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Teak Leaf Tea Product Development in Kebontunggul Village, Mojokerto

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Abstract: *Kebontunggul Village in Mojokerto, with its abundant natural resources, has a golden opportunity to develop into an herbal village. The fertile land in this village serves as a habitat for teak plants, producing leaves rich in bioactive compounds. A collaboration between the University of Surabaya, Widya Mandala Surabaya Catholic University, Village-owned Enterprises, the Tourism Awareness Group, and the Family Welfare and Empowerment Organization, facilitated by the Ministry of Education and Culture, processed the teak leaves into powder and tea. This collaboration aimed to improve public health and open up economic opportunities for the local community. The process included socialization, training, and evaluation, with the Participation Rural Appraisal (PRA) method employed to*

ensure active community participation at every stage, from identifying the potential of natural resources to the production and marketing of the products. As a result, the village has successfully produced teak leaf powder and teak leaf tea, which have started to be commercialized.

Introduction

Indonesia is an archipelagic country with various regions having natural resources that can be developed to increase the potential of the area. One of them is Kebontunggul Village in Mojokerto Regency which has fertile land that besome habitat for herbals with certain bioactivities having health benefits.[1] In addition to having fertile soil, this village has also tourism destination, i.e. Mbencirang Valley. This tourism destination is directly adjacent to the Alas Wedok Teak Forest. The use of teak leaves by local community is still not optimal, thus practically only the tree trunks are taken for construction purpose.

Kebontunggul Village has several processed products of the household industry in the form of chips and herbal drinks whose marketing is limited to the local level in the Mojokerto area. Collaboration with universities is carried out to increase the knowledge of the village community about the potential of existing herbal plants, one of which is teak leaves that can be obtained abundantly and has health benefits thus can be developed into commercial processed herbal products. So far, teak leaves are only used as food wrappers or food coloring and the rest is left to dry and fall off. Based on the potential of the teak leaves to be developed into beneficial products, Kebontunggul Village was chosen for community empowerment program, i.e. Pemberdayaan Desa Binaan (PDB) Desa Herbal Kebontunggul.[2] This PDB Program involves the University of Surabaya (UBAYA) and Widya Mandala Catholic University Surabaya (Universitas Katolik Widya Mandala Surabaya, UKWMS), Gajah Mada Village-Owned Enterprises (BUMDes), Tourism Awareness Groups (Pokdarwis), and Family Welfare Empowerment (PKK) Kebontunggul Village. This present program was focusing on the development of teak leaf tea product.

The problems encountered are the processing of herbal products in this village is still carried out with simple methods using conventional equipment and the processing has not met good food product processing standards. The drying process of herbal products are still depending on sunlight. Residents are carrying out the processing based on experience and have not paid attention to sanitation and hygiene aspects properly. The

[1] Rudin, Nur Ahmad, Hulaimah, Asma, and Rahmawati, Rini. "The potential utilization of young teak leaves (Tectona grandis Linn.f.) as basic ingredients on producing anti-cancer herbal tea". Jurnal Pendidikan Biologi Undiksha 9(1), (2022): 10–23.

[2] Sutanto, Tiffany Arista, et.al. "The Development of Teak Leaf Cookies for BUMDes Gajah Mada, Pokdarwis, and PKK in Kebontunggul Village, Mojokerto". Amalee 5(1), (2024): 321-336. https://doi.org/10.37680/amalee.v5i1.4126

previous test results of herbal products from this village indicated the growth of fungi and non-pathogenic bacteria. The presence of fungi and bacteria can cause product damage and pose a health risk to humans.

The activities of the program involved preparation of standard operating procedure (SOP) as a guide for villagers in carrying out the product processing. Understanding of SOP was conveyed through socialization and training sessions. The SOP was the basis for residents to carry out the herbal processing, including the sanitation and hygiene aspects that must be met. The villagers involved actively carry out their role in collaboration by conducting the herbal product processing in accordance with the SOP that have been set.

