

SFRN 2019

Security in
food,
renewable
resources,
and
natural
medicines



PROCEEDING

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**3rd INTERNATIONAL CONFER-
ENCE ON SECURITY IN FOOD,
RENEWABLE RESOURCES, AND
NATURAL MEDICINES 2019
(SFRN 2019)**



hosted by,
Politeknik Pertanian
Negeri Payakumbuh



co-Hosted by,
Universitas Andalas
(UNAND)

Convention Hall Politeknik Pertanian Negeri Payakumbuh
INDONESIA

QUANTUM-LEAP OF AGRI-FOOD SYSTEM 4.0 AND DELIVERY OF SUSTAINABLE DE- VELOPMENTS GOALS (SDGS)

September 25-26, 2019



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Theme:
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SUSTAINABLE DEVELOPMENTS GOALS (SDGS)”**

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Welcome Message
**Executive Chairman of The 3rd International Conference on Security in Food,
Renewable resources, and Natural Medicines (SFRN) 2019**



Dear Honorable ladies and gentlemen,

Good Morning and Assalamu'alaikum wr.wb

On behalf of the SFRN 2019 organizing committee, I am really honoured and delighted to welcome all of you to the 3rd International Conference on Security in Food, Renewable resources, and Natural Medicines (SFRN) 2019 at the State Polytechnic of Agriculture Payakumbuh, West Sumatra Indonesia

Our technical program is rich and varied with 8 keynote speeches and 4 invited talks and more than 170 technical papers split between 8 parallel oral sessions and 1 poster sessions. The speakers and participants came from 8 different countries, consist of Academicians, Scientists, Researchers, Practitioners, Professionals, and Government Officials in multidiscipline branch of knowledge, who gathered here today to share and discuss new findings and applications of innovations for promoting Food Security, Renewable Energy, Sustainable Resources and HealthCare Free for All, in particular for those who in needs. As the chairman of conference 2019 SFRN, I know that the success of the conference depends ultimately on the how many people who have worked in planning and organizing both the technical program and supporting social arrangements. This year, the conference is jointly organized by the Payakumbuh State Agricultural Polytechnic and Andalas University. We also thank to the steering committee for their wise and brilliant advice on organizing the technical program; and also to the the Program Committee, both from the Payakumbuh State Agricultural Polytechnic and Andalas University , for their thorough and timely reviewing of the papers and to the Director of Payakumbuh State Agricultural Polytechnic and the rector of Andalas University, and the Head of the Institute for Research and Community Service of Andalas University, and Payakumbuh State Agricultural Polytechnic. Our recognition should go to the Organizing Committee members who have all worked really hard for the details of the important aspects of the conference programs and social activities, and then we extend our gratitude to our students who bore the arduous burden for preparing this event.

We hope this event is also a good step in gaining strengthened cooperation between our universities as we know that the State Agricultural Polytechnic of Payakumbuh is part of the Andalas University previously, of course the psychological relationship between the State Agricultural Polytechnic and the Andalas University is really close.

Finally on behalf of the committee, we apologize profusely for all the shortcomings and everything that is not properly in organizing this event and hopefully AES-Network contributes significantly to the research and technology for the good of humanity.

Thank you

Fithra Herdian, S.TP, MP

**Message from Afro-Eurasia Scientific (AES) Network
3rd International Conference on Security in Food, Renewable resources, and
Natural Medicines (SFRN) 2019**



Dear Honorable and Distinguished guests,
Ladies and gentlemen,

Assalamu'alaikum Warahmatullahi Wabarakatuh and Good Morning

On behalf of the AES Network, I am honored and delighted to welcome you to the 3rd International Conference on Security in Food, Renewable resources, and Natural Medicines (SFRN) 2019 at the Agricultural State Poly Technique of Payakumbuh, Indonesia. I believe we have chosen a venue that guarantees a successful technical conference amid the culture, delicacy and scenery of Payakumbuh, the city of "Rendang".

