



## **Effect of Temperature and Storage Time on the Amount of Bacteria Content and Physical Quality of Se'i Pork in Kefamenanu City, North Central Timor Regency**

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**Abstract.** Pork se'i meat is a special product from East Nusa, which is processed by smoking it using wood. However, temperature conditions and storage time can affect the quality of pork se'i meat. This study aims to determine the effect of temperature and storage time on the bacterial content and the physical quality of pork se'i. The research sample was taken from the Se'i Babi production depot in Kefamenanu City. This study used a factorial Completely Randomized Design (CRD). The temperature factor was 3 treatments, namely 27°C, 32°C, and 37°C, while the storage time factor was 3 treatments, namely 1 day, 2 days, and 3 days. Observation of bacterial content with the Total Plate Count (TPC) test, and observation of the physical quality of the se'i with the organoleptic test. Data analysis is descriptive and quantitative. The results showed that temperature and storage time affected the amount of bacterial content and physical quality of pork se'i, where a good temperature for storing pork se'i was 32°C. The lowest average bacterial growth was 146.6 cfu/g, 120 cfu/g, and 156.6 cfu/g, and the lowest average organoleptic value is at 32°C, and the highest is at 27°C. For making pork se'i so that in the future we can pay more attention to processing methods because in the future pork se'i will increasingly become a favorite food in society.

**Keywords:** Long storage; Se'i Pork; Temperature

### **I. INTRODUCTION**

Pork is one type of meat widely consumed by people in East Nusa Tenggara (NTT). This is because pork contains nutrients such as carbohydrates, proteins, vitamins, and minerals, and has the advantage of containing a lot of thiamin (vitamin B1) needed by the body (Hartawan, 2000). According to Soeparno (2009), meat is an excellent medium for bacterial growth besides being a good food substance for humans.

The growth of microorganisms in meat is prevented by cooling, freezing, salting, drying, and smoking. The principle is to suppress the activity of microorganisms and reduce enzymatic processes that can accelerate the breakdown of meat (Buckle et al., 1978). One of the

processed pork products that is a specialty of people in NTT to reduce the growth of microorganisms is Se'i meat.

According to Raza et al., (2012), se'i meat is meat smoked using wood. Smoking aims to obtain meat products with a distinctive taste and aroma, and smoking is believed to be useful for preventing the growth of microorganisms. Se'i meat has a bright red texture, almost similar to fresh meat, even though it has been stored for a long time. The red color is what makes se'i distinctive. Smoking can increase the shelf life of se'i babi, but there are still many producers and consumers who have not paid attention to how long se'i babi is suitable for consumption and at what temperature se'i babi is effective to store. This research aims to determine the effect of temperature and storage time on the amount of bacterial growth of pork se'i

and also to determine the effect of temperature and storage time on the physical quality of pork se'i.

## II. METHODS

This research will be carried out at the Biological Laboratory, Faculty of Agriculture, University of Timor from April 2023 to June 2023.

The tools used in this study are Tools used in this study include, Petri dishes, erlenmeyer, test tubes, test tube racks, micropipettes, pipette tips, spreaders, Ose needles, refrigerators, incubators, oven, bunsen fires, analytical scales, coolboxes, scissors, Laminar Air Flo (LAF).

The materials used in this study were pork Se,i pork, Plate Count Agar (PCA), Sodium Chloride (NaCl 0.85%), alcohol, spirits, label paper, plastic wrap, aluminum foil, heat-resistant plastic, rubber bands, tissue, cotton.

This research was conducted by experimental method. The research design used was a Complete Randomized Design (RAL) consisting of 3 X 5 temperature treatments (27 °C, 32 °C, 37 °C) and 3 storage duration treatments (1 day, 2 days, 3 days). Samples were taken from 3 pig se'i depots in Kefamenanu City, and then Total Plate Count (TPC) and organoleptic tests were carried out. Total Plate Count (TPC) and organoleptic testing of pork sei meat is carried out daily i.e. at the same hour as the initial storage time for each storage condition.

The Total Plate Count (TPC) testing procedure is following:

### a. Sample Homogenization

Pig se'i samples were aseptically weighed 25 g using a sterile stomaker bag/plastic in a sterile cylindrical container. Then 225 ml of 0.85% NaCl was added, then homogenized using a shaker for 30 seconds to obtain a 10-1 dilution suspension (BPOM, 2009).

