INTERNSHIP REPORT

OPTIMIZATION OF KOMBUCHA PRODUCTION FLOW AND HYGIENITY, RESEARCH ON SCALING-UP PRODUCTION, AND STABILIZING KOMBUCHA

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ABSTRACT

This internship program at PT Ramuraga Tirta Lestari aimed to optimize and improve various aspects of kombucha production, including food safety, data organization, and production efficiency. The intern worked on several projects to achieve this goal, such as calibrating pH meters to ensure accurate measurement of acidity levels in kombucha, sterilizing bottles to prevent contamination and maintain product quality, and implementing hygiene protocols in line with PIRT guidelines to increase food safety. The intern also focused on improving data organization by creating batch production sheets, which allows for better tracking and traceability of products, and implementing a system to increase the efficiency of the production process.

Scaling up production was another major area of focus for the intern, where they suggested the use of larger tanks in production to minimize labor tasks and increase efficiency. The intern also carried out several R&D projects before integrating new methods or technologies into the production flow at Ramuraga Kombucha, such as testing the use of a larger 60L tank for production, researching and potentially incorporating new equipment or technology from the SS-Brewtech catalog to improve production processes and worked on trying to stabilize kombucha by reducing yeast through filtering with a micron filter. This is an important aspect of kombucha production as it can help to improve product consistency, taste and prolong shelf life.

Overall, this internship provided a valuable learning experience for the intern and provided PT Ramuraga Tirta Lestari with several recommendations for improving their kombucha production process. The intern's knowledge of food science and nutrition, as well as their work on various projects, contributed to a successful internship experience and helped the company to achieve a more efficient and optimized production process. It is recommended that PT Ramuraga Tirta Lestari continue to accept interns interested in learning about kombucha and fermentation, to gain a better understanding of the production process and how to optimize it.

Keywords : *Kombucha, Yeast Stabilization, Filtration, Production, Hygiene, Data Organization, Halal Certification*

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Last but not least, I am very thankful to all of my friends that keep me sane during these semesters.

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I. INTRODUCTION

1.1. Brief History of the Company

Ramuraga Kombucha is a Start-Up Beverages based company located in Jakarta Selatan, Provinsi DKI Jakarta. Ramuraga started operating in 2020 in the owner's house full of innovation and entrepreneurship skills that have just been learned by the owner, Ivy Londa, who now is the CEO and Managing Director of PT Ramuraga Tirta Lestari. Moving from a home-based factory, Ramuraga now moved to Madrasah Raya Street in Kemang in 2021 and has its own office. Ramuraga Kombucha then started to become legal or incorporated in 2022 with the name of PT. Ramuraga Tirta Lestari, and continues to specialize in fermented tea or is known as Kombucha.

Specialized or main product of PT. Ramuraga Tirta Lestari, is kombucha with addition of fresh fruit, dry flowers, and spices which give an alternative choice in beverages which gives fresh fullness, increase or improve gut health, and also improve the sensitivity of our taste buds.

Ramuraga can grow in many aspects during the midst of a pandemic. Noticeable growth includes team numbers, revenue, and also customers. Ramuraga i ntends to run a healthy and nature responsible business with aspects of sustainability, continuity, empathy, and innovation.

In the meantime, Ramuraga are looking up to the next growth, which includes addition of team members including interns, scaling up the production, and also accompanied with more explorative marketing strategy.

Products of ramuraga are mainly and specified to Kombucha, which is made using a combination of premium black tea and oolong tea. Traditionally brewed in small batches, and fermented around 7-12 days. Kombucha is then flavored with 100% Natural fruits, herbs, and flowers without any preservatives.

1.2. Vision and mission

PT. Ramuraga Tirta Lestari has a vision to become the leader in the market, product and role model of value-based entrepreneurship in (food and) beverage industry. To be one of the biggest beverages companies that keeps making continuous improvement and a good quality of products.

PT. Ramuraga Tirta Lestari also has a mission to disrupt the circular business model for RTD/beverage industry, while also in mission to become the role model in value based entrepreneurship and to decode and formalize the code of conduct in value based operation.

