



Fermentation Method with the Help of Extremely Low Frequency (ELF) Magnetic Field Radiation to Support *Luwak* Coffee Superior Products in Sidomulyo Village, Silo District, Jember Regency, East Java

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Abstract: Coffee production in Sidomulyo Village, located at the foot of Mount Gumitir, Silo District, Jember Regency, is famous for being very abundant. This condition is very supportive of the increasing needs of coffee drink lovers. However, the taste of ready-to-brewed ground coffee produced by the Sidomulyo *Koperasi WANITA* is still unable to compete with coffee on the market. This activity aimed to provide training on civet coffee production through the dry coffee bean fermentation method as a primary ingredient. The fermentation process was carried out using a Magnetic Fermentation machine which was the result of research in 2020. The fermentation process training activity was attended by 15 members of the *Koperasi WANITA*. 50 kg of dry coffee was fermented using a Magnetic Fermenter machine. Dry coffee was soaked first in warm water (temperature around 30 - 40°C) for 5 hours. Then it was drained and put in a fermenter box by adjusting the intensity of the ELF magnetic field to around 300 T for 90 minutes. The coffee beans were transferred to buckets and ripened for up to 5 days, then washed and sun-dried for three days, after drying in Roasting and continue grinding. The targeted outputs of this activity included scientific publications in the National Journal of *Abdimas* with ISSN. The results of this activity had produced fermented coffee beans that had been roasted in the form of roasted coffee beans and ground coffee. Based on the results of the evaluation, the members of the *Ketakasi Koperasi* already had skills in producing artificial *Luwak* coffee. This had the potential to develop superior products for Sidomulyo civet coffee.

Keywords: Coffee; Fermentation; Magnetic Field; Productivity

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Introduction

Sidomulyo Village, Silo District, Jember Regency, East Java, is located at Mount Gumitir, an abundant Robusta coffee-producing center. The "Ketakasi" *Koperasi* is one of the *Koperasi* s that are very persistent in fighting for the economic value coffee of in the Sidomulyo community. The production of post-harvest

dry coffee beans under the umbrella of the *Koperasi* is not less than 50 tons per harvest period. Generally, people still rely on selling superior dry coffee beans with an average selling price of Rp. 16,000 to Rp. 20,000 per kg. However, in the current condition of the last year, coffee harvested was still piled up more than 5 tons. It is still stored in the *Koperasi* Storehouse and has not been sold.

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Figure 1. Harvested Coffee Still Piled Up in Storehouse Last Year

To increase the coffee selling value of the Sidomulyo community, the *Ketakasi Koperasi* also produces black ground coffee under the "Ratu Gumitir" brand. The production tools of ground coffee "Ratu Gumitir" at the beginning of 2012 are 1) pulping machines, 2) roasting machines, and 3) packaging tools. Nowadays, the production capacity is still unstable, with the maximum production being about 1 quintal, and neither has been sold within one month nor has an actual increase in production capacity. If there is an order, the production can reach more than 2 quintals. Factors that determine competitiveness are price, taste, unique characteristics, and familiar brands. In terms of price, the ground coffee product by *Koperasi WANITA* is relatively cheap, which is only Rp. 8,000/100 grams. However, it has no distinctive characteristics regarding superior taste and uniqueness.



Figure 2. Ground Coffee Products of "Ratu Gumitir"

The fact is that people's purchasing power for coffee drinks during the Covid-19 pandemic remains high. The exports of Indonesian coffee products to Egypt in the January-February 2020 period during the Covid-19 Pandemic proved to increase by 21 percent compared to the same period in 2019 (Kompas.com, April 30, 2020). The development of the processed

coffee industry in the country is still up-and-coming, considering the potential of raw materials and the government's efforts to optimize people's per capita coffee consumption further," said Industry Minister Agus Gumiwang Kartasasmita at an online talk show through a virtual broadcast in Jakarta, Thursday, April 23, 2020.

The fermentation process that the community has known can improve the quality of coffee beans. However, during the harvest period, farmers do not have enough time and energy to carry out the fermentation process of their harvested coffee. This is because the fermentation process understood is only the wet fermentation process, which is the fermentation process carried out on freshly harvested coffee fruits. The fermentation process generally aims to imitate the real *Luwak* coffee, which is the process of fermentation of coffee beans in the intestines of civet animals. Although the taste of fermented coffee does not match the original *Luwak* coffee from the civet beast, it has proven to be better than non-fermented coffee.

