

Community Empowerment in Knowing Sources of Natural Antioxidants Through Hydroponic Systems

Nurmeily Rachmawati¹, Syarah Anliza²

¹Teknologi Laboratorium Medis, Poltekkes Kemenkes Banten

²Teknologi Laboratorium Medis, Poltekkes Kemenkes Banten

Email: 1nurmeily.rachmawati@gmail.com, 2syarah125@gmail.com,

Abstract

Health is one of the main pillars of human life. The quality of health of a country or a person can be affected by the development of the disease. Based on the results of the Basic Health Research (Riskesdas) in 2018, degenerative diseases showed an escalation. These diseases originate from environmental factors that have decreased in quality. One of them is the emergence of free radical compounds. These free radicals can oxidize nucleic acids and initiate degenerative diseases. Antioxidants are able to ward off free radicals which can be obtained from natural sources. One of the natural sources of these antioxidants is plants. The method used in this service activity is community education through counseling activities and hydroponic system skills training that can be applied at residents' homes using simple tools and materials. The purpose of this service activity is to increase public knowledge about sources of natural antioxidants and training on hydroponic systems. The implementation of this service activity was carried out in RW013 Gebang Raya Village, Periuk District, Tangerang. The results of the service showed an increase number in knowledge which was originally 42% to 66% from the results of the pretest and posttest that has been carried out. The knowledge indicators provided information including the definition of antioxidants, knowledge of free radicals, sources of antioxidants, and last but not least natural and artificial antioxidants. The residents also gained skills improvement from learning through a hydroponic system using kale, spinach, pokcoy, and lettuce as sources of natural antioxidants.

Key words : antioxidant; knowledge; hydroponic; education

INTRODUCTION

As one of the developing countries in the world that does not escape the limitations of technology and other common problems, and one of them is health. Based on the results of the 2018 Riskesdas, it shows that Indonesia has experienced an increase in degenerative diseases compared to the results of the Riskesdas in 2013. Several degenerative diseases include cancer, stroke, diabetes, hypertension, etc. The incidence of cancer in Indonesia (136.2/100,000 population) is 8th in Southeast Asia, while in Asia it is 23rd (Kemenkes, 2019).

These health problems can be caused by an unhealthy lifestyle. For example, not eating healthy and nutritious foods,

smoking, not doing physical activities such as exercising regularly, and other activities that have a negative effect on body health. According to the health profile the City of Tangerang, hypertension and diabetes are the biggest diseases in the City of Tangerang. These two health problems are also problems in one of the sub-districts, namely Neglasari (Dinkes Kota Tangerang, 2016).

These diseases can be occur due to environmental factors that have decreased in quality. One of them with the emergence of free radical compounds. The facts have shown that the tendency of the presence of free radical compounds in the body and from the environment can trigger the emergence of several degenerative

diseases. These free radicals can react with molecules that are components of body cells by binding to molecular electrons. These free radicals can oxidize nucleic acids, proteins, fats and even cell DNA and initiate degenerative diseases (Reynertson, 2007). The formation of pro-oxidant free radicals (oxidation boosters) is balanced by the body by forming antioxidants (oxidation antidotes). A number of enzymes in the body act as radical scavengers, such as catalase, glutathione, glutathione peroxidase (Refli, 2012).

In a healthy state the amount of antioxidants in the body can offset free radicals. However, under certain conditions such as illness, stress, heavy smokers, alcohol drinkers, and environmental conditions that are unhealthy and polluted by pollution can interfere with the body's defense against free radicals that are formed. This situation is called oxidative stress. This situation underlies the occurrence of various diseases caused by radicals, such as cancer, high blood pressure, diabetes and so on (Astawan, 2009).

Based on research by Food Laboratories of Eastman Chemical Product Inc., it has been known the effectiveness of several types of antioxidants, the synergistic properties of phospholipids, as well as the effect of citric acid and phosphoric acid on antioxidant activity under certain conditions. Synergy is a compound that has little antioxidant properties but can increase the effect of primary antioxidants. Ascorbic acid and citric acid have a synergistic effect on antioxidants and are often used as antioxidants in food.