1.3. Organizational Structure

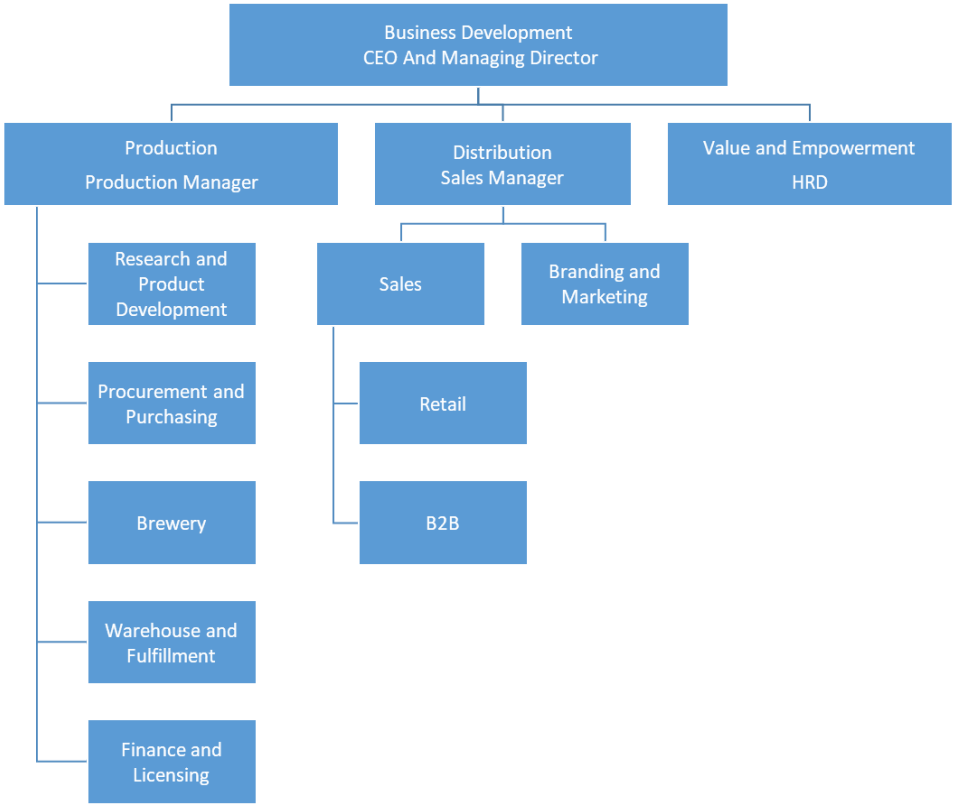


Figure 1.1. Organizational Structure of PT. Ramuraga Tirta Lestari

PT. Ramuraga Tirta Lestari is led by a CEO which also is a Managing Director. The Managing Director is in charge of 3 departments, which are Distribution, Value and Empowerment, and Production.

Distribution departments are responsible for the Sales, branding, and marketing which is led by a Sales Manager. They managed selling products in both retail and B2B, and also in charge of branding and marketing.

The Value and Empowerment department/HRD are in charge of managing recruitment and also the wealth and mental health of every department in PT. Ramuraga Tirta Lestari. This department also encourages and gives positive energy to all of the members of PT. Ramuraga Tirta Lestari by managing an event, giving consultation sessions, and also giving encouraging messages to all of the staff.

Last department is Production. It is led by the Production Manager, and the department is responsible for all of the production, procurement and purchasing materials, collecting and fermenting the kombucha, and also being responsible for all of the equipment and storing. R&D departments are also placed under this department.

1.4. Department Placement

The internship program took place in the R&D department and also the Production department. This department is the sub-department under the production department. There was no R&D department before I was accepted, usually R&D are held by the owner, who is the CEO and Managing DIrector at the first time of Ramuraga. However, Due to limited time, the R&D have not been continued due to business from other departments, since PT Ramuraga Tirta Lestari just started recruiting all of the other department members, for Sales and Marketing.

The R&D department here is made to be responsible for developing and improving the methods in production, packaging, and the product itself. PT. Ramuraga TIrta Lestari is starting to scale up, so the R&D Department will be responsible to make sure that the production can keep up with the sales department.

II. INTERNSHIP ACTIVITIES

2.1. Internship Working Conditions

The internship was carried out in the both RnD and Production department starting from 15th of November until 30th of January. The first week of the internship was an orientation week, exploring the company and its different departments from the Production department, distribution department, and value and empowerment department. The person in charge of each department took turns to explain a brief description of each department, what kind of job each department did. In this chance, I mostly focused on observing the production flow in detail while also involved in the production flow helping the production team.

The schedule for the internship was from Monday to Friday, Hybrid of WFH and WFO. While in office, from 8.30 AM to 4 PM helping the production team, while learning the production flow, and taking note for optimization or doing RnD for projects. There was a lunch break everyday from 12 PM to 12.30 PM. In addition to that, I was also asked or tasked to do desk work in home or WFH, like literature review, finding optimum equipment or methods for it to be implemented by the company and also help in preparing documents for PIRT and Halal Certification.

2.2. Internship Task and Experiences

The initial task for this internship was to help the company in productions and help in terms of applying technologies and also optimizing flows that have been conducted in the company. There are no specific projects given since there are no direct supervisors for the RnD department. In addition to that, companies have also started scaling up, they started to make teams for marketing and sales teams, in order to further push the production of Kombucha, finding equipment and making a new production flow that can optimize the production is also one of my tasks on this internship.

After every several weeks, the company has meetings for production which will be discussed in further chapters, and have been listening to their problems. In the first month of internship, the tasks involve literature review, including obtaining as much information regarding stabilizing the kombucha and finding things that can be optimized especially during the production flow while also helping the production. In addition to that, I also get to taste each of their variants/flavors.

During a 2-month internship at Ramuraga Kombucha, I assisted in production and worked on a variety of small projects. These projects were divided into three categories: optimization, R&D, and certificate application. The goal of optimization was to improve existing methods or processes within the company, which will be discussed further in this chapter. Second is R&D projects focused on integrating new techniques or technologies into the production flow of Ramuraga Kombucha, which will be explained in chapter III. Lastly, I assisted in the application process for certifications such as PIRT and Halal by creating necessary documents and other materials to be submitted to relevant government or institutional bodies.