The downside of dry coffee beans is that they have lost most water content and substrate. The water content is needed during fermentation for the process of enzymatic reactions in the seeds and the growth of microbes in the pulp. The substrates in the fermentation of coffee beans are sugar and citric acid contained in the pulp. The coffee's distinctive taste will be developed through the fermentation process. During fermentation, important precursors will be formed to support chemical reactions to form taste (Barisic et al., 2019). The research by Sudarti (2020) revealed that the fermentation process of dry coffee beans improved the bacterial activity of lactobacillus and reduced its caffeine content. The fermentation process of dry cacao beans also improved the glucose content (Sudarti, 2019). Based on the result of this research, one alternative solution to the partner problem is the product innovation of artificial Sidomulyo *Luwak* coffee with unique tastes and characteristics.

Method

This research was carried out based on previous research that fermentation could improve the quality of dry coffee beans. The method employed was Fermentation Practical Training. The coordination steps with the partner were conducted under agreement by implementing the Fermentation method of dry coffee beans to improve the coffee taste through the following stages.

Preparation Stage

The plans that had been executed included: 1) conduct coordination with the team and partner, 2)

arrange the schedule of fermentation practice training, 3) conduct procurement of ingredients and tools for the fermentation process and fermented *Luwak* coffee processing.

Fermentation process Training of Dry coffee beans stage

The training was conducted on ten members of *Ketakasi Koperasi* for the fermentation process of dry coffee beans. The fermentation process was done for five days, followed by a sun-dried process for three days to reach a water level of about 7%. This stage produced dry artificial *Luwak* coffee beans.

Production of Sidomulyo Luwak coffee stage

In this stage, a *Luwak* coffee sachet that is ready to brew was produced. The steps include:

- Roasting, the dried coffee beans were fried using a roasting machine owned by a partner.
- Grinding, the cooked coffee beans were put into the grinding machine.
- Packaging, the roasted coffee beans or coffee powder was put into a good package.

Evaluation step and program sustainability

An evaluation of the organization of this program to partner with *Ketakasi Koperasi* was carried out through online and offline discussion with the committee of the *Koperasi* by implementing health protocols.

Result and Discussion

Fermentation Process

The dry coffee fermentation process is usually done using an Arduino-based Magnetic Fermentation machine.



Figure 3. Arduino-Based Magnetic Fermentation Machine

This machine is the design result of the research process and has been proven to produce Extremely Low-Frequency magnetic field exposure that reaches a maximum of 250 T. This intensity has been proven effective in increasing the quality of the dry coffee bean fermentation process 50 kg of coffee beans were

used for fermentation practice. The steps for the fermentation process are as follows.



Figure 4. Dry Coffee Bean Fermentation Process

The fermentation process was carried out for five days, followed by a sun-dried process for three days until the water level reached 7%. Afterward, a roasting process was conducted to obtain cooked dry coffee beans.

Roasting Process

The roasting process of 50 kg of fermented coffee beans was done using a roasting machine owned by *Ketakasi Koperasi*, as presented in the following figure.



Figure 5. Roasting Machine

After being roasted, a sorting process was carried out to eliminate stuff that can damage the coffee taste.



Figure 6. Sorting Process of Roasted Coffee Beans

Packaging Process

The roasted coffee beans were packaged using aluminum foil, while the coffee powder was packed using a suitable plastic bag. The packaging process aimed to keep the coffee sterilized and maintain its taste.



Figure 7. Artificial Roasted *Luwak* Coffee Beans



Figure 8. Artificial *Luwak* Coffee Powder

The coffee products were presented in two types of packages: (1) Sidomulyo *Luwak* roasted coffee beans; (2) Sidomulyo *Luwak* black coffee powder. However, assistance is still needed to reach the marketing stage.

Conclusion

The fermentation process training activity, attended by 5 staff and apprentice students at the *Ketakasi Koperasi*, has increased the knowledge and skills of the community that dry coffee beans can be fermented and proven to improve the taste of coffee. The results of this activity have produced fermented coffee beans that have been roasted in the form of roasted coffee beans and ground coffee and are named "Kopi *Luwak* Sidomulyo". The coffee taste of ready-to-brew coffee powder produced by Sidomulyo is still unable to compete with coffee on the market. Based on the results of discussions with the leadership and staff of the *Ketakasi Koperasi*, it showed good enthusiasm to develop the superior product of Sidomulyo civet coffee. However, assistance is still needed until the superior product of Sidomulyo civet coffee reaches the market.

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