These antioxidants can also be obtained from natural sources, one of which is plants (Rahmi, 2017). Some

sources of antioxidants that are easily obtained from plants include kale, mustard greens, pakcoy, tomatoes, and others. To be able to create a healthy culture by consuming vegetables, people can take advantage of the hydroponic system. This hydroponic system has various methods including the NFT system, wick, drip, etc. (Suhardiyanto 2010; Sendari 2020).

The hydroponic system is a way of farming by providing nutrients to plants using water media without using soil media (Buleleng, 2021). The hydroponic system does not require a large area of land and can be done in their respective homes with limited land availability (Hasta et al., 2021). Vegetable cultivation activities as an alternative source of natural antioxidants can increase food security and can increase household income (Rahmi et al., 2020).

Thus, this activity is necessary with the stages of increasing public knowledge beforehand through education and training on hydroponic system skills as an alternative source of natural antioxidants. By increasing the level of knowledge to the application stage, it is expected that a culture of healthy lifestyles in countering free radicals can be formed. So that the community can become a healthy and superior generation. The following are some of the solutions offered in this activities:

- a) It is necessary to increase public knowledge about antioxidants by implementing educational activities so that the level of public knowledge increases to the applicable stage
- b) This educational activity is to provide counseling and create a mini antioxidant garden through the introduction of a hydroponic system so that people can cultivate a healthy life by utilizing natural sources of antioxidants to ward off free radicals circulating in the environment.

c) Creating a clean and healthy lifestyle so that public knowledge about natural sources of antioxidants can continue to be applied both to themselves, their families, and the surrounding environment.

METHOD

The implementation of this community service activity uses community education methods, namely in the form of counseling education about natural antioxidant sources using power point media. Meanwhile, to improve skills, it is carried out with a hydroponic system demonstration media that can be applied at home. The target of this activity is women who are in the area of RW013 Kelurahan Gebang Raya Tangerang.

The number of participants in this activity was 20 people who were housewives and elderly cadres with an age range of 38-70 years. This activity takes place by implementing health protocols including the use of masks during the activity, the use of sanitizers before and after the activity, and is carried out in an open space and distanced from each participant. This activity will be carried out in October 2021 and an evaluation will be carried out in November 2021. The activity stages are carried out with permission from the head of the local RW and reviewing the location of the activity. The next stage of implementation involves a community service team consisting of 2 lecturers, 2 students, and 2 staffs. At this stage, it begins with a pretest, then education is carried out using power points about natural antioxidant sources and closed with a demonstration of a simple hydroponic system using a wick system. The last stage is an evaluation to see the results of the implementation of activities carried out in November 2021.

To measure the level of knowledge of participants, a questionnaire was given before and after the counseling was given. It aims to see the difference in the level of knowledge of participants before and after the activity. The questionnaire contains 5 multiple choice questions with question indicators including the definition of antioxidants and free radicals, natural and artificial sources of antioxidants, and the impact of antioxidants on body health.

The evaluation was carried out by monitoring the service participants who had implemented the knowledge gained by carrying out the hydroponic system at their respective homes. This evaluation activity also aims to see the community's commitment to creating a healthy environment. In addition, by evaluating this activity, it is possible to see service participants who can successfully carry out a hydroponic system until the crop harvest time arrives.

RESULTS AND DISCUSSION

The community service activities carried out aim to increase the knowledge and skills of the community, especially the group of women who are in RW013 Gebang Raya Village, Periuk District, Tangerang City. To find out the increase in participants' knowledge, a pre-test was carried out first with 5 multiple choice questions. After being educated using powerpoint media and subsequent leaflets for hydroponic system skills training, then participants filled out a posttest questionnaire to see if there was a change in knowledge after being given education. The following are the results of filling out the pre and posttest questionnaires for participants in community service activities in table 1. below:

Table 1. Results of Filling in the Pre and Posttest Questionnaires

Number of question	Pretest		Posttest	
	Correct answer	Wrong answer	Correct answer	Wrong answer
1	80%	20%	95%	5%
2	40%	60%	60%	40%
3	25%	75%	45%	55%
4	50%	50%	85%	15%
5	15%	85%	45%	55%
average	42%	58%	66%	34%

Based on the results in table 1, it can be seen that there was an increase in the knowledge of the activity participants from 42% to 66%. Several indicators of the questions asked also showed an increase in knowledge. Changes in increasing knowledge in this service activity are shown in the graph below.

