HAND SOAP BASED ON MORINGA LEAF TO REINFORCE AGRO-ECO-EDU-TOURISM IN GENERATING CREATIVE YOUNGER GENERATION

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ABSTRACT

Teaching Factory is a learning model that can be adopted in the Agro-Eco-Edu-Tourism (AEET) program. The learning model products in Teaching Factory are soap and hand sanitizer. The study's results reported that hand washing soap with the addition of Moringa leaf extract could inhibit the growth of *Staphylococcus aureus* and *Escherichia coli* bacteria that cause diarrheal disease. Diarrheal disease is still a public health problem in developing countries such as Indonesia because of its high morbidity and mortality. Diarrhea occurs due to the spreading *S. aureus* and *E. coli* bacteria, most often transmitted from hand to hand. Washing hands using soap and hand sanitizer is an activity that aims to remove dirt on hands.

Keywords: hand sanitizer, moringa leaf extract, teaching factory

INTRODUCTION

Agro-Eco-Edu-Tourism (AEET) is a tourism activity based on agriculture (Agro), environment (Eco) and education (Edu) as the main objects in tourism planning. In general, AEET activity aims to introduce insights into agriculture, environment and education and is expected to give the impression or experience of tourists when they travel. While the goals of AEET are in terms of the economy, one of which is to provide business relations in agriculture, such as plantations, fisheries, animal husbandry, horticulture and food crops (Mandiangan, 2013). Agro-Eco-Edu-Tourism (AEET) is intended to provide travel experiences related to the field of education through experience in tourism travel from every interconnected aspect of tourism. These tours are visited to see the educational or educational value of the visits (Brent & Ritchie, 2003). The development of the AEET sector is determined mainly by its Human Resources (HR). Implementation of education that demands the birth of graduates who are creative, inventive, and capable of entrepreneurship requires the patience of teaching factories as a place for business practice (Zakaria et al., 2022). A teaching factory is a learning model in vocational/skill education institutions that uses a product (goods/services) as a learning medium to meet needs and is organized through school synergy with industry (Muttaqien, 2019). One product that can be used as a learning model in the Teaching Factory is soap and hand sanitizer.

The raw materials for making soap and hand sanitizer come from Moringa leaves (*Moringa oleifera*). We know that Indonesia has high biodiversity and many beneficial and efficacious plants for health. One type of plant that can be utilized and explored for its potential is Moringa leaves. Moringa leaves contain the sort of active ingredients as secondary plant metabolism, which are efficacious as anti-cancer, hypotensive, inhibiting bacterial and fungal activity. Moringa leaves have active compounds. The active compounds have many functions as antibacterial, such as saponins, flavonoids, alkaloids, and tannins (Busani et al., 2020).

