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# Herbal Candy Formulation for Active and Passive Smokers through Prebiotic and Antioxidant Activity Test of Fruit Peel Waste

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**Abstract.** Smoking behavior has become an urgent global health problem, leading to an increased risk of various chronic diseases and posing a significant health burden on society. In the context of efforts to prevent and reduce the negative impact of smoking, the role of prebiotics and antioxidants is increasingly being paid attention to because of their potential to improve gut health and counteract the negative effects of free radicals produced by exposure to cigarette smoke. Based on the description of the impact of smoking and the exploration of the health potential of banana peel and dragon fruit peel, this research will focus on the formulation of herbal candies. This study is experimental research with a post-test and a control group design. Dragon fruit and banana peels are extracted and evaporated until they form a paste, and then antioxidant and prebiotic activity is measured. After that, the basic formulation of herbal candies is determined and tested organoleptic. The test results were obtained. The best formulation based on the highest value was found in the FPKB3 treatment with values of color parameters of 5.76 (active smokers) and 5.86 (passive smokers), aroma 5.6 (active smokers) and 5.56 (passive smokers), taste 5.96 (active smokers) and 5.6 (passive smokers), and texture 5.66 (active smokers) and 5.76 (passive smokers).

**Keywords***:* Candy_Herbal_Perokok; Candy_Antioksidan; Prebiotics; Antioxidant; Fruit Peel Waste

## INTRODUCTION

Smoking behavior requires complex solutions because it is an urgent global problem. Cigarettes are a trigger for an increase in the prevalence of Non-Communicable Diseases (NCDs), addiction problems, air pollution, and even death. Tobacco plays a role in the deaths of as many as 8 million people every year. More than 7 million deaths were due to smoking behavior (active), and 1.2 million deaths were due to exposure to other people's ( (Health Sciences Duta Bangsa University Surakarta & Ika Listyorini, 2023) *passive*) cigarette smoke causing cardiovascular disease and respiratory disorders. Indonesia is in the top 10 countries

with the highest number of smokers, and occupies the top 3 with the highest number of smokers in the world, after China and India. Cumulatively, the number of tobacco users has increased, namely 70.2 million people in 2021 from 61.4 million people in 2011. Even if viewed by age group, out of a total of 34.5% of the Indonesian population who use tobacco products, the age group of 15-24 years ranks second with the most at 33.5%. This means that the adverse effects of exposure to cigarette smoke have a longer span of time because it has started since adolescence. The main challenge in active smokers is the dependence on nicotine, an addictive substance found in tobacco, which leads to strong physical and psychological dependence. This makes it difficult for individual smokers to quit, even though they are aware of the health risks associated with the habit. For passive smokers, their limitations in controlling the surrounding environment are also a serious problem. They may be exposed to secondhand smoke at home, at work, in public places such as restaurants and markets, and on public transportation. Constant contact with this cigarette smoke can cause adverse health effects. (Health Sciences Duta Bangsa University Surakarta & Ika Listyorini, 2023) (Handayani, 2023) (Andi Djemma et al., 2023) (Nazila et al., 2023)

Amid efforts to prevent and reduce the negative effects of smoking, research continues to explore treatment alternatives that can help reduce the health risks associated with smoking habits. In this context, the role of prebiotics and antioxidants is increasingly being paid attention to because of their potential to improve gut health and counteract the negative effects of free radicals produced by exposure to cigarette smoke. Smoking can disrupt the balance of the gut microbiota, causing dysbiosis that can affect the immune system and overall health. Prebiotics help restore the balance of the gut microbiota by increasing the population of good bacteria, such as (Patria & Prayitno, 2022) (Zahid et al., 2021) (Yaumil Bay Thaifur et al., 2024) *Bifidobacteria* and *Lactobacillus* (Mahore & Shirolkar, 2018) . Smoking also increases the production of free radicals in the body, which can lead to oxidative stress and cell damage. Antioxidants are compounds that can prevent or slow down cell damage caused by these free radicals and oxidation. (Haveni & Permana Sari, 2019)

The results of the antioxidant activity test in processed candies made from agarwood leaves were classified as very strong in FHCDG2 treatment and obtained organoleptic tests with high scores so this agarwood leaf herbal candy can be an alternative healthy consumption choice for active and passive smokers. Another study also mentioned that the manufacture of cinnamon extract substitution candy with the highest organoleptic test was

with a formula of 75% sucrose and 15% cinnamon extract. This candy product can be an alternative solution in an effort to quit smoking. (Nazila et al., 2023) (Andi Djemma et al., 2023)