### b. Dilution

Prepare several tubes, each of which has been filled with 9 ml of 0.85% NaCl. The results of the homogenization of the sample, which is a 10-1 dilution, are pipetted with 1 ml into the first 0.85% NaCl tube and vortexed (homogenized) until a 10-2 dilution is obtained. After that, 1 ml of the sample, which is a 10-2 dilution, is pipetted into a second 0.85% NaCl tube, then vortexed (homogenized) until a 10-3 dilution is obtained. Then the next dilution is made in the same way as the required dilution level (BPOM, 2009).

### c. Inoculation and Incubation

For the first dilution, pipette 1 mL and inoculate it in a petri dish, then pour in 15-20 mL of PCA + TTC media, then shake left and right until evenly mixed, making a

duplicate. Do the same thing for the next dilution (BPOM, 2009).

### d. Observation

Observation of the bacterial content in pig se'i was carried out by calculating the Total Plate Count (TPC) by the Analysis Method (MA) 43/MI/14 issued by the Food and Drug Supervisory Agency (2009). Calculations were carried out on plates containing between 30-300 bacterial colonies. The amount of bacterial content is calculated using the formula:

$$N = \frac{\sum C}{(V (n_1 + 0.1n_2) \times d)}$$

Information:

N is the sample microbial number;  $\sum C$  is the number of colonies in the petri dish from the dilution that meets the calculation range; V is the volume of inoculum put into each petri dish (V = 1 mL);  $n_1$  is number of Petri dishes used in the first dilution calculated;  $n_2$  is number of Petri dishes used in the second dilution calculated; d is dilution corresponding to the first calculated dilution.

The organoleptic test is carried out using a hedonic test with a minimum number of consumer panelists of 5 people. Each panelist will choose which palatability component they like best among the three types of pork sei by filling in the assessment sheet provided. The organoleptic tests tested were appearance organoleptic, smell organoleptic, taste organoleptic, and consistency organoleptic (Setyaningsih et al., 2010).

Data for the amount of bacterial content and physical quality of pig se'i were analyzed quantitatively descriptively against the Total Plate Count (TPC) and organoleptic observed and the results were calculated as average values.

## III. RESULTS AND DISCUSSION

### *The Effect of Temperature and Storage Duration on the Number of Se'i Babi Bacteria*

The calculation of the amount of pork se'i bacteria content in samples A, B, and C stored at temperatures of 27 °C, 32 °C, and 37 °C and at the storage of 1 day, 2 days, and 3 days can be seen in Table 1.

Based on Table 1 it can be seen that at depot A, at a temperature of 27°C the first day the amount of bacteria content is 120 cfu/gr, on the second day, is 150 cfu/gr, the third day is 180 cfu/gr. At a temperature of 32°C the first day the total bacterial content was 120 cfu/gr, the second day 150 cfu/gr, and the third day 170 cfu/g. And at a temperature of 37°C the first day was 140 cfu/g, the second day 160 cfu/gr, and the third day 180 cfu/g. The lowest

average number of bacterial content is at 32°C. At 37°C the number of bacteria increases.

At depot B, at a temperature of 27°C the first day the total bacterial content was 110 cfu/g, the second day 140 cfu/gr, and the third day 150 cfu/g. At 32°C the first day the number of bacteria content was 100 cfu/g, the second day 120 cfu/gr, and the third day 140 cfu/g. And at a temperature of 37°C the first day was 130 cfu/g, the second day was 150 cfu/gr, and the third day was 170 cfu/g. The lowest average number of bacterial content is at 32°C.

At depot C, at a temperature of 27°C the first day the total bacterial content was 150 cfu/g, on the second day 180 cfu/gr, the third day 200 cfu/g. At a temperature of 32°C the first day, the total bacterial content was 150 cfu/g, the second day 150 cfu/g, and the third day 170 cfu/g. And at a temperature of 37°C the first day was 140 cfu/g, the second day 160 cfu/gr, and the third day 180 cfu/g. Unlike the previous two depots, in depot C microbial growth gets the highest average value at 27°C, and the lowest amount of bacteria content is at 32°C.

