UNIVERSITI MALAYSIA KELANTAN

INVESTIGATION OF FLUID CHARACTERISTIC OF CHICKEN BLOOD

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A proposal submitted in fulfillment of the requirements for the degree of Bachelor of Applied Science (Husbandry Science) with Honours

Faculty of Agro Based Industry

UNIVERSITI MALAYSIA KELANTAN

2018

DECLARATION

I hereby declare that the work embodied in this report is the result of the original research and has not been submitted for a higher degree to any universities or institutions.

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Student

Name: Loi Kuan Wai

Date:10/1/2019

I certify that the report of this final year project entitled "Investigation Fluid Characteristic of Chicken Blood" by Loi Kuan Wai, matric number F15A0073 has been examined and all the correction recommended by examiners have been done for the degree of Bachelor of Applied Science (Husbandry Science) with Honours, Faculty of Agro-Based Industry, Universiti Malaysia Kelantan.

Approved by:

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Supervisor

Name:

Date:

ACKNOWLEDGEMENT

I would like to express my heartfelt gratitude to Prof. Madya Dr. Lukman Bin Ismail for the guidance and providing me valuable advices and scientific knowledge since the framing of my study.

Secondly, I would like to express my sincere gratitude to the lab assistant, En. Shamsul for teaching me using the viscometer and helping me during my labwork.

I also thank to the shop that providing me broiler and some information of his slaughter houses for the study.

And finally I thank my parents for helping me to complete the project despite many personal difficulties either in financial support and material support.

INVESTIGATION OF FLUID CHARACTERISTIC OF CHICKEN BLOOD

ABSTRACT

Blood is always a medium for the growth of microorganism. Blood agar is an example that microorganism can grow on it. Enriched agar is providing more nutrients for the microbes to grow faster and to be used in lab for observing hemolytic pathogen. Therefore, slaughter houses in that should pay attention to the cleanliness of the slaughter houses as which is a source of blood. If the cleanliness is not being taken care, contamination food will cause certain disease to the public. This study focused on the cleaning of the chicken blood, collect chicken blood from live chicken, relate the effect of temperature with the viscosity of the chicken blood. Viscosity is tested by using vibration viscometer. The constraint of the chicken for taking blood is required. Correlation *r*, will be calculated and $P<0.05$ will be the significance level. The result of this study is that temperature is negatively significant correlated with the viscosity of chicken blood and the average time for completely collect the chicken blood is 28.7 minutes. Chicken blood is easy to be cleaned when the blood is coagulated in water or in liquid form, but difficult to be cleaned when the blood coagulated and stick on the surface of container. In conclusion, the cleaning of the blood should be done before the blood coagulated and the temperature is significant correlated with viscosity chicken blood.

Keywords: *chicken blood, cleanliness, slaughter houses, viscosity, temperature*

PENYIASATAN TERHADAP CIRI-CIRI DARAH AYAM

ABSTRAK

Darah adalah satu sumber untuk pertumbuhan microorganisma. Darah agar adalah satu contoh untuk microorganism bertumbuh dalam darah. Agar yang telah ditambah nutrient adalah untuk mempercapatkan pertumbuhan hemolitic microorganisma. Oleh itu, rumah penyebelihan perlu manjagakan kebersihan tempat sebab rumah penyebelihan adalah sumber datang darah.Kebersihan tidak dijaga akan menyebabkan makanan dicemar oleh microorganism dan boleh menyebabkan penyebaran penyakit. Penyelidikan ini, mengutamakan dalam pembersihan darah ayam, pengumpulan darah ayam daripada ayam yang hidup, menghubungkaitkan suhu dengan viscosity darah ayam.Viscosity diujikan dengan pengunaan viscometer getaran. Kekangan ayam adalah diperlukan semasa mengumpul darah ayam.Correlation *r*, akan dikira dan $P<0.05$ akan dijadikan sebagai level significance. Hasilnya, suhu mempunyai kaitan penting dengan viscosity darah ayam dan masa purate untuk mengumpul darah ayam sepenuhnya adalah 28.7 minits.Darah ayam senang untuk dibersihkan apabila pemeluwapan dengan air dan dalam cecair,tetapi susah untuk dibersihkan apabila melekit pada sesuatu dan jadi kering. Kesimpulanya, pembersihan darah ayam patut dijalankan sebelum darah ayam menjadi kering dan suhu adalah berhubungkait dengan viscositi darah ayam.

Kata Kunci: *darah ayam, pembersihan, rumah penyebelihan, viscositi, suhu*

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CHAPTER 1

INTRODUCTION

Fluid characteristic of chicken blood is different under different environmental condition like temperature. The time taken for the coagulation of chicken blood is affected by temperature. Coagulation of chicken blood fasten when the temperature is low. Coagulated blood possible on growing of pathogen and can be difficult to remove. The viscosity is tested in certain range of temperature and related to the cleaning of the blood. Cleanliness of slaughter houses always not being well managed because the owner does not have the awareness about the important of cleanliness. Growth of microorganism may harmful to the consumer who buy the chicken.

This is a research that shows that chicken blood is capable for growing microorganism. Chicken blood is a medium for bacterial growth from the using of blood agar as the medium for the isolation of microorganism in lab. For example, Blood agar is an enriched medium for bacterial growth as blood have the characteristic for bacteria growth. From the research Effect of Blood Agar from Different Animal Blood on Growth Rates and Morphology of Common Pathogenic Bacteria that had been done by researchers Egwuatu et al in 2014, the chicken blood used in that research to make blood agar and it proved that chicken blood agar achieved good growth of the isolated microorganism. Other than that, Based on Kelly Boles(2010), the blood agar, is used to identify fastidious pathogenic bacteria studying the hemolytic reactions caused. However, the awareness of the cleanliness in the slaughter houses are not been given too much attention.

1.2 Objectives and limitation of study

The objectives were:

- To fully collect the blood from the chicken.
- To determine the viscosity of chicken blood
- To relate effect of temperature to viscosity of chicken blood.
- To determine which state of chicken blood is easier to be cleaned

Fully collect the chicken blood is a way contribute to the cleanliness by preventing the blood spilled everywhere during slaughter. The coagulation of the blood providing a better cleaning or uncoagulated blood is better to be cleaned are tested in this study. Other than that, the time towards the coagulation of the blood has been recorded.

The limitation of study in this study is that the uncontrolled environmental temperature. The temperature when slaughtering chicken is different when raining days and hot day. The environmental temperature affected the state of chicken blood during the blood collecting process. The state of the chicken blood therefore affect the testing process for viscosity. When the blood coagulated before testing process, when u test the coagulated blood under viscometer, the value obtained from the vibration viscometer is vary.

1.3 Hypothesis

Null Hypothesis(H_0)= There is no statistically significance relationship between the temperature and the viscosity of chicken blood.