Natural ingredients such as banana peel and dragon fruit peel have attracted attention as a potential solution to smoking-related health problems. Banana peels are known to contain rich dietary fiber, which has prebiotic properties. Meanwhile, dragon fruit peel is rich in antioxidants, especially betacyanins, which can help protect the body from free radical damage caused by smoking. Among several types of fruit peels that have been researched, the high antioxidant activity is found in dragon fruit peel waste, which is an IC50 value of 2.69 ppm. These two natural ingredients promise to be the basis for the development of herbal products that can help reduce the risk of smoking-related diseases and improve overall health. Herbal candies containing prebiotics and antioxidants can help overcome exposure to secondhand smoke through mechanisms that improve gut health, neutralize free radicals, reduce oxidative stress, and strengthen the immune system. The combination of prebiotics and antioxidants in herbal candies provides double protection that can improve and maintain health despite exposure to secondhand smoke. (Nazila et al., 2023) (Patria & Prayitno, 2022) (Fitria et al., n.d.)

Previous research on the formulation of candy products and the like for smokers has been carried out. Still, the majority has focused on therapeutic products as a substitute for cigarettes or smoking cessation therapy (Nicotine Replacement Therapy (NRT) products. The novelty of this study is to produce a formulation of herbal candies to reduce the danger of exposure to cigarette smoke for active and passive smokers through two combinations of bioactive compounds, prebiotics and antioxidants, and utilizing fruit peel waste. One study examined herbal candy formulations for active and passive smokers but only tested one parameter (antioxidants) with different variables. (Amnestiya et al., 2023; Fitria et al., n.d.; Haveni & Permana Sari, 2019; Khoirunnisa & Subarnas, 2023; Mahore & Shirolkar, 2018; Yaumil Bay Thaifur et al., 2024; Zahid et al., 2021)

Based on the description of the impact of smoking and the exploration of the health potential of banana peel and dragon fruit peel, this research will focus on the formulation of herbal candies. This study will identify the most effective herbal candy formulations in providing the desired health benefits by testing the prebiotic and antioxidant activity of banana peels and dragon fruit peels. Thus, this research is expected to contribute to the

development of products that have the potential to reduce the negative impact of smoking and improve overall public health by utilizing the potential of available natural ingredients.

## METHOD

This study is experimental research with a post-test and *a control group design*. The research was carried out from August to September 2024 at the Integrated Laboratory of Raden Fatah State Islamic University, Palembang. The flow of the research implementation is illustrated through the following flow diagram:


**Figure 1. Research Flow**

The collected data is processed using SPSS 23.00 for Windows. The data analysis technique used in this study is a quantitative descriptive analysis technique. The variables were assessed descriptively in the prebiotic and antioxidant activity tests. In the organoleptic test, data analysis was carried out using an analysis of variance (ANOVA). The level of preference of the panelists about the quality of fruit peel waste candy was obtained through an organoleptic test assessment by assessing four indicators, namely color, aroma, texture, overall taste, and hedonic test. (Muslich Ansori & Sri Iswati, 2019)

## DISCUSSION

The result of this study is the formulation of herbal candies, which begins with testing the antioxidant activity of dragon fruit peel and banana peel prebiotics, which are then combined into cigarette smoke-free radical antidote candy products. The stages of the research process are as follows:

Dragon fruit peels and kepok banana peels are washed and cut into thin strips, then dried using an oven at 50ºC to reduce the moisture content. The peel of the fruit is mashed using a blender. Then the crushed fruit peel is weighed as much as 200 grams each, soaked with ethanol with a ratio between simplicia and solvent (1:15), and maceration is carried out for 3 x 24 hours by filtering every 24 hours, and the solids are re-soaked with a new solvent. The filtrate from the maceration results was combined and evaporated using a rotary evaporator to obtain a thick extract of 8.1 grams of dragon fruit peel extract and 21.8 grams of banana peel extract.

