



Potential Pharmaceutical Biotechnology Products in the Form of Formulations and Preparations of Telang Flower Kombucha Dish Soap (*Clitoria ternatea L*) as an Antibacterial from Beef (*Bos taurus*) Isolate

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ABSTRACT

This research aims to see the potential of each formulation and preparation of dishwashing soap with the active ingredient telang flower kombucha in inhibiting the growth of pathogenic bacteria isolated from beef. This research is a laboratory experiment, namely by making a dishwashing soap base without the active substance of telang flower kombucha. Make a dishwashing soap base that adds the active substance of butterfly pea flower kombucha at concentrations of 20%, 30% and 40%. Biochemical identification results have shown that beef samples contain gram-positive bacteria in the form of *Staphylococcus aureus* and *Listeria monocytogenes*, as well as gram-negative bacteria in the form of *Salmonella thyposa* and *Escherichia coli*. The results of this research have also proven that pharmaceutical biotechnology products in the form of formulations and dishwashing soap preparations with the active ingredient telang flower kombucha have a positive correlation in inhibiting the growth of the four test bacteria. Based on the one-way ANOVA statistical test at each P value <0.05, it proves that telang flower kombucha dish soap at a concentration of 40% according to post hoc analysis is not significantly different from concentrations of 20% and 30% as a pharmaceutical and antibacterial biotechnology product. isolated from beef. The conclusion of this research is that the formulation and preparation of dishwashing soap at a concentration of 40% proved to be the most effective as a pharmaceutical biotechnology product in inhibiting the growth of the four test bacteria.

Key Messages:

- Dish washing soap, butterfly pea flower kombucha, beef isolate, pathogenic bacteria, gram positive negative
- The novelty in this research is that dishwashing soap with the active ingredient kombucha butterfly pea flower is able to inhibit the growth of pathogenic bacteria isolated from beef.

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Introduction

Food ingredients that come from livestock, especially meat, are one of the food ingredients that are easily damaged or perishable. This means that these foodstuffs cannot last long during the storage process. One of the perishable properties is due to contamination by pathogenic microbes, both gram-positive and negative bacteria, so that they have the potential to naturally destroy and spoil the meat. One side causes long-term harm, especially to human health. Plates are a facility for storing food, both fruit and meat. Isolates in beef containing gram-positive and negative bacteria in damaged or rotten beef include *Salmonella enteritidis ser thypimurium*, *Pseudomonas aeruginosa*, *Escherichia coli*, *Bacillus cereus*, and *Staphylococcus aureus*. The bacteria contained in beef isolates need to be inhibited in order to find alternative secondary metabolite compounds which play an important role as antibacterial sources (1).

Telang flower kombucha is one of the active ingredients that can be used in this research for the formulation and preparation of dishwashing soap which is designed as a pharmaceutical biotechnology product and gram-positive and negative antibacterial derived from beef isolate. Considerations in this research using butterfly pea flower kombucha as an active ingredient include its ability as an antibacterial source (2); (3); (4) both gram positive bacteria (5); (6) ; (7) or negative (8); (9) ; (10), antimicrobial source (11), antifungal source (12); (13) ; (14), and a source of anti-cholesterol (15); (16) ; (17) ; (18) ; (19) ; (20). The results of research conducted by Saddam et al., (2022) prove that butterfly pea flower kombucha has the ability to inhibit the growth of *Bacillus cereus* bacteria (21). The results of research conducted by Puspitasari et al., (2022) prove that butterfly pea flower kombucha has the potential to inhibit the growth of *Salmonella typhi* bacteria (11). The results of research conducted by Rezaldi et al., (2021) state that butterfly pea flower kombucha has the potential to inhibit the growth of *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Escherichia coli* bacteria (21).

Due to the ability of butterfly pea flower kombucha as a source of gram-positive and negative antibacterials from the results of previous research, in this research the author is interested in making a formulation and preparation of dish soap made from the active ingredient of butterfly pea flower kombucha fermentation solution to inhibit the growth of bacteria originating from beef isolate as an ingredient. Basis of previous research was carried out by Ma'ruf et al., (2022), namely that dishwashing soap made from the active ingredient of butterfly pea flower kombucha fermentation solution plays an important role as a pharmaceutical biotechnology product as well as a gram-positive and negative antibacterial (22). In line with the results of research conducted by Rustini et al., (2023), telang flower kombucha can be used as an active ingredient in gel dishwashing soap which is designed as a pharmaceutical biotechnology product to inhibit the growth of pathogenic bacteria both from gram-positive and negative bacteria (23). This research aims to create pharmaceutical biotechnology products in the form of formulations and preparations of dishwashing soap with the active ingredient butterfly pea flower kombucha at concentrations of 20%, 30% and 40% which are designed as antibacterials for both gram positive and negative by isolating it from beef.