Alternate Hypothesis(H_1)= There is statistically significance relationship between the temperature and the viscosity of chicken blood

CHAPTER 2

LITERATURE REVIEW

2.1 Slaughter houses/abattoirs

Slaughter houses/abattoirs are the place that contribute to large amount of blood as the place is for the slaughtering process and that place is where our food first processed. As it related to the food for the consumer, the cleanliness of the place is extremely important. Dirtiness of slaughter houses may lead to infectious disease being brought to the consumer as the food are contaminated. Guergueb, N & Alloui, Nadir & Ammar, Ayachi & Bennoune, Omar.(2014) showed the prevalence of infection by *Salmonella* and *Staphylococcus aureus* at 6 slaughter houses was 50% and 46.66% respectively. The application of good hygiene practices in the slaughter houses are absolute necessary. There is good hygiene practices published by FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATION [FAO],1978. It included site of building for slaughtering and processing, size, buildings and facilities, equipment, climate condition, FAO The Food and Agriculture Organization (FAO) is specialized agency of the United Nations that leads international efforts to defeat hunger.Their goal is to achieve food security for all and make sure that people have regular access to enough high-quality food to lead active, healthy lives. With over 194 member states, FAO works in over 130 countries worldwide. We believe that everyone can play a part in ending hunger.

2.1.1 Site of building for slaughtering and processing

The slaughterhouse should be situated away from residential areas. Access for animals either by road, rail and or stock route - must be assured. The slaughterhouse should be located in areas where flooding is impossible. An abundant supply of portable water as well as adequate facilities for treatment and disposal is important. The land acquired for the proposed slaughterhouse should be sufficient to permit future expansion as overcrowding of facilities may give sanitation problems.

There should be a reasonable relationship between the size of slaughter facilities and the number of animals to be killed. Sufficient space is required to dig pits for condemned animals, compost stacks, lavatories etc., and for disposal of liquid and solid waste.

Buildings and facilities should be so constructed that clean and unclean processes and products do not mix. The floor must be smooth and impervious, sloping sufficiently towards a drain thus allowing cleaning with water. Materials for the walls must which can be cleaned by water. Roofing is recommended to protect and allow the slaughter process to be independent of the weather, and to provide shade and keep down the internal temperature.

Climatic conditions will influence hygiene and processing. Different precautions should be taken depending on the climate in the area. In a tropical climate it will often be necessary to start slaughtering during the night hours before sunrise and distribute the meat for sale in the morning hours. Slaughterhouses/slaughter facilities in these areas may be very weather-dependent like outdoor temperature, rainy, dry periods, water supplies and etc. The floor and wall surfaces in this kind of slaughterhouses will in dry periods be allowed to dry completely thus assuring that no microorganisms will multiply. If water supplies are insufficient, for example like in dry periods, surfaces should be scraped clean and then sun-dried if possible. This procedure will presumably give the same or even better hygienic results than a cleaning process with insufficient amounts of water.

2.2 Condition of the slaughter houses in Malaysia

In Malaysia, only one in five poultry abattoirs licensed (Agriculture and Agro-based industry, 2014). Nearly 80% of 2000 poultry slaughter houses in Malaysia are not licensed and registered with the Veterinary Services Department (MalayMail, 2014). When the slaughter houses are not licensed and registered, they do not receive any hygiene and sanitation courses, therefore they do not know how to take care of the hygiene of the slaughter houses. A lot slaughter house does not meet the requirement for the standard cleanliness condition.

The pictures below shows the condition of the stalls and slaughtering process.

Figure 2.1: Slaughtering process of the stall

Figure 2.2: Slaughtering process and cutting of stall

The working environment are not meet the hygienic requirement. Figure 2.1 shows that chicken blood stick on the iron plate and it is dried, this means the blood have been leave there for few hours. From the Figure 2.2, the floor that are not cleaned and may contaminated the chicken.

2.3 Chicken Blood

Didisheim et al (1959) and Soulier et al. (1959) reported Lee-White clotting times of chicken blood varying from 9 to 16 min. However, Delezenne (1897) and Howell (1909) earlier had reported much longer times. More recent work by Bigland and Triantaphyllopoulos (1960) confirmed the longer clotting times, recording a mean time of 69 min. at 42 °C. for 37 laying hens.

Blood clotting of poultry is vitamin K dependent, but is probably minor importance. Haemorrhages are caused mainly by mechanical forces, but the physiological status of the bird is the determining factor. The presence of blood in slaughtered broilers is practically always a multifactorial problem (Kan, C.A. (Kees. (1993).

The determination of blood volume in living birds is quite a complicated procedure. The volume certainly depends on weight or age of the bird, but probably also on the method used to determine the volume. The flow of any liquid from a tube is mainly determined by the diameter of the tub, surface tension and viscosity and blood clotting.

CHAPTER 3

METHODOLOGY

3.1 Apparatus

The apparatus used were knives, vibration viscometer, a plastic container, plastic rope, mechanical weighing scale 50kg,

3.2 Sample and Sample size

The samples for this study were purchased from the shop that sell processed chicken and live chicken. The samples were aged about 6-7 weeks. The samples were weighed before slaughter. A total of 15 broilers are used in this study.

3.3 Blood collection

The chicken was tie with plastic rope to prevent it from moving around and to prevent the broiler to spread their wings that will cause the bloods spilled around. Other than tie, holding still is required for collecting the blood because the struggle will also causing the blood spill around. After tie the chicken up, put the throat on to a container, and the gravity will lead to faster bleeding. It shows the way to tie the chicken in Picture 1.

Figure 3.1: Constraint of the movement of the broiler

3.4 Blood Testing

The blood collected was weighted on a weighing machine. The physical state of the blood was observed and recorded. Afterwards, the blood samples were tested for the viscosity under the viscometer. The viscometer used is as picture below.

Figure 3.2: Vibration Viscometer Used for testing viscosity

Blood Cleaning

The blood after tested for viscosity will be washed away by running water. However, the blood coagulated after certain of time, some coagulated blood was easy to be cleaned but some of the coagulated was difficult to be cleaned.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Mechanism to collect chicken blood

Figure 4.1 shows the blood collected after certain of time and it is coagulated.

Figure 4.1: Blood collected from slaughtered chicken (coagulated)

After collection of the blood, the uncoagulated samples will be used for testing viscosity. Coagulated blood as shown in Figure 4.1 cannot be tested on the vibration viscometer.

The time taken for fully collecting blood is recorded as in Table 4.1

Table 4.1.1: Time usage for collected the blood

Sample	Time usage(Minutes)
1	30
2	28
3	30
4	28
5	26
6	27
7	28
8	25
9	27
10	31
11	33
12	35
13	28
14	27
15	28
Average	28.7

The average time for collection the blood is 28.7 minutes, and Table 4.1 shows that the time is vary and it is because of different weight of chicken has different amount of blood. However, cutting the vein in the right position will be faster at the blood will flow out faster. If the cutting of the vein is small and narrow, the blood flowing out will be slower. Other than that, stunning with different electric voltage before slaughtering significantly affects the rate of bleed out in broiler (Abdalla Ali, Moira Ann Lawson, Anne-Helene Tauson, J. Fris Jensen and André Chwalibog, 2007). The research that they did showed that moderate stunning (53-63 Voltage AC) is more effective in bleed out and resulted in better carcass quality which obtained grade A.

Table 4.1.2: Data of the collected Chichen Blood

Sample	weight of container(g)	weight of chicken(g)	weight of blood and container(g)	Weight of blood(g)	Percentage (%)
1	90g	2500	160	70	2.80
2	90g	2350	142	52	2.21
3	90g	2500	161	71	2.84
4	90g	2400	145	55	2.29
5	90g	2300	139	49	2.13
6	90g	2300	140	50	2.17
7	90g	2400	143	53	2.21
8	90g	2200	145	45	2.05
9	90g	2300	149	49	2.13
10	90g	2500	159	69	2.76
11	90g	2600	165	75	2.88
12	90g	2700	170	80	2.98
13	90g	2400	145	55	2.29
14	90g	2300	140	50	2.17
15	90g	2400	142	52	2.16

From the Table 4.1.2, it shows that, the higher the weight, the percentage of the blood is higher. If possible, weight of the chicken using a digital weight machine will get a more accurate result rather than using mechanical weight. In this experiment, I used mechanical weight because the chicken struggling and could spoil the digital weight.

