UTILIZATION OF RED GINGER POWDER ON IMPROVING THE QUALITY OF BACTERIOLOGICAL FRESH ETAWA GOAT MILK

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Abstract

Etawa crossbreed goat's milk, is one of the traditional dairy products without sterilization treatment before being sold to the public, by reason of reducing the freshness and quality of the milk. The fresh Etawa goat's milk has the possibility of being contaminated by bacteria from the milking process. Added red ginger powder will improve the bacteriological quality of fresh Etawa goat's milk. This is experimental study with completely randomized design, statistical ANOVA test, if the calculated F is greater than the F table then continued with the BNT test with error rate of 5%. T test was carried out to compare the decrease in the number of bacteria before and after added of red ginger powder. Samples were fresh Etawa goat's milk before and after added red ginger powder sizes 1, 2, 3, 4, and 5 grams with 3 repetitions, and 0 grams as positive control. The results of the identification of bacteria found in pure fresh Etawa goat's milk were found *Coliforms*, *E.coli*, *Salmonella sp*, *Staphylococcus aureus*, *Vibrio sp*, and *Neisseria sp*. After added red ginger powder size 1, 2, 3, 4 and 5 grams there was decrease in the number of germs in fresh milk of Etawa goats, from $35{,}4x10^3$ CFU/ml to $30{,}8x10^3$ CFU/ml, $26{,}6x10^3$ CFU/ml, $23x10^3$ CFU/ml, $18{,}8x10^3$ CFU/ml, and 5 grams red ginger powder had the highest reduction in the number of germs that is $16{,}8x10^3$ CFU/ml or 47%. The T test results p=0,000, there is difference the Etawa goat's milk after added red ginger powder.

Key Words : Bacteriological, Etawa Goat Milk, Red Ginger Powder,

Introduction

Fresh milk is a highly nutritious food ingredient because it contains complete and balanced food substances such as protein, fat, carbohydrates, minerals, and vitamins that are needed by humans. Its high nutritional value also makes milk an excellent medium for micro-organisms for growth and development, so that in a very short time milk becomes unfit for consumption if not handled properly [1][2]. Microorganisms that thrive in milk, apart from causing spoilage of milk, can also harm human health as end consumers. Improper handling of milk can also cause the shelf life of milk to be short, the selling price to be cheap which in turn will also reduce the income of farmers as milk producers [3].

Etawa crossbreed goat's milk, is one of the traditional dairy products without sterilization treatment before being sold to the public, on the grounds of reducing the freshness and quality of the milk. Etawa milk has the opportunity to be contaminated by bacteria that contaminate the milking process.

The goat that wants to be milked must be calm first, the goat's body part from the groin to the back of the body is washed or cleaned with a wet cloth dipped in water mixed with disinfectant, the goat's udder must be washed with clean warm water using a sponge, water can be mixed With disinfectants, the place or cage for dairy goats must be clean, milkers are in good health,

fingernails should not be long, hands must be washed with soap and rinsed thoroughly, and milking equipment is clean [4].

Goat's milk is starting to be loved by the public because of its benefits, including containing essential amino acids, does not cause allergies, improves the digestive tract, acts as a metabolic agent, has a high calcium value, is a good and natural nutrient, can treat tuberculosis and asthma, and can nourish the skin. Etawa Peranakan goat milk has a milk composition consisting of 3.6% protein content, 6.17% fat, dry matter 15,49%, and BKTL 9.32%. High nutritional content causes milk to quickly be damaged due to the growth of microorganisms in milk.

Goat's milk has a nutritional content that is superior to cow's milk, besides that, fat and protein in goat's milk are easier to digest and the content of vitamin B1 is higher than cow's milk. One of the milk-producing livestock is the Etawa Peranakan goat. Etawa crossbreed goats are small ruminants with potential to be developed as milk-producing livestock.

Goat's milk has smaller globules, homogenizes longer so it is not easily damaged. Etawa crossbreed goat's milk is believed to have many benefits both in terms of health and beauty.