The AES-Network aims to Promote Livelihood Through Food Security, Promote Future Smart and Green Mobility by Using Renewable Energy, Promote Prosperity by Equally Managing and Distributing the Sustainable Resources and Promoting Enjoyable Long-Life by using Natural Medicines With Free Health Care For All. The AES-Network was established in 2018 and already have memberships from 12 countries. Our members consist of Academicians, Scientists, Researchers, practitioners, professionals, and government officials from multidiscipline branch of knowledge, who gathered and contributed their expertise to share and discuss new findings and applications of innovations for promoting Food Security, Renewable Energy, Sustainable Resources and Free Health Care for All. In particular, the network aims to alleviate the condition of those who in dire needs. In the future, we also expect to provide technical demonstrations, and numerous opportunities for informal networking for Promoting Food Security, Renewable Energy, Sustainable Resources and Free Health Care for All. In this opportunity, we invited you to become our members and join our efforts for a better life to all of mankind.

As a team, we acknowledge the existence of mutual interest among university and college educators, researchers, activists, business sector, entrepreneurs, policy

makers, and all society members. We must promote the need to strengthen cooperation for establishing Security in Food, Renewable Resources, and Natural Medicines in Africa, Europe, and Asia.

The AES-Network believe, a firm foundation for mutual collaboration with the spirit of equality and partnership and thereby contribute towards sustainable development in these three regions.

Therefore, through networking, friendships, and joint efforts, the capacity of our network can be enhanced to address major challenges in securing the Food, Renewable Resources, and Natural Medicines in Africa, Europa, and Asia. Our Network goals are to increase the awareness of educators, researchers, scientific community, business sector, entrepreneurs, and policy makers in Africa, Europa, and Asia, that the future of a better world, lies within their responsibilities, and to improve the networking, mobility and mutual collaboration of scientific community, business sector, entrepreneurs, and policy makers in Africa, Europe, and Asia to energize the delivery of Sustainable Development Goals.

Finally, I hope that, by registering our network, you will be provided a common platform and support the exchange of knowledge, while at the same time, we offer constructive dialogue across and within the various interest and stakeholder groups, including the intended beneficiaries, and arrived at the best solutions to our terminal goal, Promoting Food Security, Renewable Energy, Sustainable Resources and Free Health Care based on scientific evidence in Africa, Europa, and Asian region.

Thank You for Joining us!

President

Assoc. Prof. Dr. Eng. Muhammad Makky

Welcome Message
Head of Institute for Research and Community Service
Universitas Andalas



Dear Honorable and Distinguished guests,
Ladies and gentlemen,

Assalamu'alaikum Warahmatullahi Wabarakatuh and Good Morning

It is with great pleasure that I welcome the participants of the SFRN 2019 in Payakumbuh, the city of “Rendang”, the prime of Indonesian delicacy.

In this esteem event, we share the knowledges, and imparted it to the people. The quest for knowledge has been from the beginning of time but knowledge only becomes valuable when it is disseminated and applied to benefit humankind. It is hoped that this conference will become a platform to gather and disseminate the latest knowledge which can be adopted for securing the food, resources, and health for mankind, in Asian, European and African region.

Academics, Scientists, Researchers and practitioners from multidiscipline branch of knowledge who gathered here today will be able to share and discuss new findings and applications of innovations for ensuring food security, in particular for those who reside in developing countries. It is envisaged that the intellectual discourse will result in future collaborations between universities, research institutions and industry both locally and internationally. In particular it is expected that focus will be given to issues on environmental and sustainability. Therefore, we urge to all participants, to establish a scientific network that will voice the needs

Researchers in the multi sectoral aspects related to the benefit of mankind have been progressing worldwide. Food is a basic right, while energy drive the world. Human need a lot of resources so the civilization can be flourished. But human is not immune, and thus, ones need to take care of their health regularly. Modern Agri-food systems is the foundations of a decent life, a sound education and the achievement of

the Sustainable Development Goals. Over the past decade, we have witnessed a chain reaction that threatens the very foundations of life for millions of the world's people. Rising energy prices drove up the cost of food and ate away the savings that people otherwise would have spent on health care or education. Unsustainable plantation management induced forest fire and posed haze hazard to the whole Sumatra island and our neighboring countries.

The human cost of the food and energy crisis has been enormous. Millions of families have been pushed into poverty and hunger. Thousands more suffering from the collateral effects. Over the past year, food insecurity led to political unrest in some 30 countries. Yet because the underlying problems persist, we will continue to experience such crises, again and again -- unless we act now. That is why we are here today.