In terms of optimization, the objectives included improving all aspects of kombucha production. One specific area of focus was food safety, specifically in regards to pH meter calibration and sterilization methods. It was determined that the 2 pH meters in use at Ramuraga Kombucha were producing different results. To address this, I calibrated the pH meters using buffer solutions of known pH values and established a standard operating procedure (SOP) for regular calibration. Accurate pH measurements are crucial for ensuring product quality and meeting regulatory requirements. In addition, I suggested utilizing boiling or the use of vinegar or alcohol for sterilizing bottles used in kombucha brewing to prevent contamination. Hygiene was another area identified for improvement, particularly in terms of PIRT guidelines. I implemented measures such as the use of food-grade gloves, head caps, masks, and head shields, as well as the creation of a sterile production space to be accessed only while wearing the appropriate equipment or uniforms. All of these suggestions are based from PIRT guidelines, and other things that are included from PIRT guidelines seem already present. Furthermore, I proposed the use of a batching system and the creation of production sheets using Gsheets to increase traceability and standardization of products based on the new pH calibration data.

Another production optimization suggestion was the acquisition of larger tanks to decrease the labor-intensive nature of certain tasks. The company ultimately purchased a 60L tank for testing in R&D. Additionally, I researched equipment options from the SS-Brewtech catalog to potentially improve efficiency in other areas of production.

I was also tasked to help both Halal and PIRT Certification. I help in preparing documents for applying. One of the documents that the company asks me to make is the kitchen map and production flow which I make according to the current condition and current production flow in the company.

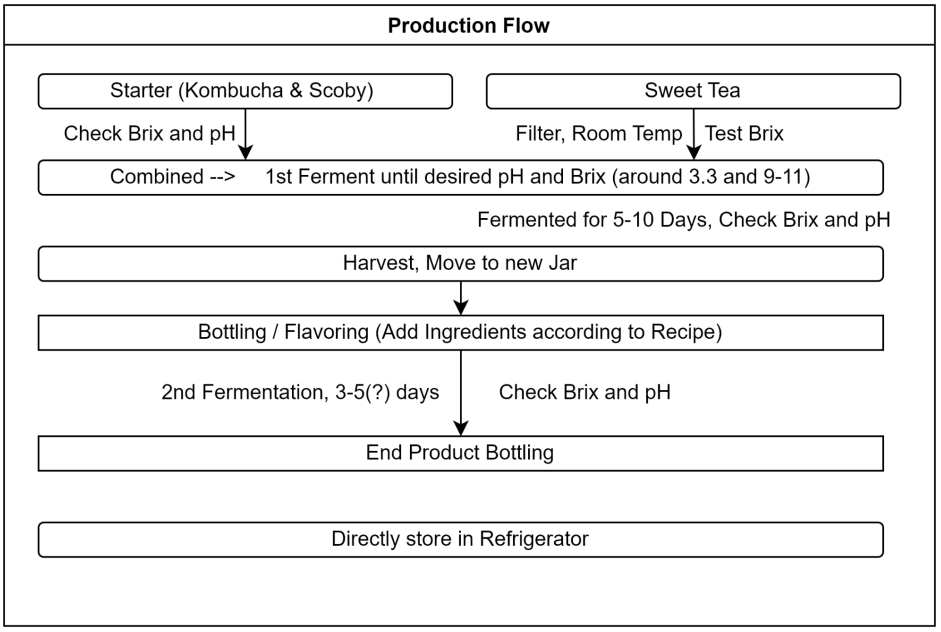


Figure 2.2 Production Flow in Ramuraga Kombucha

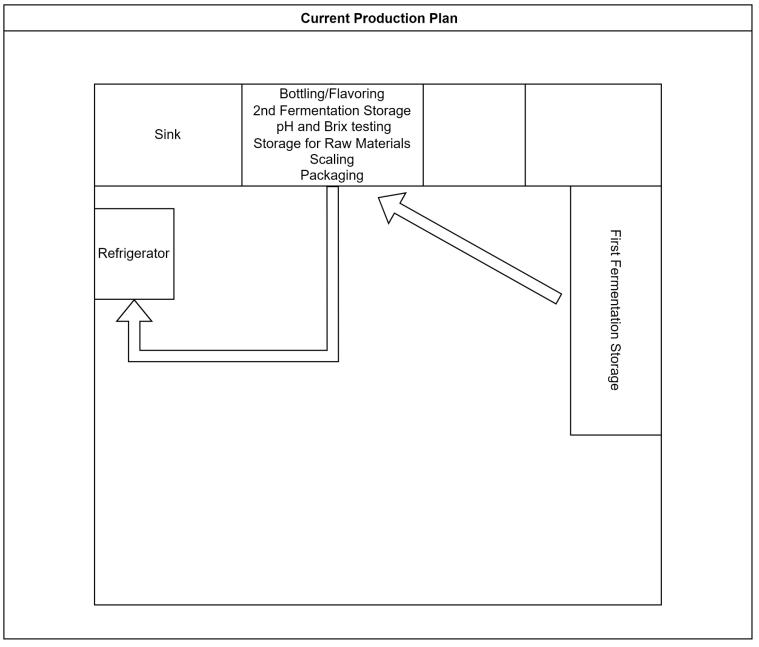


Figure 2.1 Kitchen Map in Ramuraga Kombucha

2.3. Challenges During Internship

The biggest challenge faced during this internship is that there were no people specialized in the food science or food technology field. Almost everyone in PT Ramuraga Tirta Lestari, is doing double jobs and not specialized in the food field, some of them have no time for research on their own. As has been stated, there is no one specialized in the RnD department, all of the work should be done independently, from collecting all of the information, even some of the projects/ideas also comes from my ideas when observing the company. Nonetheless, after doing literature review, the problems faced were able to be solved one at a time.

