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Making Simple Biotechnology Products for Teachers at AL-Hidayah Waqf Foundation Hatyai Thailand as a Supplement to Teaching Materials

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Abstract. Biotechnology is one of the concepts taught in science learning which is complex and dynamic and has a relationship between the application of science and technology. The application of biotechnology is very beneficial in various aspects of life. The importance of applying biotechnology in life encourages schools to provide learning platforms for students to learn about biotechnology processing properly. However, there are still issues with biotechnology processing at partner schools. Specifically, they still don't know how to properly create basic biotechnology learning supplements or process biotechnology products. This inspired the UNNES Postgraduate School service team to assist with training in the creation of basic biotechnology goods at the Al-Hidayah Waqaf Foundation in Hatyai, Thailand, as an addition to instructional resources. This training aims to provide training in making simple biotechnology products to improve educators' skills in packaging supplements for simple biotechnology teaching materials, identify the benefits of apple and pineapple vinegar, and train skills in making apple and pineapple vinegar correctly. The training method was implemented by providing tools and materials, presenting the material, and providing assistance in the practice of making apple and pineapple vinegar biotechnology. The training has been carried out well. The results of the training can help teachers prepare science learning that is contextual and has an entrepreneurial spirit.

Keywords: biotechnology, apple cider vinegar, pineapple vinegar

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INTRODUCTION

Thailand is referred to as an agricultural country in Southeast Asia because of its well-known agricultural industry. In Thailand, 46% of the land is used for agriculture (Asrofi et al., 2023). One of the countries that produces a lot of fresh pineapple fruit is Thailand (Azizah et al., 2023). One of the most popular fruits in the world, it has a sour and sweet taste (Azizah et al., 2023). In addition, Hasibuan and Sinambela (2024) list apples as one of the other tropical fruit commodities available in Thailand.

During harvest, apples and pineapples are so plentiful that they are frequently discarded. When there is an over harvest, this is what motivates the service staff to search for answers. Therefore, it encourages researchers to apply biotechnological concepts to science learning so that they can utilize harvested fruit in products that are more durable and can increase the selling value of commodities.

One of the concepts covered in scientific education is biotechnology. Utilizing biological agents and scientific ideas, biotechnology creates valuable products for human use (Utami et al., 2023). According to Afif et al. (2022), biotechnology is a science subject that is dynamic and complicated, with a connection between science and technological applications. One of the main justifications for becoming an expert in the field of biotechnology is the swift advancement of science and technology (Utami et al., 2023).

Aside from that, biotechnology is being used to great advantage in many facets of life, such as the environment, health, and agriculture. The significance of utilizing biotechnology in daily life motivates educational institutions to offer resources that help students understand how biotechnology is processed (Budiarti et al., 2022; Mujab et al., 2019; Pato et al., 2022). However, at partner schools (at the junior high school level in Indonesia) there are still obstacles in the way of processing biotechnology, namely that they still do not understand correctly how to make simple biotechnology learning supplements and the correct processing of biotechnology products. The target of the training activities is the Al Hidayah Waqaf Foundation in Hatyai Thailand. The teachers who

teach Science at the Al-Hidayah Waqaf Foundation Thailand generally have a Bachelor's degree in English Language Education.

Based on interviews, the problems currently experienced by partners can be mapped into two main aspects, as follows. Firstly there is a lack of understanding in packaging learning supplements on simple biotechnology topics. Second, there is a lack of skills in processing apple cider vinegar and pineapple properly. Based on the identification of the problem, alternative solutions were offered and agreed upon with partners through training activities on making simple biotechnology by making apple and pineapple vinegar. Therefore, the aim of this community service is (1) to provide training in making simple biotechnology products so that they can improve educators' skills in packaging supplements for simple biotechnology teaching materials and identifying the benefits of apple and pineapple vinegar. (2) practice skills in making apple and pineapple vinegar correctly. It is hoped that this training can provide science learning that is oriented towards an entrepreneurial spirit because the vinegar products that have been made can be sold and become a business opportunity in their own right.

METHODS

The service preparation stages were carried out through the coordination of a team of community service lecturers at the UNNES Postgraduate School with partners, namely the Al-Hidayah Waqaf Foundation in Hatyai, Thailand, chaired by Mr Abdul Maetam. Preparation is carried out by preparing a schedule for implementing activities with partners, compiling and preparing training materials, and determining topics for training materials to be offered to partners.

The implementation stage is carried out through direct practice in making apple and pineapple vinegar. This training in making apple and pineapple vinegar is an initial pioneering effort in implementing biotechnology correctly by scientific principles. The UNNES Postgraduate School service team assisted in preparing tools and materials as well as accompanying a series of processes for making apple and pineapple vinegar. After implementing the training activities, an evaluation stage is carried out in the form of an interview to determine the achievements of the implementation of the activities and to reflect on the implementation of subsequent service activities.

RESULTS AND DISCUSSION

The UNNES Postgraduate School Service Team held training on making simple biotechnology products for teachers at the Al-Hidayah Waqaf Foundation Hatyai Thailand as a supplement to teaching materials, on Saturday 22 June 2024. The service team consists of three lecturers, namely Dyah Rini Indriyanti, Arif Widiyatmoko, and Fidia Febriana. The training was opened with remarks by the Chairman of the Al-Hidayah Waqaf Foundation Thailand, Mr. Adul Maetam.

