

Antibacterial Activity of Dairy Kefir for Escherichia coli, Staphylococcus aureus, and Bacillus subtilis

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EXTENDED ABSTRACT

Antibacterial Activity of Dairy Kefir for *Escherichia coli*, *Staphylococcus aureus*, and *Bacillus subtilis*

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SUMMARY

Dairy kefir is a ¹⁰memade functional beverage from fermented milk using kefir grains. This study aims to determine the activity of goat's milk and cow's milk kefir in ²inhibiting the growth of *Escherichia coli*, *Staphylococcus aureus*, and *Bacillus subtilis*. The dairy kefir used was made from cow's and goat's milk varied at 25%, 50%, and 75% concentrations. This research used the well diffusion method with 3 replications. The results were analyzed using two-way MANOVA and showed that all the treatments had a significant effect p-value < α (0.00<0.05). Based on discriminant analysis, it is known that *B. subtilis* has the highest correlation with a correlation ¹⁷value of 0.554 for the type of kefir and 0.994 correlation value for the concentration. Cow's and goat's milk kefir were able to inhibit the growth of test bacteria.

Keywords: Antibacterial activity, Cow's milk kefir, Functional beverage, Goat's milk kefir, Microorganisms' consortium

INTRODUCTION

Kefir is a natural product made from pasteurized milk which is traditionally fermented using a starter called kefir grains. Kefir grains consist of good microorganisms that form a consortium of white- or cream-colored granules. The fermentation process results in kefir containing carbonate, high lactic acid, and low alcohol. Kefir is known to have synbiotic properties because it contains probiotics and prebiotics that interact synergistically (1). Probiotics are living organisms that have a positive effect on health (2) and are not known to cause disease ⁴(3). Previous research has shown that probi ¹⁶cs can inhibit the growth of pathogenic bacteria (4). *Escherichia coli*, *Staphylococcus aureus*, and *Bacillus subtilis* are ³pathogenic bacteria that can cause disease in humans. The activity of cow's milk and goat's milk kefir against these bacteria is not yet known, so it is important to conduct this research.

MATERIALS AND METHODS

Kefir was made by mixing 1 liter of pasteurized milk with 50 grams of kefir grains in a tightly closed sterile ⁷ntainer. The mixture was incubated anaerobically for 24 hours in the dark at room temperature, the lid

was opened, and ⁹ was stirred every 12 hours. The test bacteria cultures (*E. coli* ATCC 8739, *S. aureus* ATCC 6538, and *B. subtilis* ATCC 6633) were suspended with ¹⁴transmittance of 25%. A microbial sensitivity test was carried out using the well diffusion method. The concentrations of kefir used were 25%, 50%, and 75% (using distilled water), and kanamycin was used as a positive control. Each test was repeated in 3 replications. The area of the inhibition zone was measured after 24 hours of incubation at 37°C. The data were analyzed using two-way MANOVA with a significant level of 5% followed with descriptive discriminant analysis.

RESULTS AND DISCUSSION

The results showed ⁸ that cow's milk and goat's milk kefir had inhibitory activity against the growth of *E. coli*, *S. aureus*, and *B. subtilis* as shown in Table I. Cow's and goat's milk kefir had the highest inhibitory activity at 75 % concentration against the test bacteria, with a wider inhibition zone than the positive control against *S. aureus* and *B. subtilis*. The results of the two-way MANOVA showed the significant effect p(0.00)< α (0.05) in all cases. Data analysis was followed with a descriptive discriminant test and the results are shown in Table II.

Table I: Inhibition area of dairy kefir to *E. coli*, *S. aureus*, and *B. subtilis*

Type of kefir	Concentration	Area of Inhibition (mm)		
		<i>E. coli</i>	<i>S. aureus</i>	<i>B. subtilis</i>
Cow's Milk Kefir	- Control	9.00	9.00	9.00
	+ Control	20.88	14.70	13.30
	25%	14.58	11.10	9.50
	50%	15.82	14.73	14.40
Goat's Milk Kefir	- Control	9.00	9.00	9.00
	+ Control	17.33	17.73	16.48
	25%	15.30	15.07	15.87
	50%	17.03	17.92	19.77
	75%	17.23	18.98	21.73

Table II. Structure matrix of descriptive discriminant analysis

Variables	Function for cow's and goat's milk kefir groups		Function for concentration group	
	1	2	1	2
<i>B. subtilis</i>	,554	,329	,944	
<i>S. aureus</i>	,352	,228	,858	
<i>E. coli</i>	-,085	,875	-,483	

Table II shows that the variable *B. subtilis* had the highest correlation with a correlation value of 0.554 (for the cow's milk and goat's milk kefir groups) and 0.994 correlation value (for the 50% and 75% concentration). The results of the discriminant analysis also showed that the mean value of *B. subtilis* for cow's milk kefir was higher than that of goat's milk kefir (16.57>12.62), and the concentration was 75% higher than 50% (17.11>17.08). The inhibition zone formed can be seen in Figure 1.

The antibacterial activity of kefir is due to the presence of a consortium of lactic acid bacteria, acetic acid bacteria, and yeast that can fight pathogen bacteria.

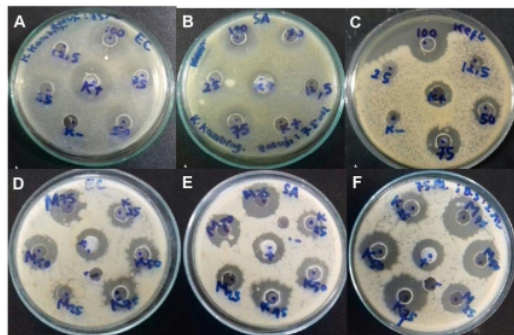


Fig. 1: Inhibition zone formed by kefir A) goat's milk kefir against *E. coli*; B) goat's milk kefir against *S. aureus*; C) goat's milk kefir against *B. subtilis*; D) cow's milk kefir against *E. coli*; E) cow's milk kefir against *S. aureus*; F) cow's milk kefir against *B. subtilis*

Kefir bacteria include probiotics that the body needs. Probiotics can compete with pathogenic bacteria. They have antagonistic properties and inhibit the growth of pathogenic bacteria.

The consumption of probiotics is used to balance the number of good microorganisms and suppress the growth of pathogenic bacteria in humans. This can be used as a solution to reduce the use of antibiotics that can cause resistance to pathogenic microorganisms. The mechanism is also triggered by an increase in bioactive compounds that occur during the fermentation process. Kefir contains active exopolysaccharide compounds, such as bioactive peptides and kefiran. Kefir also contains organic acids, especially lactic acid which have been shown to have anticancer, immune-modulatory activities, and antimicrobial (5).

CONCLUSION

Goat's and cow's milk kefir were able to inhibit the growth of bacteria with the highest inhibitory power at a concentration of 75%. *B. subtilis* is the variable with the highest correlation value for both the kefir type group (cow's milk and goat's milk kefir) and the concentration group (50% and 75%).

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