awijaya

awijaya awijaya awijaya awijaya awijaya

awijaya awijaya

awijaya

awijaya awijaya

awijaya awijaya awijaya

awijaya awijaya awijaya

awijaya

awijaya

awijaya awijaya awijaya awijaya awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

Universitas Brawijaya Universitas Brawijaya Universitas Provijaya Universitas Brawijaya

jaya Universitas Brawijaya

rawijaya Universitas Brawijaya

Brawijaya Universitas Brawijaya

Universitas Brawijaya Universitas Brawijaya

U2021 Brawijaya Universitas Brawijaya

sitas Brawijaya Universitas Brawijaya

THE EFFECTS OF OZONATION AND REFRIGERATOR STORAGE ON TOTAL PLATE COUNT, pH, AND PROTEIN CONTENT OF MILK

UNDERGRADUATE THESIS

By: Ido Hosea Hasian Simorangkir SIN. 175050107111063

Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya

Univ ANIMAL SCIENCE PROGRAM Isitas Brawijaya

ANIMAL SCIENCE FACULTY

Univers BRAWIJAYA UNIVERSITY Versitas Brawijaya

Universitas BrawijayaMALANGBrawijaya Universitas Brawijaya

NNU

Universitas Brawijay



awijaya

awijaya awijaya awijaya awijaya awijaya

awijaya awijaya

awijaya

awijaya awijaya

awijaya awijaya awijaya

awijaya awijaya awijaya

awijaya

awijaya

awijaya awijaya awijaya awijaya awijaya awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya awijaya Univer

Universitas Brawijaya Universitas Brawijaya Universitas Provijaya Universitas Brawijaya

THE EFFECTS OF OZONATION AND REFRIGERATOR STORAGE ON TOTAL PLATE COUNT, pH, AND PROTEIN CONTENT OF MILK

UNDERGRADUATE THESIS

By: Ido Hosea Hasian Simorangkir SIN. 175050107111063

This undergraduate thesis is one of the requirements to achieve Animal Science Bachelor degree at Animal Science Faculty Brawijaya University ANIMAL SCIENCE PROGRAM ANIMAL SCIENCE FACULTY BRAWIJAYA UNIVERSITY MALANG 2021



awijaya

awijaya

awijaya awijaya awijaya awijaya

awijaya awijaya

awijaya

awijaya awijaya

awijaya awijaya awijaya

awijaya awijaya awijaya

awijaya

awijaya

awijaya awijaya awijaya

awijaya

awijaya awijaya awijaya

awijaya

awijaya

awijaya awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya awijaya Universitas Brawijaya Universitas Brawijaya Universitas Provijaya Universitas Brawijaya

THE EFFECTS OF OZONATION AND REFRIGERATOR STORAGE ON TOTAL PLATE COUNT, pH, AND PROTEIN CONTENT OF MILK

UNDERGRADUATE THESIS

By: Ido Hosea Hasian Simorangkir SIN. 175050107111063

Has been declared passed the undergraduate exam on Thursday, April 8, 2021

Acknowledging:Approving:Animal Science FacultySupervisorBrawijaya University DeanProf. Dr. Sc. Agr. Ir. Suyadi,Prof. Dr. Ir. Lilik EkaMS., IPU., ASEAN Eng.Radiati, MS., IPU.NIP. 196204031987011001NIP. 195908231986092001Date:Date: April 23, 2021



awijaya

awijaya awijaya awijaya awijaya awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

wijaya Universitas Brawijaya

FOREWORD

Praised and gratitude from the author to God Almighty for His blessings and grace so the author can finish this undergraduate thesis by title "The Effects of Ozonation and **Refrigerator Storage on Total Plate Count, pH, and Protein** Content of Milk". This undergraduate thesis was arranged as one of the requirements to achieve Bachelor Degree in Animal Science Faculty, Brawijaya University. Therefore, the author wants to express sincere thank to all individuals who already gave their contribution in forms of help, support and motivation. The author would like to express sincere thanks to:

1. Prof. Dr. Ir. Lilik Eka Radiati, MS., IPU as the supervisor awijaya who always give her time, suggestions and knowledge in un guiding the author to complete this undergraduate thesis

awijaya 2. Author's parents Mr Binsar and Mrs. Irene, Author's older awijaya Un sisters Icy and Mevy as the author's family who always give awijaya their motivation, support, love and prayers since the awijaya beginning of study. awijaya

3. Dodik Suprapto, S.Pt., M.Sc as the earlier researcher about ozone treatment on milk who lend us the ozone generator and give a lot of information, suggestions, and knowledge versitas Brawijaya about ozone treatment. as Brawiiava

4. Gita Zulfie Ramadhani and Tiara Devi Maharani as research partner who worked together to finish this research

The author realize that there are some mistakes and imperfections in this undergraduate thesis, therefore the author really appreciates all critics and suggestions. Hopefully this undergraduate thesis will be useful for all parties to develop further development in animal science.

awijaya awijaya awijaya

Ilniversitas Rrawijava Universitas Rrawijava

awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawij awijaya Universitas Brawij

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya awijaya

awijaya awijaya

awijaya

awijaya

awiiava

awijaya

awijaya awijaya

awijaya awijaya

awijaya

BRAWIIA

Univer

Jniversitas Brawijaya Universitas Brawijay Jniversitas Provijaya Universitas Brawijay

THE EFFECTS OF OZONATION AND REFRIGERATOR STORAGE ON TOTAL PLATE COUNT, PH, AND PROTEIN CONTENT OF MILK

Ido Hosea Hasian Simorangkir¹⁾, and Lilik Eka Radiati²⁾

¹⁾Student of Animal Science Faculty, Brawijaya University, Malang

Malang ²⁾Lecture of Animal Science Faculty, Brawijaya University, Malang

Email : <u>simorangkirido@gmail.com</u>

ABSTRACT

University This research was conducted from August to September 2020 at Laboratory of Animal Products Technology, Animal Science Faculty, Brawijaya University, Malang. The purpose of this research was to determine the effect of ozonation on milk shelf life stored in refrigerator analyzed from microbiological and chemical quality of milk. The results of this research provide information on ozone as a process to prolong milk shelf life. The research method was Nested Experimental Design with 2 types of milk and 5 treatments nested in milk and continued by Duncan Multiple Range Test if there was significant difference. The results showed that milk types and refrigerator storage nested in milk had a highly significant effect (P<0.01) on TPC. Milk types and refrigerator storage nested in milk had a highly significant effect (P<0.01) on pH. Milk types had a highly significant effect (P<0.01) on protein content. Refrigerator storage nested in milk had a significant effect Brawliaya (P<0.05) on protein content. Suggestion for further research, it Brawijaya could be done a research about ozone half life in milk durings Brawijaya storagesitas Brawijaya Universitas Brawijaya Universitas Brawijaya Keywords: Cold storage, milk shelf life, ozonated milk versitas Brawilava

awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawij awijaya Universitas Brawij

awijaya

awijaya

awijaya awijaya

awijaya awijaya

awijaya

awijaya awijaya

awijaya

awijaya awijaya

awijaya awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya Universitas Brawijaya Universitas Brawijaya Universitas Provijaya Universitas Brawijaya

THE EFFECTS OF OZONATION AND REFRIGERATOR STORAGE ON TOTAL PLATE COUNT, PH, AND PROTEIN CONTENT OF MILK

Ido Hosea Hasian Simorangkir¹⁾, and Lilik Eka Radiati²⁾

¹⁾Student of Animal Science Faculty, Brawijaya University,

Malang ²⁾Lecturer of Animal Science Faculty, Brawijaya University, Malang Email : <u>simorangkirido@gmail.com</u>

SUMMARY

Milk is yellowish-white or bluish-white liquid resulted from mammalian udder gland secretion. The needs of milk in Indonesia continues to increase every year along with population growth and public awareness to consume food with complete nutritional content such as milk. Milk derived from dairy cows is a source of protein, fat, carbohydrates, minerals, and vitamins contained in perfect composition. The Brawleya consumption of fresh milk also continues to increase where ins Brawijaya 2017 the national consumption of cow's fresh milk reached Brawijaya 1.261.503 tons while the national fresh milk production only Brawijaya reached 928.108,13 tons which means the national fresh milk-Brawlaya production was unable to fulfill the national needs and must be Brawijaya fulfilled by milk import. One of the things that cause national milk production unable to fulfill the national milk needs is the low quality of fresh milk produced from the local farmers. Milk produced from local farmers will be distributed first to the milk collection point and then sent to the village cooperative unit to IlnivArcitas Brawijava Ilniversitas Brawijava awijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijay Universitas Brawijay Universitas Brawijay

test the milk quality whether it is decent to be consumed or sent to the milk processing industry. One of milk quality indicators is bacteria contamination, the limit of bacteria contamination based on BSN (2011) are: *Total Plate Count* (TPC) 10⁶ CFU/ml, *Staphylococcus aureus* 10² CFU/ml and *Enterobacteriaceae* 10³ CFU/ml.

Various efforts are needed to extend the shelf life of milk and reduce the amount of bacterial contamination without damaging the milk nutritional quality, so far these efforts have been carried out by heating methods such as sterilization, Ultra High Temperature (UHT) and pasteurization. One of the compounds that are commonly used for sterilization in the food sector is ozone with the ozonation method, but ozone has not been widely applied in milk sterilization. Further research needs to be done on the effectiveness of ozone to eliminate pathogenic bacteria in milk. Ozone gas, the molecular triatomic form of oxygen has been widely researched and used in the food industry for tools surface cleaning and the treatment of raw materials. Ozone has a master bactericidal effect on both Grampositive and Gram-negative, due to its high oxidation potential. Brawllava Un The objective of this research is to determine the effect of Brawlava ozonation on milk shelf life stored in refrigerator analyzed from Brawijaya microbiological and chemical quality of milk. ava Universitas Brawijaya This research was conducted from August to September Brawlaya 2020 at Laboratory of Animal Products Technology, Animal Science Faculty, Brawijaya University, Malang. The research method was Nested Experimental Design with 2 types of milk and 5 treatments nested in milk and continued by Duncan Multiple Range Test if there was significant difference. The results showed that milk types and refrigerator storage nested in milk had a highly significant effect (P<0.01) on TPC. Milk Universitas Rrawijava Universitas Rrawijava Universitas Rrawijava



awijaya awijaya awijaya awijaya awijaya vijaya Universitas Brawijaya

types and refrigerator storage nested in milk had a highly significant effect (P<0.01) on pH. Milk types had a highly significant effect (P<0.01) on protein content. Refrigerator storage nested in milk had a significant effect (P<0.05) on protein content. Suggestion for further research, it could be done a research about ozone half life in milk during storage.

awijaya awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya

Universitas Brawn

Universitas Brawijaya Ilniv^Ursitas Rrawijava Ilniversitas Rrawijava

Universitas Brawijaya Universitas Brawijaya

	awijaya	Universitas Brawijaya Universitas Brawijaya Universit	as Brawijaya
	awijaya	Universitas Brawijaya Universitas Dowijaya Universit	as Brawijaya
	awijaya	Universitas Brawijaya Universit	as Brawijaya
	awijaya	Universitas Brawijaya	as Brawijaya
	awijaya	Universitas Brawii	Brawijaya
	awijaya	Universitas Brauss OF CONTENTS	awijaya
	awijaya	Universitas	ijaya
	awijaya	Contents	as va
	awijaya	BIOGRAPHY	i
	awijaya		
	awijaya	FOREWORD	11
	awijaya	ABSTRACT	ii 📥
	awijaya	SUMMARY	iv V
	awijaya	LIST OF CONTENTS	.::
	awijaya	LIST OF CONTENTS	11
	awijaya	LIST OF FIGURES	ix
	awijaya	LIST OF TABLES	x
	awijaya	LIST OF APPENDIXES	xi
	awijaya		/a
	awijaya	LIST OF ABBREVIATIONS	.n jya
	awijaya	CHAPTER I INTRODUCTION	1 jaya
	awijaya	Un1.1. sit Background	1 wijaya
	awijaya	Universitas Bra	awijaya
	awijaya		Se Brawijaya
	awijaya	1.3. Objective	as Brawijaya
	awijaya	1.4. Significance	4 ^{S Brawijaya}
	awijaya	1.5. Framework	4 Brawijaya
	awijaya	Universitas Brawijaya Universitas Brawijaya Universit	as Brawijaya
Y	awijaya	Universitas Brawijava Universitas Brawijava Universit	as Brawijaya
	awijava	CHAPTER II LITERATURE REVIEW	7 as Brawijava
IJ/	awijaya	Un2.hrsit.MilkrawijayaUniversitas.Brawijaya.Universit	as Brawijaya
	awijaya	Un2 2 rsit Bacterial Contamination in Milk wijaya Universit	os Brawijaya
ER	awijaya	Universitas Brawijaya Universitas Brawijaya Universit	as Brawijaya
≥ 2	awijaya	2.3. Ozonation I	as Brawijaya
^z M	awijaya	Un2.4.rsit Milk pHilaya Universitas Brawijaya. Universi 1	as Brawijaya
	awijaya	Universitas Brawijaya Universitas Brawijaya Universit	as Brawijaya
	awijaya	Universitas Brawijaya Universitas Brawijaya Universit	as Brawijaya
	awijaya	Universitas Brawijaya Universitas Brawijaya Universit	as Brawijaya
	awilava	Liniversitas Rrawijava Liniversitas Rrawijava Liniversit	as Brawijava

awijaya	Universitas E	Brawijaya	Universitas	Brawijaya	Universitas	Brawijaya
awijaya	Universitas B	Brawijaya	Universitas	P wijaya	Universitas	Brawijaya
awijaya	Universitas B	Brawijaya	Univ		Universitas	Brawijaya
awijaya	Universitas B	Brawijaya			rsitas	Brawijaya
awijaya	Universitas B	Brawii			6	Brawijaya
awijaya	Universitas B	Bra		C D.		awijaya
awijaya	Universitas		ATIA	JR	2	ijaya

awijaya	CHAPTER III MATERIA	ALS AND METHODS		va
awijaya	Ung 1 Research Locat	tion and Time	12	
awijaya		· 1		
awijaya	3.2. Research Mater	r1als	13	7.
awijaya	3.3. Research Meth	od	14	1
awijaya	3.4. Research Proce	edure		Y
awijaya	3.5. Research Varia	bles		
awijaya	U 3.6 Data Analysis		18	
awijaya	Unive		20	
awijaya	3.7. Terminology		20	
awijaya	CHAPTER IV RESULTS	S AND DISCUSSIONS	21	/
awijaya	Un4.1. Total Plate Cou	unt (TPC)	21	a
awijaya	Universita 12 pH Value		24	Aya
awijaya	Universitas	4 🔊	24	jaya
awijaya	4.3. Protein Conten	t		wijaya
awijaya	CHAPTER V CONCLUS	SIONS AND		awijaya
awijaya	RECOMMENDATIONS			Brawijaya
awijaya	Universitas Brawijaya	UNIVERsites-Standyayar	-Universitas	Brawijaya
awijaya	Conclusions	Universitas Brawijaya		Brawijaya
awijaya	5.2. Recommendati	ons		Brawijaya
awijaya	REFERENCES	Universitas Brawijaya		Brawijaya
awijaya	APPENDIXES	Universitas Brawijaya	Universitas	Brawijaya
wijava	Universitas Brawijaya	Universitas Brawijaya	Universites	Brawijaya
awijaya	Universitas Brawijaya	Universitas Brawilaya	Universitas	Brawijava
wijaya	Universitas Brawijaya	Universitas Brawijaya	Universitae	Brawijaya
wijava	Universitas Brawijaya	Universitas Brawijaya	Universitas	Brawijaya
wijava	Universitas Brawijaya	Universitas Brawijaya	Universitas	Brawijava
wijaya	Universitas Brawijaya	Universitas Brawijava	Universitas	Brawijava
awiiava	Universitas Brawijaya	Universitas Brawijaya	Universitas	Brawijaya
awijaya	Universitas Brawijava	Universitas Brawijava	Universitas	Brawijava