TABLE I  
 NUMBER OF BACTERIAL CONTENT OF PIG SE'I SAMPLES

Se'i Pork Sampling Place	Temperature (°C)	Storage Length (cfu/g)			Average
		1-day	2-day	3-day	
Depot A	27	120	150	180	150
	32	120	150	170	146.6
	37	140	160	180	160
Depot B	27	110	140	150	133.3
	32	100	120	140	120
	37	130	150	170	150
Depot C	27	150	180	200	176.6
	32	150	150	170	156.6
	37	140	160	180	160

The growth of certain microorganisms that are still able to live with low temperatures or high temperatures. Microorganisms that can grow at low temperatures will cause food damage. Low temperatures can affect the response of microorganisms either directly or indirectly. Direct effects include decreased growth rate, enzyme activity, changes in cell composition, and differences in nutrient needs. As the temperature drops, the lag phase lengthens, resulting in a decrease in growth rate and final cell count (Gounot, 1991). So long storage at a temperature of 27 °C will be able to cause damage by microorganisms (Perko, 2011). The cause of microbial contamination in food can be caused because the initial number of microbes in meat affects the number of subsequent microbes so it will increase the amount of microbial contamination in processed meat. (Sukmawati & Hardianti, 2018). The results of the study of temperature and storage duration in Table 1 show that the treatment of temperature and storage duration on the Total Plate Count (TPC) value affects the amount of bacterial content. This situation shows an increase in bacteria in pig se'i placed at several temperatures (27°C, 32°C and 37°C). The increase in the number of bacteria along with the length of storage, is because bacteria in meat can carry out cell division or multiply. The proliferation of these bacterial cells will increase over time. The longer it is stored, the number of bacteria increases. According to Al-Qadiri et al (2008), bacteria will need enough time to grow and multiply, if the

required components are available enough then bacteria will develop rapidly.

*The Effect of Temperature and Storage Duration on the Number of Se'i Babi Bacteria*

The organoleptic test results of appearance, smell, taste, and consistency at the three depots showed different results. Because the scoring method used is the score sheet method, the higher the average organoleptic value, the better the physical quality of pork se'i meat. The results showed that temperature and storage duration had a real influence on the physical quality of se'i babi (Setyaningsih et al., 2010). At Depot A the lowest organoleptic value is at 37°C. While the highest organoleptic average is at 32°C. At depot B, the lowest amount of organoleptic value is at 37°C. While the highest average organoleptic value is at 32°C. Not much different at depot A and depot B, at depot C the highest average organoleptic value is at 32°C. While the lowest average organoleptic value is at 37°C.

Appearance is one of the things that changes. The color of the flesh from the originally brown changes to a dark red color. This is due to the differences between the three treatments due to different smoking methods, so the amount of smoke and chemical compounds attached to se'i meat gives the appearance of different colors between treatments (Ledesma et al., 2017).

At Depot A the lowest organoleptic odor value is at 27°C. While the highest organoleptic average is at 32°C. At depot B, the lowest amount of organoleptic value is at 37°C. While the highest average organoleptic value is at 32°C. At depot C the highest average organoleptic value is at 32°C. While the lowest average organoleptic value is at 27°C.

In organoleptic odors, the smell/aroma of food determines a lot of food's deliciousness so that it can increase appetite. Aroma testing uses more sense of smell because the deliciousness of a food is largely determined by the aroma of the food and smell is one of the important indicators in determining the quality of food ingredients (Sio et al., 2022). In the food industry, the test of odor/aroma is considered important because it can quickly provide an assessment of the results of production, whether the production is liked or not by consumers (Soekarto, 2002).

At Depot A the lowest organoleptic value is at 37°C. While the highest organoleptic average is at 32°C. At depot B, the lowest amount of organoleptic value is at 37°C. While the highest average organoleptic value is at 32°C. At depot C the highest average organoleptic value is at 32°C. While the lowest average organoleptic value is at 27°C.

