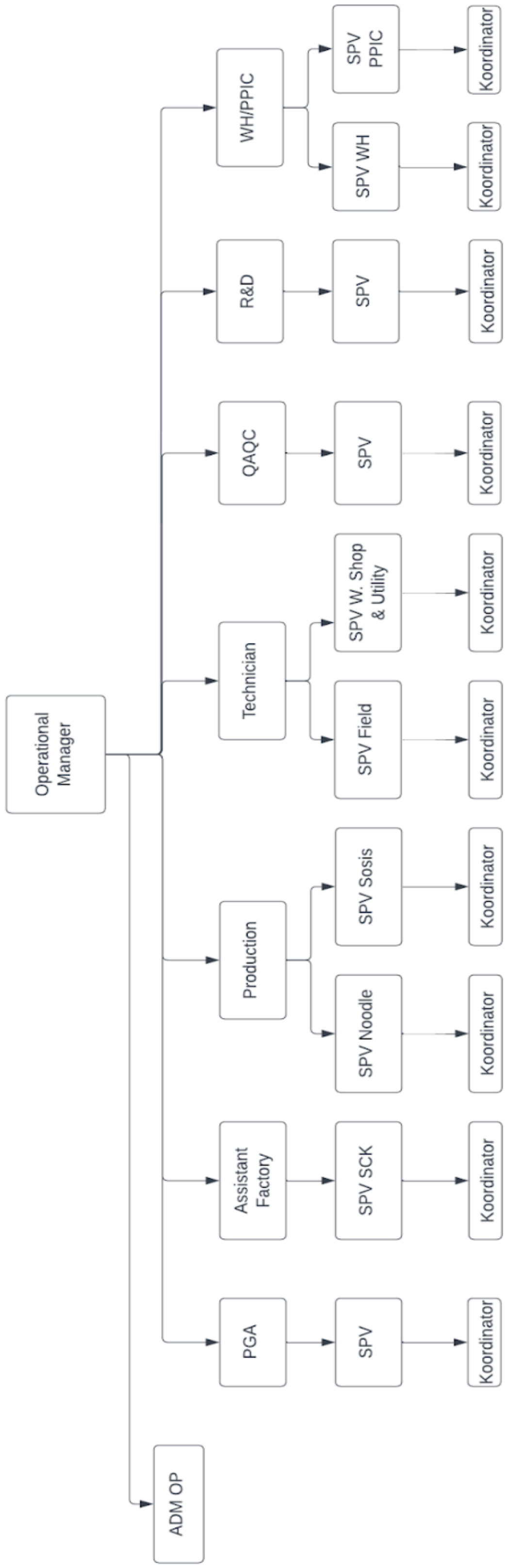
Appendix C. GAGA Mie Aussie Variants. Obtained from (PT. Jakarana Tama, b)

Appendix D. GAGA 1000 Variants. Obtained from (PT. Jakarana Tama, b)

Appendix E. GAGA Bakmi. Obtained from (PT. Jakarana Tama, b)

Appendix F. Arirang Taste Series. Obtained from (rifsta)

Appendix G. Gaga 100 Cup Series. Obtained from (PT. Jakarana Tama, b)



Appendix H. Organizational Structure of PT. Jakarana Tama

Date	Batch	Moisture Analyzer	Oven
2/9	1	8.63	7.33
	1	8.73	7.84
	2	8.27	6.60
	2	10.26	10.79
	3	8.98	8.63
	3	8.02	7.80
5/9	1	10.10	9.76
	1	10.52	10.04
	2	10.16	9.39
	2	9.32	9.72
	3	10.47	10.04
	3	10.04	9.68
6/9	1	9.86	9.52
	1	10.11	9.76
	2	9.65	9.22
	2	10.31	9.39
	3	9.42	9.01
	3	10.07	9.56
7/9	1	9.37	9.21
	1	9.86	9.47
	2	10.03	9.76
	2	10.41	10.04
	3	9.79	9.11
	3	9.20	9.21
9/9	1	9.24	8.74
	1	10.50	10.09
	2	10.36	9.64
	2	10.52	9.91
	3	9.60	9.13
	3	9.99	9.83
19/9	1	10.40	9.63

	1	9.45	9.11
	2	10.47	9.81
	2	8.26	8.21
	3	9.67	9.45
	3	9.40	10.25
Average		9.71	9.30
STD		0.69	0.85