Antioxidant activity test on dragon fruit peel using the DPPH method. Dragon fruit peel ethanol extract diluted with some concentration of 0.2, 0,4, 0,6, 0,8, and 1 mg/mL. A total of 1 mL of each concentration is taken and inserted into a test tube. Next, 2 mL of DPPH 0.1 mM is added to each test tube. The mixture was incubated for 1 hour in a dark room, homogenized, and absorbed using a UV spectrophotometer at a wavelength of 517 nm. The results of the sample absorbance measurement are presented in the following Table 1: (Mahargyani, 2018)

Table 1. Results of Dragon Fruit Skin Antioxidant Measurement

| Sample Concentration (mg/mL) | Absorbance (nm) | % inhibition |
|---|---|---|
| 1 | 0.043<br>0.056 | 78.80 |
| 0.8 | 0.070<br>0.070 | 70.15 |
| 0.6 | 0.101<br>0.110 | 54.80 |
| 0.4 | 0.124<br>0.133 | 44.95 |
| 0.2 | 0.215<br>0.212 | 8.65 |
| 0 | 0.220 | - |

The IC50 value from the antioxidant activity test of DPPH dragon fruit peel extract (2,2-diphenyl-1-pyrrylhydrazile) can be determined from the linear equation obtained from the

graph of the relationship between the concentration and absorbance of the samples. The calculation results show that the IC50 value of dragon fruit peel is 0.586 mg/mL.

Test the prebiotic activity of kepok banana peels using an MRS broth culture medium for prebiotic bacteria with Lactobacillus type. Sterilization of the culture media by autoclaving. Inoccate Lactobacillus bacteria into culture medium and incubate the bacteria at 37°C for 18-24 hours. Add the prebiotic extract from the banana peel to the culture medium with the incubated bacteria at some concentration for comparison. Re-incubate the mixture at 37°C for 24-48 hours. After incubation, bacterial growth was measured using the turbidimetry method (OD600) with a spectrophotometer or plate count method. (Rusdi & Yuniarni, 2023) (Yanti, 2020)

For the manufacture of candy products, the Fruit Peel Candy Formulation Treatment (FPKB) consists of three treatments for the addition of a combination of dragon fruit peel and banana peel, namely: FPKB1 treatment with a composition of dragon peel flour of 5 grams, banana peel flour of 5 grams, water of 50 ml, granulated sugar of 150 grams, and liquid sugar of 40 ml. FPKB2 treatment is composed of dragon peel flour 5 grams, banana peel flour 2.5 grams, water 50 ml, granulated sugar 150 grams, and liquid sugar 40 ml. FPKB3 treatment is composed of dragon peel flour 2.5 grams, banana peel flour 5 grams, water 50 ml, granulated sugar 150 grams, and liquid sugar 40 ml.

An organoleptic test or taste level test is a test parameter used to choose the best formulation and quality acceptance of fruit peel candy. The panelists used in this study were 100 people. The test indicators or hedonic scale on the product are in the form of seven scorings, namely (1) very disliked, (2) disliked, (3) somewhat disliked, (4) mediocre, (5) somewhat liked, (6) liked, and (7) strongly liked. The results of the organoleptic test with statistical analysis of Kruskall Wallis, each parameter such as color, aroma, taste, and texture got a Sig value of > 0.05, which means there was no impact, namely the sig parameters of color 0.952, aroma 0.194,, taste 0.353, and texture 0.141

The results of organoleptic tests on color, aroma, and taste parameters in FPKB3 treatment were better and most preferred by panelists compared to other treatments, while the texture of the average organoleptic homogeneous value was highest in FPKB1 treatment.

Table 2. Average Results of Organoleptic Tests

| Parameters | Mean Value of Organoleptic Test | | |
|---|---|---|---|
| | FPKB1 | FPKB2 | FPKB3 |
| Color | 5.75±0.982 | 5.78±0.890 | 5.80±0.856 |
| Aroma | 5.30±1.004 | 5.35±0.981 | 5.56±1.110 |
| Taste | 5.70±0.920 | 5.72±0.912 | 5.74±0.981 |
| Texture | 5.76±1.120 | 5.60±1.020 | 5.45±1.168 |

## CONCLUSION

The antioxidant test of dragon fruit peel showed strong results with the results of calculating the IC50 value from dragon fruit peel extract of 0.586 mg/mL. The banana peel prebiotic test obtained the highest cell count result of 1.8x108 CFU/ml. The best formulation based on the highest value was found in the FPKB3 treatment with values of color parameters of 5.78 (active smokers) and 5.88 (passive smokers), aroma 5.5 (active smokers) and 5.46 (passive smokers), taste 5.98 (active smokers) and 5.8 (passive smokers), and texture 5.62 (active smokers) and 5.78 (passive smokers), respectively.