4.2 Viscocity

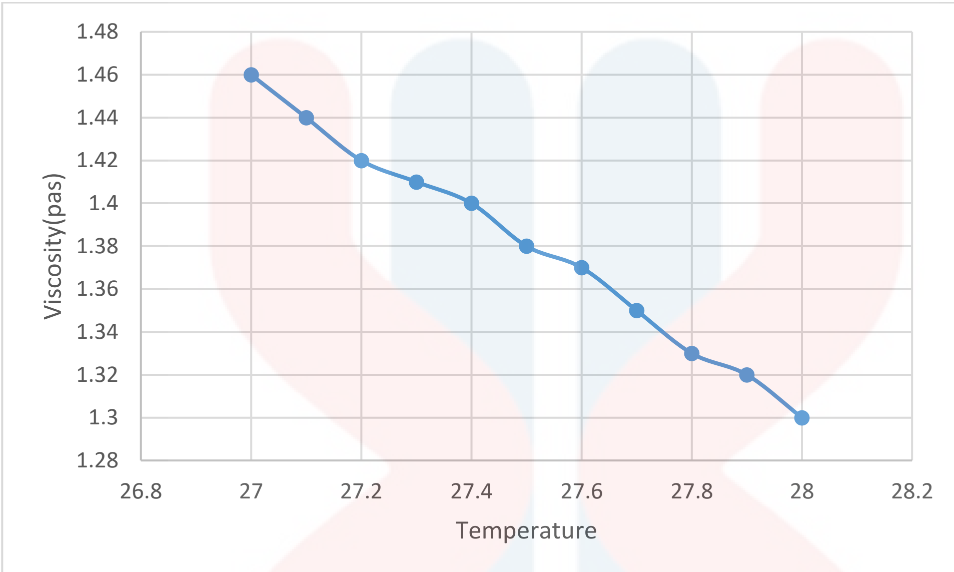
The viscosity of the chicken blood tested under vibration viscometer with the temperature range 27.0˚C to 28.0˚C are recorded in Table 4.2.1.

The initial value are different is because of few factors. The amount of water fed to the chicken will affect the viscosity of the blood, however, the water fed to the chicken could not be controlled by the seller. Secondly is the amount of blood of the chicken. Blood in the chicken different because of weight, and age. The higher the chicken weight, the more blood the chicken has. Therefore, the amount of blood will have effects on the viscosity.

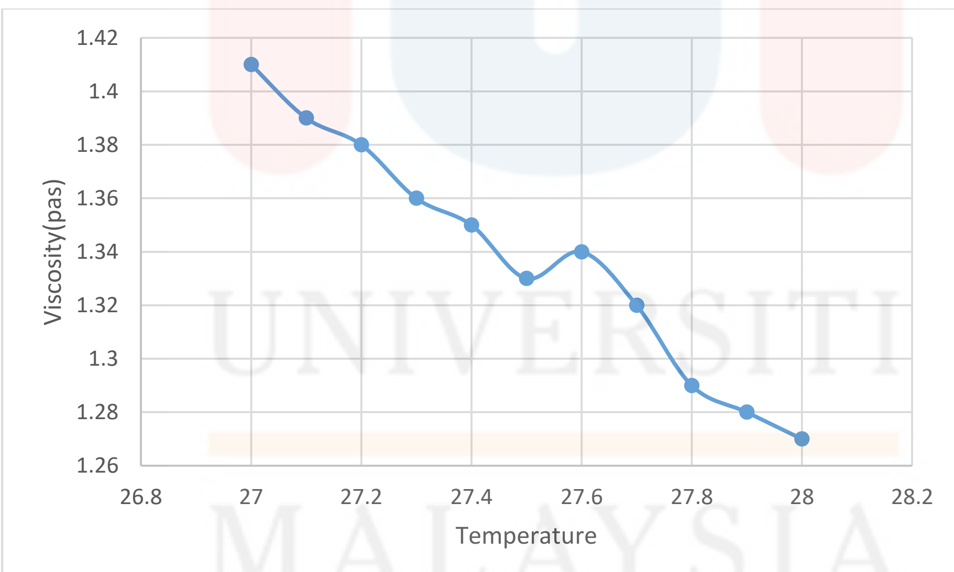
Table 4.2.1: Viscosity Measurement of Sample 1 to 15

Sample	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Temperature °C															
28.0	1.30	1.27	1.29	1.30	1.28	1.26	1.28	1.28	1.31	1.31	1.29	1.29	1.31	1.33	1.32
27.9	1.32	1.28	1.31	1.31	1.30	1.28	1.30	1.29	1.33	1.33	1.31	1.31	1.33	1.35	1.35
27.8	1.33	1.29	1.33	1.32	1.32	1.27	1.31	1.30	1.35	1.35	1.33	1.33	1.35	1.37	1.36
27.7	1.35	1.32	1.35	1.34	1.33	1.29	1.32	1.32	1.37	1.37	1.35	1.34	1.37	1.39	1.37
27.6	1.37	1.34	1.36	1.35	1.34	1.31	1.34	1.34	1.39	1.39	1.36	1.35	1.39	1.42	1.39
27.5	1.38	1.33	1.37	1.37	1.36	1.33	1.35	1.36	1.41	1.41	1.37	1.37	1.40	1.44	1.41
27.4	1.40	1.35	1.38	1.38	1.37	1.35	1.36	1.37	1.42	1.42	1.39	1.39	1.41	1.45	1.42
27.3	1.41	1.36	1.39	1.40	1.39	1.36	1.37	1.39	1.43	1.43	1.40	1.41	1.42	1.46	1.43
27.2	1.42	1.38	1.42	1.42	1.41	1.37	1.38	1.40	1.45	1.45	1.4	1.43	1.43	1.48	1.44
27.1	1.44	1.39	1.43	1.44	1.42	1.38	1.40	1.42	1.46	1.46	1.44	1.44	1.45	1.50	1.45
27.0	**1.46**	**1.41**	**1.45**	**1.46**	**1.43**	**1.39**	**1.42**	**1.44**	**1.47**	**1.47**	**1.46**	**1.45**	**1.46**	**1.51**	**1.47**