One of the focuses of the collaboration program designed by UBAYA and UKWMS together with BUMDes Gajah Mada, Pokdarwis, and PKK in Kebontunggul Village is to develop the teak leaf tea product which is intended to increase residents' income. BUMDes Gajah Mada plays a role in providing herbal raw materials, managing the production process, and improving the quality and quantity of the herbal product. The PDB Program began with socialization regarding the health benefits of teak leaves, followed by training on teak leaf picking procedures, processing into powder and tea, and ended with an evaluation using questionnaires about participants understanding before and after the process/activity.

The PDB Program aimed to support the economic growth of the village through increasing community knowledge and skills on the use and processing of herbal tea made from teak leaves. The commercialization of the product was found to have a positive impact on the village economy, increasing the income of Kebontunggul Village.

Method

The empowerment program in Kebontunggul Village ran around 6 months with the main strategy implemented being the Participatory Rural Appraisal (PRA), which allows local residents to evaluate their lives and plan actions based on the findings.[3] Lecturers, students and village communities collaborated directly both offline and online.

In an effort to provide a better understanding to the people of Kebontunggul regarding the PDB Program on the use and processing techniques of teak leaves, first socialization of PDB Program was carried out, followed by training on processing teak leaves into tea product that includes the selecting of raw materials, post-harvest processing, drying using food dehydrator, making powder with herb grinder and processing the powder into product based on the SOPs. The lecture method was used as an approach in which the instructor delivers material orally to participants. In addition,

[3] Sontakki, Bharat, Purushothaman Venkatesan, V K Jayaraghavendra Rao, and Purushothaman Venkatesan. "Participatory Rural Appraisal (PRA): Tools & Techniques". *Research Gate*. (2019).

an interactive question and answer session was provided that allows the participating residents to ask questions and get direct answers.[4] In the final stage, questionnaires were given to measure the increase in the participants knowledge about the potential of use of teak leaves and the processing techniques, before and after the PDB Program activities.

Results

Previously, a literature review and study by the team were carried out to be the basis for the development of the teak leaf products. The focus of the collaboration was on the empowering of villagers to optimize the use of teak leaves in Kebuntunggul Village. Innovations were applied to maximize the benefits of the teak leaves.

The socialization was attended by 24 participants, including lecturers and students from UBAYA and UKWMS, BUMdes Gajah Mada, Pokdarwis, and PKK members. This socialization discussed the potential of Kebontunggul Village to be a herbal village, the health benefits of teak leaves, the production process of herbal products that meet sanitation and hygiene requirements, the variety of herbal products, the need of certificates for herbal products, and the marketing of herbal products. This socialization was accompanied with the provision of questionnaires before and after the training to find out to what extent the knowledge about teak leaves gained by the participants.

In the first session, the socialization was carried out related to the PDB Program and the health benefits of teak leaves in Kebontunggul Village. The second session focused on teak leaf processing training from taking teak leaves from the teak trees, the drying process with a food dehydrator, the grinding process using a herb grinder. The training session was also attended by 24 participants including lecturers, students, BUMDes Gajah Mada, Pokdarwis, and PKK members.

In this training, BUMDes Gajah Mada, Pokdarwis, and PKK firstly received guidance and explanations regarding the procedure for processing teak leaves into powder. The resulting powder was a fine powder that passes a 40-mesh sieve and a powder that does not pass the sieve (Figure 1). Afterwards, the powder was stored in airtight containers and silica gel was added to absorb moisture thus keeping the powder dry.

[4] Kaur, Gurpreet. "Study and Analysis of Lecture Model of Teaching". International Journal of Educational Planning & Administration 1(1), (2011): 9-13.

(A) (B)

Figure 1. (A) Teak leaf powder passing the 40-mesh sieve;
(B) Teak leaf powder that does not pass the 40-mesh sieve.

The session was continued with training on making teak leaf tea. Before the training was started, each participant received a questionnaire asking their prior knowledge about teak leaf tea making. Teak leaf tea product was made in the form of tea bags. A tea bag was made by mixing 1.7 grams of the teak leaf powder passing 40-mesh sieve, 1.3 grams of the teak leaf powder that does not pass the 40-mesh sieve, and 0.5 grams of cinnamon powder to enrich the aroma and reduce the bitterness. For this formulation, organoleptic tests have been carried out on 50 UKWMS students. The mixture was then introduced into tea bags, and the tea bags was put into envelopes. The outer packages was e-flute boxes that have been labeled (Figure 2).