Universitas Brawijaya Universitas Brawijaya

Ilnivircitas Rrawijava Ilniversitas Rrawijava

BRAWIIA

awijaya



Iniversitas Brawijaya Universitas Brawijaya Universitas Brawijaya Iniversitas Brawijaya Universitas Brawijaya Universitas Brawijaya Iniversitas Brawijaya Universitas Brawijaya Universitas Brawijaya Iniversitas Brawijaya Universitas Brawijaya Brawijaya Iniversitas Brawijaya Universitas Brawijaya Brawijaya Iniversitas Brawijaya Universitas Brawijaya Brawijaya Iniversitas Brawijaya Iniversitas Brawijaya Pages 21. Fresh milk requirements. 8 16 4.1. Average amount of bacteria in milk during refrigerator storage 21 4.2. Average milk pH during refrigerator storage 22 4.3. Average milk pH during refrigerator storage 27 4.5. Average protein content during refrigerator storage 27 4.6. Average protein content during refrigerator storage 28 Iniversitas Brawijaya Iniversitas Brawijaya Iniversitas Brawijaya Iniversitas Brawi		awijaya	Universitas Brawijaya	Universitas Brawijaya	Universitas	Brawijaya
Iniversitas Brawijaya Universitas Brawijaya Iniversitas Brawijaya Universitas Brawijaya Iniversitas Brawijaya Iniversitas Brawijaya <th></th> <th>awijaya</th> <th>Universitas Brawijaya</th> <th>Universitas Provijava</th> <th>Universitas</th> <th>Brawijaya</th>		awijaya	Universitas Brawijaya	Universitas Provijava	Universitas	Brawijaya
Iniversitas Brawijaya Universitas Brawijaya Universitas Brawijaya Iniversitas Brawijaya Universitas Brawijaya Pages Avijaya Table Pages Avijaya Table Pages Avijaya Table Pages Avijaya Table Pages Avijaya Avijaya Avijaya Avijaya Avijaya Avijaya Avijaya Table Pages Avijaya Avijaya Avijaya Avijaya Avijaya<		awijaya	Universitas Brawijaya	Univ	Universitas	Brawijaya
Iniversitas Brawing LIST OF TABLES Awilaya Table Pages Awilaya A.I. Fresh milk requirements Pages Awilaya A.I. Fresh milk requirements Pages Awilaya A.I. Fresh milk requirements Pages Awilaya A.I. Average amount of bacteria in milk during refrigerator storage Pages Awilaya A.A. Average amount of bacteria during refrigerator storage Pages A.A. Average milk pH during refrigerator storage Pages A.A. Average milk pH during refrigerator storage Pages A.A. Average protein content during refrigerator storage Pages A.S. Average protein content during refrigerator storage Pages A.G. Average protein content during refrigerator storage Pages A.I. Average stawilaya Iniversitas Brawilaya Iniversitas Brawilaya Aniversitas Brawilaya Iniversitas Brawilaya Iniversitas Brawilaya Iniversitas Brawilaya Iniversitas Brawilaya Iniversitas Brawilaya		awijaya	Universitas Brawijaya		rsitas	Brawijaya
Wijaya Universitas Br LIST OF TABLES Pages Wijaya Table Pages 2.1. Fresh milk requirements. 8 Wijaya 1.1. Research data tabulation model for fresh milk. 16 4.1. Average amount of bacteria in milk during refrigerator storage 21 4.2. Average amount of bacteria during refrigerator storage 21 4.3. Average milk pH during refrigerator storage 24 4.4. Average protein content during refrigerator storage 27 4.5. Average protein content during refrigerator storage 28 Wijaya Universitas 28 Wijaya Universitas 28 Wijaya Universitas 28 Wijaya Universitas Universitas Universitas Universitas Universitas Wijaya Universitas Universitas Universitas Wijaya Universitas Universitas Universitas Wijaya Universitas Universitas Erawijaya Universitas Erawijaya Universitas Erawijaya Universitas Erawijaya Universitas Erawijaya Universi		awijaya	Universitas Brawii		6	Brawijaya
Table Pages 1.1. Fresh milk requirements 8 3.1. Research data tabulation model for fresh milk 16 4.1. Average amount of bacteria in milk during refrigerator 21 4.2. Average amount of bacteria during refrigerator storage 21 4.3. Average milk pH during refrigerator storage 24 4.4. Average milk pH during refrigerator storage 27 4.5. Average protein content during refrigerator storage 27 4.6. Average protein content during refrigerator storage 27 4.6. Average protein content during refrigerator storage 28 10.1. Versitas Bravijaya 10.1. Versitas Bravijaya 10.1. Versitas Bravijaya 10.1. Versitas Bravijaya 10.1. Versitas Bravijaya 10.1. Versitas Bravijaya 10.1. Versitas Bravijaya 10.1. Versitas Bravijaya 10.1. Versitas Bravijaya 10.1. Versitas Bravijaya 10.1. Versitas Bravijaya 10.1. Versitas Bravijaya 10.1. Versitas Bravijaya 10.1. Versitas Bravijaya 10.1. Versitas Bravijaya 10.1. Versitas Bravijaya 10.1. Versitas Bravijaya 10.1. Versitas Bravijaya 10.1. Versitas Bravijaya 10.1. Versitas Bravijaya 10.1. Versitas Bravijaya 10.1. Versitas Bravijaya 10.1.		awijaya	Universitas Br	TOF TABLES		awijaya
Table Pages 11. Fresh milk requirements		awijaya	Universitas	I OF TABLES B	2	ijaya
Wijaya 2.1. Fresh milk requirements		awijaya	Table	5.	Pages	va
3.1. Research data tabulation model for fresh milk		awijaya	2.1 Fresh milk requirem	ents	8	
4.1. Average amount of bacteria in milk during refrigerator 21 4.2. Average amount of bacteria during refrigerator storage 21 4.3. Average milk pH during refrigerator storage 22 4.3. Average milk pH during refrigerator storage nested in 22 awijaya 4.3. Average milk pH during refrigerator storage nested in 22 awijaya 4.3. Average milk pH during refrigerator storage nested in 24 awijaya 4.4. Average protein content during refrigerator storage 27 awijaya 4.6. Average protein content during refrigerator storage 27 awijaya 101/versitas Brawijaya 01/versitas Brawijaya 01/versitas Brawijaya universitas Brawijaya 01/versitas Brawijaya		awijaya	3.1 Research data tabula	tion model for fresh milk	16	
Invitage Invitage <td< th=""><th></th><th>awijaya</th><th>A 1 Average amount of 1</th><th>pacteria in milk during ref</th><th>Frigerator</th><th>9,</th></td<>		awijaya	A 1 Average amount of 1	pacteria in milk during ref	Frigerator	9,
Wijava Universitas Brawijava 1 Wijava 4.2. Average amount of bacteria during refrigerator storage 22 4.3. Average milk pH during refrigerator storage 24 4.4. Average milk pH during refrigerator storage 25 4.5. Average protein content during refrigerator storage 27 4.6. Average protein content during refrigerator storage 28 Wijava Universitas Brawijava Universitas Brawijava Universitas Brawijava Universitas Brawijava Univers		awijaya	4.1. Average amount of t	Jacteria in mink during fer	21	
Wijaya H.2. Average milk pH during refrigerator storage 22 4.3. Average milk pH during refrigerator storage 24 4.4. Average milk pH during refrigerator storage 25 awijaya 4.5. Average protein content during refrigerator storage 27 awijaya 4.5. Average protein content during refrigerator storage 27 awijaya 4.6. Average protein content during refrigerator storage 28 awijaya Universitas 28 awijaya Universitas 28 awijaya Universitas 28 awijaya Universitas 8 universitas 8 8 universitas 8 9 universitas 8 9 awijaya Universitas 8 universitas 8 9 universitas 9 9 awijaya 10 9 universitas 9 9		awijaya	4.2 Average amount of 1	antoria durina refrigorato		Y
Avvijava A.3. Average milk pH during refrigerator storage 24 A.4. Average milk pH during refrigerator storage nested in 25 Avvijava A.5. Average protein content during refrigerator storage 27 A.6. Average protein content during refrigerator storage 28 awijava 101 versitas 28 universitas 101 versitas 101 versitas awijava 10		awijaya	4.2. Average amount of t	bacteria during reingerato		
A.S. Average milk pH during refrigerator storage		awijaya		· _ e · _ ,		
Wijaya 4.4. Average milk pH during refrigerator storage nested in univ milk 25 4.5. Average protein content during refrigerator storage 27 awijaya 4.6. Average protein content during refrigerator storage 28 awijaya Universitas 28 universitas 28 39 awijaya Universitas 38 universitas 38 39 universitas 39 39 universitas 39 39		awijaya	4.3. Average milk pH du	ring retrigerator storage		
Wijaya Universitas 25 wijaya 4.5. Average protein content during refrigerator storage 27 4.6. Average protein content during refrigerator storage 28 wijaya Universitas 28 awijaya Universitas 28 awijaya Universitas 28 awijaya Universitas 28 awijaya Universitas 8 awijaya Universitas 8 awijaya Universitas 8 universitas 8 9 awijaya Universitas 8 universitas 8 9 awijaya Universitas 8 universitas 8 9 universitas 8 <th></th> <th>awijaya</th> <th>4.4. Average milk pH du</th> <th>iring refrigerator storage</th> <th>nested in</th> <th></th>		awijaya	4.4. Average milk pH du	iring refrigerator storage	nested in	
 4.5. Average protein content during refrigerator storage		awijaya	Univmilk		25	/
Awijaya 4.6. Average protein content during refrigerator storage universitas Universitas universitas Brawijaya universitas Brawijaya <th></th> <th>awijaya</th> <th>4.5. Average protein con</th> <th>tent during refrigerator sto</th> <th>orage 27</th> <th></th>		awijaya	4.5. Average protein con	tent during refrigerator sto	orage 27	
Awijaya Univensital in milk 28 yaa awijaya Universitas Jaya awijaya Universitas Jaya awijaya Universitas Brawijaya universitas Brawijaya Universitas awijaya Universitas Brawijaya universitas Brawijaya Universitas awijaya Universitas Brawijaya universitas Brawijaya Universitas universitas Brawijaya Universitas <t< th=""><th></th><th>awijaya</th><th>4.6. Average protein co</th><th>ontent during refrigerator</th><th>r storage</th><th>a</th></t<>		awijaya	4.6. Average protein co	ontent during refrigerator	r storage	a
AwijayaUniversitasJayaawijayaUniversitas BrWijayaawijayaUniversitas BrawijayaawijayaUniversitas BrawijayaUniversitas Braw		awijaya	nested in milk			aya
Awijaya awijayaUniversitas Bra awijaya awijayaUniversitas Bra awijaya universitas Brawijaya Universitas Brawijaya <br< th=""><th></th><th>awijaya</th><th>Universitas</th><th>4 14</th><th></th><th>ijaya</th></br<>		awijaya	Universitas	4 14		ijaya
AwijayaUniversitas BrawijayaUniversitas BrawijayaawijayaUniversitas BrawijayaUniversitas BrawijayaawijayaUniversitas BrawijayaUniversitas BrawijayaawijayaUniversitas BrawijayaUniversitas BrawijayaawijayaUniversitas BrawijayaUniversitas BrawijayaawijayaUniversitas BrawijayaUniversitas BrawijayaawijayaUniversitas BrawijayaUniversitas Brawija		awijaya	Universitas B			wijaya
 awijaya universitas Brawijaya universitas Brawi		awijaya	Universitas Bra			awijaya
 Awijaya Universitas Brawijaya Awijaya Universitas Brawijaya Universitas Brawijaya<		awijaya	Universitas Brawijava	Linut		Browijaya
 Universitas Brawijaya Uni		awijaya	Universitas Brawijaya	Universites Brawijaya	Universitas	Browijaya
 Awijaya Awijaya Awijaya Universitas Brawijaya Universita		awijaya	Universitas Brawijaya	Universitas Brawijaya	Universitas	Brawijaya
AwijayaUniversitas BrawijayaUniversitas BrawijayaUniversitas BrawijayaawijayaUniversitas BrawijayaUniversitas Brawijaya <td< th=""><th></th><th>awijaya</th><th>Universitas Brawijaya</th><th>Universitas Brawijaya</th><th>Universitas</th><th>Browijaya</th></td<>		awijaya	Universitas Brawijaya	Universitas Brawijaya	Universitas	Browijaya
AwijayaUniversitas BrawijayaUniversitas BrawijayaUniversitas BrawijayaawijayaUniversitas BrawijayaUniversitas Brawijaya <td< th=""><th></th><th>awijaya</th><th>Universitas Brawijaya</th><th>Universitas Brawijaya</th><th>Universitas</th><th>Brawijaya</th></td<>		awijaya	Universitas Brawijaya	Universitas Brawijaya	Universitas	Brawijaya
AwijayaUniversitas BrawijayaUniversitas BrawijayaawijayaUniversitas BrawijayaUniversitas Brawijayauniver	X	awijaya	Universitas Brawijaya	Universitas Brawijaya	Universitas	Brawijaya
awijaya Universitas Brawijaya Universitas Br	\geq	awijaya	Universitas Brawijaya	Universitas Brawijaya	Universitas	Brawijaya
AwijayaUniversitas BrawijayaUniversitas BrawijayaUniversitas BrawijayaawijayaUniversitas BrawijayaUniversitas Brawijaya <td< th=""><th>JAS JAS</th><th>awijaya</th><th>Universitas Brawijaya</th><th>Universitas Brawijaya</th><th>Universitas</th><th>Brawijaya</th></td<>	JAS JAS	awijaya	Universitas Brawijaya	Universitas Brawijaya	Universitas	Brawijaya
awijaya Universitas Brawijaya Universitas Br		awijaya	Universitas Brawijaya	Universitas Brawijaya	Universitas	Brawijaya
awijaya Universitas Brawijaya	R S	awijaya	Universitas Brawijaya	Universitas Brawijaya	Universitas	Brawijaya
awijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya awijaya Universitas Brawijaya Universitas Brawijaya universitas Brawijaya		awiiava	Universitas Brawijava	Universitas Brawijava	Universitas	Brawijava
awijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya awijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya universitas Brawijaya Universitas Brawijaya Universitas Brawijaya universitas Brawijaya Universitas Brawijaya Universitas Brawijaya	ZBZ	awiiava	Universitas Brawijava	Universitas Brawijava	Universitas	Brawijava
awijaya Universitas Brawijaya		awijava	Universitas Brawijava	Universitas Brawijava	Universitas	Brawijava
awijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya awijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya		awijava	Universitas Brawijava	Universitas Brawijava	Universitas	Brawijava
awiiava Universitas Brawiiava Univ <mark>A</mark> rsitas Brawiiava Universitas Brawiiava		awijaya	Universitas Brawijaya	Universitas Brawijaya	Universitas	Brawijaya
		awiiava	Ilniversitas Rrawilava	IlnivArcitae Rrawilava	Universitas	Rrawijava

Univ

LIST OF APPENDIXES

Appendix

awijaya awijaya awijaya

awijaya awijaya awijaya

awijaya awijaya

awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya

Universitas	
Appendix	Pages
1. The procedure of milk pH assessment	36
2. The procedure of milk protein content assessment	37
3. Inoculant planting using pour plate method procedure	38
4. Data and statistical analysis of milk TPC	41
5. Data and statistical analysis of milk pH	48
6. Data and statistical analysis of milk protein content	53

awijaya · Unive awijaya awijaya

Universitas Brawijaya IlnivXirsitas Brawijava Ilniversitas Brawijava

Universitas Brawijaya Universitas Brawijaya

awijaya



awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya PCA awijaya ANOVA awijaya DMRT awijaya TBTC awijaya pН awijaya TPC awijaya LAF awijaya PP awijaya CFU awijaya et al. unive g awijaya awijaya mL awijaya % awijaya hiver awijaya awijaya awijaya Universitas Braw, awijaya awijaya

Universitas Brawin

vijaya Universitas Brawijaya Universitas Page Univ

2AMIL RL

LIST OF ABBREVIATIONS

: Plate Count Agar : Analysis of Variance : Duncan's Multiple Range Test : Too Numerous To Count : Potential of Hydrogen : Total Plate Count : Laminar Air Flow : Pour Plate : Colony Forming Unit : et alia; et alii; et aliae : gram : mililiter percent degree celcius

Universitas Brawijaya Ilnixiireitas Rrawijava Ilniversitas Rrawijava

Universitas Devuiaya Universitas Brawijaya Unive

CHAPTER I

INTRODUCTION

1.1. Background

Universitas Brawii

BRAWIN Milk is yellowish-white or bluish-white liquid resulted from mammalian udder gland secretion. Milk needs in Indonesia increases every year along with population growth and public awareness to consume food with complete nutritional content such as milk. Milk derived from dairy cows is a source of protein, fat, carbohydrates, minerals, and vitamins contained in perfect composition. The average composition of cow's milk contains 3.3% protein; 3.8% fat; 4.7% carbohydrate; 87.6% water; 0.76% vitamin; and mineral (Cahyaningtyas, et al., 2016). The consumption of fresh milk also increases where in 2017 the national consumption of cow's fresh milk reached 1.261.503 tons while the national fresh milk production only reached 928.108,13 tons (BPS, 2018) which means the national fresh milk production was unable to fulfill the national needs and must be fulfilled by milk import.

One of the things that cause national milk production unable to fulfill the national milk needs is the low quality of fresh milk produced from the local farmers. Milk produced from local farmers will be distributed first to the milk collection point and Brawijava then sent to the village cooperative unit to test the milk qualitys Brawliava whether it is decent to be consumed or sent to the milk Brawlava processing industry. One of milk quality indicators is bacterias Brawijaya contamination, the limit of bacteria contamination based on Brawlaya BSN^{ers} (2011) are: Total Plate Count (TPC) 10⁶ Brawlaya CFU/ml, Staphylococcus Universaureus 10² ava Un CFU/ml Brawijaya UnivArsitas Brawijava Universitas Brawijava

BRAWIIA

awijaya

awijaya

awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya

and Enterobacteriaceae 103 CFU/ml. The level of bacteria contamination from local farmers tend to exceed the national standard limit mostly due to the bad sanitation of milking equipment such as inside the milk tanks, milk tank necks, milk buckets and milk filter cloths (Wicaksono and Sudarwanto, 2016). Milk is easily contaminated by bacteria because the perfect nutritional content of milk is good media for microorganisms growth, moreover, the high water content of milk which is about 87-88%, and milk pH which is close to neutral also causes milk preferred by bacteria (Cahyaningtyas, et al., 2016). Fresh milk only contain small amount of bacteria and should be stored in low temperature to keep its condition and prevent bacterial contamination. Milk spoilage in room temperature will happen in 4 hours and can be seen from the color and odor change. Cold storage and pasteurization are usually used to prolong milk shelf life (Nababan, et al., 2014). Fresh milk stored in 0-1°C will prolong its shelf life for one day (Putri, 2016).