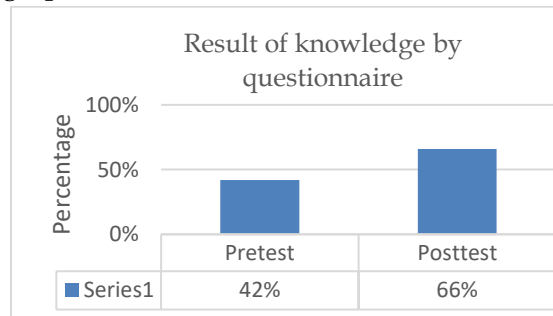


Figure 1. Graph of Increasing Public Knowledge

In general, people already have a basic concept of antioxidants. After being given education about sources of antioxidants and examples of natural antioxidant substances, public knowledge, especially participants in community service activities, has increased as seen from the posttest results. Furthermore, in this activity, skills training on hydroponics was also carried out.



Figure 1. Education About Antioxidant Sources and Hydroponic Systems

This hydroponic plant can be used as an alternative source of natural antioxidants by the RW013 community. The skills given include planting several vegetables such as spinach, kale, and pokcoy using the wick system. This method utilizes an axis with the principle of capillarity by using a wick or material that easily absorbs water, such as cloth as a link between nutrients and the root part of the growing media. The selection of plants such as spinach, pakcoy, and kale, apart from being easy to apply but also contains a number of nutrients, one of them is antioxidants..



Figure 2. Demonstration of Planting

Using a Hydroponic Wick System with Participants

Spinach contains several vitamins B6, B9, E and other minerals, including K, Mg. Antioxidant substances such as zeaxanthin, quercetin, lutein, kaempferol, iron, folic acid (Sartika, 2020). Based on a FRAP analysis, spinach alone can provide up to 0.9 mmol of antioxidants per 3.5 ounces (100 grams). Pakcoy vegetables also contain antioxidant substances such as lutein, zeaxanthin, and beta carotene which are useful for eye retina health (Haq, 2020). Kale contains abundant levels of phenolic antioxidants, such as beta carotene, lutein, xanthin, and cryptoxanthin. vitamin A, vitamin B, vitamin C, phosphorus, iron, fiber, selenium, amino acids, and calcium (Hidayati et al., 2017)

The community is also given a set of media to implement knowledge about this hydroponic wick system in the form of rockwool, flannel, seeds, netpot, trays, and AB mix nutrition. The tools and materials needed can also be replaced with used items such as used plastic bottles as netpots, jerrycan bottles can be used instead of trays. Rockwool media is used as a planting medium to absorb nutrients, flannel as a capillary medium to absorb nutrient water, and AB mix nutrients are nutrients needed by plants that cannot be obtained from the soil, namely minerals (Julyana et al., 2018).



Figure 3. Monitoring and Evaluation of Activities and Signing of Commitments Agreement

The activity evaluation process is carried out 1 month after the counseling is carried out. The community service team received a response from 20 participants who took part in this activity, only 50% (10 people) did the work after being given counseling. However, only 30% (6 people) succeeded in harvesting and consuming these antioxidant plants (spinach, lettuce, kale, and pakcoy). Some of the participants who failed to do this hydroponic wick system, among others, did not pay attention to changing water and or adding nutrients in a few days after seeding and placing the wick system in a place that did not get enough sunlight. So that some participants failed during the seeding process and did not get optimal crop yields until harvest time arrived.

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CONCLUSION AND RECOMMENDATION

Conclusion

This community service activity shows an increase in the knowledge of the residents of RW013 Gebang Raya Village, Periuk District, Tangerang about natural antioxidant sources. This can be seen from the results of the pre and posttest questionnaires of 42% to 66%. Increased skills are also shown from people who carry out hydroponic systems at home using simple tools and materials.

Recommendation

As a form of sustainability from this activity, it is hoped that the RW013 community members who have succeeded in implementing the hydroponic system can implement it to other members of the community as well as in other areas so as to create a healthy environment.