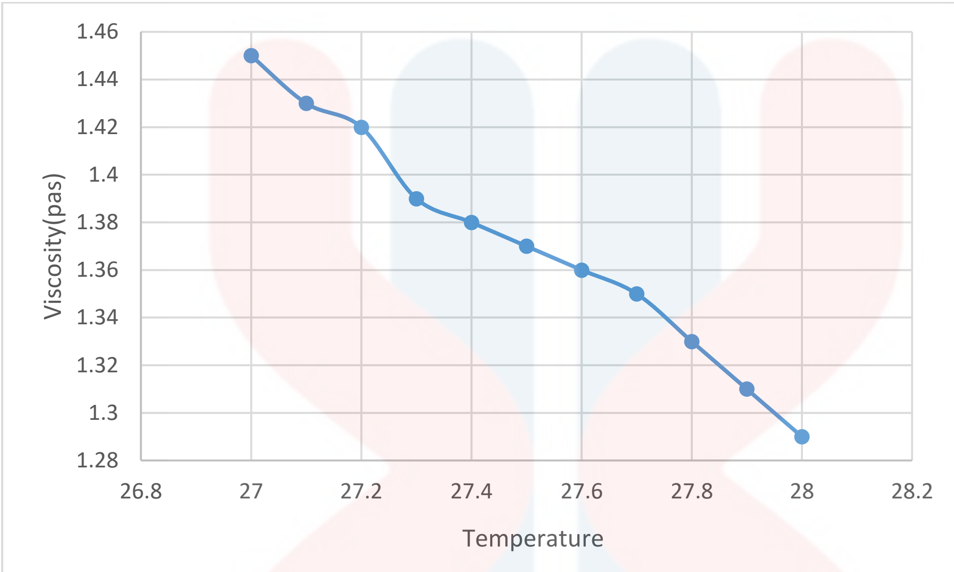
Graph 4.2.1: Graph of the viscosity with temperature of Sample 1



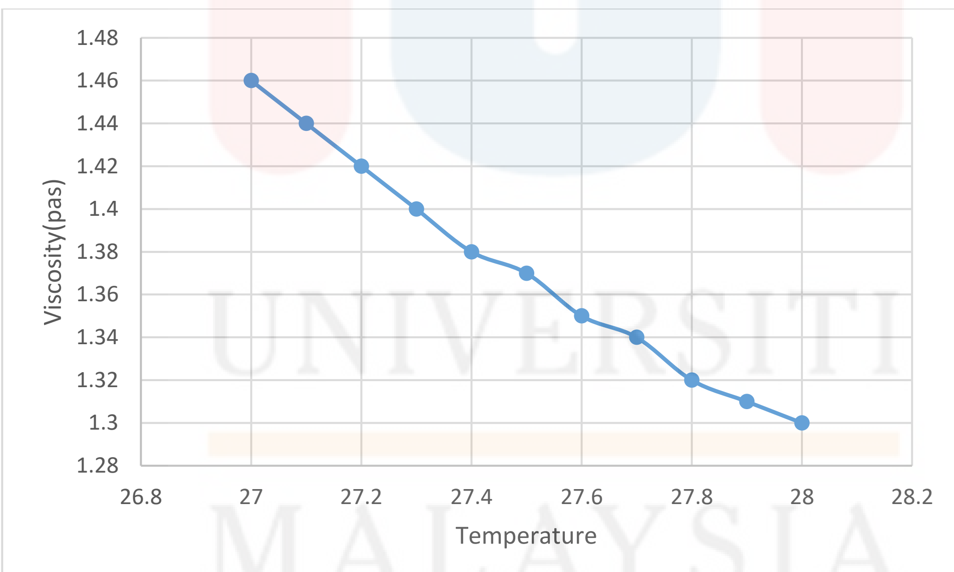
Graph 4.2.2: Graph of the viscosity with temperature of Sample 2



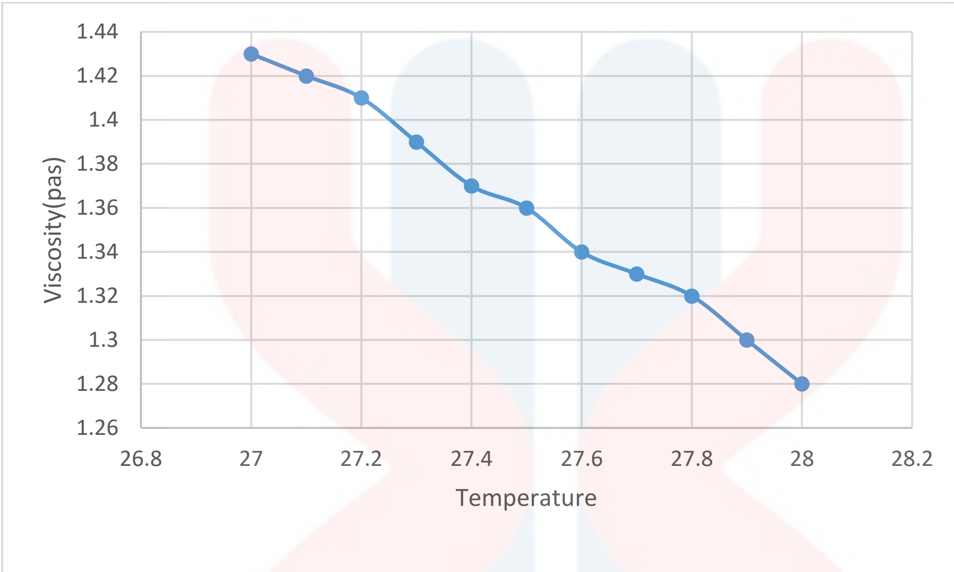
Graph 4.2.3: Graph of the viscosity with temperature of Sample 3



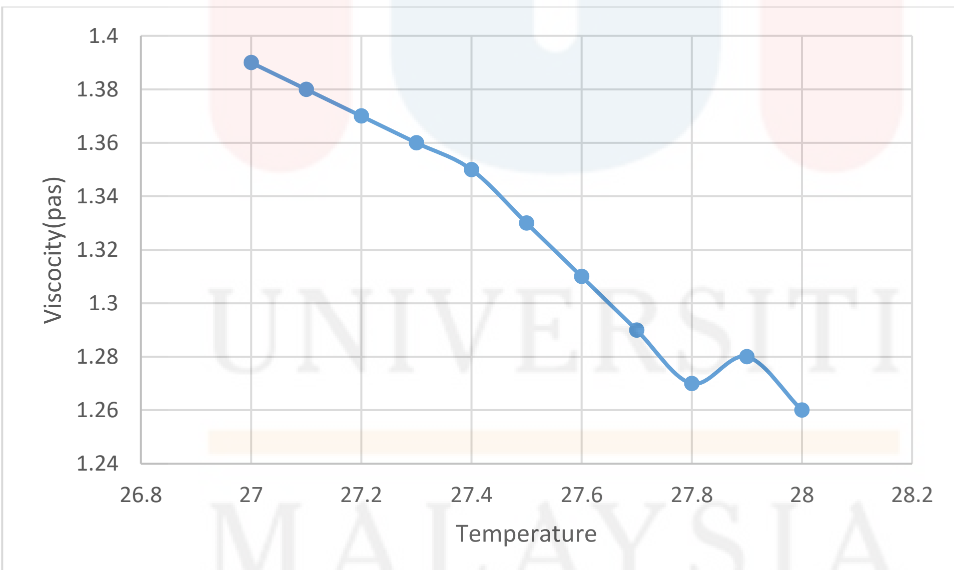
Graph 4.2.4: Graph of the viscosity with temperature of Sample 4