Various efforts are needed to extend the shelf life of milk and reduce the amount of bacterial contamination without damaging the milk nutritional quality, so far these efforts have been carried out by heating methods such as sterilization, Ultra High Temperature (UHT) and pasteurization. Those various methods are aimed to reduce bacterial contamination in milk and also useful to extend the diversification of dairy products to increase milk consumption in the community (Hendrawati and Utomo, 2017). Pasteurized milk must be stored at temperature of 4°C to maximize its shelf life while the average shelf life of pasteurized milk in Indonesia is only 5-7 days (Kristanti, 2017). One of the compounds that are commonly used for sterilization in the food sector is ozone with the ozonation



awijaya awijaya awijaya awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya awijaya

awijaya awijaya

awijaya

awijaya

Unive

method, but ozone has not been widely applied in milk sterilization. Further research needs to be done on the effectiveness of ozone to eliminate pathogenic bacteria in milk. Ozone gas, the molecular triatomic form of oxygen has been widely researched and used in the food industry for tools surface cleaning and the treatment of raw materials. Ozone has a master bactericidal effect on both Gram-positive and Gramnegative, due to its high oxidation potential (Couto, et al., 2016). Ozonation is the process of utilizing ozone (O_3) as a disinfectant to ensure the viability of food products because ozone can kill bacteria and viruses in water, meat, poultry, eggs, fish, fruits, vegetables and dry foods (Kusumawati, 2012). The use of ozone in the food sector is rated safe because it does not leave any residues. The mechanism of action of ozone in conducting sterilization is by attacking the surface layer of bacteria and oxidizing sulfhydryl from enzymes or oxidation with lipoproteins and lipopolysaccharides which are the largest layers of gram-negative bacteria. This will cause the breakdown of cell permeability to become lysis (Rusdi and Suliasih, 2002).

Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya

Based on the background description above, the problem of this research was how is the effect of ozonation and refrigerator storage on total plate count, pH, and protein content of milk 1.3. Objective rawijava Universitas Brawijava Universitas Brawijava Un The objective of this research is to determine the effect of Brawilava ozonation if ozone can reduce total plate count of milk therefores Brawijaya will slow down bacterial growth and slow down the decreases

awijaya awijaya awijaya awijaya

of pH and protein content during refrigerator storage. Iversitas Brawijaya Universitas Brawijava Universitas Brawijava



awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawij

Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya

1.4. Significance

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijava

awijaya awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya awijaya 1. The results of this research are expected to provide information in the animal science sector and academicians about the effect of ozonation on milk shelf life stored in refrigerator analyzed from Total Plate Count, pH and protein.

2. The results of this research are expected to provide information in the technology sector and milk processing industry to develop another method used for milk sterilization

Unive

1.5. Framework

Milk is yellowish-white or bluish-white liquid resulted from mammalian udder gland secretion. Milk is a food with great demand because of its high nutritional content as a source of carbohydrates, protein, and fat. However high water content and nutrition in milk is an ideal growth medium for bacteria that cause fresh milk prone to bacteria contamination and needs post-milking treatment to prevent contamination (Yudonegoro, Brawliava et al., 2014). Brawijava Universitas Brawijava Universitas Brawijava Un Fresh milk only contain small amount of bacteria and shoulds Brawijava be stored in low temperature to keep its condition and prevents Brawijaya bacterial contamination. Milk spoilage in room temperature will Brawlaya happen in 4 hours and can be seen from the color and odor Brawijaya change. Cold storage and pasteurization are usually used to prolong milk shelf life (Nababan, et al., 2014). Fresh milk stored in 0-1°C will prolong its shelf life for one day (Putri, 2016) 2016).

Ozonation is a technology using ozone (O_3) which has strong oxidizing natures to kill bacteria by entering the bacterial cell wall so the cell permeability changes and lysis occurs. General 4 awijaya awijaya awijaya awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya vijaya Universitas Brawijaya

Brawijaya

and safe ozonation are commonly used as a method to disinfect some food commodities such as vegetables, fruits, and water to eliminate contamination of pesticides, microorganisms and heavy metals (Asgar, et al., 2015).

Previous studies have shown that ozonation treatments can kill microorganisms in fresh milk. Ozonation at a temperature of 10C can kill microorganisms up to 85.35% and ozonation 10 minutes duration can kill microorganisms up to 94.50% (Rusdi and Suliasih, 2002). Ozonation for 10 minutes will produce the highest dissolved ozone, which means the reaction between ozone and bacteria is the most intensive and reduces the higher number of bacteria in milk (Kusumawati, 2012). The framework of this research can be seen in Figure 1.

1.6. Hypothesis

awijaya The hypothesis of this research is ozonation treatment on awijaya fresh milk will decrease total plate count of milk and slow down awijaya the bacterial growth during storage. Therefore, ozonation will awijaya slows down the decreases of pH and protein content of milks Brawlinga awijaya

during storage. awijaya awijaya

Universitas Brawijaya Ilniv⁵reitae Rrawijava Ilniversitae Rrawijava





wijaya Universitas Brawijaya Universitas Page

CHAPTER II

LITERATURE REVIEW

2.1. Milk

awijaya

awijaya

awijaya awijaya

awijaya awijaya awijaya

awijaya awijaya

awijaya awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya awijaya

awijaya

awijaya

awijaya

BRAWIJA Milk is yellowish-white or bluish-white liquid containing high nutritional content resulted from mammalian udder gland such as cow, buffalo, horse, goat and camel (Usmiati and Abubakar, 2009). Fresh milk is liquid resulted from healthy and clean cow's udder, obtained by using good milking practice, with natural content without any addition or reduction and does not receive any treatment other than cold storage (BSN, 2011). Milk is a nearly perfect food that can be easily digested which means that the quality and quantity of milk production must be concerned to keep its nutritional content (Wicaksono and Sudarwanto, 2016).

In The important components in milk are protein, fat, vitamin, mineral, lactose, enzymes and some species of microorganisms that give healthy effects as probiotics (Usmiati and Abubakar, Brawijaya 2009). Chemical composition in milk consist of 87,1% water, Brawijaya 3,4% protein, 3,9% fat, 4,9% carbohydrate, and 0,7% minerals Brawliava (Thohari, et al., 2017). Fresh milk requirements based on BSN⁻ Brawijaya (2011) can be seen in Table 2.1. Stas Brawijaya Universitas Brawijaya

awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijava Universitas Brawijava awijaya Universitas Brawijaya Universitas Brawijaya awijaya awijaya Unive Universitas Brawijaya awijaya Universitas Brawijaya **Universitas Brawij** s Brawijaya awijaya

awijaya	Table 2.1. Fresh milk requirements	awijaya
awijaya	No. Karakteristik Sa	atuan Syarat
awijaya	1 Ver Berat Jenis (nada suhu o/m	1 1 0270
awijaya	$27.5^{\circ}C$) minimum	1,0270
awijaya	Uni	
awijaya	2 Kadar lemak minimum %	3,0
awijaya	3 Kadar bahan kering tanpa %	7,8
awijaya	University lemak minimum	「「「「「「」」
awijaya	Univ	
awijaya	4 Kadar protein minimum %	
awijaya	5 Warna, bau, rasa, -	Tidak ada
awijaya	kekentalan	perubahan
awijaya	6 Derajat asam ^O SF	60-75
awijaya	Universita	
awijaya	7 pH Universitas	6,3-6,8
awijaya	8 ver Uji alkohol (70 %) v/v -	Negatif
awijaya	Universitas Br	awijaya
awijaya	maksimum:	Brawijaya
awijaya	Universitas Brawijaya Universitas -	annjaya oniversitas Brawijaya
awijaya	Universita 1.8 Total Plate Count CFU	J/ml 1 x 10 ⁶ Irawijaya
awijaya	2. Staphylococcus	awijaya Universitas Brawijaya
awijaya	aureus	J/mljaya 1/x 10 ² sitas Brawijaya
awijaya	Universitas Brawijaya Universitas Br	J/ml 1 x 10 ³
awijaya	3. Enterobacteriaceae	awijaya Universitas Brawijaya
awijaya	10 Jumlah sel somatis Sel/	$ml_{11} = 4x10^5$ Brawijava
awijaya	Univer maksimum java Universitas Bi	rawijaya Universitas Brawijaya
awijaya	Universitas Brawijaya Universitas Br	awijaya Universitas Brawijaya
awijaya	Universitas Brawijaya Universitas Br	awijaya Universitas Brawijaya
awijaya	Univers ^{*)} Table continued in next as B	awijaya Universitas Brawijaya
awijaya	Univer page Brawijaya Universitas Br	awijaya Universitas Brawijaya
awijaya	Universitas Brawijaya Universitas Br	awijaya Universitas Brawijaya
awijaya	Universitas Brawijaya Universitas Br	rawijaya Universitas Brawijaya
wilava	Liniversitas Krawijava Tiniversitas Ri	awiiava Tiniversitas Brawiiava





awijaya awijaya awijaya awijaya awijaya awijaya Universitas Devuiaya Universitas Brawijaya Unive

The high nutrition and water content in milk is prone to be used by bacteria as growth medium which will reduce the good benefits of milk and will spoil the milk quickly there is no good handling practices after milking (Yudonegoro, et al., 2014). Milk is preferred by bacteria because of its complete nutritional content with normal pH which is 6,6-6,8 and also its high water content around 87-88% (Murti, 2010).

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

2.3. Ozonation

Ozonation is the process of using ozone (O_3) as a disinfectant to ensure the quality of food products because awijaya ozone can kill bacteria and viruses in water, meat, poultry, eggs, awijaya fish, fruits, vegetables and dry foods (Kusumawati, 2012). awijaya Utilization of ozone at low concentrations between 0.01 ppm -4.00 ppm is safe to apply in agriculture, health, the environment awijaya and industry sector (Haifan, 2017). The usage of ozone for awijaya antimicrobial purpose is already proven whether its on gramawijaya positive bacteria, gram-negative bacteria, fungi and viruses, however the level of microbial inactivation can vary according Brawlava awijaya to some factors such as organic matters, pH value and Brawlava awijaya temperature (Munhos, et al., 2019) tas Brawijava Universitas Brawijava Un Ozone can be formed by using UV rays or dielectri barrier Brawijaya discharge plasma that will break oxygen molecules into two Brawlaya awijaya oxygen atoms, those oxygen atoms will react and form ozone (Yulianto, et al., 2019)

Ozone has a bactericidal effect due to its high oxidation potential (Couto, et al., 2016). Ozonation works by the ozone reacts with all cell protoplasms and acts as an oxidizer. Ozone will directly attack the surface layer of bacteria, namely conducting oxidation of sulfidrites from enzymes, or conducting oxidation with lipoproteins and lipopolysaccharides Universitas Brawijava Universitas Brawijava



awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawij Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya

which are the largest layers of gram-negative bacteria. This will result in the breakdown of cell permeability defense and it will cause lysis (Rusdi and Suliasih, 2002).

2.4. Milk pH

awijaya

awijaya

awijaya

awijaya awijaya awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

pH (power of Hydrogen) value is the bond of hydrogen ions which dissociate in solution. Increasing the concentration of H+ (protons) will also increase the acidity of the material. A solution with a high pH indicates a low concentration of H+ (Lawrie, 2003).

Acidity is one of the parameters of milk quality. Milk acidity is caused by acidic compounds. Acids in milk are mostly lactic acid and various acidic compounds such as citric acid, amino acids and carbon dioxide that are soluble in milk (Kencanawati, et al., 2015). Acidity in milk occurs due to the formation of lactose from lactic acid by bacteria, so the longer period of time milk acidity will continue to increases due to the increasing number of bacteria that speeds up lactose fermentation to lactic acid (Nababan, et al., 2014).

BSN (2011) stated that the standard pH of fresh milk is 6.3-6.8. Milk pH that exceed 6.7 indicate the possibility that milk is produced from mastitis cow and if the pH value is below 6.5 then the milk may be colostrum or has been spoiled by bacteria (Soeparno, et al., 2011).

Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya 2.5. Protein Brawijaya Universitas Brawijaya

2.5. Protein Protein is main macromolecule component used by organisms to synthesize new proteins based on their needs (Susanti and Hidayat, 2016). Protein is a vital ingredients for food because it provides essential amino acids needed for health and combined with wide functional properties such as to 11



awijaya awijaya

awijaya awijaya awijaya awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

viiaya Universitas Brawijaya Univ

stabilize foams and emulsions (Singh, et al., 2014). Milk protein has high biological value which makes it a good source of amino acids with some functional properties and become a good source of protein diet (Padaga and Aulanni'am, 2017).

Duration of cold storage can decrease protein content in milk because of microorganisms, where the fresh microorganisms will decompose protein into metabolites such as indole, kadeverin, organic acids, CO2, H2S and sketol (Putri, 2016). Microorganisms will produce proteolitic enzymes to break protein down into oligopeptides and amino acids which will be used by the microorganisms as energy, this reaction will produce water and cause the protein content to decreases (Buckle, 2007).

awijaya awijaya awijaya awijaya awijaya Universitas Brawn awijaya awijaya

awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya Universitas Brawijaya Ilniul veitas Rrawijava Ilniversitas Rrawijava



Universitas Brawin

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijava awijaya

awijaya awijaya awijaya

awijaya

awijaya

awijaya

awijaya awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

Universitas Devuiava Universitas Brawijava Unive

CHAPTER III

BRAWIN **MATERIALS AND METHODS**

3.1. Research Location and Time

This research was conducted in August until September 2020 at Laboratory of Livestock Product Technology, Animal Science Faculty, Brawijaya University, Malang.

3.2. Research Materials 3.2.1. Fresh Milk

This research will use 3 L fresh milk obtained from Mr. Amin's farm, one of Malang local farmer located in Pujon, Malang.

3.2.2. Ozone Generator "Hanaco"

This research will use ozone generator "Hanaco" brand that can produce 400 mg/hour ozone for 1 L sample.

Previous research from Sari and Hadi (2014) shows that Brawleye "Hanaco" ozone generator only produce 42,11 mg/hour of Brawlava ozonersitas Brawijava Universitas Brawijava Universitas Brawijava 3.2.3. Equipments and Materials tas Brawijaya Universitas Brawijaya Un The equipments that will be used for this research are ozone Brawliaya generator, petrie dish, micropipette, incubator, autoclave. Brawljaya measuring tube, erlenmeyer, beaker glass, analytical balance, Brawijaya magnetic stirrer, vortex mixer, pH meter.

The main materials that will be used for this research are fresh milk from Mr. Amin's farm, aquadest, peptone, Plate Count Agar (PCA), buffer solution pH 4, buffer solution pH 7, fenolftalein 1%, potassium oxalate, NaOH 0,1N, formaldehide

awijaya awijaya

40% ersitas Brawijaya Universitas Brawijaya Universitas Brawijaya Ilniu13reitae Rrawijava Ilniversitae Rrawijava



awijaya awijaya

Universitas Par

3.3. Research Method

The research method was Nested Experimental Design with 2 types of milk and 5 treatments nested in milk. URI

Ozonated milk:

T₀: Milk 0 minute after ozonation treatment T_1 : Ozonated milk 24 hours after cold storage T₂: Ozonated milk 48 hours after cold storage T₃: Ozonated milk 72 hours after cold storage T₄: Ozonated milk 96 hours after cold storage

Fresh milk:

 T_0 : Fresh milk without ozonation

 T_1 : Fresh milk 24 hours after cold storage

T₂: Fresh milk 48 hours after cold storage

T₃: Fresh milk 72 hours after cold storage

T₄: Fresh milk 96 hours after cold storage

awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya

Universitas Brawijaya Ilniu4reitae Rrawijava Ilniversitae Rrawijava

Universitas Brawijaya Universitas Brawijaya



awijaya Universitas Brawijaya Iniversitas Brawijaya Universitas Brawijay Iniversitas Provijaya Universitas Brawijay Iniversitas Brawijay

3.4.1. Fresh Milk Collecting

3 L Fresh milk collected from Mr. Amin's farm unit by using plastic bottles each containing 500 mL of milk for each treatment and delivered using cooling box to laboratory.

3.4.2. Ozonation

500 mL of fresh milk poured in erlenmeyer and wait until the milk temperature reaches 15°C. 15°C temperature is used because it has the longest half life of ozone (Lenntech, 2020). Half life of ozone in pH 7 water at different temperatures can be seen in Table 3.1. Insert the diffuser stone of ozone generator into the milk, set the timer for 30 minutes and turn on the ozone generator. The ozone generator will stop working immediately after 30 minutes based on the timer. The preparation of ozonation process can be seen in Figure 3.