REFERENCES

- Astawan M. 2009. *A-Z Ensiklopedia Gizi Pangan Untuk Keluarga*. Jakarta : Dian Rakyat
- Buleleng. 2021. Cara Menanam Menggunakan Sistem Hidroponik [Internet]: [Diakses pada:]. Tersedia pada : 16/04/2021]. Tersedia pada : <https://buleleng.bulelengkab.go.id/informasi/detail/artikel/86-cara-menanam-menggunakan-sistem-hidroponik>
- Dinas Kesehatan Kota Tangerang.2016. Profil Kesehatan Kota Tangerang Tahun 2015
- Haq, N. N. 2020. 8 Manfaat yang Bisa Kamu Dapatkan dengan Konsumsi Sayur Pakcoy. Diakses 22 Sept 2021
- Pukul 16.17 .
<https://www.idntimes.com/health/medical/nadhiifah-nurul-haq/8-manfaat-yang-bisakamu-dapatkan-dengan-konsumsi-sayurpakcoy-c1c2/7>
- Hasta L., Thoriq A., Sampurno R. M., (2021).Penerapan Urban Farming dengan Sistem Hidroponik Menggunakan Botol Bekas melalui Kuliah Kerja Nyata Mahasiswa (KKNM) Virtual. *Agrokreatif : Jurnal Ilmiah Pengabdian kepada Masyarakat*. Juni 2021, Vol. 7 (2) : 115-121.
- Hidayati N., Roswanti P., Yusuf F., Hanafi N., 2017. Kajian Penggunaan Nutrisi Anorganik Terhadap Pertumbuhan Kangkung (*Ipomoea reptans* Poir) Hidroponik Sistem Wick. *Jurnal Daun*. Vol. 4 No. 2, Desember 2017 : 75-81
- Julyana S. M. Suhendar R. M., Janizal,. 2018. Sistem Pengendalian Nutrisi Pada Tanaman Kangkung Hidroponik Menggunakan Mikrokontroler Arduino Mega 2560. *ELEKTRA*, Vol.3, No.2, Juli 2018, Hal. 69 - 72
- Kemenkes. 2019. Hari Kanker Sedunia 2019. Diakses <http://www.depkes.go.id/article/view/19020100003/hari-kanker-sedunia-2019.html>
- Kemenkes RI. 2017. GERMAS- Gerakan Masyarakat Hidup Sehat. Diakses <http://promkes.kemkes.go.id/germas>
- Rahmi D.Y., Faisal R.F., Agestayani, Susiana, Marlina W.A., Mardiah F.P., Erizal, Ahmad FA, Srivani M. 2020. Hidroponik Sebagai Bentuk Pemanfaatan Lahan Sempit Untuk Peningkatan Pendapatan Rumah Tangga di Nagari Sungai Kamuyang. *Jurnal Hilirisasi IPTEKS*. 3 (1): 20-30
- Rahmi, H. 2017. Review : Aktivitas Antioksidan dari Berbagai Sumber Buahbuahan di Indonesia. *Jurnal Agrotek Indonesia* 2 (1) : 34 - 38 (2017)

- Refli, R. 2012. Potensi Ekstrak Daun Tin sebagai Antioksidan dan Aktivitas Hambatannya terhadap Proliferasi Sel Kanker Hela. [Skripsi]. IPB. Bogor
- Reynertson, K.A. 2007. Phytochemical analysis of bioactive constituents from edible myrtaceae fruit. University of New York, New York.
- Sartika, R. E. A. 2020. Fakta Nutrisi Bayam Yang Menjadikan Superfood. Diakses 22 Sept 2021 Pukul 16.00. <https://health.kompas.com/read/2020/07/23/060600668/fakta-nutrisi-bayam-yangmenjadikannya-superfood?page=all>
- Sendari AA. 2020. 7 Macam-Macam Hidroponik untuk Berkebun, Mudah untuk Pemula [Internet]: [Diakses pada: 24/08/2021]. Tersedia pada: <https://hot.liputan6.com/read/4284237/7-macam-macam-hidroponik-untuk-berkebunmudah-untuk-pemula>.
- Suhardiyanto, H. 2010. Teknologi Hidroponik untuk Budidaya Tanaman. Bogor (ID): IPB Press