Methods

This research is a laboratory experiment by providing dishwashing soap that is sold or available on the market as a positive control, making a dishwashing gel soap base without active substances as a negative control, and making a dishwashing gel soap base with the active ingredient of butterfly pea flower kombucha fermentation solution at a concentration 20% sugar as the first treatment, 30% sugar concentration as the second treatment, and 40% sugar concentration as the third treatment.

Some of the tools and materials used in this research include glass beakers, stirring rods, petri dishes, gas stoves, glass jars, hot plates, analytical calipers, scoby, butterfly pea flower kombucha fermentation solution with sugar concentrations of 20%, 30%, and 40 % as an active ingredient in dishwashing soap, the main ingredients for making dishwashing soap and additional ingredients for dishwashing soap, and bacterial isolates taken from beef containing the bacteria *Salmonella thyposa*, *Listeria monocytogenes*, *Staphylococcus aureus*, and *Escherichia coli*.

How to make dishwashing soap made from the active ingredient of butterfly pea flower kombucha fermentation solution using the fluid hot process method using a slow cooker with adjustments to the method used according to research results (22); (23). The formulation and preparation of this dishwashing soap includes soap base which acts as a negative control, dishwashing soap which is available on the market which acts as a positive control, dishwashing soap base which is made from active kombucha fermentation solution at a sugar concentration of 20%, 30%, and 40%. The results of previous research regarding the active ingredients used in the form of telang flower kombucha fermentation solution at each substrate concentration have proven that the higher the substrate concentration, the greater its potential as an antibacterial.

Testing the inhibitory power of bacterial growth in the species *S. aureus*, *L. monocytogenes*, *S. thyposa*, and *E. coli* by calculating the average diameter of the inhibitory zone in each formulation and preparation of dish soap with the active ingredient of butterfly pea flower kombucha fermentation solution with disc diffusion method. In this research, the fermented solution of butterfly pea flower kombucha was used as an active ingredient in dishwashing soap which was designed to inhibit the growth of gram-positive and negative bacteria contained in beef isolate.

Table 1. Formulation and Preparation of Telang Flower Kombucha Dish Soap.

Material	F0 (-)	F1 (+)	F2 (20%)	F3 (30%)	F4 (40%)
Butterfly flower kombucha fermentation solution	0	X	20 mL	30 mL	40 mL
Hydroxy Ethyl Cellulose	2 mL	2 mL	2 mL	2 mL	2 mL
Texapon 70	125 mL	125 mL	125 mL	125 mL	125 mL
NaCl	20 mL	20 mL	20 mL	20 mL	20 mL
Citric acid	2 mL	2 mL	2 mL	2 mL	2 mL
Sodium benzoate	2 mL	2 mL	2 mL	2 mL	2 mL
Sanisol	2 cc	2 cc	2 cc	2 cc	2 cc
Canthaxantin	1 cc	1 cc	1 cc	1 cc	1 cc
Tergitol NPX	20 cc	20 cc	20 cc	20 cc	20 cc
Yoghurt	5 cc	5 cc	5 cc	5 cc	5 cc
Essense oil	5 cc	5 cc	5 cc	5 cc	5 cc
H2O	820 cc	820 cc	820 cc	820 cc	820 cc

Information, F0 (Dish soap base without active substances); F1 (Dishwashing soap base with the active ingredient of butterfly pea flower kombucha fermentation solution at a sugar concentration of 20%); F2 (Dishwashing soap base with the active ingredient of butterfly pea flower kombucha fermentation solution at a sugar concentration of 30%); F4 (Dishwashing soap base with the active ingredient of butterfly pea flower kombucha fermentation solution at a sugar concentration of 40%.)

The categories of inhibitory power produced in each pharmaceutical biotechnology product in the form of formulations and dishwashing soap preparations made from the active ingredient of butterfly pea flower kombucha fermentation solution in inhibiting the growth of pathogenic bacteria contained in beef isolates can be classified as including; > 20 mm is in the very strong category, 10 to 20 mm is in the strong category, 5 to 10 mm is in the moderate category, and 1 to 5 is in the weak category, and < 1 mm is in the very weak category (24).

The diameter of the inhibition zone which has been calculated on average for each formulation and preparation of dishwashing soap which is made from the active ingredient of butterfly pea flower kombucha fermentation solution as a pharmaceutical and antibacterial biotechnology product derived from beef isolates was analyzed via one way ANOVA and if each biotechnology product If the pharmaceutical inhibits the growth of pathogenic bacteria, if the value is less than 0.05, further testing will be carried out in the form of post hoc analysis (25).