 Table 3.1. Half life of ozone in pH 7 water at different temperatures

java	Temperature (°C)		Half life		Brawijaya
jaya	Universitas Bawijaya	Universites	30 minutes	universitas	Brawijaya
jaya	Universitas 20 awijaya	Universitas	20 minutes	Universitas	Brawijaya
jaya	Universitas 25 awijaya	Universitas	15 minutes	Universitas	Brawijaya
jaya	Universitas 30 awijaya	Universitas	12 minutes	Universitas	Brawijaya
jaya	Universitas 35 awijaya	Universitas	8 minutes	Universitas	Brawijaya
jaya	Source : (Lenntech, 202)	Universitas	Brawijaya	Universitas	Brawijaya
jaya	Universitas Brawijaya	Universitas	Brawijaya	Universitas	Brawijaya
jaya	Universitas Brawijaya	Universitas	Brawijaya	Universitas	Brawijaya
jaya	Universitas Brawijaya	Universitas	Brawijaya	Universitas	Brawijaya
jaya	Universitas Brawijaya	Universitas	Brawijaya	Universitas	Brawijaya
jaya	Universitas Brawijaya	Universitas	Brawijaya	Universitas	Brawijaya
jaya	Universitas Brawijaya	Universitas	Brawijaya	Universitas	Brawijaya
jaya	Universitas Brawijaya	Universitas	Brawijaya	Universitas	Brawijaya
jaya	Universitas Brawijaya	Universitas	Brawijaya	Universitas	Brawijaya
jaya	Universitas Brawijaya	Universitas	Brawijaya	Universitas	Brawijaya
iava	Ilniversitas Brawijava	Iniv <mark>16</mark> reitae	Rrawijava	Universitas	Rrawijava



awijaya awijaya awijaya awijaya awijaya awijaya

awijaya awijaya

awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

Universitas Brawijaya Universitas Brawijaya Unive



Figure 3. Ozone generator preparation

3.4.3. Storage

Ozonated milk and fresh milk poured into plastic bottle, locked tight and stored in refrigerator at $\pm 4^{\circ}$ C temperature with duration based on each treatment before testing: 24, 48, 72 and 96 hours. For treatment 0 (T_0) will be tested without cold storage

Universitas Br 3.5. Research Variables

3.5.1. Total Plate Count Universities Statinger Universitias Brawijaya awijaya Total Plate Count of milk will be counted by diluting milks Brawlinva awijaya sample then grow the sample in Plate Count Agar using pours Brawliava plate method. The sample will be incubated at 37-40°C for 24 Brawline hours before calculating the Total Plate Count (Radiati, et al., Brawlava awijaya 2019) rsitas Brawijaya Universitas Brawijaya Universitas Brawijaya awijaya 3.5.2 pHas Brawijaya Universitas Brawijaya Universitas Brawijaya awijaya The milk pH will be measured by using pH meter (Cable, Brawliava awijaya 2005). The pH meter electrode will be calibrated first by using awijaya buffer solution with pH 4 and 7. Milk pH measured by dipping awijaya the pH electrode into the milk and the screen will show its pH. awijaya niversitas Brawijaya Universitas Brawijaya awijaya awijaya

Universitas Brawijava Universitas Brawijava



awijaya awijaya

awijaya

awijaya awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

Universitas Page Unive

3.5.3. Protein Content

Protein content will be measured by using formol titration method (Rohman and Sumantri, 2017). 10 mL of milk added with 20 mL aquadest; 0,4 mL saturated potassium oxalate solution and 1 mL fenolftalein indicator 1% then let it for 2 minutes before titrated with NaOH 0,1 N until it reaches standard color (standard color is the color resulted by adding 10 mL milk with 10 mL aquadest; 0,4 mL saturated potassium oxalate solution and one drop of rosanilin chloride indicator 0.01%). After the mixture reaches standard color, add 2 mL of 40% formaldehide solution and titrated with NaOH 0,1 N until it reaches standard color. Blank titration made by mixing 20 mL aquadest, 0,4 mL saturated potassium oxalate solution, 1 mL fenolftalein indicator 1% and 2 mL of 40% formaldehide solution and titrated with standar solution of NaOH.

Formol Titrant = Sample Titration Volume – Blank Titration Volume

Univers Milk Protein Content = Formol Titrant x 1,83 versitas Brawijava 3.6. Data Analysis

Obtained data will be analyzed statistically using Nested awijaya awijaya Experimental Design method and variance analysis. If there is awijaya significant result Duncan Multiple Range Test (DMRT) will be awijaya used to determine the difference in each treatment. The Brawijaya awijaya mathematical model is : awijaya Universitas Braw $Y_{ij(k)} = \mu + \alpha_i + \beta_{j(i)} + \varepsilon_{k(ij)}$ Universitas Brawijaya awijaya awijaya Universitas Brawijaya Universitas Brawijaya awijaya awijaya Universitas Brawijaya Universitas Brawijaya awijaya Ilniv18 reitas Brawijava Universitas Brawijava



awijaya vijaya Universitas Brawijaya awijaya awijaya awijaya awijaya Where: awijaya awijaya = observation of A factor i-levek and B factor j-level Yijiver awijaya

- with k replication
- μ_{n}
- α_i

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya awijaya awijaya

awijaya

awijaya

awijaya

- = general average = effects of A factor at i-level
- = effects of B factor at j-level nested on A factor at i $\beta_{i(i)}$
- Ek(ij)
- level = effects of error

Duncan's Multiple Range Test (DMRT) will be calculated using the following formula:

 $S_{\overline{x}} =$

MSE

Where: MS_{E} = middle square of error r = replication

Universitas Braw awijaya awijaya

Universitas Brawijaya Ilniu19reitae Rrawijava Ilniversitae Rrawijava



awijaya awijaya awijaya awijaya awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

3.7. Terminology

a. Ozonation : Milk tratment by infusing ozone (O₃) into milk to eliminate microorganisms.

b. Total Plate Count (TPC) : Method to count the amount of microorganisms in a sample.

c. Dilution : Process to decrease the concentration of a sample awijaya by mixing it with other solvent such as aquadest or peptone awijaya awijaya Un water.

awijaya d. Calibration : Act to adjust the instrument to provide more awijaya Un accurate results.

awijaya e. Titration : Slow addition of a solution with known awijaya concentration to determine the concentration of unknown awijaya solution. awijaya

f. Incubation : Process to incubate microorganisms in constant temperature to let the microorganisms grow Universita

awijaya awijaya

Universitas Brawijaya Ilni 20 reitas Rrawijava Ilniversitas Rrawijava



Universitas Brawin

awijaya awijava Universitas awijaya Univer awijaya awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

Universitas Provijava Universitas Brawijava Univ

RAWIN

CHAPTER IV

RESULTS AND DISCUSSIONS

4.1. **Total Plate Count (TPC)**

The average amount of bacteria in ozonated milk and fresh milk stored in refrigerator are presented in Table 4.1 - Table 4.2.

awiiava	Table 4.1.	Average a	mount of	Dacterra	m m	ik uu	inng
awiiava	Univer	refrigerator	storage	EZI	i s	0	
awijava	UnivMilk	Tre	atments	Av	erage a	mount	of
awijaya	Universit		同	55	bact	eria	
awijaya	Universita		4 4	ENG.	log CF	U/ml)	
awijaya	Universitas	T0 (with	hout storage	e)	$5.96 \pm$	0.03 ^a	
awijaya	Universitas	T1 (24 hours)		$6.01 \pm$	0.03 ^a	
awijaya	Ozonaleu	Bra T2 (48 hours)		$6.01 \pm$	0.02 ^a	_
awijaya	Universitas	Braw T3 (72 hours)		6.78 ±	0.02^{b}	
awijaya	Universitas	Brawij T4(96 hours)		7.19 ±	0.01 ^c	sitas
awijaya	Universitas	T0 (with	hout storage	e) Brawi	$6.05 \pm$	0.02 ^a	sitas
awijaya	Universitas	Brawijava TI (24 hours)	as Brawi	6.16 ±	0.02 ^b	sitas
awijaya	Fresh Milk	T2 (48 hours)	as Braw	6.24 ±	0.02 ^b	sitas
awijaya	Universitas	T3 (72 hours)	as Brawi	7.27 ±	0.07 ^c	sitas
awijaya	Universitas	T4 (96 hours)	as Brawi	8.06 ±	0.06 ^d	sitas
awijaya	Notes: Diffe	erent supersc	ripts (a-d)	in the sa	me col	umn s	how
awijaya	highly	significant	difference ((P<0.01).	Supers	cript o	rder
awijaya	shows	s the total bac	cteria amou	nt from lo	owest to	o highe	est.
awijaya	Universitas	Brawijava	Universit	as Brawi	iava l	Iniver	sitas
awijaya	Universitas	Brawijaya	Universit	as Brawi	ijaya l	Iniver	sitas
awijaya	Universitas	Brawijaya	Universit	as Brawi	ijaya l	Iniver	sitas
awijaya	Universitas	Brawijaya	Universit	as Brawi	jaya l	Iniver	sitas
awijava	Universitas	Brawilava	Universit	as Brawi	liava l	Iniver	sitas

Universitas Rrawijava Universitas Rrawijava Universitas Rrawijava

Table 4.1. Average amount of bacteria in milk during



awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawij

awijaya

awijaya

awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya

awijava

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya awijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya

Universitas Brawijava Universitas Brawijava

 Table 4.2. Average amount of bacteria during refrigerator storage nested in milk

Treatments	Milk	Average amount
Univ		of bacteria
Uni	EAP	(log CFU/ml)
T0 (without	Ozonated Milk	5.96 ± 0.03^{a}
Uni storage)	Fresh Milk	$6.05\pm0.02^{\mathrm{b}}$
$T_1(24 hours)$	Ozonated Milk	6.01 ± 0.03^{a}
University (24 hours)	Fresh Milk	$6.16\pm0.02^{\text{b}}$
$T_{1}(19 \text{ hours})$	Ozonated Milk	6.01 ± 0.02^{a}
12 (48 Hours)	Fresh Milk	6.24 ± 0.02^{b}
$T_2 (72 hours)$	Ozonated Milk	6.78 ± 0.02^{a}
15 (72 hours)	Fresh Milk	7.27 ± 0.07^{b}
$T_{4}(06 hours)$	Ozonated Milk	$7.19\pm0.01^{\rm a}$
Universitas	Fresh Milk	$8.06\pm0.06^{\rm b}$

Notes: Different superscripts (a-b) in the same column show highly significant difference (P<0.01). Superscript order shows the total bacteria amount from lowest to highest.

One of the milk quality indicators is bacterial contamination, the limit of Total Plate Count (TPC) in fresh milk based on BSN (2011) is 10^6 CFU/ml or 6 log CFU/ml. The bacterial contamination level in milk from small farmers tend to exceed the national standard because of low sanitation level such as the inside of milk tank, neck of milk tank, milk bucket and milk filter cloth (Wicaksono and Sudarwanto, 2016). The high nutrition and water content in milk is prone to be used by bacteria as growth medium which will reduce the good benefits of milk and will spoil the milk quickly there is no good handling practices after milking (Yudonegoro, et al., 2014).



awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya Jniversitas Brawijaya Universitas Brawijaya Iniversitas Brawijaya Universitas Brawijaya

Analysis of TPC in this research was carried out by growing it in PCA. The colonies' shape tend to be round or oval (Yousef and Carlstorm, 2003). The average amount of total bacteria in ozonated milk and fresh milk stored in refrigerator is presented in Table 4.1 – Table 4.2 while the statistical analysis is presented in appendix 4.

Analysis of variance showed that there is highly significant difference of total bacteria among treatment in ozonated and fresh milk. The average amount of bacteria in fresh milk from T0; T1; T2; T3; and T4 respectively is 6,05; 6,16; 6,24; 7,27; and 8,06 log CFU/ml while in ozonated milk the average amount of bacteria from T0; T1; T2; T3; and T4 respectively is 5,96; 6,01; 6,01; 6,78; and 7,19 log CFU/ml. The average amount of bacteria both in ozonated and fresh milk was increasing due to nutritional content of milk, milk neutral pH which is 6,6-6,8 and its high water content which is around 87-88% (Murti, 2010).

The result shows that the bacteria in fresh milk grow faster during storage compared to ozonated milk. It also can be seen from the ANOVA results where there is highly significant effect of cold storage on total bacteria in both ozonated and fresh milk, but the bacteria amount in ozonated milk had a high significant difference after 72 hours (T3) while the bacteria amount in fresh milk already had a significant difference after 24 hours (T1). This could be resulted because ozonated milk still contain ozone during the storage because of the ozone treatment as ozone has longer half life in low temperature based on Lenntech (2020) that ozone can be dissolved in water at 15°C with pH 7 for 30 minutes, milk was ozonated at 15°C and then stored at 4°C that cause ozone to dissolved in milk longer and killed the bacteria for the first several hours. This result is similar to earlier awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawij

awijaya

awijaya

awijaya

awijaya

awijaya

Jniversitas Brawijaya Universitas Brawijay Jniversitas Brawijaya Universitas Brawijay Iniversitas Brawijay

research done by Genecya, et al., (2019) which shows that bacterial growth in ozonated milk during cold storage is faster than in fresh milk.

Ozone has a bactericidal effect due to its high oxidation awijaya potential (Couto, et al., 2016). Ozonation works by the ozone awijaya reacts with all cell protoplasms and acts as an oxidizer. Ozone awijaya will directly attack the surface layer of bacteria, namely awijaya conducting oxidation of sulfidrites from enzymes, awijaya or awijaya conducting oxidation with lipoproteins and lipopolysaccharides awijaya which are the largest layers of gram-negative bacteria. This will awijaya result in the breakdown of cell permeability defense and it will awijaya cause lysis (Rusdi and Suliasih, 2002). awijaya

awijaya 4.2. pH Value

awijaya
by The average amount of pH value in ozonated milk and fresh
by milk stored in refrigerator are presented in table 4.3 – table 4.4.
by the stored in table 4.3 – table 4.4.

Table 4.3. Average milk pH during refrigerator storage

awijaya	Universitik Braw	Treatments	Average pH Brawija
awijaya	Universitas Brawijaya) (without storage)	6.82 + 0.10 Cas Brawija
awijaya	Universitas Brawijaya	T1 (24 hours)	6.81 ± 0.07
awijaya	Universitas Brawijaya	T2 (48 hours)	6.80 ± 0.07
awijaya	Universitas Brawijaya	T2 (72 hours)	6.00 ± 0.05
awijaya	Universitas Brawijaya	T3 (72 liours) Brawija	ya 14 ± 0.04 itas Brawija
awijaya	Universitas Brawijava	T4 (96 hours)	6.74 ± 0.08 tas Brawija
awijaya	Universitas Brawijaya) (without storage)	$6.79 \pm 0.02^{\circ}$ tas Brawija
awijaya	Universitas Brawijaya	T1 (24 hours) Brawija	6.64 ± 0.06^{b} tas Brawija
awijaya	Un Fresh Milkawi aya	T2 (48 hours) Brawija	6.52 ± 0.04^{ab} as Brawija
awijaya	Universitas Brawijaya	T3 (72 hours) Brawija	6.45 ± 0.07^{a} tas Brawija
awijaya	Universitas Brawijaya	T4 (96 hours) Brawija	6.43 ± 0.01ª as Brawija
awijaya	Universitas Brawijaya	Universitas Brawija	ya Universitas Brawija
awijaya	Universitas Brawijaya	Universitas Brawija	ya Universitas Brawija
awijaya	Universitas Brawijaya	Universitas Brawija	va Universitas Brawija
awijaya	Universitas Brawijaya	Universitas Brawija	ya Universitas Brawija
awijava	Universitas Brawijava	Univ ²⁴ rsitas Brawija	va Universitas Brawija

awijaya awijaya awijaya awijaya awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya awijaya awijaya awijava awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijava awijaya

awiiava

awijaya awijaya Universitas Devuiava Universitas Brawijava Univ

Notes: Different superscripts (a-c) in the same column show highly significant difference (P<0.01). Superscript order shows the pH from lowest to highest.

Uni	in milk		
Uni	Treatments	Milk	Average pH
UnT	(without storage)	Fresh Milk	6.79 ± 0.02

Table 4.4. Average milk pH during refrigerator storage nested

Treatments	Milk	Average pH
TO (without storage)	Fresh Milk	6.79 ± 0.02
(without storage)	Ozonated Milk	$6{,}82\pm0.10$
Univ T1 (24 hours)	Fresh Milk	6.64 ± 0.06^{a}
Unive	Ozonated Milk	$6.81\pm0.07^{\rm b}$
Univerta (49 hours)	Fresh Milk	$6.52\pm0.04^{\rm a}$
Univers	Ozonated Milk	$6.80\pm0.05^{\text{b}}$
Universit	Fresh Milk	$6.45\pm0.07^{\rm a}$
Universita	Ozonated Milk	$6.74\pm0.04^{\text{b}}$
Universitas T4 (06 hours)	Fresh Milk	6.43 ± 0.01^{a}
Universe (96 nours)	Ozonated Milk	6.74 ± 0.08^{b}

Notes: Different superscripts (a-b) in the same column show highly significant difference (P<0.01). Superscript order shows the the pH from lowest to highest. Universitas Brawijava Universitas Brawijava Universitas Brawijava

Un pH (power of Hydrogen) value is the bond of hydrogen ions Brawllava which dissociate in solution. Increasing the concentration of H+ (protons) will also increase the acidity of the material. A solution with a high pH indicates a low concentration of H+ (Lawrie, 2003). pH indicates milk acidity, acidity is one of the parameters of milk quality. Milk acidity is caused by acidic compounds. Acids in milk are mostly lactic acid and various acidic compounds such as citric acid, amino acids and carbon Brawijaya dioxide that are soluble in milk (Kencanawati, et al., 2015). The Brawijaya average pH of milk stored in refrigerator is presented in Table Brawline 4.3 - Table 4.4 while the statistical analysis is presented in Brawleye Universitas Brawijava Universitas Brawijava Universitas Brawijava



Universitas Brawin

appendix 5.

awijaya awijaya awijaya awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya awijaya

awijaya

awijaya awijaya

awijaya awijaya

awijaya awijaya

awijaya awijaya

awijaya awijaya The result shows that the pH value of fresh milk decreased rapidly during refrigerator storage while the pH value of ozonated milk was just slowly decreasing. The ANOVA result shows that there is highly significant effect of cold storage on pH value in fresh milk while there is no significant effect of cold storage on pH value in ozonated milk. The average pH value in fresh milk from T0; T1; T2; T3; and T4 respectively is 6,79; 6,64; 6,52; 6,45; and 6,43 while in ozonated milk the average amount of pH value from T0; T1; T2; T3; and T4 respectively is 6,82; 6,81; 6,80; 6,74; and 6,74. The pH value was decreasing during storage because of the increasing amount of total bacteria, acidity in milk occurs due to the formation of lactose from lactic acid by bacteria, so the longer period of time milk acidity will continue to increases due to the increasing number of bacteria that speeds up lactose fermentation to lactic acid (Nababan, et al., 2014).