The first activity presented material related to the implementation of biotechnology in science learning by Dyah Rini Indriyanti, Arif Widiyatmoko, and Fidia Febriana. The resource person delivered good material regarding the implementation of biotechnology in science learning and the important role of biotechnology in science learning, especially in implementing learning that supports 21st-century skills. Biotechnology is an applied science that can develop rapidly following the demands of global trends and is applied to everyday life to help in fulfilling human needs.

Figure 1. Presentation of material by the resource person

The session continued with practical activities for making apple and pineapple vinegar guided by the resource person demonstrating making apple and pineapple vinegar. The teacher and his group colleagues practice making apple and pineapple vinegar following the correct procedures. The teachers are very enthusiastic about making simple biotechnology products. If there are problems, the service team is ready to help solve the problem.

Making apple cider vinegar was adapted from research by Isda et al. (2020). The manufacturing process is done by washing three apples cleanly and then cutting the fruit into dice. The fruit is then placed in a 2.5-liter container and given 1.5 liters of

mineral water and two tablespoons of granulated sugar. To prevent dirt contamination as well as the fermentation stage, the container is then covered with a clean cloth and tied with rubber/raffia rope. Apples are fermented for 1 month to become good-quality apple cider vinegar. Once every 3 days, the cloth cover is opened, and the apples are stirred for the maximum fermentation process. This is done for approximately the first two weeks, after which the container remains covered with cloth for up to one month. After one month, the apple cider vinegar is filtered using a coffee filter to get clean apple cider vinegar, the apple ingredients are discarded, just the water is taken. The apple cider vinegar that has been obtained is then poured into 330 ml glass bottles. The session continued with making pineapple vinegar, guided by the resource person.

Figure 2. Practice of making apple and pineapple vinegar

Making pineapple vinegar was adapted from modified research by Rakhmatullah (2024). The process for making this activity is the same as making apple cider vinegar, done by cleanly peeling three small pineapples. Next, soak it in 1.5 liters of mineral water and add two tablespoons of granulated sugar. Plastic containers are stored covered with cloth lids and placed in a place protected from sunlight. This step is the fermentation stage and is carried out for 3 months. The pineapple's position will slowly move from floating to submerged. Pineapple vinegar that is ready to be consumed is characterized by the liquid changing color to yellowish and has a sour taste.

Apple cider vinegar has many health benefits (Soraya et al., 2023). Processed apple cider vinegar has many benefits, including lowering cholesterol and blood pressure, acting as an anti-cancer agent, stabilizing blood sugar, and maintaining body weight (Namruddin et al., 2023). Apple cider vinegar contains vitamin C and acetic acid (Pranowo et al., 2006; Akanksha et al., 2017). The vitamin C content in apple cider vinegar can also whiten teeth naturally (Sugianti et al 2012). Apple vinegar can be used as a kitchen spice and facial toner (Widjaya, 2023).

Pineapple vinegar contains benefits in preventing obesity because it can regulate obesity gene expression (Mohamad et al., 2020). Therefore, pineapple vinegar can be used as an alternative treatment for obesity sufferers (Jumadi et al., 2023). Pineapples contain protease enzymes which are often known as bromelain enzymes (Dzulqaidah et al., 2021). The bromelain enzyme can hydrolyze proteins into simple compounds such as peptides and amino acids (Slahhudin, 2011). The bromelain enzyme is useful as an anti-inflammatory agent and for treating burns; apart from that, this enzyme can also be used to tenderize meat (Dzulqaidah et al., 2021).

Fadlurahman's research results (2022) show that pineapple vinegar contains saponins and tannins as antibacterial substances. This statement is supported by research by Lestari & Fitri (2019), which states that pineapple extract can inhibit the growth of E. Coli. This is in line with the results of research (Daely et al., 2019) which states that juice with a concentration of 100% pineapple flesh can inhibit the development of E. Coli bacteria so that it can play an active role as an anti-bacterial with an inhibitory zone diameter of 11 mm. At pineapple juice concentrations of 25%, 50%, and 75%, the effectiveness of the antibacterial inhibition zone for E. Coli was respectively with an inhibitory diameter of 9.06 mm, 10 mm, and 10.49 mm.

Figure 3. UNNES Postgraduate service team, together with representatives of teachers from the Al-Hidayah Waqaf Foundation Hatyai Thailand who took part in training activities

The training activity for making apple and pineapple vinegar had a very positive impact on partners. Apart from providing biotechnology material as a supplement to teaching materials for science learning, the service team also presented

marketing techniques for the apple and pineapple vinegar products that had been made. Partners gain knowledge about product marketing and the results can then be used to develop educational facilities at the Foundation. It is hoped that this training can facilitate teachers and students in developing an entrepreneurial spirit.

CONCLUSION

Training on making simple biotechnology products as a supplement to teaching materials at the Al-Hidayah Waqaf Foundation Hatyai Thailand has been carried out well. This training helps teachers prepare contextual science learning with an entrepreneurial spirit.

It is recommended that the biotechnology products presented in the training be increased so that partners better understand the processing and manufacture of more complex and varied biotechnology products. Activities can also be spread to the wider community so that they can understand and apply the principles of biotechnology correctly to life.

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