Figure 2. Teak leaf tea products

After the product processing training session, the evaluation was carried out via questionnaires. The responses in the final questionnaires were compared with those before the training.

The results of the questionnaire evaluations before the socialization of PDB Program showed an average score of 3.5 and that after the socialization was 4.3 out of the maximum score of 6 (Figure 3). The questionnaire before and after the socialization of PDB included questions about participants knowledge related to teak leaf raw materials, questions about whether teak leaves are categorized as herbal, the uses and related benefits of teak leaves, and the extent of the attractiveness of food products derived from teak leaves in their views.

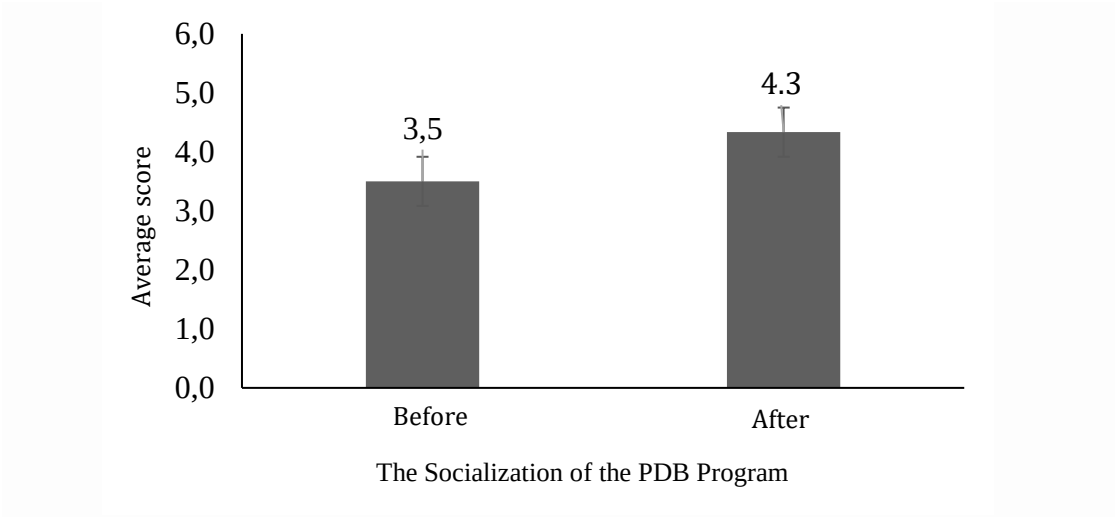

Figure 3. Results of the PDB Program Socialization questionnaires. The results are expresses as average score ± standard deviation.

Meanwhile, the evaluation of the teak leaf tea processing training questionnaires showed an average score of 55.0 before the training and it increased to 78.3 after the training out of the maximum score of 100.0 (Figure 4). The teak leaf tea processing training questionnaires included questions about the processing procedure, the ingredients used, the knowledge gained, and the good practices in tea processing.