Universitas Braw

4.3. Protein Content

Universitas Brawijaya Universitas Brawijaya Un The average amount of protein content in ozonated milk and Brawijava fresh milk stored in refrigerator are presented in Table 4.5- tables Brawijava

4 dversitas Brawijaya

Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Ilniv26 citas Rrawijava Ilniversitas Rrawijava



Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya

awijaya awijaya

awijaya

awijaya

awijaya

BRAWIIA

Universitas Brawijaya Universitas Brawijaya Universitas Provijaya Universitas Brawijaya

NY.

awijaya	Table 4.5 A	Brance protein conten
awijaya	Universitas	Brawii
awijaya	Universitas	Brawijaya

amjaya	Table 4.5. Ave	erage protein conten	t during refrigerator storage
awijaya	Milk	Treatments	Average protein content
awijaya	Univer	14 3	(%)
awijaya	Univ	T0 (without	2.77 ± 0.11
awijaya	Uni .	storage)	
awijaya	U Ozonated	T1 (24 hours)	2.64 ± 0.06
awijaya	Uni milk 🚬	T2 (48 hours)	2.63 ± 0.09
awijaya	Uni	T3 (72 hours)	2.63 ± 0.12
awijaya	Univ	T4 (96 hours)	2.61 ± 0.08
awijaya	Unive	T0 (without	$2.66 \pm 0.19^{\circ}$
awijaya	Unive	storage)	
awijaya	Fresh	T1 (24 hours)	2.57 ± 0.10^{bc}
awijaya	Milk	T2 (48 hours)	2.47 ± 0.12^{abc}
awijaya	Universit	T3 (72 hours)	2.39 ± 0.10^{ab}
awijaya	Universita	T4 (96 hours)	$2.29\pm0.12^{\rm a}$
awijaya awijaya	Notes: Differe	ent superscripts (a-c) in the same column show

Notes: Different superscripts (a-c) in the same column show significant difference (P<0.05). Superscript order shows the protein content from lowest to highest

awijaya Universitas Brawijaya awijaya Universitas Brawijaya

Universitas Brawijaya Universitas Brawijaya

Universitas Brawijaya Universitas Brawijaya Universitas Provijaya Universitas Brawijaya

 Table 4.6. Average protein content during refrigerator storage nested in milk

Unive Treatments	Milk	Average protein content (%)
Un T0 (without	Fresh Milk	2.66 ± 0.19
Uni storage)	Ozonated Milk	2.77 ± 0.11
Uni T1 (24 hours)	Fresh Milk	2.57 ± 0.10
University (24 nours)	Ozonated Milk	2.64 ± 0.06
T_2 (49 hours)	Fresh Milk	2.47 ± 0.12
Univi 2 (46 nours)	Ozonated Milk	2.63 ± 0.09
$\mathbf{U}_{1} = \mathbf{U}_{2} \left(72 \mathbf{h}_{2} \mathbf{u}_{2} \right)$	Fresh Milk	2.39 ± 0.10
15 (72 nours)	Ozonated Milk	2.63 ± 0.12
$T_{4}(06 hours)$	Fresh Milk	2.29 ± 0.12^{a}
Universita	Ozonated Milk	2.61 ± 0.08^{b}

Notes: Different superscripts (a-b) in the same column show highly significant difference (P<0.01). Superscript order shows the protein content from lowest to highest.

Protein is a vital ingredients for food because it provides essential amino acids needed for health and combined with wide functional properties such as to stabilize foams and emulsions (Singh, et al., 2014). Milk protein has high biological value which makes it a good source of amino acids with some functional properties and become a good source of protein diet (Padaga and Aulanni'am, 2017). The average protein content of milk stored in refrigerator is presented in Table 4.5 – Table 4.6 while the statistical analysis is presented in appendix 6. The result shows that the protein content of fresh milk decreased rapidly during refrigerator storage while the protein content of ozonated milk was just slowly decreasing. The awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

Universitas Brawijaya Universitas Brawijay Universitas Brawijay Universitas Brawijay Universitas Brawijay

ANOVA result shows that there is significant effect of cold storage on protein content in fresh milk while there is no significant effect of cold storage on protein content in ozonated milk. The average protein content in fresh milk from T0; T1; T2; T3; and T4 respectively is 2,66; 2,57; 2,47; 2,39; and 2,29 while in ozonated milk the average amount of pH value from T0; T1; T2; T3; and T4 respectively is 2,77; 2,64; 2,63; 2,63; and 2,61. The protein content was decreasing during storage because of the increasing amount of total bacteria, bacteria will produce proteolitic enzymes to break protein down into oligopeptides and amino acids which will be used by the bacteria as energy, this reaction will produce water and cause the protein content to decreases (Buckle, 2007). Research done by Putri (2016) also confirms that cold storage will decrease milk protein content as bacteria will decompose protein into metabolites such as indole, kadeverin, organic acids, CO₂, H₂S and sketol.

Universitas Brawn awijaya awijaya

Universitas Brawijaya Universitas Brawijaya

BRAWIJAYA

Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

awijaya

awijaya awijaya awijaya awijaya awijaya

awijaya awijaya

awijaya awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

It was concluded that:

• Ozonation slows the bacteria growth during cold storage where the bacteria in ozonated milk had a highly significant increase after 72 hours of cold storage (T3) while bacteria in fresh milk already had a highly significant increase just after 24 hours of cold storage (T1).

• Ozonation prevent milk pH from decreasing significantly during cold storage where the pH of ozonated milk did not have any significant increase during cold storage while pH in fresh milk already had a highly significant decrease just after 24 hours of cold storage (T1).

• Ozonation prevent milk protein content from decreasing during cold storage where the protein content of ozonated milk did not have any significant increase during cold storage while protein content in fresh milk had a significant difference between T0 and T4.

5.2. Recommendations Further research about ozone half life in milk is suggested to be done as the author found that the ozone odor still smell strongly until 72 hours of storage. The usage of sterilized glass bottle as fresh milk container from farm and during storage will be better than the usage of plastic bottle to reduce contamination risks.



awijaya Universitas Brawijaya Universitas Brawijaya Universitas Provijaya Universitas Brawijaya

REFERENCES

Asgar, A., Setyabudi, D.A. and Hasan, Z.H., 2015. Teknologi Ozonisasi untuk Mempertahankan Kesegaran Cabai Cultivar Kencana Selama Penyimpanan. *Jurnal Penelitian Pascapanen Pertanian, 12*(1), pp.20-26.

BPS. 2017. Kajian Konsumsi Bahan Pokok 2017. Badan Pusat Statistik. Jakarta.

BPS. 2019. Produksi Susu Segar menurut Provinsi 2009-2019. Badan Pusat Statistik. Jakarta.

BSN. 2011. Susu segar-Bagian 1: Sapi. Badan Standardisasi Nasional: Jakarta.

awijaya Universita

awijaya awijaya

awijaya awijaya awijaya awijaya

awijaya awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijava

awijaya awijaya

awijaya

awijaya awijaya

awijaya

Buckle, K.A., R.A. Edwards, G.H. Fleet, and M. Wooton. 2009. Food Science. Penerjemah Hari Purnomo dan Milaya University Adiono. UI Press. Jakarta.

awijaya Cable, M. 2005. Calibration: A Technician's Guide. Durham: Brawlaya awijaya UniversISA. Brawijaya Universitas Brawijaya Universitas Brawijaya awijaya Cahyaningtyas, A.A., Pudjiastuti, W. and Ramdhan, I., 2016. awijaya awijaya Pengaruh Suhu Penyimpanan terhadap Organoleptik, awijaya Derajat Keasaman dan Pertumbuhan Bakteri Coliform awijaya pada Susu Pasteurisasi. Jurnal Riset Teknologi Industri, awijaya *Universi10*(1), pp.13-23. Jniversitas Brawijaya Universitas Brawijaya Universitas Brawijava Universitas Brawijava Universitas Brawijava awijaya awijaya Couto, E.P., Alencar, E.R., Gonçalves, V.S.P., dos Santos, Brawlaya awijaya UniversA.J.P., Ribeiro, J.L. and de Aguiar Ferreira, M., 2016. Brawijaya awijaya UniversEffect of ozonation on the Staphylococcus Aureus Brawijaya Universinnoculated in milk. Semina: Ciências Agrárias, 37(4), Brawlava awijaya Universpp.1911-1917.a awijaya awijaya awijaya Universitas Brawijava Universitas Brawijava



awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya

awijaya

awijaya

awijaya awijaya

awijaya awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya

Fikri, F., Hamid, I.S. and Purnama, M.T.E., 2017. Uji organoleptis, pH, uji eber dan cemaran bakteri pada karkas yang diisolasi dari kios di Banyuwangi. *Jurnal Medik Veteriner*, 1(1), pp.23-27.

Haifan, M., Review Kajian Aplikasi Teknologi Ozon untuk Penanganan Buah, Sayuran dan Hasil Perikanan (Review Study of Ozone Technology Applications for Handling Fruits, Vegetables and Fishery Products).

Hendrawati, T.Y. and Utomo, S., 2017. Optimasi Suhu dan Waktu Sterilisasi Pada Kualitas Susu Segar di Kabupaten Boyolali. *Jurnal Teknologi*, 9(2), pp.97-102.

awijaya Kencanawati, A.P., Suprayogi, T.H. and Sayuthi, S.M., 2015. awijaya University Total Bakteri Dan Derajat Keasaman Susu Sapi awijaya UniversPerah Akibat Perbedaan Lama Waktu Dipping awijava Univers Menggunakan Larutan Iodosfor Sebagai Desinfektan awijaya Univers(Total Plate Count and Phof Fresh Milk of Dairy awijaya Cows After Dipping Using Iodosphor Solution as awijaya Univers Desinfectantat on Differ. Animal Agriculture Journal, Brawijaya awijaya Univers4(1), Brpp.127-131. niversitas Brawijaya Universitas Brawijaya awijaya Kusumawati, D.D. and Sulchan, M., 2012. PERBEDAAN Brawlaya awijaya UniversJUMLAH BAKTERI TOTAL DAN KOLIFORM PADAS Brawijaya awijaya Univer SUSU SEGAR DENGAN OZONISASI DAN Brawieva awijaya PASTEURISASI (Doctoral dissertation, Diponegoro awijaya University). awijaya Lawrie, R. A. 2003. Ilmu Daging Edisi Kelima. Jakarta: UI awijaya awijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya awijaya awijaya awijaya awijaya awijaya Ilnivarsitas Brawijava Universitas Brawijava



awijaya awijaya awijaya Universitas Brawik awijaya

awijaya

awijaya

awijava

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijava

awijaya

awijaya awijaya

awijaya

awijaya

Universitas Devuiava Universitas Brawijava Unive

Lenntech. 2020. Ozone Decomposition. https://www.lenntech.com/library/ozone/decompositio n/ozone-decomposition.htm. Accessed 21st November 2020.

Munhõs, M.C., Navarro, R.S., Nunez, S.C., Kozusny-Andreani, D.I. and Baptista, A., 2019. Reduction of Pseudomonas Inoculated into Whole Milk and Skim Milk by Ozonation. In XXVI Brazilian Congress on Biomedical Engineering (pp. 837-840). Springer, Singapore.

Murti, T. W. 2010. Pasca Panen dan Industri Susu. Fakultas Peternakan Universitas Gadjah Mada. Yogyakarta.

awijaya Nababan, L.A., Suada, I.K. and Swacita, I.B.N., 2014. awijaya Ketahanan susu segar pada penyimpanan suhu awijaya Universituang ditinjau dari uji tingkat keasaman, didih, dan awijava Universit waktu reduktase. Indonesia Medicus Veterinus, 3(4), pp.274-282. awijaya awijaya Universitas Bra

Padaga, M. C., and Aulanni'am. 2017. Susu sebagai Nutrasetika awijaya Gangguan Metabolit. Malang: UB Brawlava untuk Penyakit awijaya UniversPress. rawijava awijaya Putri, E., 2016. Kualitas Protein Susu Sapi Segar Berdasarkan awijaya awijaya CHEMPUBLISH Waktu Penyimpanan. J,*l*(2), awijaya pp.14-20. awijaya Radiati, L. E., R. D. Andriani, M. W. Apriliyani and P. P. awijaya awijaya Mikrobiologi Dasar Hasil Ternak. Rahayu. 2019. awijaya Malang: UB Press. niversitas Brawijaya Universitas Brawijaya awijaya awijaya Makanan. Brawijaya Rohman, A., and Sumantri. 2017. Analisis Yogyakarta: UGM Press. Sitas Brawijaya Universitas Brawijaya awijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya awijaya awijaya Ilnivareitae Rrawijava Ilniversitae Rrawijava



awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawij awijaya Universitas Brawij

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijava

awijaya awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

Jniversitas Brawijaya Universitas Brawijaya Jniversitas Brawijaya Universitas Brawijaya Iniversitas Brawijaya

Rusdi, U.D. and Suliasih, N., 2002. Ozonisasi dan Kualitas Air Susu. *Bionatura*, 4(2).

Sari, A.P. and Hadi, W., 2014. Penggunaan Unit Slow Sand Filter, Ozon Generator dan Rapid Sand Filter Skala Rumah Tangga Untuk Meningkatkan Kualitas Air Sumur Dangkal Menjadi Air Layak Minum (Parameter Zat Organik dan Deterjen). Jurnal Teknik ITS, 3(2), pp.D120-D125.

Singh, H., M. Boland and A. Thompson. 2014. Milk Proteins From Expression to Food Second Edition. Elsevier.

Soeparno, R. A. Rihastuti, Indratiningsih and S. Triatmojo. 2011. Dasar Teknologi Hasil Ternak. Yogyakarta: Gadjah Mada University Press.

Susanti, R. and Hidayat, E., 2016. Profil protein susu dan produk olahannya. *Jurnal Mipa*, 39(2), pp.98-106.

Suwito, W., 2016. Bakteri yang sering mencemari susu: deteksi, Brawijaya awijaya awijaya Universpatogenesis, epidemiologi, dan cara pengendaliannya. Brawijaya Univers Jurnal Penelitian dan Pengembangan Pertanian, Brawlaya awijaya Univers29(3), pp.96-100. Universitas Brawijaya Universitas Brawijaya awijaya awijaya Thohari, I., Mustakim, M. C. Padaga and P. P. Rahayu. 2017. awijaya awijaya Teknologi Hasil Ternak. Malang: UB Press. awijaya ersitas Brawijaya Universitas Brawijaya awijaya Usmiati, S., and Abubakar. 2009. Teknologi Pengolahan Susu. Brawijaya awijaya Univer Bogor: Balai Besar Penelitian dan Pengembangan Brawi aya UniversPascapanen Pertanian ersitas Brawijaya Universitas Brawijaya awijaya awijaya awijaya Universitas Brawijaya Universitas Brawijaya awijaya awijaya Ilnivareitae Rrawijava Ilniversitae Rrawijava



awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawij

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya awijaya awijaya awijaya awijaya awijaya

awijaya awijaya

awijaya

awijaya

Universitas Brawijaya Universitas Brawijay Universitas Brawijay Universitas Brawijay Universitas Brawijay

Universitas Brawijaya Universitas Brawijaya

Ilniva5reitae Rrawijava Ilniversitae Rrawijava

Wicaksono, A. and Sudarwanto, M., 2017. Peningkatan kualitas susu peternakan rakyat di Boyolali melalui program penyuluhan dan pendampingan peternak sapi perah. Agrokreatif Jurnal Ilmiah Pengabdian kepada Masyarakat, 2(2), pp.55-60.

Yudonegoro, R.J., Nurwantoro, N. and Harjanti, D.W., 2016. KAJIAN **KUALITAS** SUSU SEGAR DARI TINGKAT PETERNAK SAPI PERAH, TEMPAT PENGUMPULAN SUSU DAN KOPERASI UNIT DESA JATINOM DI KABUPATEN KLATEN (Quality of Raw Milk From Dairy Farm, Milk Collection Center and Dairy Cooperative Jatinom Kabupaten Klaten). Animal Agriculture Journal, 3(2), pp.323-333.

awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya

awijaya

awijaya

awijaya awijaya awijaya awijaya

awijaya awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

wijaya Universitas Brawijaya Universitas Page

APPENDIXES

Appendix 1. The procedure of milk pH assessment

According to Cable (2005), the procedure for pH value analysis of milk using pH meter is as follows:

1. Clean the electrode of pH meter using aquadest and wipe the electrode with tissue

awijaya 2. Dip the electrode to buffer solution pH 4

awijaya 3. Rinse the electrode with aquadest and wipe the electrode awijaya Un with tissue

4. Dip the electrode to buffer solution pH 7

5. Rinse the electrode with aquadest and wipe the electrode

with tissue

6. Dip the electrode to the milk sample

7. Read the pH value on the monitor

awijaya

awijaya awijaya Universitas Brawn awijaya awijaya

Universitas Brawijaya Ilnivareitas Rrawijava Ilniversitas Rrawijava



awijaya awijaya awijaya awijaya awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya awijaya

awijaya

awijaya

Universitas Devuiaya Universitas Brawijaya Unive

Appendix 2. The procedure of milk protein content assessment

According to Rohman and Sumantri (2018), the procedure to measure protein content in milk is as follows:

Sample Titration

1. Pour 10 mL milk sample to erlenmeyer 125 mL.

2. add 20 mL aquadest, 0,4 mL saturated potassium oxalate and 1 mL fenolftalein indicator 1%.