Appendix I. Data for GMTK

Date	Batch	Moisture Analyzer	Oven
3/8	1	4.12	2.60
	2	3.61	2.07
	3	3.40	3.69
9/8	1	3.92	2.67
	2	4.01	3.37
	3	3.84	4.02
10/8	1	3.86	3.18
	2	3.50	3.51
	3	3.84	3.04
12/8	1	3.20	2.50
	2	3.92	3.24
	3	3.74	4.34
18/8	1	3.03	3.29
	2	3.40	2.51
	3	3.60	3.48
19/8	1	3.60	2.83
	2	2.87	2.70
	3	3.63	2.93
20/8	1	3.91	3.45
	2	3.94	3.15
	3	3.80	3.40
22/8	1	3.11	2.47
	2	4.00	3.43
	3	3.54	3.17
24/8	1	3.82	2.64
	2	3.48	2.65
	3	4.21	3.01
26/8	1	3.66	3.05
	2	3.90	3.48
	3	3.48	3.04
30/8	1	3.91	3.78

	2	3.32	4.31
	3	3.78	3.25
5/9	1	3.50	2.65
	2	4.20	3.40
	3	3.90	3.05
6/9	1	4.07	2.89
	2	3.00	3.28
	3	3.00	2.84
Average		3.66	3.14
STD		0.35	0.49

Appendix J. Data for GCEPKJ

No.	Kriteria uji	Satuan	Persyaratan	
			Digoreng	Dikeringkan
1	Keadaan			
1.1	Bau	-	normal	normal
1.2	Rasa	-	normal	normal
1.3	Warna	-	normal	normal
1.4	Tekstur	-	normal	normal
2	Kadar air	fraksi massa,%	maks. 8	maks. 13
3	Kadar protein (N x 6,25)	fraksi massa,%	min. 8	min. 10
4	Bilangan asam	mg KOH/g minyak	maks. 2	-
5	Kadar abu tidak larut dalam asam	fraksi massa,%	maks. 0,1	maks. 0,1
6	Cemaran logam			
6.1	Timbal (Pb)	mg/kg	maks. 1,0	maks. 1,0
6.2	Kadmium (Cd)	mg/kg	maks. 0,2	maks. 0,2
6.3	Timah (Sn)	mg/kg	maks. 40,0	maks. 40,0
6.4	Merkuri (Hg)	mg/kg	maks. 0,05	maks. 0,05

Appendix K. SNI 8217:2015

No	Kriteria uji	Satuan	Persyaratan
1	Keadaan[1]		
1.1	Bau	-	normal
1.2	Rasa	-	normal
1.3	Warna	-	normal
1.4	Tekstur	-	normal
1.5	Benda asing [1]	-	tidak ada
1.6	Keutuhan [2]	fraksi massa, %	min. 90
2	Kadar air [2]		
2.1	Pengeringan dengan penggorengan	fraksi massa, %	maks. 10
2.2	Pengeringan cara lainnya	fraksi massa, %	maks. 14
3	Kadar protein (N x 5,7)[2]	fraksi massa, %	min.6,0
4	Bilangan asam [2] [3]	mg KOH / g minyak	maks. 2
5	Cemaran logam berat[1]		
5.1	Kadmium (Cd)	mg/kg	maks. 0,05
5.2	Timbal (Pb)	mg/kg	maks. 0,25
5.3	Timah (Sn)	mg/kg	maks. 40
5.4	Merkuri (Hg)	mg/kg	maks. 0,03
6	Cemaran arsen (As) [1]	mg/kg	maks 0,10
7	Deoksinivalenol [2] [4]	µg/kg	maks. 750
8	Okratoksin A [2] [4]	µg/kg	maks. 3
9	Kriteria mikrobiologi		lihat Tabel 2

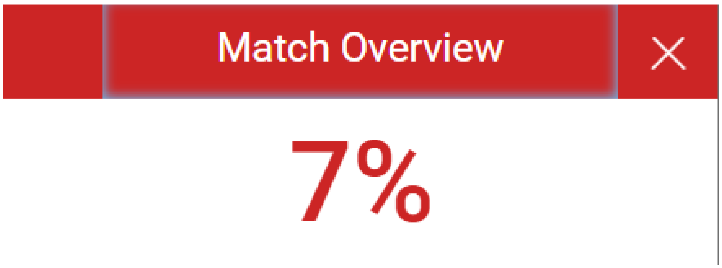
CATATAN
[1] Berlaku untuk keping mi dan bumbu
[2] Berlaku untuk keping mi
[3] Berlaku untuk keping mi dengan proses penggorengan
[4] Untuk Deoksinivalenol dan Okratoksin A diuji hanya pada saat sertifikasi dan sertifikasi ulang

Appendix L. SNI 3551:2018

Appendix M. The Author Working at PT. Jakarana Tama

Appendix N. The Author with Interns and Workers

Appendix O. The Authors with the Peer, Supervisor, and HRD



Appendix P. Turnitin Plagiarism Check Result