We must make significant changes to feed ourselves, and most especially, to safeguard the poorest and most vulnerable. We must ensure safety nets for those who cannot afford food, or energy, nor even a health service. We must transform agricultural development, markets and how resources is distributed. We must do so based on a thorough understanding of the issues. That is the only possible way we can meet the Goals of Sustainable Development.

Thank You,

Assoc. Prof. Dr.-Ing. Uyung Gatot S. Dinata,MT.

**Opening Ceremony
Rector of Andalas University**



Dear Honorable and Distinguished guests,
Ladies and gentlemen,

Assalamu'alaikum Warahmatullahi Wabarakatuh and Good Morning

I welcome the opportunity to address you at this important event.

It gives me great pleasure in welcoming you to this 3rd Conference on "Security in Food, Renewable resources, and Natural Medicines (SFRN)" 2019. I am delighted that so many have accepted our invitation. I am particularly happy that we have in this room, dedicated individuals from so many stakeholder groups — including our most respected and distinguished guest “The ministry of Agriculture of the Republic of Indonesia”. We also welcome the mayor of Payakumbuh and the Regent of Lima Puluh Kota. We extend our welcome to the civil society, the private sector, international organizations; the science community; and others dedicated to help create an environment in which people can escape food insecurity. Imagine what we can do together if we make the security for all as an our top priority, and pull in the same direction. We can make a difference in the lives of millions.

Food is a basic right. Food security are the foundations of a decent life, a sound education and the achievement of the Sustainable Development Goals Access to medicines - a fundamental element of the right to health. Health is a fundamental human right, indispensable for the exercise of many other rights in particular the right to development, and necessary for living a life in dignity. Moreover, human rights principles and language are being used to support resource access claims as rights-based approaches empower individuals and groups to gain or maintain access to natural resources

Much progress has been made during the last decades but much more needs to be done. Millions of people are Insecure worldwide, meaning that they either starve or they do not know from where their next meal, health care or resources will come.

Much of the progress on security has occurred at the expense of our environment. With business as usual, we foresee that the production improvements during the next decade will be less than the last one, while the environmental degradation will continue, and health will deteriorate significantly. Without available resources to seek, mankind will become endanger species in a very short time.

Solutions to the security problems need to be designed and implemented within a new and rapidly changing environment. Globalization and sweeping technological changes offer new opportunities for solving these problems. A number driving forces or trends must be taken into account in developing appropriate action. Some of the action needed, such as appropriate technology for small farms, is not new but it must be cast in the new and changing global and national environment, taking into account new opportunities and risks. I hope that by providing a forum for knowledge exchange, this conference will help identify the action to be taken. Furthermore, this conference will help to provide constructive dialogue across and within the various interest and stakeholder groups, including the intended beneficiaries, and arrive at the best solutions.

In conclusion, even if those responsible give high priority to achieving sustainable security for all and back it up with action, the world may not achieve the goal by 2030. But we will be much closer than with business as usual. I urge all of us to provide the strongest support for this event, to enable securing the food for all in the closest time possible. It is my sincere optimism that through the accomplishment of the objectives of this event, we will come to an important step nearer to secure the food for all.

Finally, I would like to thank the organizing committee who have spent their utmost efforts to prepare and manage this event successfully. Let me conclude my remarks by wishing our guests happiness, good luck and great success in the conference.

May I announce now the opening of the “3rd International Conference on Security in Food, Renewable resources, and Natural Medicines (SFRN) 2019” in Payakumbuh.

Thank you.

Rector,
Prof. Tafdil Husni, SE, MBA, PhD

Welcome Message
Director of Politeknik Pertanian Negeri Payakumbuh



Dear Honorable ladies and gentlemen,

Good Morning and Assalamu'alaikumwr.wb

I congratulate to all participants on the invitation and participate at our beloved campus Payakumbuh State Agricultural Polytechnic. I feel really honoured to welcome all of you at our event, the 3rd International Conference on Security in Food, Renewable Resources, and Natural Medicines (SFRN) 2019 at the Payakumbuh State Agricultural Polytechnic, Indonesia.