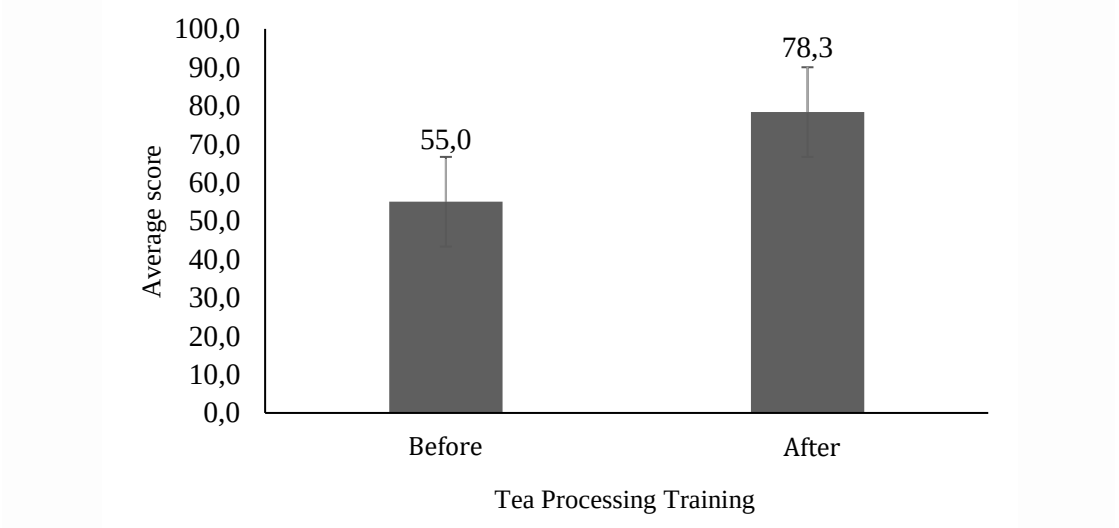

Figure 4. Results of Tea Processing Training questionnaires. The results are expresses as average score ± standard deviation.

Discussion

Social media that can be accessed easily and quickly allow individual to obtain various information and could be affected by the contents. Actually, users have choices

to select the types of information they want to follow, which can influence their views and behaviors.[5] This phenomenon is one of the factors that contribute to changes in people's lifestyles. Public awareness for health and environment can increase, thus the trend of consuming beneficial healthy herbal foods and beverages can be increasing. This trend leads to an increasing utilization of herbals in Kebontunggul Village. With the application of the Participatory Rural Assessment (PRA) technique by the community empowerment team in collaboration with the Village Government, BUMDes Gajah Mada, Pokdarwis, and PKK, the utilization of teak leaves that was previously very limited is now increasing, including the use for teak leaf tea product.

The use of teak leaves for the production of teak leaf powder and tea is an innovation that is in line with the vision of Kebontunggul Village to be a herbal village in Indonesia. Some previous herbal innovations has led to Kebontunggul Village becoming a pioneer village of East Java Province for Toga-Based Agrotourism at National Level in 2007.[6]

The drying and grinding process to convert the teak leaves into powder aims to extend the shelf life by lowering moisture content and water activity. It makes microorganisms difficult to grow and chemical reactions are minimized, thus the quality is increased. When the leaves decay, the antioxidant compounds, that are essential for human body in fighting free radicals, would be degraded. The antioxidant compounds are useful for body prevention against various diseases, such as diabetes mellitus, cardiovascular diseases (atherosclerosis, hypertension, etc.), asthma, various types of cancer, cataracts, and a number of other chronic diseases.[7]

Teak leaves contain compounds with high antioxidant activity such as anthocyanins, eicosanol, glycerin monoacetate, and glycerin diacetate. Other components found in teak leaves include tannins, phenols, and flavonoids, as identified by previous studies.[8] Similar to tea leaves (*Camellia sinensis*), teak leaves contain compounds such as tannins, flavonoids, and catechins that also have antioxidant activity.[9] Thus, there is a promising opportunity to develop the teak leaves into teak leaf tea product. A number of previous studies have also shown the potential of developing

[5] Susanti, Kiki Anasya. "Pengaruh Influencer Dr. Zaidul Akbar Terhadap Perilaku Gaya Hidup Sehat (Healthy Lifestyle) Konsumen". (2021).

[6] Romero, Jessica Erdy. "Fasilitas Wisata Edukasi Tanaman Herbal Kebontunggul di Kabupaten Mojokerto". Jurnal eDimensi Arsitektur 11(1), (2023): 481-488.

[7] Phaniendra, Alugoju, Dinesh Babu Jestadi, dan Latha Periyasamy. "Free Radicals: Properties, Sources, Targets, and Their Implication in Various Diseases". Indian Journal of Clinical Biochemistry 30(1), (2015): 11–26.