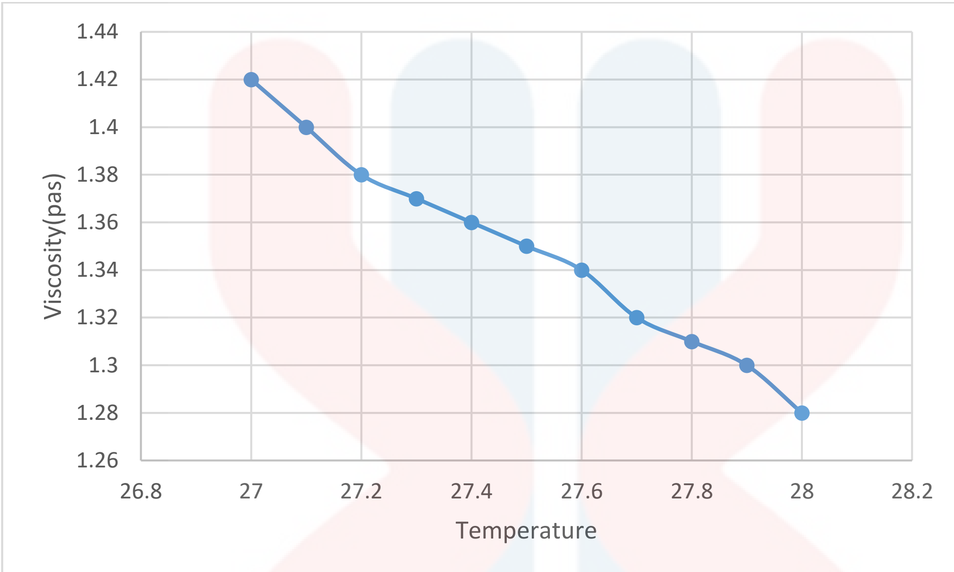
Graph 4.2.5: Graph of the viscosity with temperature of Sample 5



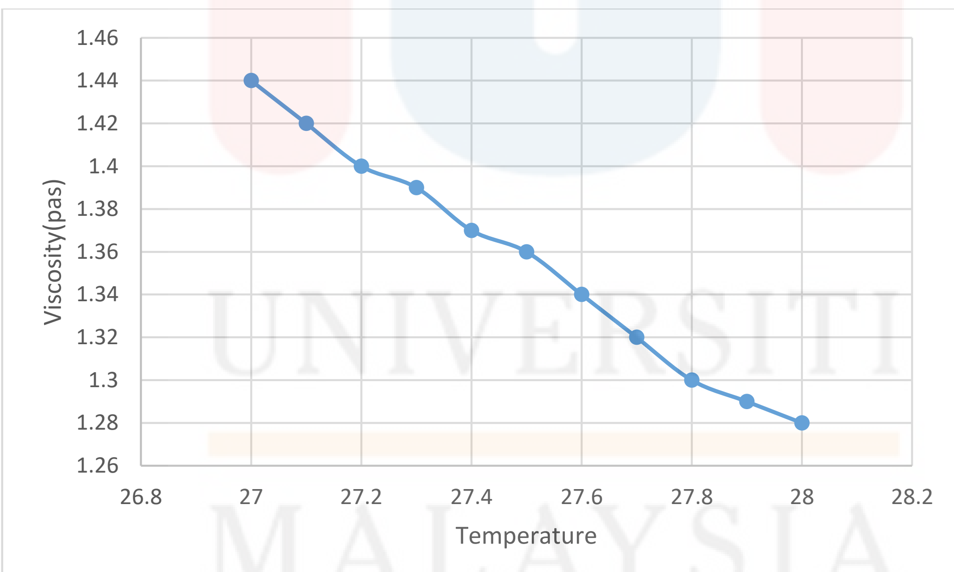
Graph 4.2.6: Graph of the viscosity with temperature of Sample 6



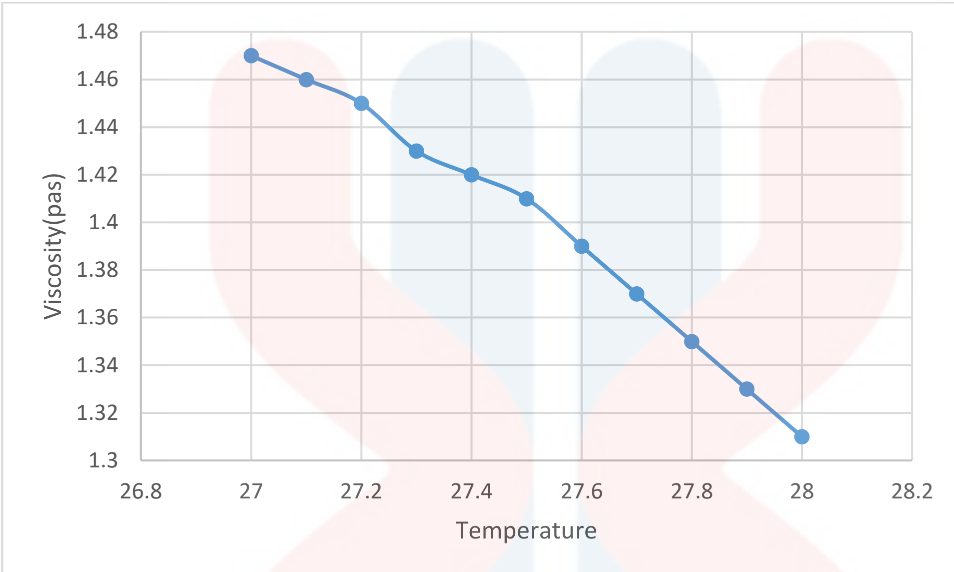
Graph 4.2.7: Graph of the viscosity with temperature of Sample 7



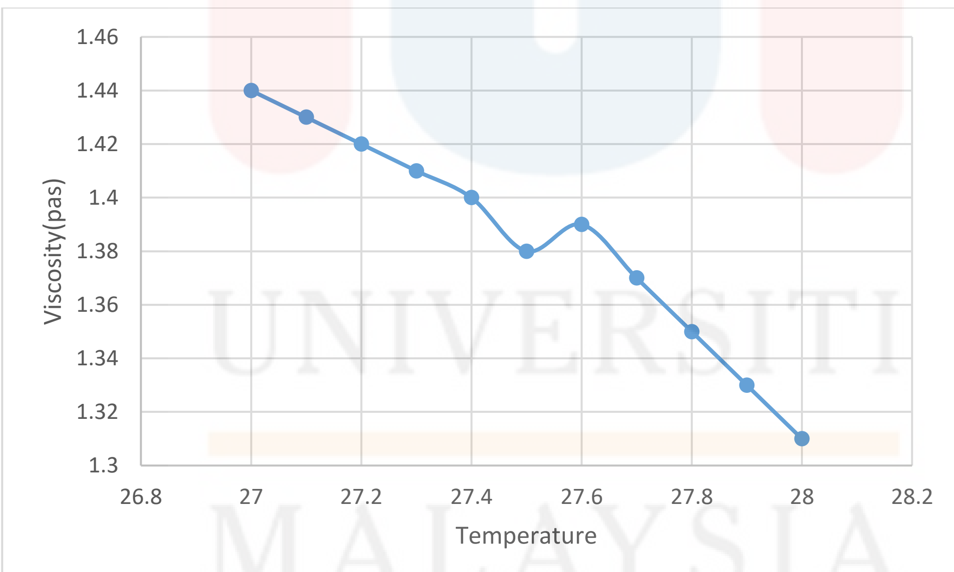
Graph 4.2.8: Graph of the viscosity with temperature of Sample 8