Food security is a very important aspect in a country's sovereignty. Food also determines the future direction of a nation. Many social and political fluctuation can also occur if food security is disrupted. Food availability that is smaller than its needs can create economic instability. This critical food condition can even endanger economic and national stability. In the current situation, there are many challenges in exteriorize food security, such as climate change, population, limited natural resources and other challenges both locally, regionally and globally.

Renewable resources are also our starting point to start sustainable development. Research on renewable resources is also very important as the solution in meeting the principles of sustainable development. As we know that Sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Sustainability is the foundation for today's leading global framework for international cooperation - the 2030 Agenda for Sustainable Development and its Sustainable Development Goals (SDGs)

The discovery of treatment based on local culture also contributes greatly to the good of humanity. Unfortunately, there are still many treatments that have not been carried out by scientific research. So, through this conference we hope it can be a trigger to increase in traditional plant-based treatments that not go through complex

chemical processes, so that the effectiveness of the pillars can be further suppressed and also contribute to the community's economy.

Finally, I would like to express my gratitude to all people who involved in organizing this event and to all of stakeholders who have helped to make this event go on successfully. Please accept my apologize for any shortage, Assalamu'alaikumwr.wb.

Thank you

Ir. Elvin Hasman, MP

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The Effect of Addition of Na_2CO_3 Solution Into the Decaffeination Process of Dry Coffee Seeds on Physicochemical Characteristics of Coffee Powder.

Ruri Wijayanti, Malse Anggia

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Abstract. Coffee is one of the most favored beverages for various age groups ranging from the young, the middle ages, to the elders. This condition is due to its delicious taste, distinctive aroma, and a million benefits of drinking it as well as being able to refresh the consumer's body. The compound that acts as a refresher contained in the coffee is caffeine. However, the excessive consumption of caffeine could bring danger to human health. So we need a method to reduce caffeine levels in the coffee bean to lower the level of caffeine. The purpose of this research is to analyze the effect of the addition of Na_2CO_3 on the physicochemical characteristics of coffee powder. The design used in this study is a 1 Factor Complete Random Factor. The results showed that the moisture content is ranging from 1,3768 % to 1,7287 %, and the ash content is 4,5284% to 5,1736%, and the content of caffeine is 0,9677% to 1,0187%.

INTRODUCTION

Coffee is an export commodity from the plantation sector that is very promising, especially to increase the country's foreign exchange and support the people's economy. This condition is indicated by the number of Indonesia's exports in 2015 with a total of 502,021 tons or US \$ 1,197,735 (BPS, 2016). West Sumatra is one of the supporters of the export market in Indonesia. Coffee is not only favored by the world community but also by the Indonesian people themselves. This preference is inseparable from the delicious taste and the distinctive aroma and a million benefits that can be gained, which include being able to refresh the drinker's body.

Compounds that act as a refresher contained in coffee is caffeine. Caffeine is included in one of the alkaloid compounds found naturally in coffee beans (Arwangga, Asih, and Sudiarta, 2016). Other than that, caffeine is a non-alcoholic aphrodisiac compound in the form of a crystalline, bitter taste, easily soluble in water, which is known to have benefits as an analgesic drug that can reduce pain. Besides, coffee is also able to stimulate the central nervous system, urination frequency, increased psychomotor work, muscle tension, gastric acid secretion, and heart rate (Kartasasmita and Addyantina, 2012).

But behind its positive attributes, caffeine has adverse effects on some people. If consumed in excessive amounts, it can increase muscle tension, stimulate the work of the heart, and increase gastric acid secretion (Mulato, *et al.*, 2001). It is considered dangerous, especially for people with a history of heartburn or heart disease.

Therefore we need a method to reduce levels of caffeine in coffee beans in the hope of getting ground coffee with low caffeine levels.

The process of reducing caffeine content in agricultural materials is better known as Decaffeination. The method commonly used to reduce levels of caffeine is through wet processing (fermentation). In previous studies, the decaffeination process was carried out using a controlled horizontal type cylindrical rotating fermenter and a single column reactor using 10% ethyl acetate solvent (Widyotomo *et al.*, 2012). But considering the user is a Home Industry, then, of course, such processing is costly. Therefore we need an alternative with a relatively low cost, namely by soaking in an alkaline solution.