Results

Table 2 is the result of research regarding the role of pharmaceutical biotechnology products in inhibiting the growth of pathogenic bacteria isolated from beef. The results of this research have also proven that all pharmaceutical biotechnology products in the form of formulations and preparations of dishwashing soap made from the active ingredient of butterfly pea flower kombucha fermentation solution have sufficient potential to inhibit the growth of various gram-positive and negative bacteria as pathogens.

Table 3 is a one-way ANOVA test and has proven that each pharmaceutical biotechnology product in the form of a formulation and preparation of dish soap with the active ingredient of butterfly pea flower kombucha fermentation solution has a respective p value below 0.05, so further tests can be carried out in the form of post hoc analysis listed in table 4.

Table 4 is a further test in the form of post hoc analysis which has proven that dishwashing soap made from the active ingredient of butterfly pea flower kombucha fermentation solution at concentrations of 20% and 30% is not significantly different as a pharmaceutical and antibacterial biotechnology product that has been tested from the three beef isolates, However, it is significantly different with a concentration of 40% as a pharmaceutical and antibacterial biotechnology product that has been tested from three beef isolates. Dish washing soap with the active ingredient of butterfly pea flower kombucha fermentation solution at a concentration of 40% is significantly different as a pharmaceutical and antibacterial biotechnology product in beef that has been isolated from beef.

Table 2. Average diameter of the inhibition zone in pharmaceutical biotechnology products in the form of dish soap formulations and preparations in inhibiting the growth of pathogenic bacteria originating from beef isolates

Type of bacteria	Diameter of the Inhibition (mm)	Negative Control (mm)	Positive Control (mm)	Diameter of the inhibition zone for each formulation and preparation of butterfly pea flower kombucha dish soap (mm)		
				20%	30%	40%
Staphylococcus aureus	I	0	16.00	8.50	9.00	17.24
	II	0	16.03	8.52	9.00	17.30
	III	0	16.07	8.55	9.00	17.40
	Average	0	16.03	8.52	9.00	17.31
Listeria monocytogenes	I	0	15.22	8.00	8.08	16.09
	II	0	15.27	8.00	8.09	16.09
	III	0	15.36	8.00	8.13	16.09
	Average	0	15.28	8.00	8.1	16.09
Salmonella thyposa	I	0	13.25	7.01	8.00	15.12
	II	0	13.25	7.02	8.00	15.12
	III	0	13.25	7.05	8.00	15.12
	Average	0	13.25	7.02	8.00	15.12
Escherichia coli	I	0	14.09	6.08	7.03	15.00
	II	0	14.09	6.08	7.12	15.00
	III	0	14.09	6.09	7.13	15.00
	Average	0	14.09	6.08	7.09	15.00

Table 3 Results of one-way ANOVA

	One Way Anova Test	Sig
Staphylococcus aureus		0.02
Listeria monocytogenes		0.01
Salmonella thyposa		0.01
Escherichia coli		0.01

Table 4 post hoc test

		20%	30%	40%	Positive Control	Negative Control
Staphylococcus aureus	20%	-	0.1222	0.002*	0.000*	0.000*
	30%	0.1222	-	0.999	0.000*	0.000*
	40%	0.002*	0.999	-	0.000*	0.000*
	Positive Control	0.000*	0.000*	0.000*	-	0.000*
	Negative Control	0.000*	0.000*	0.000*	0.000*	-
Listeria monocytogenes	20%	-	0.111	0.001*	0.000*	0.000*
	30%	0.111	-	0.888	0.000*	0.000*
	40%	0.001*	0.111	-	0.000*	0.000*
	Positive Control	0.000*	0.000*	0.000*	-	0.000*
	Negative Control	0.000*	0.000*	0.000*	0.000*	-
Salmonella thyposa	20%	-	0.100	0.0010*	0.000*	0.000*
	30%	0.100	-	0.777	0.000*	0.000*
	40%	0.0010*	0.777	-	0.000*	0.000*
	Positive Control	0.000*	0.000*	0.000*	0.000*	0.000*
	Negative Control	0.000*	0.000*	0.000*	0.000*	-

		20%	30%	40%	Positive Control	Negative Control
Escherichia coli	20%	-	0.999	0.009*	0.000*	0.000*
	30%	0.999	-	0.666	0.000*	0.000*
	40%	0.006*	0.999	-	0.000*	0.000*

*: States that there is a significant difference (p<0.05)

Discussion

The results of this research have proven that the higher the concentration of the dishwashing soap preparation, the more potential it has as an antibacterial derived from beef isolate and as a pharmaceutical biotechnology product. This is because the active ingredient used is a telang flower kombucha fermentation solution which contains several secondary metabolite compounds such as alkaloids, flavonoids and saponins. This statement is in accordance with the results of research conducted by (26) where in the results of his research it has been proven that the butterfly pea flower kombucha fermentation solution contains secondary metabolite compounds such as alkaloids, flavonoids and saponins. The potential of these three secondary metabolite compounds is very potential in this research as an antibacterial obtained from beef isolates.