Projects and things that should be done often come from me independently as an Intern. First, I will propose the idea by presenting it to the owner and the main team. After the meeting, and the proposal is accepted, I will be starting on listing the items or equipment needed to hold the project, propose it to the production manager, and then the items will be purchased. Purchasement took about 1 week until all of the equipment arrived and after all of the equipment arrived, I am starting to work on the projects.

One of the projects given is to stabilize the Kombucha, which has many aspects that should be concerned, such keeping the method inline with the company beliefs and to keep the benefits of kombucha as optimized as possible, such as keeping the bacteria alive, and avoid using any kind of chemicals.

III. Projects

3.1 Literature Review

3.1.1 Kombucha

Kombucha is a fermented beverage made by using a symbiotic culture of bacteria and yeast (SCOBY) also known as "tea fungus" to ferment sugar dissolved black tea. The resulting beverage has a sweet sparkling apple cider taste when freshly prepared, but if fermented for a longer period, it develops a vinegar-like acidic flavor. The main bacterial strains found in traditional SCOBY are *Acetobacter xylinoides, Komagataeibacter xylinus, Gluconacetobacter xylinus, Acetobacter aceti,* and *Acetobacter pasteurianus*. Yeasts such as *Schizosaccharomyces pombe, Saccharomycodes ludwigii, Kloeckera apiculata, Saccharomyces cerevisiae, Torulaspora, Zygosaccharomyces bailii, Brettanomyces bruxellensis, Brettanomyces lambicus, Brettanomyces custersii, Candida, and Pichia* species have been reported (Dutta & Paul, 2019). The mixture is fermented for 7-14 days at room temperature, depending on desired flavor and carbonation (Dutta & Paul, 2019). Kombucha has a long history of consumption in parts of Asia and eastern Europe, and has recently gained popularity as a health drink in Western countries (Jayabalan, Malbaša, & Sathishkumar, 2016). While the health benefits of drinking kombucha are still under scientific research, studies suggest it may improve digestion, boost energy, and support the immune system (Bishop, Pitts, Budner, & Thompson-Witrick, 2022).

3.1.2 Fermentation

According to Nout (2014), fermentation is the utilization of microorganisms to create desirable characteristics in fermented foods and beverages. The term "fermentation" generally refers to anaerobic metabolism, but it can also encompass all types of anaerobic and aerobic microbiological and biochemical changes that lead to positive changes in the quality of food and beverage ingredients (Nout, 2014). The fermentation process is a part of the manufacturing process, which includes multiple operations that impact microbial activity (Nout, 2014). The variety of food fermentations includes not only typical anaerobic events such as lactic acid fermentation, alcoholic fermentation, and brine maturations, but also aerobic processes like alkaline fermentation and fungal fermentation (Nout, 2014). During these fermentations, various antimicrobial metabolites like organic acids, alcohols, and bacteriocins may be produced, which can increase food safety by inhibiting or killing foodborne pathogens (Nout, 2014). However, it is also possible for harmful metabolites like biogenic amines and ethyl carbamate to accumulate and for certain pathogenic microorganisms to survive or grow in fermented foods (Nout, 2014)

Factors affecting fermentation in general are aeration, temperature, pH, substrate type and concentration, and fermentation time. Aeration is an important component that affects the fermentation process of many components, as high aeration causes a decrease in the final ethanol yield of yeast (Mengesha, Tebeje, & Tilahun, 2022). Main purpose of aeration is to supply oxygen and also release carbon dioxide at the same time, as stated there are fermentation that needs oxygen and does not want oxygen depending on what is targeted (Yoshida, 1982).

Temperature is an important factor for microbial growth; all microbes have a certain optimum range in which they can grow (Mengesha, Tebeje, & Tilahun, 2022). It is even possible that a higher or lower temperature has an important coeffect with some of the other factors involved (Mengesha, Tebeje, & Tilahun, 2022). Temperature also can interfere with other things, such as change of transport activity, saturation level, or accumulated toxins (Mengesha, Tebeje, & Tilahun, 2022).

The optimum temperature range for yeasts is 20-30°C (Mengesha, Tebeje, & Tilahun, 2022). Most lactic acid bacteria thrive at temperatures between 18-22°C, whereas Lactobacillus species thrive at temperatures above 22°C (Mengesha, Tebeje, & Tilahun, 2022).

pH is a component that could affect cell development or growth due to resistance (Mengesha, Tebeje, & Tilahun, 2022). Just like temperature, Microorganisms have their own comfortable/optimal pH level where they have maximum growth (Mengesha, Tebeje, & Tilahun, 2022).

Substrate concentration also can affect the fermentation pattern (Mengesha, Tebeje, & Tilahun, 2022). Assefa's Study (2018) stated that fermentation patterns are highly affected by the amount of substrates, which can vary fermentation time and results (Mengesha, Tebeje, & Tilahun, 2022). However, after products reach a certain concentration, it may reduce the growth rate (Mengesha, Tebeje, & Tilahun, 2022).