One of the food ingredients that can be used as an ingredient to kill bacteria because it has antibacterial properties is red ginger. Ginger is one of the spices that is widely known by the public. Apart from being a flavor producer in various food products, ginger is also known to have the property of curing various diseases such as colds, coughs and diarrhea [5]. According to (Purnomoet al., 2010), ginger contains compounds that are antioxidants. The results of research by Kikuzakiet al., 1993), showed that non-volatile phenol active compounds such as gingerol, shogaol and zingeron, which were found in ginger were proven to have antioxidant abilities. Gingerol and shogaol are able to act as primary antioxidants against lipid radicals. Gingerol and shogaol have antioxidant activity because they contain a benzene ring and a hydroxyl group [6].

Red ginger is a spice that contains natural antioxidant compounds. Ginger contains 7-10% oleoresin, 1-3% essential oil, about 52% essence, a small amount of protein, vitamins, minerals. Ginger contains chemical compounds in the form of trapenoids, gingerols and shogaols which are believed to be anti-inflammatory, antioxidant and antibacterial.

Based on the above background, the authors conducted a study entitled "Utilization of Ginger Powder on Improving the Quality of Fresh Etawa Goat's Milk".

Methods

This research is experimental. The dependent variable in this study was the quality of fresh Etawa goat's milk, while the independent variable in this study was red ginger powder. The subject of this research is fresh Etawa goat's milk in Sungai Langka Pesawaran originating from Etawa crossbreed goat farm. This research was conducted in July 2019 at the Lampung Veterinary Laboratory. Analysis of the data used is univariate and bivariate analysis. This analysis was used to observe the amount and calculate the percentage of fresh Etawa Peranakan goat milk samples in Sungai Langka Pesawaran. Data is presented in tabular form. The research design was completely randomized design, statistical test ANNOVA, if the calculated F is greater than Ftable then continued with the BNT test (Least Significant Difference) at an error rate of 5% and 1%. Furthermore, a T test was carried out to compare the decrease in the number of bacteria before and after added of red ginger powder. Samples were fresh Etawa goat's milk before and after red ginger powder with sizes 1, 2, 3, 4, and 5 grams with 3 repetitions, and 0 grams as a positive control.

Results

The results of the research on the use of ginger powder to improve the quality of fresh Etawa goat's milk are as follows:

Table 1. Percentage of germ numbers in fresh Etawa goat's milk before giving red ginger powder

Sample	Dilution					CFU/ml
	10^{-1}	10^{-2}	10^{-3}	10^{-4}	10^{-5}	
A	296	150	115	61	19	29 x 10^3
B	345	288	253	211	100	54 x 10^3
C	279	150	92	33	5	25 x 10^3
D	287	173	112	85	22	31 x 10^3
E	350	253	189	35	6	38 x 10^3

Table 2. Percentage of germ numbers in fresh Etawa goat's milk after red ginger powder was given.

Sample	Dilution					CFU/ml
	10^{-1}	10^{-2}	10^{-3}	10^{-4}	10^{-5}	
A 1g	264	130	105	42	24	26 x 10^3
A 2g	259	125	81	36	17	23 x 10^3
A 3g	256	120	75	30	9	22 x 10^3
A 4g	254	103	60	23	8	20 x 10^3
A 5g	251	75	36	12	0	17 x 10^3
B 1g	288	250	250	243	87	51 x 10^3
B 2g	284	250	185	132	86	42 x 10^3
B 3g	276	193	173	109	23	35 x 10^3
B 4g	262	153	120	25	18	26 x 10^3
B 5g	254	135	91	39	8	24 x 10^3
C 1g	268	110	20	10	6	19 x 10^3
C 2g	173	58	53	8	5	14 x 10^3
C 3g	96	48	43	6	3	9 x 10^3

C 4g	47	44	27	5	2	6×10^3
C 5g	35	27	9	4	0	7×10^2
D 1g	289	190	99	55	21	30×10^3
D 2g	275	179	94	32	14	27×10^3
D 3g	268	163	73	30	12	25×10^3
D 4g	263	134	21	9	2	20×10^3
D 5g	255	87	18	9	1	17×10^3
E 1g	280	174	131	31	5	28×10^3
E 2g	275	150	129	28	5	27×10^3
E 3g	266	157	68	27	3	24×10^3
E 4g	254	145	57	28	2	22×10^3
E 5g	254	115	35	14	1	19×10^3

Table 3. The results of the identification of bacteria in fresh Etawa goat's milk before giving red ginger powder

