

UTILIZATION OF FLAVONOIDS FROM VEGETABLES AND FRUITS AS IMMUNE SYSTEM ENHANCERS DURING A PANDEMIC IN PANIKI VILLAGE, MAPANGET DISTRICT, MANADO CITY

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Abstract: Along with the end of the COVID-19 pandemic, various problems have emerged, which health being a sector that requires more attention for recovery. People believe that consuming immune system enhancing supplements can help maintain health, but the issue of affordability poses another challenge for them. Maintaining a strong immune system can be achieved in a simple and cost-effective way, namely by incorporating vegetables and fruits into the diet. These natural foods contain nutrients that have the potentiation to act as antioxidants, anti-inflammatories, and detoxifiers. The benefits of antioxidants are believed can enhance and sustain the immune system, particularly during pandemic. Flavonoids, which are found abundantly in fruits and vegetables, can be extracted by soaking them in suitable solvents. Flavonoids are soluble in polar and semipolar solvents, including water. Community education on the utilization of flavonoids was conducted in Paniki Village, Mapanget District, using direct learning and simulation methods. The target audience consisted of productive individuals aged 20-40 years and teenagers. The evaluation, has been held through direct interviews 5 days after the activity, revealed an increased knowledge among the participants regarding the utilization of vegetables and fruits, as well as an improved understanding of the processing methods to optimize the nutritional benefits they provide. Based on these findings, it can be concluded that direct learning dan simulation activities effectively enhance the knowledge of flavonoids utilization from vegetables and fruits among the productive age residents and adolescents in Paniki Village.

Keywords: flavonoids, immune system, community education

Introduction

The outbreak of the COVID-19 (Coronavirus Disease) pandemic has had a negative impact on most aspects of life for the people of Southeast Asia, including Indonesia. The health is the sector that is most worrying due to the high number of reported cases of COVID in a short period of time, limited medical personnel who ultimately infected by the virus from patients who are being treated, lack of patient isolation facilities and the widespread hunting for equipment and consumables which are thought to be “savior” from exposure to the virus (United Nation, 2020). COVID in Indonesia is

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spreading rapidly in several areas on the islands of Java, DKI, Bali and Sulawesi with quite high death percentages. The number of positive corona cases in North Sulawesi in June 2020 reached 1,024 since the first case was discovered in March 2020 (Wicaksono, 2020).

The government has made various efforts to prevent and control COVID-19 through education about new normal procedures and regulations for carrying out daily life. The public is advised to always use masks correctly, regularly wash their hands, keep their distance and maintain good eating and living patterns (Kemenkes R1, 2020). Apart from the many efforts suggested by the public to overcome COVID-related problems, many other efforts are considered efficient for improving the quality of public health, one of which is by exercising, maintaining healthy eating and drinking patterns. Paniki Dua Village, Mapanget District is a residential area in the center of Manado city whose people are active both in terms of family activities and office activities. Such activities make it possible for someone to be careless in consuming drinking water due to the many things they do during the day. Lack of water consumption risks causing dehydration or lack of body fluids. Vieux et al., (2017) explained that there has been an increase in drinking water consumption in several developing countries, including Indonesia. An alternative that is becoming a trend to increase the habit of drinking water at this time is the widespread use of Infused Water.

Infused water is drinking water that is mixed with fresh vegetables or fruit and several types of spices. A previous study suggested the benefits of fruit-infused water in increasing blood glucose around 45 minutes after intake (Ali et al., 2018). The addition of colorful fruit slices can increase appetite to encourage people to drink more water (Haitama et al., 2017). When making infused water, things that need to be considered are the quality of the water used and the cleanliness of vegetables and fruit as a good source of nutrition. The benefits of infused water follow the benefits provided by the types of vegetables, fruit or spices mixed in it, for example vitamins and flavonoids as natural compounds with antioxidant activity (Surati, 2017). Panche, et al., (2016) in their review article stated that flavonoids are compounds that have several biological activities, including anti-inflammatory and antioxidant, so they are widely used in the nutraceutical, medicine, food and even cosmetics industries.

Flavonoids are one of the derivatives of phenolic compounds (hydroxybenzoic and hydroxycinnamic acids), polyphenols (hydrolyzed and condensed tannins) contained in plants or parts of plants. The basic structure of this compound is presented in Figure 1. The presence of a hydroxyl group in the basic structure of flavonoids causes this compound to be polar and it is possible to extract it using polar to semi-polar solvents, such as flavonoids from tea (De Luna et al., 2020; Do, 2014). On this basis, it is very possible that the flavonoids from fruit and vegetables soaked using the infusion method will be absorbed into the soaking water.