During the fermentation process in kombucha, the bacteria and yeast consume the sugar in the tea, producing a variety of organic acids, vitamins, and other beneficial compounds (Bishop, Pitts, Budner, & Thompson-Witrick, 2022). This gives a unique taste, and slight carbonation. The finished product is a lightly effervescent, slightly sour, and mildly sweet drink that contains a small amount of alcohol (usually less than 0.5%) (Bishop, Pitts, Budner, & Thompson-Witrick, 2022). The most commonly found bacteria in kombucha include *Acetobacter* and *Lactobacillus* (Bishop, Pitts, Budner, & Thompson-Witrick, 2022). *Acetobacter* species are known to form the cellulosic network that serves as the physical base for the symbiosis development (Dutta & Paul, 2019). During the fermentation process, the combined action of yeast and bacterial species results in the formation of ethanol and acids, which act as natural

preservatives and contribute to the beverage's long shelf-life (Dutta & Paul, 2019). Additionally, a number of other bioactive components are formed during the fermentation process, which contribute to the nutraceutical value of the drink (Dutta & Paul, 2019). Kombucha is traditionally believed to have antibiotic properties, improve gastrointestinal and glandular functions, relieve joint rheumatism, have positive effects on cholesterol, detoxify the blood, and address aging problems (Dutta & Paul, 2019). Research on the composition of tea and its health-promoting factors has been conducted extensively in the late 20th and 21st centuries and the microbial composition is still studied until this very time (Dutta & Paul, 2019).

3.1.2.1 Acetobacter

Acetobacter is a type of bacteria that converts alcohol into acetic acid, giving kombucha its characteristic sour flavor (Bishop, Pitts, Budner, & Thompson-Witrick, 2022) . *Acetobacter* is a genus of gram-negative, aerobic bacteria that belong to the acetic acid bacteria group (Hommel, 2014). They are rod-shaped (bacillus) microorganisms that typically range in size from 0.5 to 1.0 micrometers in width and 1.5 to 5.0 micrometers in length (Hommel, 2014). They can vary in size, shape and number depending on the environment (Hommel, 2014).

3.1.2.2 Lactobacillus

Lactobacillus is a genus of gram-positive, rod-shaped (bacillus) bacteria that belongs to the lactic acid bacteria group (Batt, 2014). They ferment sugar to lactic acid and they are usually between 0.5 to 1.0 micrometers in width and between 2 to 10 micrometers in length. Some species within the genus can be slightly larger or smaller than this range (Batt, 2014). It is important to note that *Lactobacillus* is a genus that includes over 180 different species, each one of them can have variations in size, shape, metabolism and ecology (Batt, 2014). Some species are known to play important roles in fermented food and beverages, while others may be considered contaminants (Batt, 2014).

3.2.3 Yeast/Saccharomyces

Saccharomyces is a genus of fungi, also known as yeasts, that are commonly used in the production of fermented foods and beverages, including kombucha (Sá-Correia, Guerreiro, Loureiro-Dias, Leão, & Côrte-Real, 2014). They are unicellular, eukaryotic microorganisms that can ferment sugars into alcohol and carbon dioxide (Sá-Correia, Guerreiro, Loureiro-Dias, Leão, & Côrte-Real, 2014). Yeasts play a crucial role in fermentation, they are responsible for the carbonation and alcohol levels in kombucha. *Saccharomyces cerevisiae* is the most common yeast used in kombucha brewing, it is a type of yeast that is used to ferment beer and wine, and is considered a "top-fermenting" yeast because it ferments at the surface (Sá-Correia, Guerreiro,

Loureiro-Dias, Leão, & Côrte-Real, 2014). Another common yeast used in kombucha brewing is *Saccharomyces boulardii*, a non-pathogenic yeast that is known for its probiotic properties (Sá-Correia, Guerreiro, Loureiro-Dias, Leão, & Côrte-Real, 2014). *Saccharomyces* yeasts are typically between 3-5 micrometers in diameter and can be spherical or oval in shape (Sá-Correia, Guerreiro, Loureiro-Dias, Leão, & Côrte-Real, 2014).

3.1.2.4 Fermentation factor

Fermentation factors play a role in producing a consistent flavor and carbonation level in the finished product (Dutta & Paul, 2019). Techniques such as temperature control, monitoring pH levels, using a consistent ratio of tea and sugar, fermentation time, and secondary fermentation can be used to stabilize the fermentation process (Dutta & Paul, 2019).

Temperature control helps ensure that the fermentation process proceeds at a steady rate and produces a consistent flavor (Dutta & Paul, 2019). A temperature range between 68-85F (20-30C) or room temperature is ideal for fermentation (Dutta & Paul, 2019).

Monitoring pH levels help ensure that the fermentation process is not over-fermenting, which can lead to a sour or vinegary taste (Dutta & Paul, 2019). The target pH range is usually between 2.5-3.5, ideally under 3.0 (Dutta & Paul, 2019).

Consistent Tea and sugar ratio help ensure that the fermentation process proceeds at a steady rate and produces a consistent flavor (Dutta & Paul, 2019). Different ratios of sugar and tea can affect the taste of the end product of the kombucha and also the fermentation speed (Dutta & Paul, 2019).

For a consistent carbonation level and flavor, it is important to ferment for a consistent amount of time (Dutta & Paul, 2019). You can start taste testing around day 7, and the final product should be ready to consume between day 10-14 (Dutta & Paul, 2019). Secondary fermentation is the one responsible to improve the carbonation level of the final product by the anaerobic fermentation of yeast which produce Carbon Dioxide and Alcohol (Dutta & Paul, 2019).

3.1.2.5 Stabilize kombucha / Stop further carbonation

Yeast is a crucial component in the carbonation process of kombucha (Dutta & Paul, 2019). However, reducing the amount of yeast can also help to lower the level of carbonation. It 's important to note that too little yeast can also inhibit fermentation (Sá-Correia, Guerreiro, Loureiro-Dias, Leão, & Côrte-Real, 2014).