Taste is the sensation felt in the tongue such as sour, salty, sweet, and bitter. During the chewing process, food fibers will release flavor, liquid, and odor compounds into the mouth, causing a liking for a type of food ingredient (Dheko et al., 2022). Table 4 shows that the best of the three temperatures is 32°C. In organoleptic taste, the taste that was originally good and savory over time of storage of taste begins to turn stale/rotten. According to (Malelak et al., 2014) the taste of meat is influenced by fat-soluble components and proteins at the time of cooking so if evaporation occurs, the components that affect the taste will also be lost.

At Depot A the lowest consistency organoleptic value is at 37°C. While the highest organoleptic value is at 32°C. At depot B, the lowest amount of organoleptic value is at 27°C. While the highest organoleptic value is at 32°C. At depot C the highest organoleptic value is at 32°C. Meanwhile, the lowest organoleptic value is at 27°C.

Tenderness and texture of meat are the most important determining factors in meat quality. According to Soeparno (2009), the overall impression of tenderness includes texture and involves three aspects, namely the initial ease of tooth penetration, the ease with which the meat is chewed, and the amount of residue left after chewing.

The texture of pork se'i is quite soft. This is because the curing process (preserving using salt) on pork is carried out quite a long time before smoking. The longer the curing

process, the higher the level of tenderness. According to Aoetpah et al (2023), meat that is smoked by planting certainly takes a shorter time compared to closed smoking and open smoking, where the smoke produced does not just spread but the smoke is only focused on the se'i meat so that the meat cooks faster and doesn't lose much water content/becomes dry.

#### IV. CONCLUSION

Based on the results of the research and discussion above, the researchers can conclude that there is an influence between temperature and storage time on the amount of se'i bacteria content in pork and the effective temperature for storing pork se'i is 32°C with the lowest average bacterial content of the 3 temperature treatments available are 146.6 cfu/g, 120 cfu/g and 156.6 cfu/g. Apart from that, there is an influence of temperature and storage time on the physical quality of se'i pigs. According to research that has been carried out, 32°C is the best temperature for organoleptic values for appearance, smell, taste, and synthesis.

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TABLE II  
 ORGANOLEPTIC VALUES OF PORK SE'I SAMPLE APPEARANCE

Se'i Pork Sampling Place	Temperature (°C)	Storage Duration		
		1-day	2-day	3-day
Depot A	27	6.2	3.4	3.8
	32	9	7.8	3
	37	7.4	5.4	2.2
Depot B	27	5	4.2	4.2
	32	9	8.2	3.4
	37	9	5	2.6
Depot C	27	4.2	3.8	3.4
	32	9	5.8	2.6
	37	7.4	3.4	1

TABLE III  
 ORGANOLEPTIC VALUE OF ODOR OF PORK SE'I SAMPLES

Se'i Pork Sampling Place	Temperature (°C)	Storage Duration		
		1-day	2-day	3-day
Depot A	27	6.2	3.4	1
	32	8.2	7	1.4
	37	6.2	4.2	1.4
Depot B	27	2.2	3	2.2
	32	8.2	7	3
	37	7.4	4.2	1
Depot C	27	3.4	3	1.4
	32	8.2	5	1.8
	37	6.2	3	2.2

TABLE IV  
 ORGANOLEPTIC VALUE OF TASTE OF PORK SE'I SAMPLE

Se'i Pork Sampling Place	Temperature (°C)	Storage Duration		
		1-day	2-day	3-day
Depot A	27	5	1.4	1.8
	32	8.2	6.6	1.4
	37	6.2	4.2	1
Depot B	27	3.8	2.2	1.4
	32	9	7	3
	37	7.4	3.4	1
Depot C	27	2.6	1.8	1
	32	7.8	4.2	1.4
	37	6.2	3	1.8

TABLE V  
 ORGANOLEPTIC VALUES OF SAMPLE CONSISTENCY OF PORK SE'I

Se'i Pork Sampling Place	Temperature (°C)	Storage Duration		
		1-day	2-day	3-day
Depot A	27	5	4.2	2,2
	32	8.6	6.6	3
	37	5.8	4.2	1.8
Depot B	27	3.4	2.6	1.8
	32	7.8	7.4	3
	37	7	4.2	2.2
Depot C	27	4.2	3.4	1.4
	32	8.2	4.6	2.2
	37	6.2	3	1.8