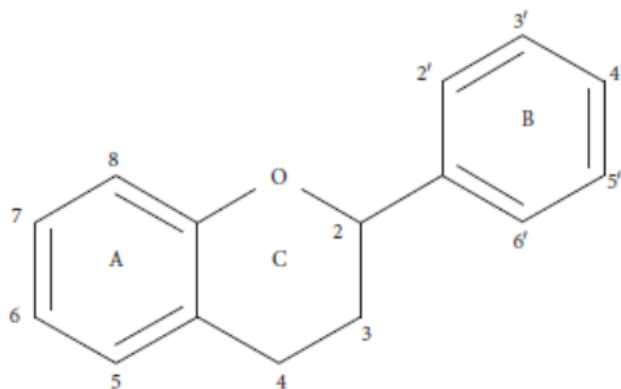


Figure 1. Basic Structure of Flavonoids (De Luna, et al., 2020)

The important role of flavonoids for plants has long been known as providing color to leaves and flowers, providing a sweet aroma to flowers, pollination mediators and supporting plant development. Flavonoids have the activity of protecting plants from the bad effects of ultraviolet (UV) rays, functioning as detoxifying and antimicrobial substances (Panche et al., 2016). Kumar and Pandey in Panche, (2016) stated that the activity of flavonoids in humans is as good as the activity that occurs in the plants that produce them. Various researchers have carried out research related to flavonoids which shows that most types of flavonoids have a low level of solubility in nonpolar solvents. The presence of hydroxyl groups in flavonoids increases their ability to bind with polar solvents such as distilled water (De Luna et al., 2020).

Materials and Methods

Tools used during activities include water containers for infused water, knives, cutting boards and fruit and vegetable containers. The ingredients prepared include vegetables, fruit and spices including oranges, lemons, lemongrass, cinnamon, cloves, red dragon fruit, grapes and cucumbers.

Community service activities are carried out using educational and simulation methods. The education is intended to socialize the benefits of vegetables, fruit and regular water consumption as an alternative effort to live a post-pandemic lifestyle in a more economical way. The simulation in this activity was carried out as a guide to procedures for making infused water for the audience present with the aim of facilitating the production process independently. What is done after education and simulation is evaluating the results of activities carried out directly by conducting interviews with residents. The evaluation questions given are related to the differences felt when daily water needs are met, the differences in sensations obtained when consuming mineral water and infused water, as well as the different benefits felt by the body after consuming mineral water and infused water. The activity framework is briefly presented in Figure 2.

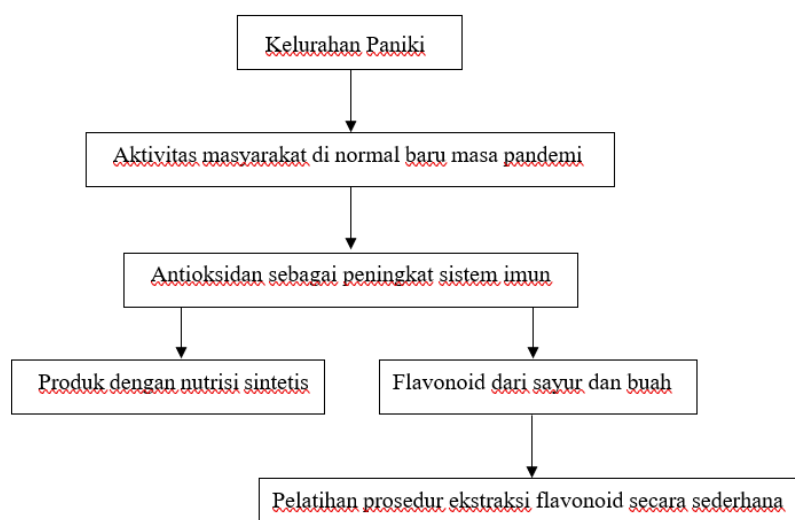


Figure 2. Problem Solving Framework for Utilizing Flavonoids as immune system enhancers during the pandemic.

Results and Discussion

Community service with the theme Utilization of Flavonoids from Vegetables and Fruit to Boost the Immune System during the Pandemic was carried out in Paniki Village, Mapanget District, Manado City on April 8 2021. There were 22 participants, most of whom were residents with daily activities as students , office workers and household routines. The activity lasted for approximately 2 hours, and a series of material was delivered by Hindun A. Rahim and Febrianika A. K., in parallel without a moderator. Things that are considered important and are explained directly in the activity are related to the current situation where the COVID-19 pandemic is still ongoing and health protocols must continue to be implemented carefully, while the economic situation of the community requires that most people's activities are not done from home or Work From Home. (WFH).