[8] Suryanti, Venty, Triana Kusumaningsih, Soeraya Dewi Marliyana, Hilda Alfiani Setyono, Elyna Wahyu Trisnawati. "Identification of Active Compounds and Antioxidant Activity of Teak (Tectona grandis) Leaves". Biodiversitas 21(3), (2020): 946-952

[9] Koch, Wojciech, Justyna Zagórska, Zbigniew Marzec, and Wirginia Kukula-Koch. "Applications of Tea (Camellia sinensis) and its Active Constituents in Cosmetics". Molecules 24(23), (2019): 4277

herbal teas from various sources, including mint leaves, bamboo, and moringa.

Teak leaf powder can be incorporated into teak leaf tea mixture up to 80%. For higher composition of the teak leaf powder (e.g. 90%), the taste was unacceptable for panelists because it is too bitter. The development of teak leaf tea product is opening up greater utilization of teak leaves that were previously limitedly utilized and it gives a positive contribution for the increasing income of the local community.

The addition of cinnamon powder (*Cinnamomum burmannii*) aims to enhance the aroma and taste. In addition to improving the sensory characteristics, the essential oils in the cinnamon powder are rich in active compounds such as cinnamaldehyde, cinnamic acid, eugenol, and cinnamate acid. Some of these compounds, including cinnamaldehyde as a key component, have been shown to have antidiabetic and antihyperglycemic properties.[10]

Socialization of the PDB Program, as well as training on the production of teak leaf powder and processing the powder into teak leaf tea has succeeded in improving the knowledge and skills of the participants, as indicated by the increase in average score after the activity compared to that before the activity (Figures 3 & 4). The participants now have a higher awareness of the health benefits and utilization of teak leaves into useful and beneficial products.

The production cost for the teak leaf tea product is as follows: teak leaf powder price is Rp. 150,000 per 1 kg, tea bag Rp. 66,070 per 1000 pcs,[11] cinnamon powder Rp. 36,000 per 1 kg,[12] tea envelope packaging, the outer e-flute box and label sticker worth Rp. 3,000 per package of 10 pcs. Thus, the total production cost of 1 package of teak leaf tea product containing 10 pcs @ 3 grams is around Rp. 8,000. The teak leaf tea products are marketed at a price of Rp. 14,000 per package. Then the profit is Rp. 6,000 per package. If in one period 500 packages can be sold, then the profit obtained in that period reaches Rp. 3,000,000. Therefore, the teak leaf tea product gives a positive contribution for the increasing income of Kebontunggul villagers.

As a support, the team has supplied a SOP which consists of guideline for making teak leaf powder and formulation for making teak leaf tea. Equipments i.e. food dehydrator and herb grinder were also provided (Figure 5) to facilitate the drying and grinding of the dry leaves. These provisions are intended to maintain the standardized

[10] Plumeriastuti, Hani, Budiastuti, Mustofa Helmi Effendi, and Budiarto. "Identification of Bioactive Compound of The Essential Oils of Cinnamomum burmannii from Several Areas in Indonesia by Gas Chromatography-mass Spectrometry Method for Antidiabetic Potential". National Journal of Physiology, Pharmacy and Pharmacology Volume 9, Issue 4, (2019): 279-283.

[11] Shopee. "Kantung teh celup kosong dan tali". (Diakses pada 28 April 2024). Website: https://id.shp.ee/7cMZ1Cj

[12] Tokopedia. "Yutakachi bubuk kayu manis". (Diakses pada 28 April 2024). website: https://tokopedia.link/cz4PG0OzaJb

and sustainable production of teak leaf tea products.

(A) *(B)*

Figure 5. (A) Food Dehydrator and (B) Herb Grinder provided for Kebontunggul Village.

It is possible to develop ready-to-drink teak leaf tea products packaged in bottles kept in a cold showcase and marketed to people visiting Mbencirang Valley in Kebontunggul Village. This type of product can be enjoyed directly by the visitors. It is planned for the next product innovation.

Conclusion

Community empowerment program, i.e. Pemberdayaan Desa Binaan (PDB), which included socialization of the program, training on making teak leaf powder and processing the teak leaf powder into teak leaf tea has improved the understanding and skills of the Kebontunggul villagers about the health benefits and utilization of teak leaves for commercial products. The program has given a positive contribution to the increasing income of the community.

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