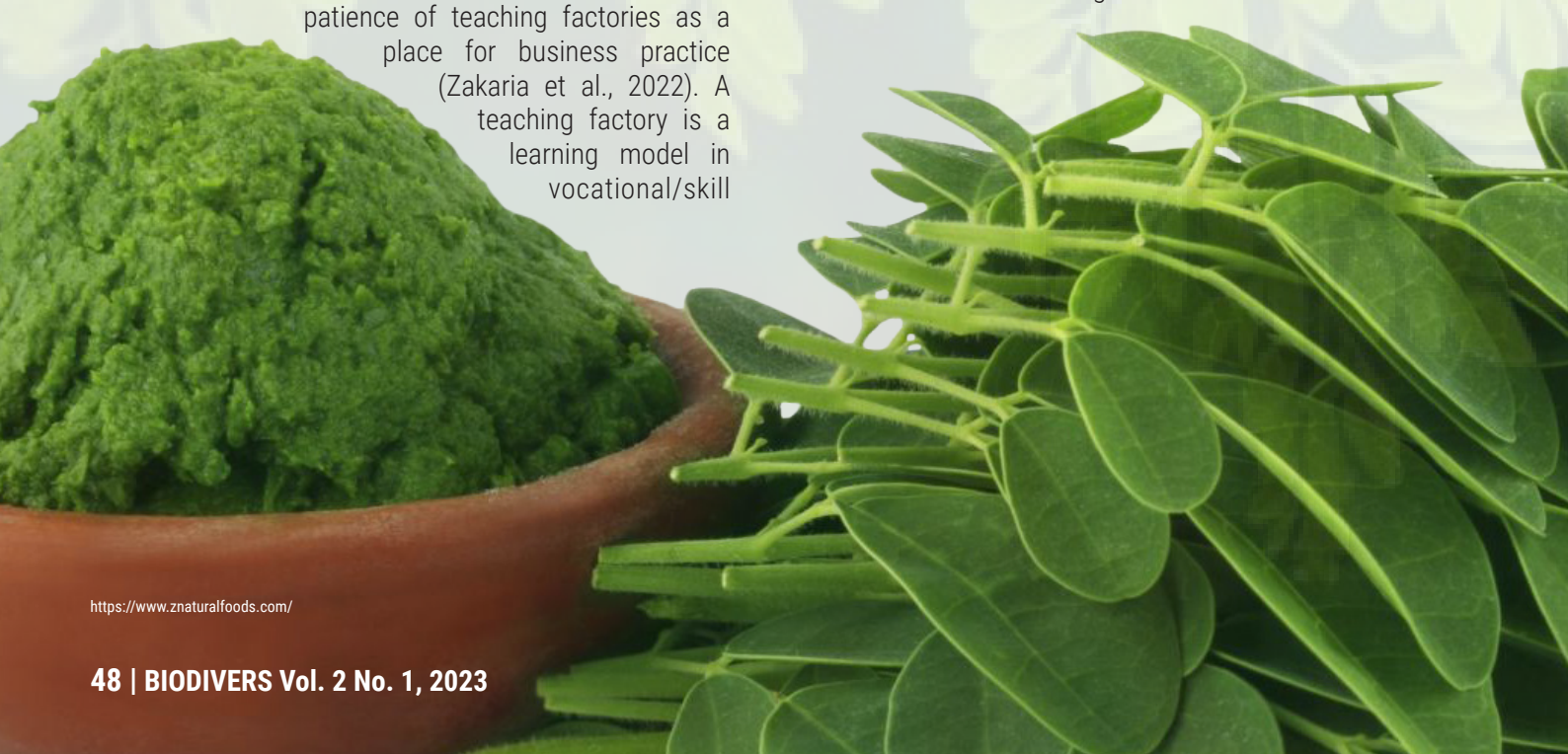
In addition to Moringa leaves, in the manufacture of soap, it is necessary to prepare several raw materials as follows:

1. Surfactants: active substances with hydrophilic and hydrophobic properties that function to reduce the surface tension of water
2. Builder: function to increase the washing efficiency of surfactants by deactivating minerals that are caused by water hardness
3. Filler: a soap additive that cannot increase washing power but can solidify the soap
4. Additives: supplementary ingredients to make the product more attractive (fragrances, solvents, Etc.)

METHODS

1. **Extraction of phytochemical compounds in Moringa leaves**

   Moringa leaves are dried (Figure 1) using an oven at 40°C until the moisture content is less than 10%, then blended and sieved through a 60 mesh sieve to reduce



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the surface area so that the ingredients in the powder can be extracted more easily. The extraction process lasted for approximately 3x24 hours to obtain the total extract. Afterwards, the extract was put in a water bath at 70 ºC for 6 hours to extract the active compounds optimally with 98% ethanol solvation.

2. Content test of phytochemical compounds in Moringa leaves

2.1. Saponins test

The amount of 0.5 g extract was weighed and put in a test tube, and then 10 ml of hot water was added and shaken for 10 minutes. Furthermore, after the foam or more was formed and dripped with 2N HCl, the extraction positively contained saponins if the foam did not disappear with the addition of 2N HCl.

2.2. Tannin test

The extract was put into a test tube, added 10 ml of hot water and shaken, then 20 ml of 10% NaCl and filtered. Afterwards, the filtrate was added with $FeCl_3$, and if the filtrate's colour changed, becoming a dark blue or black colour change, it was positive for tannins.

2.3. Flavonoid test

The extract weighed as much as 0.5 grams and was added to ethanol. After that, 5-6 drops of concentrated HCl were added. If the extract's colour changed to red, indicating the presence of flavonoids. Meanwhile, the formation of an orange colour indicated the presence of flavones.

2.4. Polyphenol test

The amount of 1 ml of the test extract solution was reacted with 10% $FeCl_3$ solution. If a dark blue, blackish blue, or greenish-black colour occurred, it indicated the presence of polyphenolic compounds.