Alkaline solutions is commonly added during the fermentation process include Na_2CO_3 , K_2CO_3 , and NaOH . The more alkaline base used in robusta coffee fermentation, the lower is the caffeine content (Hanifah, *et al.*, 2013). Giving an alkaline treatment on unfermented coffee can improve the quality of the beans. This improvement is characterized by a decrease in water content (Sudiby, *et al.*, 1998). But so far, no research had stated what is the optimum concentration of this alkali without reducing the quality of the coffee powder produced. Therefore this research was conducted to find the optimum levels of the alkaline solution used, with the hope of obtaining a low level of caffeine, without compromising the quality of the ground coffee produced.

The objectives of this study are (a) Determine the effect of Na_2CO_3 concentration on caffeine content, and the quality of the ground coffee produced, and (b) Determine the concentration of Na_2CO_3 that is most appropriate to be used to obtain caffeine content and quality of ground coffee that conforms with Indonesian Industry Standard (SNI). (c) Producing appropriate technology that is applicable to developing the downstream coffee industry in Indonesia, especially West Sumatra.

RESEARCH METHODOLOGY

1 Materials and Tools

The material used in this study was coffee obtained from farmers in Alahan Panjang, Solok Regency. Experimental raw materials used in whole coffee fruit with sufficient maturity are marked in red on the fruit.

The equipment used is HPLC with specifications of agglent technologies I 120 Compact LC, analytical scales, stirrers, whatman filter paper funnels No. 1, water baths, membrane filters, glassware, ovens, and desiccators.

2 Stages of Research Implementation

This research was conducted in two steps. The first stage was the production of dry coffee beans to form ground coffee, while the second stage was the observation of the chemical characteristics of the resulting ground coffee. The following is a flowchart of the research implementation.

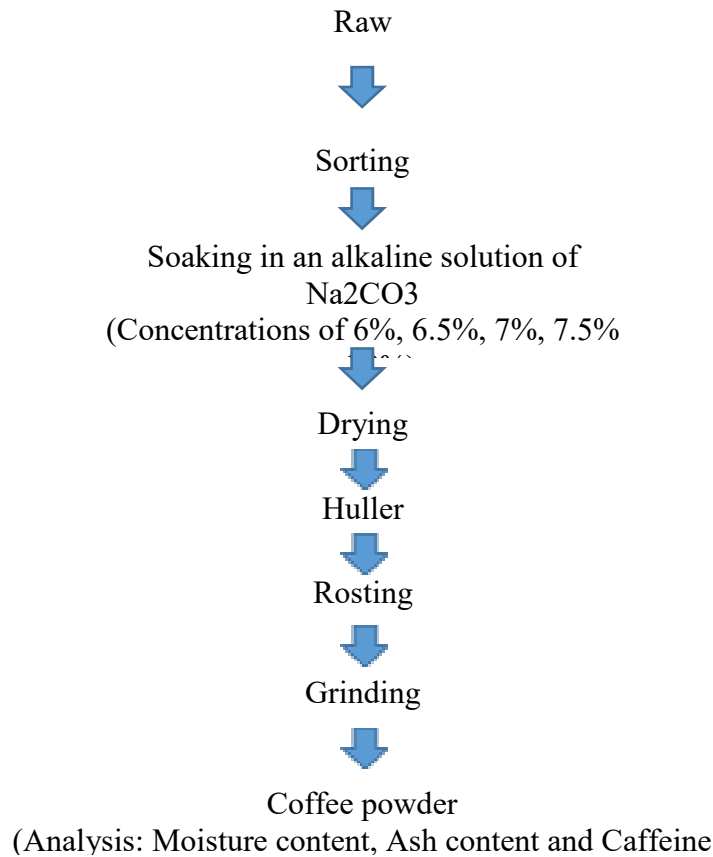


Figure 1. Flow Chart of The Research

The observations were conducted at Fateta Agricultural Product Technology Laboratory and competent laboratories in the field of coffee processing and related agencies. The properties being observed are (1) Caffeine content, method: AOAC (Official Method of Analysis). (2) Moisture Content, AOAC method (Official Method of Analysis) 2005. (3) Ash Content, AOAC method (Official Method of Analysis) 2005.