There are several methods to prevent carbonation in kombucha, such as slowing down yeast activity or eliminating the yeast altogether. One method to slow down yeast activity is to refrigerate the kombucha after fermentation is finished to remove excessive carbonation(Dutta & Paul, 2019). Reducing the amount of sugar used in the kombucha recipe can also limit the

amount of carbon dioxide produced (Dutta & Paul, 2019). This is because sugar is the main food source for yeast and affects its activity and growth (Dutta & Paul, 2019).

Eliminating yeast are other method to eliminate excessive carbonation, this can be done by using antifungals such as nystatin or fluconazole (Sá-Correia, Guerreiro, Loureiro-Dias, Leão, & Côrte-Real, 2014), or by adding natural remedies such as lemon juice or apple cider vinegar, which can lower the pH of the kombucha and inhibit yeast growth (Dutta & Paul, 2019).

High temperature pasteurization, which involves heating the kombucha to a high temperature for a few minutes, can also kill yeast and other microorganisms. However, this method can also change the taste and nutritional value of the final product and kill beneficial bacteria (Sá-Correia, Guerreiro, Loureiro-Dias, Leão, & Côrte-Real, 2014). Filtration can also be used to eliminate yeast, but this can also remove some of the beneficial bacteria and make the kombucha less effervescent (Dutta & Paul, 2019).

3.2 RnD

Research and Development (R&D) projects are focused on testing and evaluating new techniques or technologies before integrating them into the production flow of Ramuraga Kombucha. These projects may originate from requests made by the company's owner or from suggestions made by the intern.

One specific area of focus for R&D projects is delivering issues related to secondary fermentation that can occur after products are delivered to buyers. These problems may include broken glass, broken bottle caps, or bursting due to excessive carbonation. These issues often occur as a result of the inability to control or slow down secondary fermentation during delivery or transportation, particularly when products are stored outside of refrigerated conditions.

To address these issues, R&D projects have been proposed such as canning and stabilizing methods. Canning is the process of preserving food by sealing it in an airtight container, while stabilizing is the process of preventing or slowing down secondary fermentation.

Additionally, R&D projects also include testing the use of larger tanks in production, as well as evaluating cost and time optimization methods to improve efficiency within the company. These projects are crucial in ensuring the quality and safety of the final products, as well as meeting the expectations of buyers.

3.2.1 Canning Packaging

The idea of canning the product was proposed by the owner of Ramuraga Kombucha. The owner instructed the intern to investigate a canning facility in Cipete, specifically Gory’s Canning, to determine whether it uses heating or pressuring methods and to evaluate the resulting flavor, carbonation, pH, and durability of the canned product.

Upon investigation, it was discovered that Gory’s Canning primarily focuses on repackaging rather than heating or pressuring the kombucha. The cost of the canning process was found to be Rp. 7000,00 per can. The intern proceeded to test the canned kombucha product and found that there were no significant changes in flavor, carbonation, and safety. In terms of carbonation, the intern left the can in room temperature for 3, 5, and 7 days and compared it to the original bottled product. The results showed that the carbonation levels were still present and there was still a risk of bursting. The flavor test was conducted by the staff and workers, and it was determined that there was no significant difference between the canned and bottled products. For safety test, the intern sent it to Bali using Paxel and AnterAja delivery services. It was found that the cans were safe and secure when delivered using Paxel's next-day service, however, when delivered using AnterAja, the cans were found to be leaked before arrival in Bali.

3.2.2 Stabilizing Kombucha - Filter Kombucha

The idea of stabilizing the kombucha through filtration was proposed by the intern. According to literature, yeast cells in kombucha are typically 3-5 micrometers in size, so using a filter with a pore size of 1 micron should be sufficient to filter out the yeast. There are 3 trials that are conducted to test stabilizing the yeast. First is using a 10 micron filter and 1 micron filter, the kombucha is filtered once. Second Trial, conducted using 10 micron filter and 1 micron filter, but instead of filtered once, the kombucha is filtered 5 times(5x), 10 times (10x), and 20 times(20x). In the third trial, the kombucha is filtered using a 0.4 micron ceramic filter. After being filtered, sample

are placed in a fermentation bottle, and are left for 3 days, 5 days, and 7 days and can be more if there is no bursting occurred in the previous days.

The first trial, the intern first tested a 10 micron filter before applying a 1 micron filter to prevent clogging the 1 micron filters with sediments. The sample was filtered once using a 10 micron polyester filter bag and left for 3, 5, and 7 days. However, it did not show any significant difference and there was still a possibility of bursting.

In a second trial, the intern used the filter 5x, 10x, and 20x filtering. The samples were left at room temperature for 3, 5, and 7 days. There is an additional experiment, in the 20x filtered kombucha, there is a lot amount of sugar added to check yeast activity. The results showed a significant improvement, with minimal bursting in the 10x filtering and no bursting at all in the 20x category within 7 days. and then the 20x category was left for 2 weeks and there was still a low bursting present. Flavor testing showed no significant difference between the flavor of the filtered and unfiltered kombucha.

The intern also evaluated a 0.4 micron ceramic filter suggested by the owner's friend but found that it was not suitable for kombucha as it reduced the acidity of the kombucha and resulted in a pH above 6 and a flavor similar to sweetened water. Additionally, the ceramic filter had a long duration and took 2 days to filter 2L of kombucha, making it not practical for commercial use.