## BIBLIOGRAPHY

Amnestiya, P., Putra, A. Y., & Sari, Y. (2023). Identification Of Secondary Metabolite Compounds And Antioxidant Activity Tests In Fruit Peel Waste. *MULAWARMAN CHEMICAL JOURNAL*, *20*(2), 97. https://doi.org/10.30872/jkm.v20i2.1129

Andi Djemma, J., Education, J., & Qur, B. (2023). Cinnamon Extract Candy (Cinnamomum Burmanii) as an Alternative to Reduce Smoking Addiction in Adolescents. *Andi Djemma Journal*, *6*(2).

Fitria, A., Mulkiya Pharmacy Study Program, K. Y., Mathematics and Natural Sciences, F., & Islam Bandung, U. (n.d.). *Literature Search: Potential Activity of Antioxidant Activity and Food Fiber of Red Dragon Fruit Peel (Hylocereus polyrhizus) and Its Utilization in Functional Food*. https://doi.org/10.29313/bcsp.v2i2.ID

Handayani, L. (2023). Overview of Smoking Habits in Adults in Indonesia: Findings from the 2021 Global Adult Tobacco Survey (GATS). *WINS Journal*, *3*(4), 193–198. http://ojs.uho.ac.id/index.php/winsjo

Haveni, D., & Permana Sari, R. (2019). Ethanol Extract Of Super Red Dragon Fruit Peel (Hylocereus costaricensis) As An Antioxidant Using The (Dpph) Method. In *KATALIS, Journal of Chemistry and Chemical Science Education* (Vol. 30, Issue 2).

Health Sciences, Duta Bangsa University of Surakarta, F., & Ika Listyorini, P. (2023). Smoking Behavior of Indonesian People Based on the 2021 Global Adult Tobacco Survey. In *Proceedings of the National Health Information Seminar (SIKesNas)*.

Khoirunnisa, A., & Subarnas, A. (2023). *Indonesian Journal of Biological Pharmacy Review: Utilization of Some Herbal Plants as a Potential Drug Aiding in Smoking Cessation* (Vol. 3, Issue 1).

Mahargyani, W. (2018). Compound Identification and Antioxidant Activity Test of Ethanol Extract of Red Dragon Fruit Peel (Hylocereus polyrhizus). In *General Achmad Yani Cimahi PINLITAMAS 1* | (Vol. 1, Issue 1).

Mahore, J. G., & Shirolkar, S. V. (2018). Investigation of Effect of Ripening and Processing on Prebiotic Potential of Banana. *J Young Pharm*, *10*(4). www.jyoungpharm.org|www.phcog.net

Muslich Ansori, H., & Sri Iswati, H. (2019). *Quantitative Research Methodology* (Vol. 2). Airlangga University Press.

Nazila, N., Asta, H., & Salwati, N. U. (2023). Formulation And Antioxidant Activity Of Agarwood Leaf Hard Candy As A Herbal Product For Active And Passive Smokers. *Indonesian Health Scientific Media*, *1*(1), 16–22. https://doi.org/10.58184/miki.v1i1.60

Patria, D. G., & Prayitno, S. A. (2022). *Functional Foods and Their Benefits for Health* (A. Kurniawan, Ed.; First Printing). UMG Press.

Rusdi, B., & Yuniarni, U. (2023). Prebiotic Activity of Ambon Banana (Musa acuminata (AAA Group) 'Ambon') Peel Starch Against Lactobacillus. acidophilus and Escherichia coli In Vitro. *Phytopharmaca: Scientific Journal Of Pharmacy*, *13*(2), 97–104. https://doi.org/10.33751/jf.v13i2.9237

Yanti, F. (2020). The calculation of the number of bacteria in the Microbiology Laboratory uses the development of the Spectrophotometry method. In *Journal of Science Research* (Vol. 22, Issue 2). http://ejurnal.mipa.unsri.ac.id/index.php/jps/index

Yaumil Bay Thaifur, A. R., Nadziyran Urufia, W. O., Fitriani, & Jumadi. (2024). Candy Substitution Strategy for Active Smokers to Reduce Cigarette Consumption among Adolescents: Alternative Milk Candy Management Method for a Healthy Life without Smoking. *Collaborative Journal of Science*, *7*(3). https://jurnal.unismuhpalu.ac.id/index.php/JKS

Zahid, H. F., Ranadheera, C. S., Fang, Z., & Ajlouni, S. (2021). Utilization of mango, apple and banana fruit peels as prebiotics and functional ingredients. *Agriculture (Switzerland), 11*(7). https://doi.org/10.3390/agriculture11070584