Sample	Test Type					
	Coliforms	*E. Coli*	*Salmonella sp*	*Staphylococcus areus*	*Vibrio sp*	Neisseria *sp*
A	+	+	+	+	+	+
B	+	+	+	+	+	+
C	+	+	+	+	+	+
D	+	+	+	+	+	+
E	+	+	+	+	+	+

Table 4. ANOVA Test Results on Germ Numbers in Etawa Goat's Milk with the addition of red ginger powder

Treatment	Repetition	Mean	F	*P-value*
Murni	5	35.4×10^3	2.772	.041
Red Ginger Powder 1 Gram	5	$30{,}8 \times 10^3$		
Red Ginger Powder 2 Gram	5	$26{,}6 \times 10^3$		
Red Ginger Powder 3Gram	5	23×10^3		

Red Ginger Powder 4 Gram	5	18,8 x 10^3
Red Ginger Powder 5 Gram	5	15,54 x 10^3

Table 5. T-Test Analysis on Etawa Goat's Milk Treatment

with the addition of red ginger powder

Treatment	Mean	SD	SE Mean	N	*P-value*
Red Ginger Powder	25023.33	11407.006	2082.625	30	.000

Discussion

The results of statistical tests showed that in the ANOVA test, the *P value* ≤ 0.05 was 0.044. So it can be concluded that there is a decrease in the number of germs in each treatment with the addition of red ginger powder. In the T test results the effect of red ginger powder on the number of germs in Etawa goat's milk with $p = 0.000$. Which means that there is a significant difference with the addition of red ginger powder to Etawa goat's milk.

Based on Table 4.1, it was found that the treatment without giving ginger powder in sample A the number of colonies in milk $29x10^3$ CFU/ml, sample B the number of colonies $54x10^3$ CFU/ml, sample C the number of colonies $25x10^3$ CFU/ml, sample D the number of colonies $31x10^3$ CFU/ml, and sample E number of colonies $38x10^3$ CFU/ml. This difference in results is because each sample is a sample of goat's milk from a different goat. The number of colonies in sample B was greater, because the goat's milk in sample B received food intake in the form of tofu dregs with the aim that the milk produced was more savory when consumed. Meanwhile, samples A, C, D, and E were lower because the goats received food intake in the form of grass. Milk that is good for consumption for treatment is milk that comes from goats that get grass food intake.

Tofu dregs contain high enough protein, therefore it is very good to be used as animal feed. Tofu pulp contains 21% crude protein, 23.58% crude fiber, 10.49% crude fat, and 2.96% ash. Meanwhile, grass contains 9.66% crude protein, 30.86% crude fiber, 2.24% fat, and 15.96% ash (Tarmidi, 2010). The protein content in grass feed is smaller, but the crude fiber and ash content is greater. In sample B, the number of colonies increased rapidly when compared to samples A, C, D and E. In sample B, the number of colonies was $54x10^3$ CFU/ml. Meanwhile in samples A, C, D and E the number of colonies ranged from $29x10^3$ CFU/ml to $38x10^3$ CFU/ml.

In Table 4.2, the results of the number of colonies with the addition of ginger powder in sample A with the addition of 1 gram of ginger are $26x10^3$ CFU/ml, sample A with the addition of 2grams of ginger is $23x10^3$ CFU/ml, sample A with the addition of 3gram of ginger is $22x10^3$ CFU/ml, sample A with the addition of 4grams of ginger there are $20x10^3$ CFU/ml, and sample A with the addition of 5grams of ginger there are $17x10^3$ CFU/ml. The number of colonies in sample A after added of red ginger powder 1gram was $26x10^3$ CFU/ml compared to the number of colonies in sample A before added of red ginger powder $29x10^3$ CFU/ml the results were greater in sample A before added of red ginger powder. Sample B with the addition of 1gram ginger contained $51x10^3$ CFU/ml, sample B with the addition of 2gram ginger contained $42x10^3$ CFU/ml, sample B with the addition of 3gram ginger contained $35x10^3$ CFU/ml, sample B with the addition of 4gram ginger contained $26x10^3$ CFU/ml, and sample B with the addition of 5 grams of ginger contained $24x10^3$ CFU/ml. The number of colonies in sample B after added of 1gram red ginger powder was

$51x10^3$ CFU/ml compared to the number of colonies in sample B before added of red ginger powder $54x10^3$ CFU/ml the results were greater in sample B before added of red ginger powder.