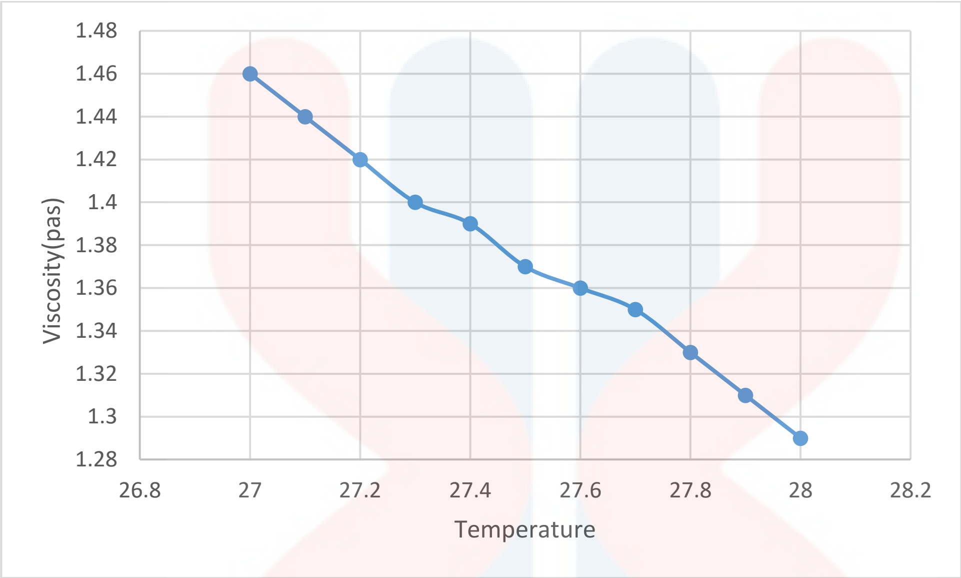
Graph 4.2.9: Graph of the viscosity with temperature of Sample 9



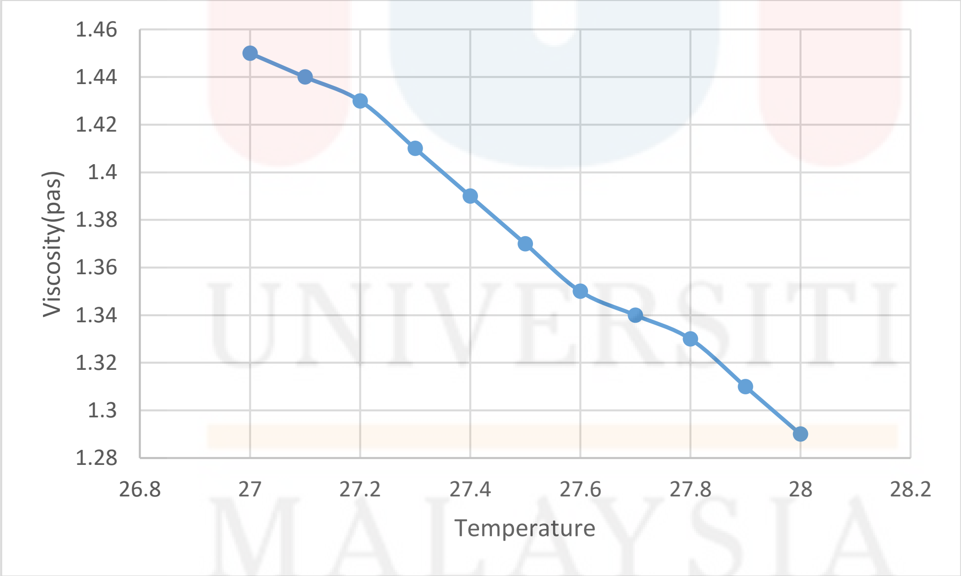
Graph 4.2.10: Graph of the viscosity with temperature of Sample 10



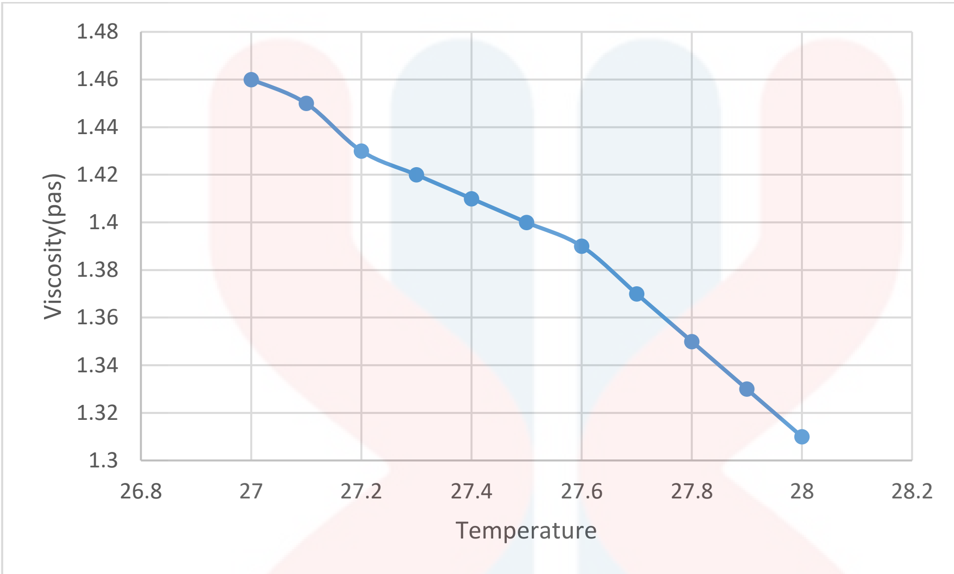
Graph 4.2.11: Graph of the viscosity with temperature of Sample 11



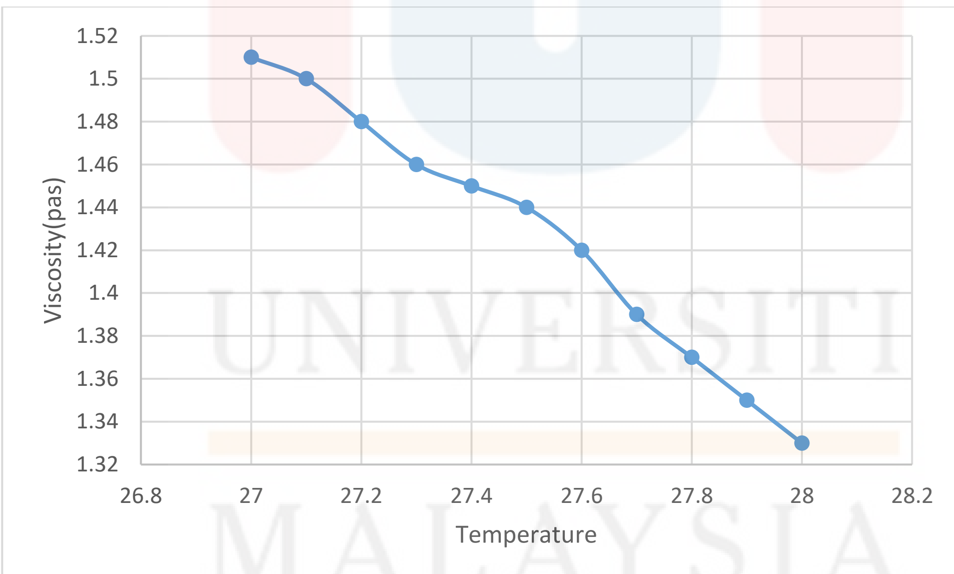
Graph 4.2.12: Graph of the viscosity with temperature of Sample 12