3. Let it for 2 minutes

4. Titrated with NaOH 0,1 N until it reaches standard color (standard color is the color resulted by adding 10 mL milk sample with 10 mL aquadest; 0,4 mL saturated potassium oxalate solution and one drop of rosanilin chloride indicator 0.01%)

5. Add 2 mL formaldehide 40% solution.

6. titrated with NaOH 0,1 N until it reaches standard color awijaya awijaya

7. Take note of NaOH 0,1 N volume needed to reach standard awijaya Unicologitas Brawijaya Universitas Brawijaya Universitas Brawijaya awijaya awijaya Blank Titration Wijaya

1. Mix 20 mL aquadest, 0,4 mL saturated potassium oxalate solution, 1 mL fenolftalein indicator 1% and 2 mL of 40% niversitas Brawijaya formaldehide solution. 2. titrated with NaOH 0,1 N until it reaches standard colors as Brawline 3. Take note of NaOH 0,1 N volume needed to reach standard Brawijaya

Unicoroitas Brawijaya Universitas Brawijaya Universitas Brawijaya awijaya Formol titrant = Sample titration volume – Blank titration awijaya awijaya volume versitas Brawijaya Universitas Brawijaya awijaya UniversMilk protein content = Formol titrant x 1,83 versitas Brawijava awijaya Universitas Rrawijava Universitas Rrawijava



awijaya awijaya awijaya awijaya awijaya awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya

awijaya awijaya

awijaya

awijaya

Iniversitas Brawijaya Universitas Brawijay Iniversitas Brawijaya Universitas Brawijay Iniversitas Brawijay

Appendix 3. Inoculant planting using pour plate method procedure

1. Preparation of Plate Count Agar (PCA) as growth media PCA were dissolved in aquadest with the dose of 22,5 grams PCA for every liter of aquadest, heated and homogenized with an ekectric stove until the solution become clear. Covered with cotton and aluminium foil, sterilized in autoclave.

2. Preparation of peptone water as growth media

Peptone were dissolved in aquadest with the dose of 1 gram peptone for every liter of aquadest, heated and homogenized with an ekectric stove until the solution become clear. Covered with cotton and aluminium foil, sterilized in autoclave.

3. Milk sample dilution

Sample dilution done in Laminar Air Flow (LAF). 1 mL of milk taken using micropipette and inserted into a reaction tube containing 9 mL of sterile peptone water, homogenized and the first dilution (10^{-1}) obtained. Taken 1 mL of the first dilution and inserted intp a reaction tube containing 9 mL of sterile peptone water, homogenized and the second dilution (10^{-2}) obtained. Dilution process continud until the sixth dilution (10^{-6}) .

4. Inoculant Planting

Inoculant planting done by using pour plate (PP) method in Laminar Air FLOW (LAF). 1 mL of the selected dilution inserted in a sterile petrie dish using micropipette then poured with 10-15 mL of sterile PCA solution and homogenized, wait until the media solidified and incubated at 37°C for 24 hour. Inoculant planting was done using the last 3 dilution (10⁻⁴, 10⁻⁵,

awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya

Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya



awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya

awijaya

Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya

vijaya

5. Calculating of total colonies

Calculating done after the incubation process completed. Calculating was done manually using mica paper and permanent marker. Founded bacteria are marked and drawn on the mica paper.

Guidelines to calculate bacteria :

 $PP = \frac{1}{dilution factor} x \text{ total colonies (colonies counted are colonies within 30-300 range)}$

a. If total colonies are all <30, then counted using the lowest dilution factor.

b. If total colonies are all >300, then counted using the highest dilution factor.

c. If there is one colony within 30-300, counted using that dilution factor.

d. If there are 2 colonies within 30-300, made a comparison between dilution factor, if the comparison result >2, counted using the lowest dilution factor, if the comparison ≤2, made an average between the 2 diluton factor.
a. If all 3 colonies are within 30,300 made a group and

e. If all 3 colonies are within 30-300, made a group and awijaya compared, choose the group with comparison result closest awijaya to 2, if that comparison result >2, counted using the lowest awijaya dilution factor in that group, if the comparison ≤ 2 , made an awijaya the 3 Bra diluton factor. average between awijaya Universitas Brawijaya Universitas Brawijaya awijaya awijaya awijaya Universitas Brawijaya Universitas Brawijaya awijaya Universitas Brawijaya Universitas Brawijaya awijaya awijaya awijaya Universitas Brawijaya Universitas Brawijaya awijaya awijaya Ilniv39reitas Brawijava Universitas Brawijava awijaya awijaya Universitas Brawijaya Universitas Brawijaya Unive

Brawijaya

Appendix 4. Data a	and statistical analysis	s of milk Total Plate
Count	SUNC	DRA

awijaya awijaya

BRAWITA

awijaya

awijaya

nivovi	/			3374 7254		The second	
liven	T		10-4	105	10-6	CFU/	LOG
MIIK	1	ĸ	10.	10.3	10 °	mL	CFU/
	1		06	10		0.6 + 105	5 08
	0	2	90	10	3	9,6 x 10	5,98
	0	2	80	10	2	$8,0 \times 10^{-1}$	5,95
		3	91	10	4	$9,1 \times 10^{5}$	5,96
	1	1	95	32		$9,5 \times 10^{5}$	5,98
	1	2	106	22		$1,1 \ge 10^6$	6,04
Ve		3	100	27	0	1.0×10^{6}	6,00
Ozo		1	106	8	3	$1,1 \ge 10^6$	6,04
nated	2	2	103	10	5	$1,0 \ge 10^{6}$	6,00
versi		3	104	9	4	$1,0 \ge 10^{6}$	6,00
versita	1/	1	TNTC	63	3	$6,3 \ge 10^6$	6,80
versita	53	2	TNTC	58 -	4	5,8 x 10 ⁶	6,76
versita	S B	3	TNTC	60	3	$6,0 \ge 10^6$	6,78
ersita	s Bra	1	TNTC	157	10	1,6 x 10 ⁷	7,20
versita	s Bra	2	TNTC	150	12	$1,5 \ge 10^7$	7,18
versita	s Bra	3	TNTC	148	19	1,5 x 10 ⁷	7,18
/ersita	s Bra	a li	107	iver ⁷ itas	R4aw	$1,1 \ge 10^6$	6,04
ersita	0	2	118	40	B5	$1,2 \ge 10^6$	6,08
oreita	e Br	3	113	24	_4	$1,1 \ge 10^6$	6,04
oreita	c Br	1	140	15	3	$1,4 \ge 10^6$	6,15
oreita		2	138	10	2	$1,4 \ge 10^6$	6,15
versita		3	145	13	2	$1,5 \ge 10^6$	6,18
resh	D DI	1	167	12	4	$1,7 \ge 10^6$	6,23
versita	2	2	181	18	_0	$1.8 \ge 10^6$	6,26
versita	s Bra	3	174	15	_2	$1.7 \ge 10^6$	6,23
versita	s Bra	awij	TNTC	217	20	$2,2 \times 10^7$	7,34
/ersita	s Bra	2	TNTC	157 ^{as}	37	1.6×10^7	7,20
ersita	s Bra	3	TNTC	189	29	1.9×10^{7}	7.28
versita	5 4 10	awij	TNTC	TNTC	102	1.0×10^8	8,00
Vorcito	C Br	awli	ava lin	iversitas	Braw	ilava Linive	reitas l

awijaya	Universitas	s Brawijaya	Unive	ersitas	s Braw	ijaya	Unive	rsitas	Brawijaya
awijaya	Universitas	Brawijaya	Univ	ersitas	. Pour	iiaya	Unive	rsitas	Brawijaya
awijaya	Universitas	Brawijaya	Univ				Unive	rsitas	Brawijaya
awijaya	Universitas	Brawijaya						rsitas	Brawijaya
awijaya	Universitas	Brawii						6	Brawijaya
awijaya	Universitas	B 2 TN	TC	INTC	117	12	x 10 ⁸	8 08	awijaya
awijaya	Universitas	3 TN	TC 1	INTC	126	1.3	$x 10^8$	8.11	ijaya
awijaya	Notes : $T =$	Treatment	2	334				1.	- va
awijaya	Univer $\mathbf{R} = \mathbf{R}$	Replication		X. A	2.	, j	E.L.	1	. \
awijaya	Univ	3	34	0.8	29.		15	10	
awijaya	Uniti	Storage	Re	enlicati	on	S	77	Л	Y,
awijaya	Milk	Treatment	1.0	2	3	- Tota		ntal	
awijaya	Unit	то	5.08	5.03	5.06	17.8	7		Y
wijaya	Univ	10 T1	5.90	5.95	5.90	17.0			
wijaya	Oronotad		5.98	0.04	0.00	18.0			
awijaya	Ozonated	12	0.04	0.00	0.00	18.0	4		1
awijaya	Univer	13	0.8	0.70	0.78	20.3	4	00	
wijava	Univers	14	1.2	/.18	/.18	21.5	6 95	.83	
awijaya	Universi	TO	6.04	6.08	6.04	18.1	6		
awijaya	Universita	TI	6.15	6.15	6.18	18.4	8		va
awiiava	Fresh	T2	6.23	6.26	6.23	18.7	2		hava
awijaya	Universitas	T3	7.34	7.2	7.28	21.8	2		wijava
awijaya	Universitas	Br T4	8	8.08	8.11	24.1	9 101	1.37	awijaya
awijaya	UniTotaltas	Braw					197	7.20	Brawijaya
awijaya	Notes : S To	otal = Storage	e Treat	ment T	'otal	ijaya	unive	rsitas	Brawijaya
awijaya	UniversMat	otal = Milk 7	Total V	ersitas	Braw	ijaya	Unive	rsitas	Brawijaya
awijaya	Universitas	Brawijaya	Univ	ersitas	Braw	ijaya	Unive	rsitas	Brawijaya
awijaya	a. Correction	on Factor (Cl		ersitas	Braw	ijaya	Unive	rsitas	Brawijaya
awijaya	CF = (197.20)	<u>))</u> 3rawijaya	Univ	ersitas	Braw	ijaya	Unive	rsitas	Brawijaya
awijaya	-1206	Brawijaya	Univ	ersitas	Braw	ijaya	Unive	rsitas	Brawijaya
awijaya	Universites.	Brawijaya	Univ	ersitas	Braw	ijaya	Unive	rsitas	Brawijaya
awijaya	b. Sum of s	auare total	Univ	ersitas	Braw	ijaya	Unive	rsitas	Brawijaya
awijaya	SS T = (5.98)	$8^2 + + 8.11$	(2) - 12	296.261	Braw	ijaya	Unive	rsitas	Brawijaya
wijaya	Universitia = 14.1	Brawijaya	Univ	ersitas	Braw	ijaya	Unive	rsitas	Brawijaya
awijaya	Universitas	Brawijaya	Univ	ersitas	Braw	ijaya	Unive	rsitas	Brawijaya
awijaya	Universitas	Brawijaya	Univ	ersitas	Braw	ijaya	Unive	rsitas	Brawijaya
awijaya	Universitas	Brawijaya	Univ	ersitas	Braw	ijaya	Unive	rsitas	Brawijaya
awijaya	Universitas	Brawijaya	Unive	ersitas	Braw	Ijaya	Unive	rsitas	Brawijaya
awijaya	Universitas	Brawijaya	univer 4	ersitas	Braw	ijaya	Unive	rsitas	Brawijaya
wiiava	Iniversitas	s Brawllava	1110117	areitae	: Fraw	uava	I Inive	reitae	Krawilava

BRAWIJAYA

W.E	ijaya	Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya
aw	ijaya	Universitas Brawijaya Universitas Devijaya Universitas Brawijaya
aw	ijaya	Universitas Brawijaya Universitas Brawijaya
aw	ijaya	Universitas Brawijaya
aw	ijaya	Universitas Brawijaya
aw	ijaya	C Sum of square milk
aw	ijaya	$95.83^2 + 101.37^2$ 1006 261
aw	ijaya	$SS M = \frac{1296.261}{3 x 5} - 1296.261$
aw	ijaya	Unive = 1.02305
aw	ijaya	Univ
aw.	ijaya	d. Sum of square storage nested in ozonated milk 17.07^2 + 121.56^2 of 02^2
aw	ijaya	SS S-Ozonated = $\frac{17.87 + \dots + 21.56}{3} - \frac{95.83}{3 \times 5}$
aw	ijaya	= 3.790106667
aw	ijaya	Uni N S S S S S S S S S S S S S S S S S S
WE	ijaya	e. Sum of square storage nested in fresh milk
aw	ijaya	SS S-Fresh = $\frac{18.16^2 + \dots + 24.19^2}{-101.37^2}$
aw	ijaya	$3^{3} x^{5} = 927584$
aw	ijaya	Univer
aw	ijaya	f. Sum of square storage nested in milk
aw	ijaya	SS S-M = SS S-Ozonated + SS S-Fresh
aw	ijaya	Universi = 3.790106667 + 9.27584
aw	ijaya	Universi=13.06595
aw	ijaya	Universitas B
aw	ijaya	g. Sum of square error
aw	IJaya	SS E = SS T - SS M - SS S - M
EI W	Ijaya	-0.02
aw	ijaya	Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya
ELVV	ijaya	Analysis of Variance (ANOVA)
aw.	ijaya	SV df SS MS Escore E0.05 E0.01
	ijaya	N/II 1 1022 10220 057 207 5 20 11 20
	ijaya	Milk I 1,023 1,0230 857,307 5,32 11,26
	ijava	(S-M) 8 13,0659 1,6332 1368,64 2,45 3,56
	ijaya	Error 20 0,02 0,0011
	ijaya	Total 29 Bra14,11 Universitas Brawijava Universitas Brawijava
	iiava	Conclusion : Fscore > F0.01 means that there is highly
	iiava	significant difference of total plate count
	iiava	between milk. There is highly significant effect
we we	ilava	Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya
aw	ijaya	Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya
31//	ilava	Ilniversitas Rrawijava Ilniv42 sitas Rrawijava Ilniversitas Rrawijava

awijaya Universitas Brawijaya Universitas Brawijaya Universitas awijaya Universitas Brawijaya Universitas Dovijaya Universitas awijaya Universitas Brawijaya Universitas awijaya Universitas Brawijaya universitas Brawijaya universitas Brawijaya universitas Brawijaya awijaya Universitas Brawijaya awijaya Universitas Brawijaya universitas Brawijaya

Further test was carried out using Duncan's Multiple Range Test (DMRT)

$=\sqrt{\frac{MS_E}{r}}$
$=\sqrt{\frac{0,00119}{3}}$
= 0.0199444
$= (0.01; df error) \times S_x$

versi

1% of Duncan's Multipl	e Range Test (l	DMRT) c	ritical table	Aya
UnivePsitas 2	3	4	5	jaya
SSR 1% 4,024	4,197	4,312	4,395	wijaya
LSR 1% 0,0802	0,0837	0,086	0,0876	awijaya
Universitas Braw,	Statement of the second se			Brawijaya
Ozonated Milk Notation	Universities	Braingay	a universitas	Brawijaya
Treatments	Average	Brawijay	Notation	Brawijaya
Universitas Brawijaya	5.96 ± 0.03	Brawijay Brawijay	a Universitas	Brawijaya
Universitas Brawijaya	6.01 ± 0.03	Brawijay	a Universitas	Brawijaya
Universita ²² Brawijaya	6.01 ± 0.02	Brawijay	a Universitas	Brawijaya
UniversitaT3Brawijaya	6.78 ± 0.02	Brawijay	a Uhiversitas	Brawijaya
Universita 44Brawijava	0.019 ± 0.01	Brawijav	a Universitas	Brawijava

Universitas Brawijaya Universitas Brawijaya

Universitas Brawijaya Universitas Brawijaya

Universitas Brawijaya Universitas Brawijaya

Ilniv43 reitas Rrawijava Ilniversitas Rrawijava

awijaya awijaya

awijaya

awijaya

awijaya awijaya awijaya

awijaya awijaya awijaya awijaya awijaya

awijaya awijaya awijaya awijaya awijaya Sx

LSR 1%

Universitas Brawijaya

BRAWI

Universitas Brawin

Universitas Brawijaya Universitas Brawijaya Unive

Ilniversitas Rrawijava Ilniversitas Rrawijava

java

awijaya	Fresh Milk Notation	ANSD	
awijaya	Treatments	Average	Notation
awijaya	Univer T0	6.05 ± 0.02	a
awijaya	Univ T1	6.16 ± 0.02	b_
awijaya	Uni T2	6.24 ± 0.02	b
awijava	Uni T3	7.27 ± 0.07	c
awijaya	Uni T4	8.06 ± 0.06	d
awijaya	Unit	R L R	
awijaya	Univ		
awijaya	T0 Notation		
awijaya	Unive Milk	Average	Notation
awijaya	Unive Ozonated	5.96 ± 0.03	a
awijaya	Univers		1 bec
awijaya	UniversiFresh	6.05 ± 0.02	b
awijaya	Universita		4.6
awijaya	T1 Notation	4 1	
awijaya	Milk	Average	Notation
awijaya	UniverOzonated	6.01 ± 0.03	a
awijaya	Universitas Brawijaya	616 ± 0.02	va universitas
awijaya	Universitas Brawijaya	Universitas Brawija	ya Universitas
awijaya	Universitas Brawijaya	Universitas Brawija	ya Universitas
awijaya	T2 Notation Brawijaya	Universitas Brawija	ya Universitas
awijaya	Universi Milk ³ rawijaya	Average	Notation
awijaya	Universitas Brawijaya	6.01 ± 0.02	ya Universitas
awijaya	Universitas Brawijaya	Universitas Brawija	ya Universitas
awijaya	Universitas Brawijaya Fresh	0.24 ± 0.02 Brawija	ya Upiversitas
awijaya	Universitas Brawijaya	Universitas Brawija	ya Universitas
awijaya	Universitas Brawijaya	Universitas Brawija	ya Universitas
awijaya	Universitas Brawijaya	Universitas Brawija	ya Universitas
awijaya	Universitas Brawijaya	Universitas Brawija	ya Universitas
awijaya	Universitas Brawijaya	Universitas Brawija	ya Universitas
awijaya	Universitas Brawijaya	Universitas Brawija	ya Universitas
awijaya	Universitas brawllava	Universitas brawlia	va universitas

awijaya awijaya awijaya awijaya awijaya awijay awijay



awijaya awijaya awijaya awijaya

awijaya

Universitas Brawijaya Universitas Devijaya Universitas Brawijaya

Brawijaya

awijaya	T3 Notation	ANG D	-
awijaya	Milk	Average	Notation
awijaya	Unive Ozonated	6.78 ± 0.02	*a 1/
wijaya	Univ	7.07	E- L
wijaya	UniFresh	7.27 ± 0.07	b
wijaya	Uni		1300
wijaya	T4 Notation		and the
wijaya	Milk	Average	Notation
wijaya	Univ	7.10 ± 0.01	Rotation
wijaya	Univ Ozonated	7.19 ± 0.01	a
wijaya	Unive	8.06 ± 0.06	
wijaya	Univer		S
wijaya	Univers		a line
wijaya	Universit		
wijaya	Universita		4.6
wijaya	Universitas	4 6	
wijaya	Universitas B		
wijaya	Universitas Bra		
wijaya	Universitas Braw,		
wijaya	Universitas Brawijaya	Universities	a universitas
wijaya	Universitas Brawijaya	Universitas Brawijay	a Universitas
wijaya	Universitas Brawijaya	Universitas Brawijay	a Universitas
wijaya	Universitas Brawijaya	Universitas Brawijay	a Universitas
wijaya	Universitas Brawijaya	Universitas Brawijay	a Universitas
wijaya	Universitas Brawijaya	Universitas Brawijay	a Universitas
wijaya	Universitas Brawijaya	Universitas Brawijay	a Universitas
wijaya	Universitas Brawijaya	Universitas Brawijay	a Universitas
wijaya	Universitas Brawijaya	Universitas Brawijay	a Universitas
wijaya	Universitas Brawijaya	Universitas Brawijay	a Universitas
wijaya	Universitas Brawijaya	Universitas Brawijay	a Universitas
wijaya	Universitas Brawijaya	Universitas Brawijay	a Universitas
wijaya	Universitas Brawijaya	Universitas Brawijay	a Universitas
wijaya	Universitas Brawijaya	Universitas Brawijay	a Universitas
wijaya	Universitas Brawijava	Universitas Brawijay	a Universitas