The new normal situation causes many things to change in society, where implementing these health protocols also carries serious risks if they are violated, namely exposing someone to the corona virus. A person's immune system is really tested in this situation, therefore many people are "hunting" for multivitamins and health supplements which are thought to help prevent exposure to viruses. In fact, the body's defense system cannot be built by consuming supplements or multivitamins alone, but lifestyle habits such as eating good food and getting enough rest and doing regular physical exercise play a big role in building a good body defense system.

Most people still lack knowledge that fruit and vegetables are a source of vitamins, minerals and compounds that are good for the body. Most of the reasons for not liking the taste of certain types of fruit and vegetables are the main factors in people's rejection of them. This then became the basis for

community service activities which were carried out using 2 methods, namely providing materials and training. The type of training carried out is a demonstration of making fruit and vegetable infused water preparations.

Infused water is the latest and more modern term known to the public for the method of extracting compounds from vegetables and fruit by soaking them in a suitable solvent, in this case the solvent used is drinking water or mineral water. The work procedure for making this preparation refers to the book containing infused water recipes by Jane Burton (2014) entitled *Infused Water Recipes – Tasty Vegetable and Fruit Infusion Recipes for Your Infuser Bottle or Pitcher*. This book explains the importance of consuming water and water containing compounds from fruit and vegetables which have good health benefits.

Some literature is used to support matters related to infused water preparations, flavonoids from plants and extraction methods. During the demonstration for activity participants, tools and materials have been provided by the resource persons, work procedures for making preparations have also been provided in leaflets. Haitama (2017) in his article states that the cold maceration method using water powder is suitable for samples containing vitamin C. Vitamin C is a water-soluble vitamin where in the procedure for preparing infused water preparations the vitamin C contained in vegetables or fruit can be slowly absorbed by water as a solvent. Likewise, the activity of vitamin C and flavonoids as antioxidants in vegetables and fruit is extracted during the extraction process with water solvents.

In general, infused water or maceration at cold temperatures is carried out by storing the preparation in a refrigerator at a temperature of approximately (5°C). Based on research by Wassalwa (2016), maceration at this temperature causes a tendency to increase antioxidant concentrations along with increasing soaking time compared to maceration carried out at room temperature or temperatures above 37°C. Sahin (2013) presented the results of his research regarding the comparison of the composition of phenolic compounds contained in fruit infused water based on temperature differences starting from 20.40, 70 and 100°C. Increasing temperature significantly affects the total amount of phenolic compounds that are absorbed in the solvent such as flavonoids and anthocyanins, but increasing temperature also causes a decrease in antioxidant activity (Haitama, 2017).

Storage of the infused water preparation at a temperature of 5°C is carried out for approximately 8 hours or 1 night. This aims to give the solvent time to slowly draw chemical compounds from vegetables and fruit through a diffusion mechanism. Cold temperatures will maintain chemical compounds and their benefits optimally. Apart from maintaining the quality of antioxidants and their activity on the body, filtering at this temperature also refers to the therapeutic effect of antioxidant compounds on the immune system during the pandemic.

The extraction results can be drunk directly by family members who are interested in consuming it without requirements for drinking time, because the preparation of this preparation aims to improve the quality of water consumption that is appropriate for the body. Vegetable and fruit residues left in the container can still be reused by soaking for the same time. The soaking process can be carried out approximately 3 times to prepare one sample of vegetables and fruit.

Evaluation is carried out 5 days after the activity is completed. The 5 day period starts on Monday, 12 – 16 April 2021, based on consideration of most of the activities carried out by residents in Manado City within 5 working days. Based on interviews conducted, residents stated that their desire to drink water increased by seeing the variety of colors of infused water that was made. Some other residents stated that they were interested in drinking because there was a different taste from consuming water without added fruit and vegetables or spices. Overall, in a day residents can consume more water than usual and feel better sensations in their bodies, for example less sleepy and focused on the work or activities they are doing. Residents stated that they would continue to make and consume infused water in the days to come, and make it a healthier routine during the pandemic and after.

Conclusion

Thus, community service activities in Paniki Village, Mapanget District, Manado City have been successfully carried out well and smoothly. Residents now have an understanding of how to process vegetables and fruit, not just by cooking them. Optimizing the use of ingredients cheaply, easily and efficiently with good nutritional value can now be done independently, even at home, with simple equipment. Another benefit obtained is the optimization of active substances in the form of secondary metabolites with antioxidant activity from vegetables and fruit as a post-pandemic immune system enhancer that can be produced independently by residents.

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