3 Research design

The research design used was a completely randomized design (CRD) with ten treatments and three replications. After the data was obtained, it was processed by ANOVA statistical test. It later followed by DMRT test at 5% level

RESULTS AND DISCUSSION

1 Moisture Content

The results of measurements of decaffeinated coffee grounds are described in Figure 2.

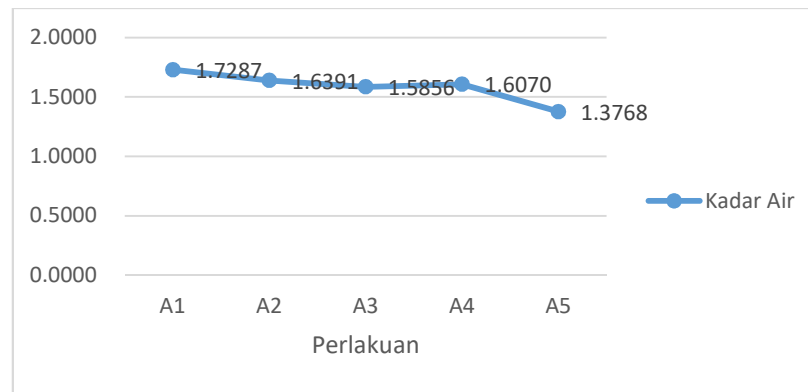


Figure 2. Decaffeinated Coffee Powder Moisture Content

Figure 2 above shows the coffee content obtained after immersion in Na_2CO_3 ranged from 1.3768% - 1.7287%. The lowest water content is produced in treatment A5 (immersion with the addition of 8% Na_2CO_3 alkaline solution) which was 1.3768%, while the highest water content is produced in treatment A1 (immersion by adding 6% Na_2CO_3 alkaline solution. Water content with treatment A1 and A2 shows an increase, while in the treatment of A3 it decreases.

Table 1. Duncan's Test Results Effect of Treatment on Decaffeinated Coffee Powder Moisture Content

Treatment	Moisture Content(%)
A1	1,7287 c
A2	1,6391 b
A3	1,5856 b
A4	1,6070 b
A5	1,3768 a

Variance analysis results show that the addition of Na_2CO_3 alkaline solution significantly affects the water content of coffee after the decaffeination process. The difference in the water content of each treatment does not differ greatly. This condition is because the entire set of decaffeination processes was carried out before roasting, so it can be understood that the water content of the final product tends to be homogeneous. Moreover, differences in water content in ground coffee can be caused by differences in the size of the seeds used. Mulanto (2001) states that differences in the size of coffee beans can affect the water content contained in coffee beans. Besides, the number of constituent cells in coffee beans is also a big factor (Primadia, 2009).

Overall, the characteristics of ground coffee meet the Indonesian National Standard (SNI 01-3542-2004) concerning ground coffee. According to SNI 01-3542-2004, the maximum water content of ground coffee is 7%. It means that the ground coffee produced in this study has fulfilled the requirements to be marketed as decaffeinated ground coffee.

2. Ash Content

Ash content is essential to measure the amount of mineral content contained in the sample material. The higher the ash content contained in the material, the

worse the quality of the food material (Sudarmadji, 2003). The results of measurements of decaffeinated coffee ground ash can be seen in Figure 3 below.

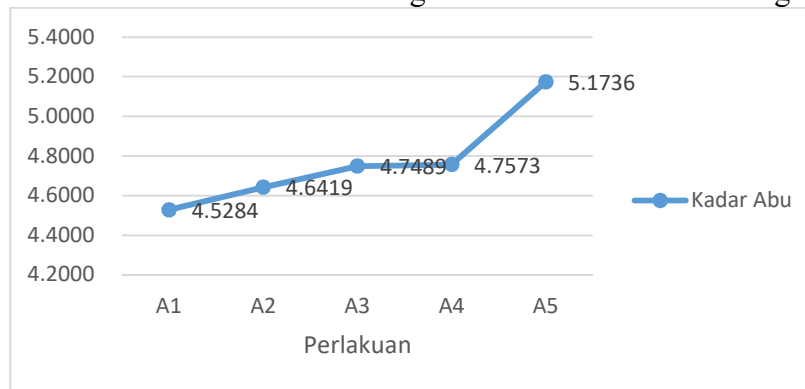


Figure 3. Decaffeinated Coffee Powder Ash Content

Figure 3 shows that the value of decaffeinated ground coffee ash content ranged from 4.5284 to 5.1736%. The lowest ash content was found in treatment A1 at 4.5284%, while the highest was at treatment A5 at 5.1736%. The higher the concentration of Na_2CO_3 added at the time of immersion, the higher the ash content detected in decaffeinated ground coffee. Yuhandini et al. (2008) state that the quality of the coffee will not be good if the mineral content is too high; unclean products will result in increasing levels of ash produced.

