

Analysis of Production Results of Clear Coffee Streamer Machines

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ARTICLE INFO	ABSTRACT
<p>Article history:</p> <p>Received October 08, 2024 Revised October 09, 2024 Accepted October 25, 2024</p> <hr/> <p>Keywords: <i>Clear coffee, streamer equipment, coffee production</i></p>	<p>Indonesia is the fourth coffee producer in the world after Brazil, Vietnam and Colombia. However, in the 2018-2021 period, the value of Indonesian coffee exports experienced a decline, which was in line with the low volume of Indonesian coffee exports in that year compared to the previous period, so that Indonesia's position fell from fourth to fifth as a coffee exporting country in the world. These various things could be due to the lack of downstream processing in coffee processing in Indonesia. The current problem is that there is no tool for the process of separating coffee into clear coffee, this tool is available abroad and the price is quite expensive. This research tries to make a clear coffee streamer and analyzes the production results of a clear coffee streamer. The results of the design of a clear coffee streamer tool using stainless steel material can be used with a capacity of 20 liters and a maximum heating temperature of 100°C, while testing the production capacity of the clear coffee streamer tool produces data using a material volume of 1500 ml resulting in a production volume of 850 ml in a time of 75 minutes. Meanwhile, using a volume of 200 ml of material produces 950 ml with a time of 75 minutes.</p>



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1. INTRODUCTION

A significant source of foreign cash for the nation, coffee is one of the plantation commodities with a relatively high economic value relative to other plantation crops (Chandra et al., 2018), (Sembiring et al., 2020), (Saidi & Suryani, 2021). In addition to being a significant source of foreign cash, coffee provides income for 1.5 million coffee farmers in Indonesia (Teniro & Zainudin, 2022). It is advised to expand rice coffee processing activities into ground coffee, instant coffee, and ready-to-drink coffee in light of the advantages and possibilities of coffee (Haris et al., 2023). After Brazil, Vietnam, and Colombia, Indonesia is the world's fourth-largest producer of coffee (Raharjo & Alifianto, 2023), (Yuhendra & Pebrian, 2024). However, the value of Indonesian coffee exports decreased in the 2018–2021 period, which was consistent with the low volume of Indonesian coffee exports in that year relative to the preceding period, causing Indonesia to drop from fourth to fifth place in the world rankings as a coffee exporting nation (Ananda et al., 2023).

The absence of downstream processing in Indonesian coffee processing may be the cause of these different issues (Cemporaningsih et al., 2020). Coffee lovers in Indonesia only enjoy processed coffee as usual and only alter the product with various additional products like milk coffee, ginger coffee, parijoto coffee, palm coffee, etc (Haris et al., 2023), (Aziz et al., 2023). This results in the coffee's value being only medium to low and makes it difficult to compete with the export market in terms of coffee processing. In general, Indonesian coffee products lack development and innovation in developing coffee products. Coffee drinking has become

popular among people, but different black coffee drinks have different health benefits and drawbacks (Pratiwi & Sodik, 2018). While there are currently many coffee varieties available in Indonesia, there has not been any innovation in processing coffee to make it clear so that people of all social classes can enjoy it. Some people are suitable for black coffee, milk coffee, or similar beverages, while others are not and can occasionally cause stomach pain, bloating, colds, or weakness (Wijayanti & Irawati, 2024).

Currently, there is no tool available for the process of separating coffee into clear coffee; the one that exists is quite expensive and only comes in one size. In order to solve this issue, a prototype tool for separating coffee into clear coffee in a variety of sizes must be created (Megandhi Gusti Wardhana, 2020). It demonstrated how to make coffee in addition to cafe equipment such small roasting machines, mixing grinders, and other items. The difficulty in purifying the product is the process's weakness. If you make clear coffee with the bare minimum of equipment, the color produced will be yellow to brownish or will not be perfectly clear like water because the precision of the equipment used is not quite correct. Domestic clear coffee making equipment components can be produced commercially, eliminating the need for trial and error and facilitating simple operation in the creation of a suitable machine. This study examines the process of creating a clear coffee streamer and evaluates the output.

2. RESEARCH METHOD

This research method is to design a tool and analyze the production results of a streamer tool to produce clear coffee. The tools and materials used in this research are as follows.

Table. 1 tools and materials

No	Component Name	Material	Information
1	Distillator Tube	Stainless Steel	1,5 mm
2	Condenser Tube	Stainless Steel	1,3 mm
3	Connecting pipe	Copper Pipe	¼ inch

2.1. Distillator tube design

The function of the distillator tube is to hold ground coffee mixed with water to be heated. The volume capacity of the tube is 20 liters. The distillator tube is designed with dimensions as shown in the image below.



Figure 1. Distilaor tube

2.2. Heating tube design

The heating tube functions to transmit the steam produced from the coffee which is then passed to the copper hose and the resulting steam will become liquid in the cooling tube. The heating tube is designed with dimensions as shown in the picture below.



Figure 2. Heating tube

2.3. Cooling tube design

The cooling tube functions to cool the resulting coffee vapor which becomes liquid from the heating tube. The cooling tube is designed with almost the same dimensions as the heating tube which functions to release wasted heat from the condenser tube using a looping water circulation system using a pump. The design dimensions are as shown in the picture below.



Figure 3. cooling tube

2.4. Design of fluid pipes in condensers

The fluid pipe in the condenser functions to remove heat and change the state of the cooling material from gas to liquid. The design dimensions are as shown in the image below.