Universitas Brawijava Universitas Brawijava Universitas Brawijava

Universitas Brawii

Universitas Dowijaya Universitas Brawijaya Unive

Brawijaya

xawijaya

Append	ix 5. Data and s	tatisti	cal ana	lysis o	f milk	рН
UniMat	Trootmont	CR	eplicati	on	T	M
Univer	Treatment	SY.	2	3	Total	Total
Univ	TO	6,77	6,93	6,75	20,45	- "L
Uni	T1	6,81	6,74	6,88	20,43	
Ozonat	red T2	6,85	6,75	6,80	20,40	175
Uni	T 3	6,70	6,75	6,77	20,22	
Uni	T4	6,69	6,83	6,71	20,23	101.73
Univ	Т0	6,79	6,81	6,77	20,37	
Univ	T1	6.67	6.58	6.68	19.93	à
UniFresh	т2	6,49	6,56	6,50	19.55	
Univer	T3	6.38	6.51	6,46	19.35	y 7
Univers	T4	6.42	6 44	6 44	19 30	98 5
Univers		0,12	0,11	0,11	17,50	200.23
Notas	Γ Total – Treatm	ont To	tol	TH:	1	200.23
Notes .	I = I = I = Mill I	Cotol	nai			
Univers	vi i otal – wilik i	otai				
Univers	itas Bra					
a. Corre	$(200.22)^2$	-)				
CFvers	$=\frac{(200.23)}{2x5x3}$	Univ	CISICas	D	njaya l	Iniversita
Univers	= 1336.46	Univ	ersitas	Braw	ijaya l	Jniversita
Univers	itas Brawijaya	Univ	ersitas	Braw	ijaya l	Jniversita
b. Sum	of square total	Univ	ersitas	Braw	ijaya t	Jniversita
SST	$= (6.77^2 + + 0.70)$	6.44 ²)	- 1336	.46	ijaya t	Iniversita
Univers	11=0.70 iwijaya	Univ	ersitas	Braw	ijaya t	Iniversita
Univers	of square mills	Univ	ersitas	Brow	ijaya t	Iniversite
C. Sum	$101.73^2 + 98.5^2$	Univ	oreitas	Brow	ijaya t	Iniversit
SS M	$=\frac{101.001750.00}{3 \times 5}$	- 133	6.46	Braw	ijaya t liava t	Iniversit
Universi	= 0.34863	Ilniv	arcitas	Braw	ijaya t ilava t	Iniversit
Universi	itas Brawijaya	Univ	orcitae	Braw	ijaya t ijava t	Iniversit
Universi	itas Brawijaya	Univ	orsitas	Braw	ijaya t ijava t	Iniversite
Universi	itas Brawijaya	Univ	oreitoe	Braw	ijaya t ijava t	Iniversite
Univers	itas Brawilava	Univ	ersitas	Braw	ijaya t	Jniversita
Univers	itas Brawijava	Univ	6 _{reitae}	Braw	iiava I	Iniversita

awijaya awijaya



	awijaya	Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya
	awijaya	Universitas Brawijaya Universitas Devijaya Universitas Brawijaya
	awijaya	Universitas Brawijaya Universitas Brawijaya
	awijaya	Universitas Brawijaya
	awijaya	Universitas Brawije S Brawijaya
	awijaya	d. Sum of square storage nested in ozonated milk
	awijaya	$20.45^2 + \dots + 20.23^2 101.73^2$
	awijaya	SS S-Ozonated = $\frac{3}{3x5}$
	awijaya	Univer $= 0,016935$
	awijaya	Univ
	awijaya	e. Sum of square storage nested in fresh milk $20.37^2 + \dots + 19.30^2 - 98.5^2$
	awijaya	SS S-Fresh = $\frac{20.57 + 115.50}{3} - \frac{50.5}{3 \times 5}$
	awijaya	= 0,268933
	awijaya	
	awijaya	f. Sum of square storage nested in milk
	awijaya	SS S-M = SS S-Ozonated + SS S-Fresh 0.01(025 + 0.268022)
	awijaya	$= 0.010935 \pm 0.208935$ = 0.28587
	awijaya	
	awijaya	g. Sum of square error
	awijaya	SSE = SST - SSM - SSS-M
	awijaya	= 0.70 - 0.34863 - 0.28587
	awijaya	= 0.07
	awijaya	Universitas Br. awijaya
	awijaya	Analysis of Variance (ANOVA)
	awijaya	LINSV rsit df Braw SS Jon MS Fscore F0,05 F0,01 Brawijaya
	awijaya	Milk 1 Br 0,3486 0,3486 104,154 5,32 11,26 Brawijaya
	awijava	
	awijaya	U(S-M) it 8 Bra0,2858 U 0,0357 ta10,6756 ja 2,45 niv 3,56 as Brawijaya
	awijaya	U(S-M) 1 8 Bra0,2858 U 0,0357 10,6756 2,45 niv 3,56 as Brawijaya U Error 1 20 Brav0,07 a U 0,0033 tas Brawijaya Universitas Brawijaya
	awijaya awijaya awijaya	(S-M) 8 0,2858 0,0357 10,6756 2,45 3,56 Brawlay Error 20 0,07 0,0033 0,0033 0,0033 0,0033 0,0033 0,0033 0,0033 0,0033 0,0033 0,00033 0,
YA	awijaya awijaya awijaya awijaya	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
ÅYA	awijaya awijaya awijaya awijaya awijaya	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
TJAYA	awijaya awijaya awijaya awijaya awijaya	(S-M) 8 0,2858 0,0357 10,6756 2,45 3,56 Error 20 0,07 0,0033 Total 29 0,70 Conclusion : Fscore > F0.01 means that there is highly significant difference of pH value between milk. There is highly significant effect of refrigerator
WIJAYA	awijaya awijaya awijaya awijaya awijaya awijaya	(S-M)80,28580,035710,67562,453,56Error200,070,0033Total290,70Conclusion:Fscore> F0.01means that there is highly significant difference of pH value between milk. There is highly significant effect of refrigerator storage duration nested in milk on pH value
VERSITAS AWIJAYA	awijaya awijaya awijaya awijaya awijaya awijaya awijaya	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
RAWIJAYA	awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya	(S-M)80,28580,035710,67562,453,56Error200,070,0033Total290,70Conclusion:Fscore > F0.01means that there is highly significant difference of pH value between milk. There is highly significant effect of refrigerator storage duration nested in milk on pH value
BRAWIJAYA	awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya	(S-M)80,28580,035710,67562,453,56Error200,070,0033Total290,70Conclusion:Fscore > F0.01 means that there is highly significant difference of pH value between milk. There is highly significant effect of refrigerator storage duration nested in milk on pH value
BRAWIJAYA	awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya	(S-M)80,28580,035710,67562,453,56Error200,070,0033Total290,70Conclusion:Fscore > F0.01 means that there is highly significant difference of pH value between milk. There is highly significant effect of refrigerator storage duration nested in milk on pH value
BRAWIJAYA	awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya	 (S-M) 8 0,2858 0,0357 10,6756 2,45 3,56 Error 20 0,07 0,0033 Total 29 0,70 Conclusion : Fscore > F0.01 means that there is highly significant difference of pH value between milk. There is highly significant effect of refrigerator storage duration nested in milk on pH value
BRAWIJAYA	awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya	(S-M)80,28580,035710,67562,453,56Error200,070,0033Total290,70Conclusion:Fscore > F0.01 means that there is highly significant difference of pH value between milk. There is highly significant effect of refrigerator storage duration nested in milk on pH valueUniversitaBrawlayaUniversitaBrawlayaUniversitaBrawlayaUniversitaBrawlayaUniversitaBrawlayaUniversitaBrawlayaUniversitaBrawlayaUniversitaBrawlayaUniversitaBrawlayaUniversitaBrawlayaUniversitaBrawlayaUniversitaBrawlaya47

	Universitas Brawijaya	Universitas Brawijaya	Universitas	Brangaya
awijaya	Universitas Brawijaya	Universitas Proviiaya	1 Universitas	Brawijaya
awijaya	Universitas Brawijaya	Univ	Universitas	Brawijaya
awijaya	Universitas Brawijaya		rsitas	Brawijaya
awijaya	Universitas Brawii			Brawijaya
awijaya	Further test was carried	out using Duncan's Mi	ultiple Range	awijaya
awijaya	Test (DMPT)	out using Duncan's Wit	intiple Range	ijaya
awijaya	Test (DIVINT)	3.	AL.	va
awijaya	Univer	IMS -	業レ	
awijaya	$S_X = v$	$\frac{r}{r}$	La U	
awijaya	Uni	0.00335	-	7,
awijaya	Uni S =	3		1
awijaya	Uni 🔾 😑	0,033403		Y
awijaya	Uni	R S SANGAR		10
awijaya	LSR 1% = (0)	$0.01 \cdot df error x Sx$	17	
awijaya	University		4.2	
awijaya	1% of Duncan's Multink	a Range Test (DMRT) cri	tical table	
awijaya		$\frac{2}{2}$ $\frac{1}{4}$		/
awijaya	Univer 2	3 5 4	5	
awijaya	SSR 1% 4,024	4,197 4,312	4,395	a
awijaya	LSR 1% 0,0802	0,0837 0,086	0,0876	Jaya
awijaya	Universitas	4 1		ijaya
awijaya	Ozonated Milk Notation			wijaya
awijaya	Treatments	Average	Notation	awijaya
awijaya	Universitas Prowiious	$6,82 \pm 0.10$	a	brawijaya
awijaya	INVERSITAS BRAWNAVA		the waite a	The second second second second
The A & A & A & A & A & A & A & A & A & A	Universitan Drawijaya	6.81 ± 0.07	a	Brawijaya
awijaya	Universitas Brawijaya	6.81 ± 0.07 6.80 ± 0.05	Universitas	Brawijaya Brawijaya
awijaya awijaya	Universitas Brawijaya Universitas Brawijaya	6.81 ± 0.07 6.80 ± 0.05 6.74 ± 0.04	universitas Universitas Universitas	Brawijaya Brawijaya Brawijaya
awijaya awijaya awijaya	Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya	6.81 ± 0.07 6.80 ± 0.05 6.74 ± 0.04 6.74 ± 0.08	oniversitas a Universitas Universitas universitas universitas	Brawijaya Brawijaya Brawijaya Brawijaya
awijaya awijaya awijaya awijaya awijaya	Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya	$\begin{array}{l} 6.81 \pm 0.07 \\ 6.80 \pm 0.05 \\ 6.74 \pm 0.04 \\ 6.74 \pm 0.08 \end{array}$	Universitas Universitas Universitas Universitas Universitas	Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya
awijaya awijaya awijaya awijaya awijaya awijaya	T1 Universita Universita Universita Universita Universitas Univers	$\begin{array}{c} 6.81 \pm 0.07 \\ 6.80 \pm 0.05 \\ 6.74 \pm 0.04 \\ 6.74 \pm 0.08 \end{array}$	oniversitas Universitas Universitas Universitas Universitas Universitas	Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya
awijaya awijaya awijaya awijaya awijaya awijaya awijaya	T1 T2 T3 T3 T4 T4 T4 T4 T4 T4 T4 T4 T4 T4 T4 T4 T4	6.81 ± 0.07 6.80 ± 0.05 6.74 ± 0.04 6.74 ± 0.08	Valversitas Universitas Universitas Universitas Universitas Universitas Universitas	Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya
awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya	T1 T2 T3 T4 Fresh Milk Notation Treatments T0	6.81 ± 0.07 6.80 ± 0.05 6.74 ± 0.04 6.74 ± 0.08 Average 1 $6.79 \pm 0.02^{\circ}$	o aversitas Universitas Universitas Universitas Universitas Universitas Notation sitas	Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya
awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya	T1 T2 T2 T3 T3 T4 T4 T4 T4 T4 T4 T4 T4 T4 T4 T4 T4 T4	6.81 ± 0.07 6.80 ± 0.05 6.74 ± 0.04 6.74 ± 0.08 Average 1 $6.79 \pm 0.02^{\circ}$ $6.64 \pm 0.06^{\circ}$	Notation sitas	Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya
awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya	T1 T2 T2 T3 T3 T4 T4 T4 T4 T4 T4 T4 T4 T4 T4 T4 T4 T4	6.81 ± 0.07 6.80 ± 0.05 6.74 ± 0.04 6.74 ± 0.08 Average 1 6.79 ± 0.02^{c} 6.64 ± 0.06^{b} 6.52 ± 0.04^{a}	Notation sitas Universitas Universitas Universitas Universitas Universitas Universitas Universitas	Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya
awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya	T1 T2 T3 T3 T4 T4 T4 T4 T4 T4 T4 T4 T4 T4 T4 T4 T4	6.81 ± 0.07 6.80 ± 0.05 6.74 ± 0.04 6.74 ± 0.08 Average II 6.79 ± 0.02^{c} 6.64 ± 0.06^{b} 6.52 ± 0.04^{a} 6.45 ± 0.07^{a}	valversitas universitas u ^a iversitas u ^a iversitas universitas universitas Universitas Notation sitas uciversitas ubiversitas	Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya
awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya	T1 Universit T2 Universit T3 Universit T4 Universit T4 Universit T4 Universit T4 Universit T0 Universit T0 Universit T0 Universit T1 Universit T2 Universit T2 Universit T3 Universit T3 Universit T3 Universit T3	6.81 ± 0.07 6.80 ± 0.05 6.74 ± 0.04 6.74 ± 0.08 Average I $6.79 \pm 0.02^{\circ}$ 6.64 ± 0.06^{b} 6.52 ± 0.04^{a} 6.45 ± 0.07^{a} $6.42 = 0.01^{a}$	Notation sitas Universitas Universitas Universitas Universitas Universitas Universitas Universitas Universitas Universitas Universitas Universitas	Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya
awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya	T1 Universit T2 Universit T3 Universit T3 Universit T4 Universit T4 Universit T4 Universit T0 Universit T1 Universit T1 Universit T2 Universit T2 Universit T3 Universit T4 Universit T4 Un	$\begin{array}{c} 6.81 \pm 0.07 \\ 6.80 \pm 0.05 \\ 6.74 \pm 0.04 \\ 6.74 \pm 0.08 \end{array}$	Notation sitas Universitas Universitas Universitas Universitas Universitas Universitas Universitas Universitas Universitas Ubiversitas Ubiversitas Ubiversitas Ubiversitas	Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya
awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya awijaya	T1 Universita T2 Universita T3 Universita T4 Universita Fresh Milk Notation T6 Universita T0 Universita T0 Universita T1 Universita T0 Universita T1 Universita T0 Universita T1 Universita T0 Universita T1 Universita T0 Universita T1 Universita T0 Universita T1 Universita T0 Universita T1 Universita T0 Universita T1 Universita T0 Universita T1 Universita T0 Universita T1 Universita T1 Universita T1 Universita T1 Universita T1 Universita T1 Universita T1 Universita T1 Universita T1 Universita T1 Universita T1 Universita T2 Universita T2 Universita T2 Universita T1 Universita T2 Universita T2 Universita T2 Universita T2 Universita T2 Universita T2 Universita T2 Universita T2 Universita T2 Universita T2 Universita T2 Universita T2 Universita T3 Universita T3 Universita T3 Universita T3 Universita T3 Universita T3 Universita T3 Universita T3 Universita T3 Universita T3 Universita T4 Universita T3 Universita T4 Universita T3 Universita T4 Univers	$\begin{array}{c} 6.81 \pm 0.07 \\ 6.80 \pm 0.05 \\ 6.74 \pm 0.04 \\ 6.74 \pm 0.08 \end{array}$	valversitas a Universitas a Universitas a Universitas a Universitas a Universitas a Universitas a Uciversitas a Uaiversitas a Uaiversitas a Uaiversitas a Uaiversitas a Uaiversitas a Uaiversitas a Uaiversitas a Uaiversitas	Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya Brawijaya