In conclusion, the intern found that filtering kombucha using a 1 micron filter is usable but labor-intensive. An alternative option being considered is the use of sheet filters integrated with pumps such as Vigo Sheet Filters. These topics will be discussed further with the owner or manager as the filters are shipped from the UK.

3.2.3 Scaling Up - Trial on new Big tank (new equipment)

In conclusion, the intern conducted a test to evaluate the feasibility of using a larger tank for kombucha production at Ramuraga Kombucha. The test involved fermenting half of a 60L tank and comparing the resulting kombucha to the company's usual product. The results showed that there was no significant difference in flavor between the kombucha produced in the larger tank and the original product. Based on these results, the intern recommended the implementation of the larger tank in the production flow. This would allow for an increase in production capacity, with the potential to produce up to 40L extra kombucha per week, with minimal labor and work required. Overall, the integration of the large tank in the production flow was a success and helped the company to increase its production capacity.

3.2.4 Cost & Time Optimization

In response to a large order from an event in Jakarta called Urban Sneakers Society (USS), the intern at Ramuraga Kombucha was tasked with researching potential methods to increase production capacity. Two methods that were investigated were extracting flowers using heated kombucha and blending very old kombucha with sweet tea.

Flowers are successfully extracted using heated kombucha but found that different flowers produced different outcomes in the extract. In addition to the methods mentioned above, Experiment found that different flowers have different effects on the pH of the final product. For example, the use of chrysanthemum flowers resulted in a rise in pH, while the use of rosella flowers resulted in a lowering of the pH. This highlights the importance of understanding the effects of

different ingredients on the final product, and the need for further experimentation and optimization in this area. The second method, blending very old kombucha with sweet tea, was also found to be successful, but resulted in a sweeter and less complex flavor that was more similar to tea and less characteristic of traditional kombucha. The intern used a pH-based approach for the first blending trial. Use of a pH-based approach in blending the very old kombucha with sweet tea, was an appropriate method as it allows for control and adjustments of the final product acidity. Additionally, it allows for consistency in the production process and quality control. Also, since the intern had found that different flowers have different effects on the pH, using a pH based approach for blending the old kombucha with sweet tea is a good strategy to make sure the final product has the desired acidity level.

Both of these research and development methods were applied to the large order and resulted in the production of 1500 bottles or 500L within a week. However, the intern noted that these methods still need further improvements for optimization.

IV. SELF REFLECTION

Throughout my internship at PT. Ramuraga Tirta Lestari since 15th November, I gained a deep understanding of the kombucha production process, improved my literature skills for problem-solving, and gained knowledge about certificate application for PIRT and Halal by BPJPH. I also gained a better understanding of the industry and how a start-up company works, including knowledge about inventory control, production scale, and product development scheme. Additionally, I learned about leadership and team building in a start-up company and gained knowledge about e-commerce and advertising, including content creation and digital marketing.

In terms of my personal strengths during this internship, I perceive myself as creative and independent. Throughout this program, I took the initiative to collect lists of optimizations for the production flow and RnD projects, and made most of the decisions on my own. I am also a fast learner and an expeditious person, able to grasp instructions and new concepts quickly. However, I still have difficulties in making the same perspective between me and my supervisor, and sometimes find it hard to explain certain concepts clearly.

I found that the knowledge and skills I gained from my courses on campus greatly helped me in my work at PT. Ramuraga Tirta Lestari. The classes I took in food science, microbiology, and chemistry provided me with a strong foundation in understanding the scientific principles behind kombucha production and fermentation.. Overall, the knowledge and skills gained from my studies on campus greatly contributed to my success in this internship.

Throughout the internship, I also developed my decision-making skills and improved my communication skills. I was able to explain concepts clearly and had a strong ability to adapt and learn quickly. In addition, I was able to contribute to the working space by suggesting and optimizing current flow, helping the company by trying new methods and researching to be integrated into the current flow. I was also involved in the marketing team, learning about e-commerce and advertising, including content creation and digital marketing.

In terms of soft skills, I believe that BRIGHT sessions really improve my ability to work well in a team, communication skills, and ability to adapt to new environments have helped me to succeed in this internship.

During my internship at PT. Ramuraga Tirta Lestari, I made significant contributions to the company in terms of improving the production process, implementing new research and development projects, and increasing the efficiency of the company. I was able to optimize the methods and flow of the kombucha production, which led to an increase in the safety and quality of

the final product. Additionally, I am doing RnD projects such as canning and stabilizing kombucha, which can lead or help to address issues related to 2nd fermentation problems after delivery. Furthermore, I helped the company in the application process for PIRT and Halal certification, which will greatly benefit the company in the future. Overall, my contributions to the company have greatly improved its overall operations and will continue to benefit the company in the future.

V. CONCLUSION & RECOMMENDATION

5.1. Conclusion

The aim of this internship program is to optimize and improve current flow/plan. The goal has been partially achieved by helping the company treat or solve problems one by one, however due to minimum days of internships, all of the results of trial and optimization cannot be accomplished at an optimal point. and also due to the company's supervisors and workers schedule, some projects are still on postponement.

In food science and nutrition, there were no courses related directly to the production of the kombucha, but there are courses that support the fundamental principles, such as food chemistry, food microbiology, and food safety and toxicology. The knowledge gained from the courses could be applied to improve and optimize the flow of production in the PT Ramuraga Kombucha.