3. Test of Bacterial Growth Inhibition

3.1. Test to inhibit *S. aureus* and *E. coli* growth using the agar bacterial diffusion method for wells and the results of measuring the average diameter of the inhibition zone of Moringa leaf extract against *Staphylococcus* and *E.coli*. The steps to test the inhibition of bacteria by preparing the solution are as follows:

a. Preparation of Negative Control Solution

The negative control solution was prepared by making a soap formula without Moringa leaves.

b. Creating Positive Controls

The positive control solution was made from 3 preparations, namely Ciprofloxacin 500 mg tablets. One Ciprofloxacin tablet was crushed, weighed, and equilibrated with 500 mg, 70% alcohol solution, and 6N $CuSO_4$ solution.

c. Preparation of Test Solutions

Test solution 1 was prepared with w/v%: 2.5%: 5%; 10%; 20%; 40%: and 80% w/v by weighing 0.025 g: 0.05 g; 0.1 g; 0.2 g; 0.4 g; and 0.8 g of Moringa leaf extract and Test solution were then dissolved in 10 ml of soap solution respectively.

4. Raw Material for Handwash Standard Scale 30 litres

4.1. Preparing a stirrer and a large 30 l capacity bucket

4.2. Preparing a refill of 25 l of water

4.3. Weighing the NaCl/table salt as much as 2 kg to accelerate the solubility process further; salt can be mashed or boiled first with 3 l of water

4.4. Entering Sosium Lauryl Sulphate (SLS) + Na_2SO_4 + Ethylenediaminetetraacetic acid (EDTA) into a small bowl, then mix well until homogeneous

4.5. Adding the salt water and mix well until homogeneous

4.6. Entering 1500 ml cup and mix well until homogeneous

4.7. Adding water per 3 l while stirring well (do the same thing until the water runs out/curdled liquid soap)

4.8. Entering the Benzalkonium Chloride (BKC) solution, glycerin, Propylene Glycol (PG), and essential oil, and mix well until homogeneous

4.9. Dissolving the dye in enough water, then pour it into the dough to taste, stir until homogeneous

5.0. Incubating the soap solution for 8 hours, did the viscosity and surface tension test (Physics) until the thickness was the same/equivalent to liquid soap on the market

RESULTS AND DISCUSSION

Based on the research results, the soap with the addition of Moringa leaf extract could inhibit the growth of *S. aureus* and *E. coli* bacteria. Antibacterial moringa leaf extract concentration of 2.5% had reached optimum conditions to inhibit *S. aureus* bacteria. Meanwhile, antibacterial moringa leaf extract concentrations of 10% and 80% inhibited the *E. coli* bacteria successfully (Yulvianah & Mahardika, 2021).

The research that had already been done proved that Moringa leaf extract soap had antibacterial activity against *S. aureus* and *E. coli* bacteria by producing the inhibition zone. Moringa leaves have secondary metabolites (flavonoids, alkaloids, phenols) that can inhibit bacterial activity. Flavonoids have three kinds of mechanisms in inhibiting bacteria, namely by inhibiting energy metabolism, inhibiting nucleic acid synthesis, and inhibiting the function of cell membranes. On the other hand, tannins inhibit bacterial growth by shrinking the cell wall so that the cell permeability is disturbed. Saponins are antibacterial by damaging cell membranes.

Meanwhile, polyphenols inhibit bacteria by poisoning protoplasm, penetrating and damaging cell walls, causing cell leakage, and precipitating bacterial cell proteins at high concentrations. In contrast, at low concentrations, they can inhibit enzyme synthesis. The phytochemical test table for moringa powder extract is shown in Table 1.

Table 1. Phytochemical Test Results for Moringa Powder Extract

Compound	Positive Result	Test Result	Description
Flavonoid	Yellow colour	Light Yellow	++
Saponin	Stable foam (< 7 minutes)	Stable foam (< 7 minutes)	++++
Tanin	Blackish green	Blackish green	++++
Polyphenol	Dark green colour	Dark green colour	++++

Description: + not clear; ++ is rather self-explanatory; +++ clear; ++++ very clear

Hand Soap Based On Moringa Leaf

CONCLUSION

The research results can be recommended for controlling diarrheal diseases. Diarrheal disease is still a public health problem in developing countries such as Indonesia because of its high morbidity and mortality. Diarrhea is an infectious disease caused by *E. coli* and *S. aureus*, which is still a significant problem in public health and has the potential to cause death. Hand washing soap with Moringa leaf extract can inhibit the growth of *S. aureus* and *E. coli* bacteria. Diarrhea occurs due to the spread of *S. aureus* and *E. coli* bacteria, most often transmitted from hand to hand. Washing hands using soap and hand sanitizer is an activity that aims to remove dirt on hands.

Through the Teaching Factory learning of Moringa leaf extract soap and hand sanitizer in the AEET area, we hope it can improve skills, create a science and technology-based entrepreneurial spirit, and foster a scientific ethos for tourists, especially for the younger generation. Furthermore, Moringa leaves as an antibacterial soap appearing friendly is essential to protect our bodies and the environment safely.

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