Sample C with the addition of 1gram ginger contained $19x10^3$ CFU/ml, sample C with the addition of 2gram ginger contained $14x10^3$ CFU/ml, sample C with the addition of 3gram ginger contained $9x10^3$ CFU/ml, sample C with the addition of 4gram ginger contained $6x10^3$ CFU/ml, and sample C with the addition of 4gram ginger contained $6x10^3$ CFU/ml. C with the addition of 5 grams of ginger there are $7x10^2$ CFU/ml. The number of colonies in sample C after giving 1gram red ginger powder was $19x10^3$ CFU/ml compared to the number of colonies in sample C before giving red ginger powder $25x10^3$ CFU/ml the results were greater in sample C before giving red ginger powder.

Sample D with the addition of 1 gram of ginger contained $30x10^3$ CFU/ml, sample D with the addition of 2gram ginger contained $27x10^3$ CFU/ml, sample D with the addition of 3 gram of ginger contained $25x10^3$ CFU/ml, sample D with the addition of 4gram ginger contained $20x10^3$ CFU/ml, and sample D with the addition of 4gram ginger D with the addition of 5 grams of ginger there are $17x10^3$ CFU/ml. The number of colonies in sample D after added of red ginger powder 1gram was $30x10^3$ CFU/ml compared to the number of colonies in sample D before added of red ginger powder $31x10^3$ CFU/ml the results were greater in sample D before added of red ginger powder.

Sample E with the addition of 1gram ginger contained $28x10^3$ CFU/ml, sample E with the addition of 2gram ginger was $27x10^3$ CFU/ml, sample E with the addition of 3gram ginger contained 24x103 CFU/ml, sample E with the addition of 4gram ginger contained $22x10^3$ CFU/ml, and sample E with the addition of 5 grams of ginger there is $19x10^3$ CFU/ml. The number of colonies in sample E after added of red ginger powder 1gram is $28x10^3$ CFU/ml compared to the number of colonies in sample E before added of red ginger powder $38x10^3$ CFU/ml the result were greater in sample E before added of red ginger powder.

The number of colonies with sample treatment before added of ginger powder compared to the number of colonies with sample treatment after added of ginger powder decreased. This proves that red ginger powder is able to improve the quality of fresh Etawa goat's milk and is able to suppress the growth of bacteria in fresh Etawa goat's milk.

In Table 4.3, the results of the identification of bacteria found in fresh etawa goat's milk before added of red ginger powder were positive for *Coliform* bacteria, positive for *E. coli* bacteria, positive for *Salmonella Sp* bacteria, positive for *Staphylococcus aureus* bacteria, positive for *Vibrio Sp* bacteria, and positive for *Neisseria Sp* bacteria. *Coliform* bacteria are a group of intestinal bacteria, which live in the human digestive tract. *Coliform* bacteria are indicators of the presence of other pathogenic bacteria. More precisely, faecal *Coliform* bacteria are indicator bacteria of contamination by pathogenic bacteria. Determination of faecal coliforms is an indicator of contamination because the number of colonies must be positively correlated with the presence of pathogenic bacteria. Examples of *Coliform* bacteria are, *Escherichia coli* and *Enterobacter aerogenes*. *E. Coli* if it enters the digestive tract in large quantities can endanger health [7]. *E. Coli* bacteria in excessive numbers can cause diarrhea, and if these bacteria spread to other body systems/organs, it can cause infection. If *E. Coli* bacteria enter the urinary tract, it can cause Urinary Tract Infections (UTI) [1].

Salmonella sp. It is parasitic in humans and animals and causes an inflammatory reaction in the intestinal tract. Salmonella is a major cause of food-borne illness. Diseases caused are usually related to digestion. Salmonellosis is the name for the disease caused by *Salmonella sp*. Some characteristics of patients with salmonellosis include diarrhea, fever, stomach cramps within 8-72 hours after eating food that has been contaminated with *Salmonella* bacteria. Patients may also experience nausea, vomiting and headaches. One type of *Salmonella sp, Salmonella typhi* is the cause of typhoid fever. These bacteria enter the blood vessels and gastroenteritis through food. Typhoid fever can cause death. *Salmonella sp* infection is also bad for babies, toddlers, pregnant women and fetuses, as well as the elderly. This is due to their weak immunity [8].