BRAWIJAYA

Universitas Powijaya Universitas Brawijaya Unive

Ilniversitas Rrawijava Universitas Rrawijava

s Brawijaya

awijaya	T0 Notation	SAN	Dr	awijaya
awijaya	University Milk	Average	Notation	iiaya
awijaya	Univer Fresh	$6.79 \pm 0.02^{\circ}$	a	
awijaya	Univ Ozonated	6.82 ± 0.10		
awijaya	Uni		Y	1
awijaya	T1 Notation		in the	
awijaya	Milk	Average	Notation	
awijaya	Univ	6.64 L 0.06b		
awijaya	Univ	0.04 ± 0.00		
awijaya	Unive Ozonated	6.81 ± 0.07	b	
awijaya	Univer			
awijaya	T2 Notation			
awijaya	12 Notation	NA DU		a
awijaya	UniversiMilk	Average	Notation	aya
awijaya	Fresh	6.52 ± 0.04^{a}	a	Jaya
awijaya	Universitas B	6.90 ± 0.05	. · //	awijaya
awijaya	Universitas Bray	0.80 ± 0.05	D	awijaya
awijaya	Universitas Brawijaya	Universites site	injaya Universitas Br	awijaya
awijaya	T3 Notation	Universitas Bra	wijaya Universitas Br	awijaya
awijaya	Universi Milksrawijaya	Average	Notation Stas Br	awijaya
awijaya	Universi Fresh rawijaya	6.45 ± 0.07^{a}	wijaya U <mark>a</mark> iversitas Br	awijaya
awijaya	Universitas Brawijaya	Universitas Bra	wijaya Universitas Br	awijaya
awijaya	UniverOzonated wijaya	0.74 ± 0.04 Bray	wijaya U h iversitas Br	awijaya
awijaya	Universitas Brawijaya	Universitas Bra	wijaya Universitas Br	awijaya
awijaya	T4 Notation Brawijaya	Universitas Bray	wijaya Universitas Br	awijaya
awijaya	Universitas Brawijaya Milk	Average	Notation Notation	awijaya
awijaya	Universitas Brawijaya	Universitas Bra	wijaya Universitas Br	awijaya
awijaya	Universitreshrawijaya	0.43 ± 0.01^{a}	wijaya U a iversitas Br	awijaya
awijaya	Universitas Brawijaya	6.74 ± 0.08	wijaya Universitas Br	awijaya
awijaya	Universitas Brawijaya	Universitas Bra	wijaya Universitas Br	awijaya
awijaya	Universitas Brawijaya	Universitas Bra	wijaya Universitas Br	awijaya
awijava	Universitas Brawilava	Universitas Bray	wilava Universitas Br	awilava

awijaya awijaya



awijaya awijaya awijaya awijaya awijaya Universitas Dowijaya Universitas Brawijaya Univ

Appendix 6. Data and statistical analysis of milk protein content P × 1

awijaya
awijaya

BRAWIJAYA

awijaya

awijaya	Universit	-	Re	eplicati	on	Т	М	1
awijaya	UniMilk	Treatment	1	2	3	Total	Total	
awijaya	Uni	T0	2,7	2,72	2,9	8,32	S Y	-
awijaya	Uni	T 1	2,71	2,61	2,6	7,92	- Chi	YL
awijaya	Ozonated	T2	2,53	2,7	2,66	7.89		-
awijaya	Unit	T3	2.51	2.64	2.74	7.89		1
awijaya	Univ	T4	2,63	2,53	2,68	7,84	39.86	
awijaya	Univ	TO	2.52	2.59	2.87	7.98	<u></u>	
wijaya	Unive	T1	2.46	2.61	2.64	7.71	8. 6	
awijaya	UniFresh	T2	2.53	2.54	2.33	7.40		
awijaya	Univers	T3	2,28	2,42	2,48	7.18		
wijaya	Universit	T4	2.27	2.18	2.41	6.86	37.13	
wijaya	Total		_,		1	4	76.99	
wijaya	Notes : T To	tal – Treatm	ent To	tal			10.77	
wijaya	M T	otal – Milk T	Cont 10	i ai				wi
wijaya	Universitas	Stal – WIIK I	Otai					awi
wijaya	Universitas	Braw,	7)					Braw
wijaya	a. Confectio	$(CI)^{2}$	')Uni⊽	CISICCS.		aya U	niversitas	Braw
wijaya	CEversites	2x5x3	Unive	ersitas	Brawi	jaya Ui	niversitas	Brawi
wijaya	Universitas	197.582	Unive	ersitas	s Brawi	jaya Ui	niversitas	Brawi
wijaya	Universitas	Brawijaya	Unive	ersitas	Brawi	jaya Ui	niversitas	Braw
wijaya	b. Sum of s	quare total		ersitas	Brawi	jaya Ul	niversitas	Brawi
wijaya	SS Tersit=($2.7^{2} + + 2$.41~) –	197.5	82 rawi	jaya Ui	niversitas	Brawi
wijava	Universites	Brawijaya	Unive	areitar	Rrawi	jaya Ul	niversites	Browi
wijaya	c Sum of s	auare milk	Unive	oreitae	Rrawi	iava U	niversitas	Brawi
wijava		39.86 ² + 37.	13 ² 1	oraitor	Brawi	iava Ili	niversitas	Brawi
wijava	55 Mi sitas	$=$ 3×5	Univ	97.582	Brawi	iava Ib	niversites	Brawi
wijaya	Universites).24843	Univ	ersites	Rrawi	iava Ib	niversites	Brawi
wijava	Universitas	Brawijaya	Univ	ersitas	Rrawi	iava Ib	niversitas	Brawi
wijava	Universites	Brawijaya	Univ	arcitad	Rrawi	iava Ib	niversites	Brawi
wijaya	Universitas	Brawijaya	Univ	ersitas	Brawi	iava Ili	niversitas	Brawi
wijava	Universitas	Rrawijava	Lini ₅	Oreitae	Rrawi	iava Ili	niversitas	Rrawi

	awijaya	Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya
	awijaya	Universitas Brawijaya Universitas Dewijaya Universitas Brawijaya
	awijaya	Universitas Brawijaya Universitas Brawijaya
	awijaya	Universitas Brawijaya
	awijaya	Universitas Brawijaya
	awijaya	d Sum of square storage nested in ozonated milk
	awijaya	$8.32^2 + \dots + 7.84^2 39.86^2$
	awijaya	SS S-Ozonated $= \frac{3}{3x5}$
	awijaya	Univer $= 0,05156$
	awijaya	
	awijaya	e. Sum of square storage nested in Iresh milk $708 \pm \pm 6.86^2 = 27.12^2$
	awijaya	SS S-Fresh = $\frac{7.56 + + 0.66}{3} - \frac{57.13}{3 \times 5}$
	awijaya	= 0,256373333
	awijaya	
	awijaya	f. Sum of square storage nested in milk
	awijaya	SS S-M = SS S-Ozonated + SS S-Fresh
	awijaya	= 0.05156 + 0.256373333
	awijaya	Univer $= 0,30793$
	awijaya	Univers
	awijaya	SSF = -SST - SSM - SSS-M
	awijaya	= 0.81 - 0.24843 - 0.30793
	awijaya	
	awijaya	Universitas E wijaya
	awijaya	Analysis of Variance (ANOVA)
	awijaya	SV df SS MS Fscore F0,05 F0,01
	awijaya	Milk 1 0 2484 0 2484 19 9595 5 32 11 26
	awijaya	(S-M) = 0.3079 = 0.0384 = 3.0925 = 2.45 = 3.56
	awijaya	Emore 20 B 0.25 0.0124 as Brawley a
	awijaya	Universitas Bravijava Universitas Brawijava Universitas Brawijava
A	awijaya	Total 29 0,81 Conducing a France & F0.01 means that there is highly
	awijava	Conclusion : Figure $> F0.01$ means that there is might be
A S A S	awijava	significant difference of protein content between
	awijaya	milk. Fscore $>$ F0.05 means that there is
E R S	awijaya	significant effect of refrigerator storage duration
\geq	awijaya	Universitas Brawijava
z d	awijaya	Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya
	awijaya	Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya
	awijaya	Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya
	awijaya	Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya
	awiiava	Ilniversitas Rrawijava Ilniv51 sitas Rrawijava Ilniversitas Rrawijava

awij	aya	Universitas Brawijaya	Universita	s Brawijaya	Universitas	Brawi
awij	iaya	Universitas Brawijaya	Universita	s Powilaya	Universitas	Brawi
awij	aya	Universitas Brawijaya	Univ		Universitas	Brawi
awij	iaya	Universitas Brawijaya			rsitas	Brawi
awij	aya	Universitas Brawii				Brawi
awij	iaya	Further test was carried	out using T	Juncan's Mu	Itiple Range	awi
awij	iaya	Tartifici test was carried	out using I	Juncan's Wit	imple Range	
awij	iaya	Test (DMRT)	2.	-	AL.	1
awij	iaya	Univer	MS-		業レノ	
awij	aya	$S_X = v$	$\frac{ms_E}{r}$	12.5	La C	
awij	aya	Uni	0.01245		-	∇
awij	aya	Uni S =	3	istin)	1.50	-
awij	aya	Uni 🔾 =	0,064412			y
awij	aya	Unit		11.200		- F.
awij	aya	LSR 1% $= (0)$).01 : df erro	r) x Sx	17	
awij	laya	Univ	Ball T		4.2	
awij	aya	5% of Duncan's Multiple	e Range Test	(DMRT) cri	tical table	
awij	aya	P 2	3	4	5	
awij	aya	SSR 5% 2.05	2 007	2 10	2 255	
awij	aya	LSP 5% 0 1000	3,097	5,19	3,255	/
awij	aya	LSK 5% 0,1900	0,1994	0,2054	0,2096	
awij	aya	Universitas	. Danas Tast		4:1 4-h1-	
awii	aya	1% of Duncan's Multiple	e Range Test	(DMRT) cri		awi
awii	ava	Universitate		2		Braw
awii	ava	SSR 1%		4,024	universitas	Brawi
awii	iava	LSR 1%	Universita	0,2591933	62	Brawi
awii	iava	Universitas Brawijaya	Universita	s Brawijava	Universitas	Brawi
awii	ava	Ozonated Milk Notation	Universita	s Brawijava	Universitas	Brawi
awij	ava	Unive Treatments	Average	s Brawijava	Notation Sites	Brawi
🛃 awij	aya	Universita DBrawijaya	$0.2.77 \pm 0.1$	b lBrawijaya	Uaiversitas	Brawi
awij	aya	Universita Brawijaya	$0.2.64 \pm 0.0$	06Brawijaya	Uaiversitas	Brawi
awij	aya	Universita T2Brawijaya	$0.2.63 \pm 0.0$	09Brawijaya	Uaiversitas	Brawi
둥 awij	aya	UniversitaT3Brawijaya	2.63 ± 0.1	12Brawijaya	Uaiversitas	Brawi
🛃 awij	aya	Universitar4Brawijaya	0.000 ± 0.000	08Brawijaya	Universitas	Brawi
2 🔁 awij	iaya	Universitas Brawijaya	Universita	s Brawijaya	Universitas	Brawi
z 🕰 awij	iaya	Universitas Brawijaya	Universita	s Brawijaya	Universitas	Brawi
awij	iaya	Universitas Brawijaya	Universita	s Brawijaya	Universitas	Brawi
awij	iaya	Universitas Brawijaya	Universita	s Brawijaya	Universitas	Brawi
awij	aya	Universitas Brawijaya	Universita	s Brawijaya	Universitas	Brawi
awii	ava	Ilniversitas Brawijava	Ilniv ² reita	s Rrawijava	Universitas	Rrawi

awijaya **Universitas Brawin** Universitas Dowijaya Universitas Brawijaya Unive

s Brawijaya

awijaya	Fresh Milk Notation	ANS	Dr	awijaya
awijaya	Treatments	Average	Notation	ijaya
awijaya	T0	2.66 ± 0.19	c /	
awijaya	Univer T1	2.57 ± 0.10	bc	
awijaya	Uni T2	2.47 ± 0.12	abc	0
awijaya	Unit T3	2.39 ± 0.10	ab	1
awijaya	Uni T4	2.29 ± 0.12	a	
awijaya	Unit			
awijaya	T0 Notation			
awijaya	Univer Milk	Average	Notation	
awijaya	Unive	2.66 ± 0.19		
awijaya	Univer	2.00 ± 0.17	a line	/
awijaya	Ozonated	2.77 ± 0.11	a	
awijaya	Universit		L L	a
awijaya	T1 Notation			aya
awijaya	Milk	Average	Notation	ijaya
awijaya	Universitas Br.	Tiverage	Ttotation	awijaya
awijaya	Fresh Universitas Bravin	2.57 ± 0.10	a	Brawijaya
awijaya	Unive Ozonated wijaya	2.64 ± 0.06	anya uanversitas	s Brawijaya
awijaya	Universitas Brawijaya	Universitas Brav	vijaya Universitas	s Brawijaya
awijaya	Universitas Brawijaya	Universitas Brav	vijaya Universitas	s Brawijaya
awijaya	12 Notation	Universitas Brav	vijaya Universitas	s Brawijaya
awijaya	Universital Brawijaya	Average	Notation Sitas	s Brawijaya
awijaya	UniversiFreshrawijaya	$0.2.47\pm0.12$ Brav	wijaya U a iversitas	s Brawijaya
awijaya	Universitas Brawijaya	Universitas Brav	vijaya Universitas	s Brawijaya
awijaya	Unive Ozonated wijaya	02.63 ± 0.09 Brav	vijaya U a iversitas	s Brawijaya
awijaya	Universitas Brawijaya	Universitas Brav	wijaya Universitas	s Brawijaya
awijaya	Universitas Brawijaya	Universitas Brav	vijaya Universitas	s Brawijaya
awijaya	Universitas Brawijaya	Universitas Brav	vijaya Universitas	s Brawijaya
awijaya	Universitas Brawijaya	Universitas Brav	vijaya Universitas	s Brawijaya
awijaya	Universitas Brawijaya	Universitas Brav	vijaya Universitas	s Brawijaya
awijaya	Universitas Brawijaya	Universitas Brav	vijaya Universitas	Brawijaya
awijaya	Universitas Brawijaya	Universitas Brav	vijaya Universitas	Brawijaya
awijava	Universitas Brawijava	Ilniv53reitae Rrav	vilava Universitas	Rrawijava

awijaya awijaya



awijaya awijaya awijaya Universitas Brawijaya Universitas awijaya awijaya

Universitas Brawijaya Universitas Devijaya Universitas Brawijaya

Brawijaya

awijaya	T3 Notation	ZAS D	-
awijaya	Milk	Average	Notation
awijaya	Univer Fresh	2.39 ± 0.10	sa V
awijaya	Univ	15 A A 5	En c
wijaya	Uni Ozonated	2.63 ± 0.12	a
wijaya	Uni	Shi Berton	1.50
wijaya	T4 Notation		
awijaya	United Milk	Average	Notation
awijaya	Univ	2.20 0.12	
awijaya	University	2.29 ± 0.12	a
awijaya	Unive Ozonated	2.61 ± 0.08	h
awijaya	Univer	2.01 ± 0.00	<u></u>
awijaya	Univers		The second
awijaya	Universit		
wijaya	Universita		11
awijaya	Universitas		
awijaya	Universitas B		
wijaya	Universitas Bra		
awijaya	Universitas Braw,		
iwijaya	Universitas Brawijaya	Universites	a universitas
awijaya	Universitas Brawijaya	Universitas Brawija	a Universita
awijaya	Universitas Brawijaya	Universitas Brawija	a Universita
awijaya	Universitas Brawijaya	Universitas Brawija	a Universita
awijaya	Universitas Brawijaya	Universitas Brawija	a Universita
awijaya	Universitas Brawijaya	Universitas Brawija	a Universita
awijaya	Universitas Brawijaya	Universitas Brawija	a Universita
awijaya	Universitas Brawijaya	Universitas Brawija	/a Universitas
awijaya	Universitas Brawijaya	Universitas Brawija	a Universitas
awijaya	Universitas Brawijaya	Universitas Brawija	a Universitas
awijaya	Universitas Brawijaya	Universitas Brawija	a Universita
awijaya	Universitas Brawijaya	Universitas Brawija	a Universita
awijaya	Universitas Brawijaya	Universitas Brawija	a Universita
awijaya	Universitas Brawijaya	Universitas Brawija	a Universita
awijaya	Universitas Brawijava	Universitas Brawija	a Universitas

awij

Universitas Rrawijava Universitas Rrawijava Universitas Rrawijava

Universitas Par Univ

Appendix 10. Research documentation

awijava awijaya awijaya

awijaya awijaya

awijaya

awijaya awijaya awijaya



awijaya awijava awijaya awijaya



Milk pH assessment



Formol titration process rawilava Formol titration results



Formol titration process Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Ilniu55reitae Rrawijava Universitae Rrawijava

ersitas Brawijaya ersitas Brawijaya ersitas Brawijaya

Jniversitas Brawijaya

awijaya awijaya

Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawij Universitas Bravij Universitas Bravij Universitas Universit Universitas Universitas

Petrie dishes after 24 hours incubation

Universita

aya Uni aya Uni



iava Univers

Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya Universitas Brawijaya

VIJA



Inoculant planting process in LAF



UniverSitas Brawijaya Universitas Brawijaya

a yaya yaya wijaya awijaya awijaya s Brawijaya s Brawijaya s Brawijaya s Brawijaya s Brawijaya