5.2. Recommendation

Given the positive working environment and valuable learning experiences provided by the internship program, it is recommended that PT Ramuraga Tirta Lestari continue to accept students interested in learning about kombucha and fermentation. Additionally, the company could consider collaborating with educational institutions to provide more specialized training for interns in relevant areas such as food chemistry, microbiology, and safety. This could further enhance the intern's ability to contribute to the optimization and improvement of the company's production process. However, students have to keep independent and creative during the Internship, and also must have a sense of contributing or helping while doing the internships at PT. Ramuraga Tirta Lestari because there are no direct supervisors that can lead and supervise the project directly.

REFERENCES

Assefa, Y., Emire, S., Villanueva, M., Abebe, W., & Ronda, F. (2018). Influence of milling type on TEF injera quality. Food Chemistry, 266, 155-160. doi:10.1016/j.foodchem.2018.05.126

Batt, C. (2014). Lactobacillus | introduction. Encyclopedia of Food Microbiology, 409-411. doi:10.1016/b978-0-12-384730-0.00176-2

Bishop, P., Pitts, E. R., Budner, D., & Thompson-Witrick, K. A. (2022). Kombucha: Biochemical and microbiological impacts on the chemical and flavor profile. Food Chemistry Advances, 1, 100025. doi:10.1016/j.focha.2022.100025

Dutta, H., & Paul, S. K. (2019). Kombucha drink: Production, quality, and safety aspects. Production and Management of Beverages, 259-288. doi:10.1016/b978-0-12-815260-7.00008-0

Hommel, R. (2014). Acetobacter. Encyclopedia of Food Microbiology, 3-10. doi:10.1016/b978-0-12-384730-0.00001-x

Jayabalan, R., Malbaša, R. V., & Sathishkumar, M. (2016). Kombucha. Reference Module in Food Science. doi:10.1016/b978-0-08-100596-5.03032-8

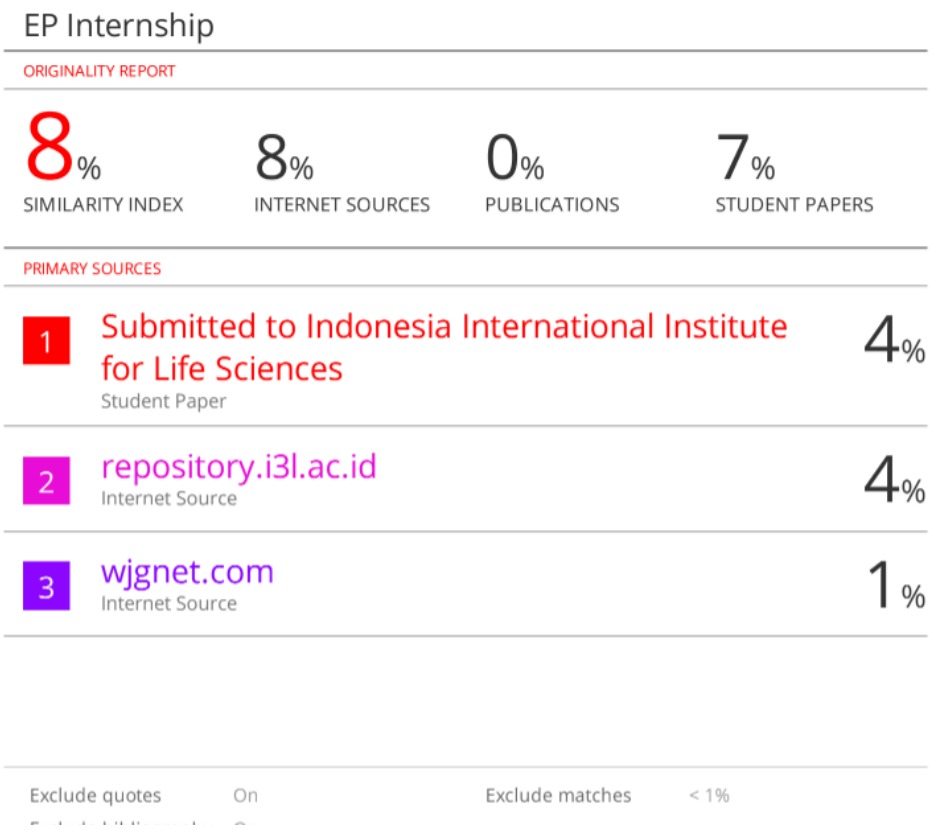
Mengesha, Y., Tebeje, A., & Tilahun, B. (2022). A review on factors influencing the fermentation process of teff (Eragrostis teff) and other cereal-based Ethiopian injera. International Journal of Food Science, 2022, 1-10. doi:10.1155/2022/4419955

Nout, M. (2014). Food Technologies: Fermentation. Encyclopedia of Food Safety, 168-177. doi:10.1016/b978-0-12-378612-8.00270-5

Sá-Correia, I., Guerreiro, J., Loureiro-Dias, M., Leão, C., & Côrte-Real, M. (2014). Zygosaccharomyces. Encyclopedia of Food Microbiology, 849-855. doi:10.1016/b978-0-12-384730-0.00364-5

Yoshida, F. (1982). Aeration and mixing in fermentation. Annual Reports on Fermentation Processes, 1-34. doi:10.1016/b978-0-12-040305-9.50005-4

APPENDICES



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