Figure 4. fluid pipes in condensers

2.5. Connecting pipe design

The connecting pipe to the condenser/cooler, functions to connect water vapor from the distillation column to the condenser/cooler. The design dimensions are as shown in the image below.

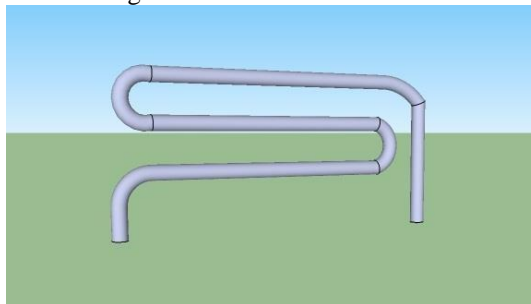


Figure 4. Connecting pipe

2.6. Thermocouple design

The thermocouple used was already assembled when purchased so it doesn't need to be re-designed.

2.7. Tool design results



Figure 5. Clear coffee streamer tool

2.8. Test the production results of the clear coffee streamer machine

In the design of this clear coffee streamer, the pressure cooker tube is designed as a distillation column with a capacity of ± 20 L with a diameter of ± 31.5 cm and a height of ± 44.5 cm. The amount of feed inserted into the reactor column is no more than $1/3$ of the reactor capacity, namely $1/3 \times 5 \text{ L} = 15 \text{ L}$. This is because the steam produced must be more than the feed introduced. The thermocouple in this device is a temperature sensor which is used to detect or measure temperature through two different types of metal conductors which are combined at the end, causing a thermo-electric effect. The condenser is designed using 2 stainless steel pipes connected to a cooling bucket and the cooling flow rate is assisted by a water pump with a capacity of 800l/h. The use of this material is to avoid corrosion due to high temperature conditions. The shell section of the condenser is connected to the reactor column using a connecting pipe with a diameter of 0.5 inches or 1.27 cm which forms a slope angle of 45° , while the tube section uses a pipe with a diameter of 2 inches or 5.08 cm.

2.9. Test the production results of the clear coffee streamer machine

After the process of designing the clear coffee streamer tool, the next stage is testing the production performance of the tool. The performance test of the clear coffee streamer tool was carried out when the tool was used for the process of making clear coffee. So if the equipment is not operating properly to produce clear coffee, it will be repaired and tested again.

3. RESULTS AND DISCUSSIONS

3.1. Design Results of a Clear Coffee Streamer Machine

The clear coffee streamer machine is designed using stainless steel material with a capacity of 20 liters with a maximum heating temperature capacity of 100°C . The distribution pipe used is a 1 meter long aluminum pipe which is twisted in a spiral inside the cooling tube. One of the benefits of this type of spiral cooler is that it does not take up too much space and can lengthen the distillation path so that the distilled material can produce high levels. In this study, the type of cooling tube used was a cylindrical tube. The temperature indicator used is a thermocouple with a maximum temperature of 100°C .

3.2. Production Test Results for Clear Coffee Streamer Machines

The data obtained for the test capacity in the production of clear coffee streamers is as follows.

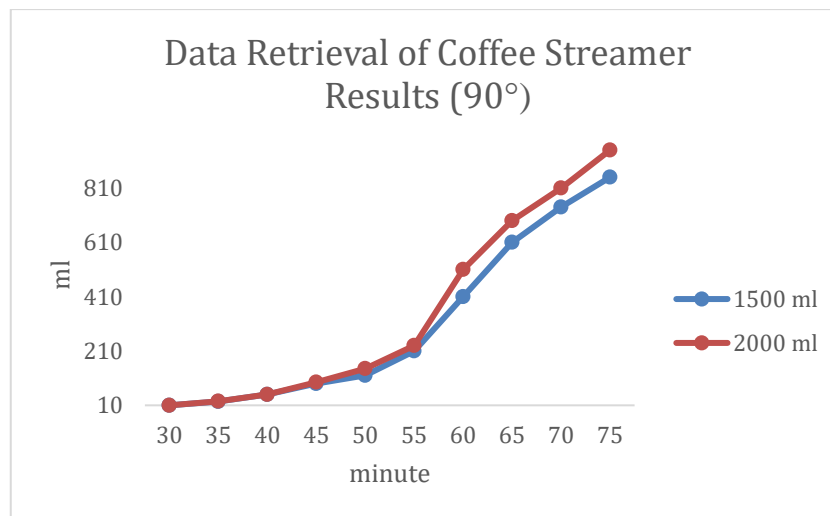


Figure 6. Graph of data collection results

From the results of data collection for production, there are two variations in the volume of ingredients, 1500 ml and 2000 ml, where coffee and water are mixed, coffee is 35 grams while water is 1500 ml and 2000 ml. Variations in the two volumes of ingredients produce different clear coffee production results. Data collection using a material volume of 1500 ml resulted in a production of 850 ml with a time of 75 minutes. Meanwhile, using a volume of 200 ml of material produces 950 ml with a time of 75 minutes. The results of data collection show that the greater the volume of material, the greater the production output as shown in figure 6.

4. CONCLUSION

The conclusions of this research resulted in the design of a coffee streamer tool and the results of testing the production capacity of clear coffee. The results of the design of a clear coffee streamer tool using stainless steel material can be used with a capacity of 20 liters and a maximum heating temperature of 100°C, while testing the production capacity of the clear coffee streamer tool produces data using a material volume of 1500 ml resulting in a production volume of 850 ml in a time of 75 minutes. Meanwhile, using a volume of 200 ml of material produces 950 ml with a time of 75 minutes.

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