The secondary metabolite compounds contained in the telang flower kombucha fermentation solution, apart from having the potential as an antibacterial source, provide opportunities for use in the field of pharmaceutical biotechnology as active ingredients for medicines and cosmetics. This is in accordance with the statement made by (27), namely that the potential of kombucha as an antibacterial source, antioxidant source (28), and anticancer source (29) has great potential to be developed as an active ingredient in medicines (30) or cosmetics from a biotechnology (31) perspective.

Table 2 has proven that dishwashing soap with the active ingredient of butterfly pea flower kombucha at a concentration of 20% and 30% is in the medium category, while dishwashing soap with the active ingredient of butterfly pea flower kombucha at a concentration of 40% is in the strong category. This is in line with the results of research conducted by (32) and it is proven that liquid bath soap with the active ingredient kombucha butterfly pea flower at a concentration of 20% and 30% has a medium category in inhibiting the growth of *Candida albicans* isolated from female sexual workers, and bath soap liquid with the active ingredient telang flower kombucha at a concentration of 40% is in the strong category.

The data analysis used in this research is statistical one-way ANOVA, where before testing the one-way ANOVA and post hoc analysis as a follow-up test provided that each resulting P value is less than 0.05. The results of this research have proven that each resulting P value is less than 0.05, so it can be further analyzed through a post hoc test. Table 4 regarding the post hoc analysis test has proven that the dishwashing soap formulation with the active ingredient telang flower kombucha at concentrations of 20% and 30% is not significantly different as a pharmaceutical biotechnology product in inhibiting the growth of the four test bacteria but is significantly different at a concentration of 40%. Table 4 regarding the post hoc analysis test has proven that the dishwashing soap formulation with the active ingredient telang flower kombucha at concentrations of 20% and 30% is not significantly different as a pharmaceutical biotechnology product in inhibiting the growth of the four test bacteria but is significantly different at a concentration of 40%.

The results of this research have proven that dishwashing soap with the active ingredient telang flower kombucha which correlates positively at all concentrations in inhibiting the growth of pathogenic bacteria isolated from beef appears to be most effective at a concentration of 40%. This is because butterfly pea flower kombucha contains bioactive compounds in the form of secondary metabolites (33), each of which has a different cellular mechanism for inhibiting the growth of pathogenic bacteria. The alkaloids contained in butterfly pea flower kombucha and available in the form of dish soap work to inhibit the growth of pathogenic bacteria by inhibiting the components that make up the peptidoglycan in pathogenic bacterial cells, so that the cell walls of pathogenic bacteria do not form completely (26). The flavonoid group in telang flower kombucha is available as an active ingredient in dishwashing soap to inhibit the growth of pathogenic bacteria, namely by damaging the permeability of the cell walls of

pathogenic bacteria, microsomes and lysosomes as a form of interaction between flavonoids and bacterial plasmids. Apart from that, it releases transduction energy in the bacterial cytoplasmic membrane. Inhibits the motility of pathogenic bacteria, the hydroxyl groups contained in the structure of flavonoid compounds, thereby causing changes in organic components and nutrient transport, resulting in toxic effects on pathogenic bacterial cells (34).

The saponin group contained in butterfly pea flower kombucha is available as a dish soap preparation which has the potential to inhibit the growth of pathogenic bacteria in beef isolates, namely by reducing the surface tension of the cell walls so that lysis occurs in the pathogenic bacterial cells, thereby disrupting the metabolism of the pathogenic bacteria and causing death. by degrading the cell walls of pathogenic bacteria, cytoplasm and cell membranes (35).

The bioactive compounds in butterfly pea flower kombucha which play an important role as secondary metabolite compounds can be recommended as environmentally friendly natural active ingredients in the manufacture of long-term active ingredients for medicines and cosmetics.

Conclusion

The results of this research can be concluded that the content of pathogenic bacteria originating from beef isolates can be inhibited by pharmaceutical biotechnology products in the form of formulations and preparations of dish soap with the active ingredient of butterfly pea flower kombucha fermentation solution.

Conflicts of Interest: This research does not contain any elements of conflict of interest that are unprofessional as academics.

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