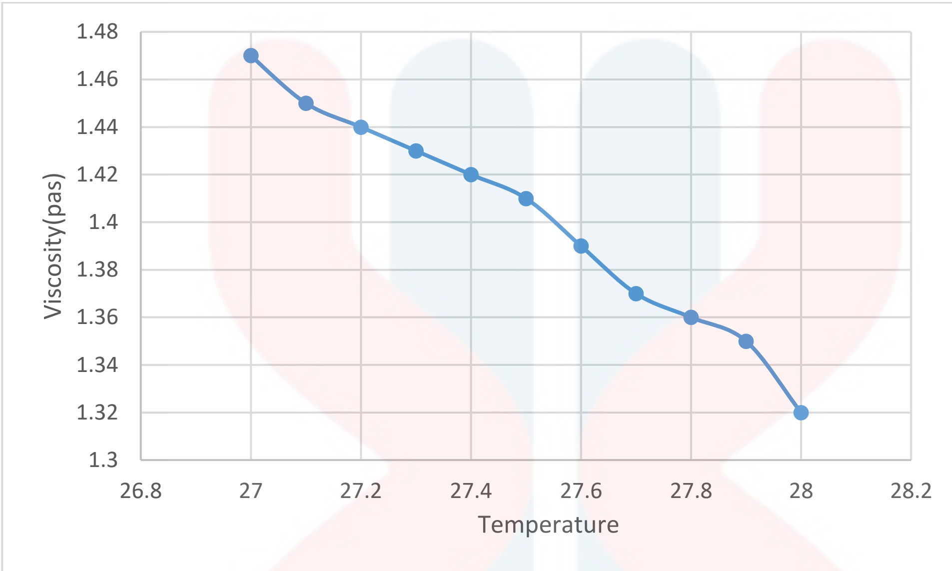
Graph 4.2.13: Graph of the viscosity with temperature of Sample 13



Graph 4.2.14: Graph of the viscosity with temperature of Sample 14



Graph 4.2.15: Graph of the viscosity with temperature of Sample 15



From the graphs and tables, there is one trend that can be seen, that is as the temperature goes lower, the viscosity is higher. This means that the blood become stickier when the temperature went low. When the temperature go further lower, the blood will start to coagulate.

4.3 Correlation *r* and p-value

Table 4.3.1 r value and p-value of Sample 1(Highlighted)

Regression Statistics	
Multiple R	0.997587
R Square	0.995179
Adjusted R Square	0.994643
Standard Error	0.003761
Observations	11

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.026273	0.026273	1857.857	9.72E-12
Residual	9	0.000127	1.41E-05		
Total	10	0.0264			

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	5.63	0.098608	57.09485	7.81E-13
x	-0.15455	0.003586	-43.1029	9.72E-12

In the table above, r value is 0.997587 while p-value is 9.72E-13. When p<0.05, it proves that the temperature is significantly related to the viscosity of chicken blood. However, from the Graph 4.2.1. it shows a negative correlation when the temperature decreased and the viscosity increased.

Table 4.3.2 r value and p-value of Sample 2(Highlighted)

Regression Statistics	
Multiple R	0.987783
R Square	0.975716
Adjusted R Square	0.973017
Standard Error	0.007521
Observations	11

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.020455	0.020455	361.6071	1.42E-08
Residual	9	0.000509	5.66E-05		
Total	10	0.020964			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	5.088182	0.197216	25.80009	9.52E-10	4.642049
x	-0.13636	0.007171	-19.016	1.42E-08	-0.15259

In the table above, r value is 0.987783 while p-value is 1.42E-08. When $p<0.05$, it proves that the temperature is significantly related to the viscosity of chicken blood. However, from the Graph 4.2.2. it shows a negative correlation when the temperature decreased and the viscosity increased.

Table 4.3.3 r value and p-value of Sample 3(Highlighted)

Regression Statistics	
Multiple R	0.993183
R Square	0.986413
Adjusted R Square	0.984903
Standard Error	0.006155
Observations	11

ANOVA

	df	SS	MS	F	Significance F
Regression	1	0.02475	0.02475	653.4	1.03E-09
Residual	9	0.000341	3.79E-05		
Total	10	0.025091			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%
Intercept	5.495909	0.161385	34.05465	8.01E-11	5.130831
x	-0.15	0.005868	-25.5617	1.03E-09	-0.16327

In the table above, r value is 0.993183 while p-value is 1.03E-09. When $p<0.05$, it proves that the temperature is significantly related to the viscosity of chicken blood. However, from the Graph 4.2.3. it shows a negative correlation when the temperature decreased and the viscosity increased.

Table 4.3.4 r value and p-value of Sample 4(Highlighted)

Regression Statistics	
Multiple R	0.995073
R Square	0.990171
Adjusted R Square	0.989079
Standard Error	0.005605
Observations	11

ANOVA

	df	*SS*	*MS*	*F*
Regression	1	0.028481	0.028481	906.627
Residual	9	0.000283	3.14E-05	
Total	10	0.028764		

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	5.796818	0.14697	39.44228	2.15E-11
x	-0.16091	0.005344	-30.1102	2.4E-10

In the table above, r value is 0.995073 while p-value is 2.4E-10. When $p<0.05$, it proves that the temperature is significantly related to the viscosity of chicken blood. However, from the Graph 4.2.3. it shows a negative correlation when the temperature decreased and the viscosity increased.

Table 4.3.5 r value and p-value of Sample 5(Highlighted)

Regression Statistics	
Multiple R	0.997165
R Square	0.994339
Adjusted R Square	0.99371
Standard Error	0.003957
Observations	11

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.02475	0.02475	1580.806	2E-11
Residual	9	0.000141	1.57E-05		
Total	10	0.024891			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	5.484091	0.103756	52.85564	1.56E-12	5.249378
x	-0.15	0.003773	-39.7594	2E-11	-0.15853

In the table above, r value is 0.997165 while p-value is 2E-11. When $p<0.05$, it proves that the temperature is significantly related to the viscosity of chicken blood. However, from the Graph 4.2.5. it shows a negative correlation when the temperature decreased and the viscosity increased.

Table 4.3.6 r value and p-value of Sample 6(Highlighted)

Regression Statistics	
Multiple R	0.986789
R Square	0.973752
Adjusted R Square	0.970836
Standard Error	0.007984
Observations	11

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.021281	0.021281	333.8843	2.01E-08
Residual	9	0.000574	6.37E-05		
Total	10	0.021855			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	5.151364	0.209345	24.60708	1.45E-09	4.677793
x	-0.13909	0.007612	-18.2725	2.01E-08	-0.15631

In the table above, r value is 0.986789 while p-value is 2.01E-09. When $p<0.05$, it proves that the temperature is significantly related to the viscosity of chicken blood. However, from the Graph 4.2.6. it shows a negative correlation when the temperature decreased and the viscosity increased.