Table 2. Duncan's Test Results Effect of Treatment on Decaffeinated Coffee Powder Ash Content

Treatment	Ash Content (%)
A1	4,5284 a
A2	4,6419ab
A3	4,7489 b
A4	4,7573 b
A5	5,1736 c

The results of the analysis of variance show that the treatment of adding Na_2CO_3 solution at several concentrations significantly affects the ash content produced. If seen from the quality characteristics of ground coffee based on the Indonesian National Standard (SNI 01-3542-2004) concerning ground coffee, the maximum ash content of ground coffee is 5%. It means that ground coffee with A5 treatment (8% Na_2CO_3 concentration) produced in this study does not meet the requirements to be marketed as decaffeinated ground coffee.

3 Caffeine Content

The results of measurements of decaffeinated coffee ground caffeine can be seen in the following Figure 4.

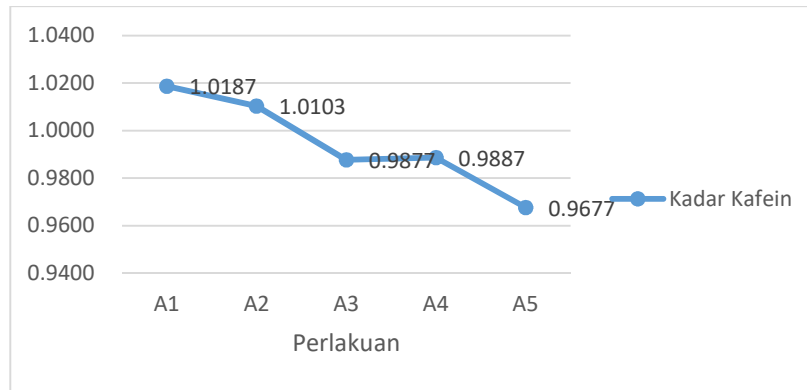


Figure 4. Decaffeinated Coffee Powder Caffeine Content

Figure 4 shows that the value of decaffeinated coffee grounds caffeine ranges from 1.0187 - 0.9677%. The lowest caffeine level was in the A5 treatment which was 0.9677%, while the highest was in the A1 treatment which was 1.0187%. In this study, caffeine levels decreased by only around 67%.

Table 3. Duncan's Test Results Effect of Treatment on Decaffeinated Coffee Powder Caffeine Content

Treatment	Caffeine Content (%)
A1	1,0187 c
A2	1,0103bc
A3	0,9877ab
A4	0,9887ab
A5	0,9677 a

The results of the analysis of variance show that the addition of Na_2CO_3 solution significantly affects the levels of caffeine powder coffee produced. Giving Na_2CO_3 in A5 treatment offers the best results by obtaining the lowest caffeine levels. The decrease in caffeine levels can be caused by several factors, including the addition of an alkaline solution, soaking time, and seed size. Mulanto (2001) states that the decrease in caffeine levels in the decaffeination process can be influenced by the time of dissolution and the size of coffee beans. The longer the soaking process is, the smaller the size of the seeds becomes, the amount of caffeine extracted will also increase.

CONCLUSIONS

The conclusion of this research are:

1. The addition of Na_2CO_3 solution significantly affects water content, ash content and decreased levels of caffeine in ground coffee.
2. Decaffeinated ground coffee produced has a moisture content ranging from 1.3768% - 1.7287%, ash content 4.5284 - 5.1736%, and caffeine content ranges from 1.0187 - 0.9677%.
3. The best treatment is in treatment A3 with 1.5856% water content, 4.7489% ash content and Caffeine content 0.9877%.

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