Staphylococcus bacteria are normal flora on the skin, respiratory tract, and digestive tract of food in humans. These bacteria are also found in the air and the environment. The pathogenic *Staphylococcus aureus* is invasive, causes hemolysis, forms coagulase, and is able to ferment mannitol [9]. Infection by *Staphylococcus aureus* is characterized by tissue damage accompanied by a purulent abscess. Some infectious diseases caused by *Staphylococcus aureus* are boils, acne, impetigo, and wound infections. More severe infections include pneumonia, mastitis, phlebitis, meningitis, urinary tract infections, osteomyelitis, and endocarditis. *Staphylococcus aureus* is also

a major cause of nosocomial infections, food poisoning, and toxic shock syndrome [10][9]. Localized boils or abscesses, such as pimples and ulcers, are skin infections in the area of the hair follicles, sebaceous glands, or sweat glands. At first local tissue necrosis occurs, then fibrin coagulation occurs around the lesion and lymph vessels, resulting in the formation of a wall that limits the necrosis process. The infection can spread to other parts of the body through the lymph vessels and blood vessels, resulting in inflammation of the veins, thrombosis, and even bacteremia. Bacteremia can cause endocarditis, acute hematogenous osteomyelitis, meningitis or lung infection [9][11].

Vibrio sp is an opportunistic pathogen that normally exists in a rearing environment, then develops from a saprophytic nature to become pathogenic if environmental conditions permit. *Vibrio* bacteria that are pathogenic can live in other body parts of organisms, either outside the body by attaching them, or in internal organs such as the liver, intestines and so on. *Vibrio* is a gram-negative rod-shaped sepsis that is widespread inside. *Vibrios* are found in water areas and water surfaces, they are bent and motile aerobic rods, have polar flagella, can move with one polar flagellum, are unable to form spores. *Vibrio* sepsis is one of the causes of diarrheal disease in humans, which can be found in large quantities in both marine and freshwater environments. This type of diarrhea can cause dehydration very quickly and electrolyte balance is disturbed if body fluids lost with feces are not replaced immediately [12].

There are two bacteria *Neisseria sp*, which are pathogenic Neisseria gonorrhoeae and *Neisseria meningitidis*. *Neisseria gonorrhoeae* (gonococcus) is the causative agent of gonorrhoea and is transmitted through sexual contact. Symptoms of infection with *Neisseria gonorrhoeae* differ depending on the site of infection. Genital infections can cause a purulent (or pus-like) discharge from the genitals that may have a foul odor, inflammation, redness, swelling, dysuria and a burning sensation when urinating. *Neisseria gonorrhoeae* can also cause conjunctivitis, pharyngitis, proctitis or urethritis, prostatitis and orchitis. Conjunctivitis is common in neonates and silver nitrate or antibiotics are often applied to their eyes as a preventive measure against gonorrhea. Neonatal conjunctivitis is contracted when the baby is exposed to *Neisseria gonorrhoeae* in the birth canal, and can result in corneal scarring or perforation. Disseminated *Neisseria gonorrhoeae* infection may occur, resulting in endocarditis, meningitis or gonococcal dermatitis-arthritis syndrome. *Neisseria meningitidis* (meningococci) causes significant morbidity and mortality in children and young adults worldwide through epidemic or sporadic meningitis and/or septicemia. *Neisseria meningitidis* is the exclusive human pathogen.

Conclusion

Based on the research conducted, it can be concluded that there was a decrease in the number of bacteria in Etawa goat's milk after added of red ginger powder. Red ginger powder size 1, 2, 3, 4 and 5 grams there was decrease in the number of germs in fresh milk of Etawa goats, from $35,4x10^3$ CFU/ml to $30,8x10^3$ CFU/ml, $26,6x10^3$ CFU/ml, $23x10^3$ CFU/ml, $18,8x10^3$ CFU/ml, and $16,8x10^3$ CFU/ml. 5 grams red ginger powder had the highest 47% reduction in the number of germs. Comparison of T test results the effect of red ginger powder on the number of germs in Etawa goat's milk with $p = 0.000$. Which means that there is a significant difference between pure Etawa goat's milk and Etawa goat's milk which has been added with red ginger powder.

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