Table 4.3.7 r value and p-value of Sample 7(Highlighted)

Regression Statistics	
Multiple R	0.995362
R Square	0.990746
Adjusted R Square	0.989718
Standard Error	0.004392
Observations	11

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.01859	0.01859	963.5654	1.83E-10
Residual	9	0.000174	1.93E-05		
Total	10	0.018764			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	4.923182	0.115177	42.74465	1.05E-11	4.662634
x	-0.13	0.004188	-31.0414	1.83E-10	-0.13947

In the table above, r value is 0.995362 while p-value is 1.83E-10. When $p<0.05$, it proves that the temperature is significantly related to the viscosity of chicken blood. However, from the Graph 4.2.7. it shows a negative correlation when the temperature decreased and the viscosity increased.

Table 4.3.8 r value and p-value of Sample 8(Highlighted)

Regression Statistics	
Multiple R	0.997528
R Square	0.995062
Adjusted R Square	0.994513
Standard Error	0.004008
Observations	11

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.029128	0.029128	1813.642	1.08E-11
Residual	9	0.000145	1.61E-05		
Total	10	0.029273			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	5.830455	0.105086	55.48255	1.01E-12	5.592733
x	-0.16273	0.003821	-42.5869	1.08E-11	-0.17137

In the table above, r value is 0.997528 while p-value is 1.08E-11. When $p<0.05$, it proves that the temperature is significantly related to the viscosity of chicken blood. However, from the Graph 4.2.8. it shows a negative correlation when the temperature decreased and the viscosity increased.

Table 4.3.9 r value and p-value of Sample 9(Highlighted)

Regression Statistics	
Multiple R	0.992879
R Square	0.985809
Adjusted R Square	0.984232
Standard Error	0.006749
Observations	11

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.028481	0.028481	625.1907	1.26E-09
Residual	9	0.00041	4.56E-05		
Total	10	0.028891			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	5.824091	0.176985	32.90731	1.09E-10	5.423724
x	-0.16091	0.006435	-25.0038	1.26E-09	-0.17547

In the table above, r value is 0.992879 while p-value is 1.26E-09. When $p<0.05$, it proves that the temperature is significantly related to the viscosity of chicken blood. However, from the Graph 4.2.9. it shows a negative correlation when the temperature decreased and the viscosity increased.

Table 4.3.10 r value and p-value of Sample 10(Highlighted)

Regression Statistics	
Multiple R	0.979393
R Square	0.959211
Adjusted R Square	0.954678
Standard Error	0.008848
Observations	11

ANOVA

	df	SS	MS	F	Significance F
Regression	1	0.016568	0.016568	211.6452	1.47E-07
Residual	9	0.000705	7.83E-05		
Total	10	0.017273			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%
Intercept	4.759545	0.232006	20.51479	7.26E-09	4.234713
x	-0.12273	0.008436	-14.548	1.47E-07	-0.14181

In the table above, r value is 0.979393 while p-value is 1.47E-09. When p<0.05, it proves that the temperature is significantly related to the viscosity of chicken blood. However, from the Graph 4.2.10. it shows a negative correlation when the temperature decreased and the viscosity increased.

Table 4.3.11 r value and p-value of Sample 11(Highlighted)

Regression Statistics	
Multiple R	0.996649
R Square	0.99331
Adjusted R Square	0.992567
Standard Error	0.004617
Observations	11

ANOVA

	df	SS	MS	F	Significance F
Regression	1	0.028481	0.028481	1336.308	4.25E-11
Residual	9	0.000192	2.13E-05		
Total	10	0.028673			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%
Intercept	5.799545	0.121057	47.90769	3.77E-12	5.525696
x	-0.16091	0.004402	-36.5555	4.25E-11	-0.17087

In the table above, r value is 0.996649 while p-value is 4.25E-11. When $p<0.05$, it proves that the temperature is significantly related to the viscosity of chicken blood. However, from the Graph 4.2.11. it shows a negative correlation when the temperature decreased and the viscosity increased.

Table 4.3.12 r value and p-value of Sample 12(Highlighted)

Regression Statistics	
Multiple R	0.996622
R Square	0.993256
Adjusted R Square	0.992506
Standard Error	0.004714
Observations	11

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.029455	0.029455	1325.455	4.41E-11
Residual	9	0.0002	2.22E-05		
Total	10	0.029655			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	5.873636	0.123611	47.51692	4.06E-12	5.594008
x	-0.16364	0.004495	-36.4068	4.41E-11	-0.1738

In the table above, r value is 0.996622 while p-value is 4.41E-11. When $p<0.05$, it proves that the temperature is significantly related to the viscosity of chicken blood. However, from the Graph 4.2.12. it shows a negative correlation when the temperature decreased and the viscosity increased.

Table 4.3.13 r value and p-value of Sample 13(Highlighted)

Regression Statistics	
Multiple R	0.990659
R Square	0.981405
Adjusted R Square	0.979339
Standard Error	0.006956
Observations	11

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.022983	0.022983	475.0084	4.25E-09
Residual	9	0.000435	4.84E-05		
Total	10	0.023418			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	5.367727	0.182396	29.42898	2.95E-10	4.955119
x	-0.14455	0.006632	-21.7947	4.25E-09	-0.15955

In the table above, r value is 0.990659 while p-value is 4.25E-09. When $p<0.05$, it proves that the temperature is significantly related to the viscosity of chicken blood. However, from the Graph 4.2.13. it shows a negative correlation when the temperature decreased and the viscosity increased.

Table 4.3.14 r value and p-value of Sample 14(Highlighted)

Regression Statistics	
Multiple R	0.993808
R Square	0.987654
Adjusted R Square	0.986283
Standard Error	0.007107
Observations	11

ANOVA

	df	SS	MS	F	Significance F
Regression	1	0.036364	0.036364	720	6.71E-10
Residual	9	0.000455	5.05E-05		
Total	10	0.036818			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%
Intercept	6.427273	0.186351	34.49008	7.15E-11	6.005717
x	-0.18182	0.006776	-26.8328	6.71E-10	-0.19715

In the table above, r value is 0.993808 while p-value is 6.71E-10. When $p<0.05$, it proves that the temperature is significantly related to the viscosity of chicken blood. However, from the Graph 4.2.14. it shows a negative correlation when the temperature decreased and the viscosity increased.

Table 4.3.15 r value and p-value of Sample 15(Highlighted)

Regression Statistics	
Multiple R	0.992413
R Square	0.984884
Adjusted R Square	0.983204
Standard Error	0.006064
Observations	11

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.02156	0.02156	586.3846	1.67E-09
Residual	9	0.000331	3.68E-05		
Total	10	0.021891			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	5.250909	0.159	33.02451	1.05E-10	4.891225
x	-0.14	0.005781	-24.2154	1.67E-09	-0.15308

In the table above, r value is 0.992413 while p-value is 1.67E-09. When $p<0.05$, it proves that the temperature is significantly related to the viscosity of chicken blood. However, from the Graph 4.2.15. it shows a negative correlation when the temperature decreased and the viscosity increased.

CHAPTER 5

CONCLUSION

In conclusion, the average time for collecting the blood is 28.7 minutes. However, the collecting time for each chicken are vary because the higher weight of the chicken, the time for collecting will be longer. The viscosity of the blood will be affected by the temperature, the lower the temperature, the higher the viscosity and the stickier is the blood. The null hypothesis, H_0 is rejected because the temperature is negatively significant correlated with the viscosity of chicken blood. Lastly, when chicken blood is coagulated inside some liquid, and it is easy to be cleaned. However, if the blood is stick on container and dried, it is difficult to be cleaned.

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