

Chemical characteristic of salt fermented meat inoculated with *Pediococcus ssp.*

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Abstract. The research goal is knowing of the characteristic of salt fermented meat by *Pediococcus ssp.* There were microbiological, chemical, and *off-flavor* compound during fermentation. This study was conducted on research of influence of salt-meat fermentation inoculated used starter. They were included microbiological characteristics, and chemical characteristics. Microbiological characteristics observed were total bacteria, number of *coliform* groups, bacteria producing bioamine, and total lactic acid bacteria. The result showed that decreasing of *coliform* and bioamine producer bacteria, and total lactic acid bacteria decreased 3 *log cycle*. While the soluble protein increased of 7-8% and bioamine increased of 5-6 mg/100 g. And then *Off-flavour* compound, TVN and TMA increased of 36-20 mg/100g and 16-30 mg/100g, respectively. Conclusion of the research that *Pediococcus ssp.* influenced salt fermented meat.

Key words : Salt fermented meat, *Pediococcus ssp.*, Microbiological, Chemical, *off-flavour*

1. Introduction

In the meat fermentation, salt has important role due to the success of fermentation. The method of salting influenced the salt-resistant microbiota. It influenced the fermentation conditions. Some lactic acid bacteria play a role in suppressing the growth of unwanted bacteria, i.e. bacteria that cause decay and bacterial pathogens. The activity of lactic acid bacteria can also suppress deamination activity by suppressing the growth of bacteria producing bioamine. The components of this bioamine should be avoided because it can



cause allergies for those who consume and is quite dangerous for people at risk of cancer because it can stimulate the development of cancer [1].

Starter *Pediococcus* spp. has potentially to suppress bacterial decay, pathogenic bacteria, and off-flavor products. This inhibitory ability is assumed by the ability to produce metabolic products, competition with existing bacteria and the bacteriocin result. This is expected to improve the fermentation quality. [2] reported that in beef fermentation, pathogenic bacteria commonly appear were the genus *Salmonella* and strains of *E. coli* species. Salt suppressed the growth of microbes because it can increase the osmotic pressure that can lead plasmolysis in microbial cells. Besides that, NaCl is also hygroscopic, it can absorb water from materials that decreased *A_w* (water activity). It also caused cells dehydration that are toxic to microbes, reducing oxygen solubility in materials so that microbes can be suppressed and inhibit proteolytic activity.

The dominant high-salted fermented meat is the genus *Pediococcus* such as member of *P. damnosus* species, *P. acidilacticii*, *P. pentasaceus*. The use of lactic acid bacteria starter served to control the fermentation process. It can suppress the pathogenic bacteria and the existing proteolytic bacteria. The ability to suppress the microbes is derived from metabolic products in addition to the resulting lactic acid. These metabolic products include hydrogen peroxide, diacetyl, and bacteriocin [3]. The purpose of this research is knowing the influence of starter *Pediococcus* spp. to the characteristics of salted fermentation is done, it is expected that fermentation will take place better.

2. Material and Method

This research used lactic acid bacteria isolate from previous research result [4] is isolate of BAL which were 11 *Pediococcus* sp. YDA1, *Pediococcus* sp. YDA10, *Pediococcus* sp. YDA3, *Pediococcus* sp. YDA4, *Pediococcus* sp. YDA11, *Pediococcus* sp. YDA2, *Pediococcus* sp. YDA5, *Pediococcus* sp. YDA6, *Pediococcus* sp. YDA7, *Pediococcus* sp. YDA8, *Pediococcus* sp. YDA9. This study was conducted on research of influence of salt-meat fermentation inoculated used starter. They were included microbiological characteristics, and chemical characteristics. Microbiological characteristics observed were total bacteria, number of *coliform* groups, bacteria producing bioamine, and total lactic acid bacteria. The measured chemical changes were pH change, total titrated acid, dissolved protein, histamine amount, TVN (total volatile base nitrogen) and TMA (tri methyl amine).

The process of salted beef fermentation used 350 g minced beef plus 100 g salt and 50 g (equivalent to 50 ml water). The fermentation process is carried out without heating before being inoculated with a starter of *pediococcus* sp. Inoculation with starter culture of 50 ml, after the pre-fermentation phase was done at 4 °C for 6 hours, then incubated 48 hours at room temperature. Sampling was done at the beginning and end of fermentation by taking 50 g at the beginning and end of fermentation, 25 g for chemical characteristics, and 25 g for microbiological characteristics.

Microbiological parameter measurement using dillution and plating method. For chemical measurements included for pH according to AOAC method [5], TVN and TMA calculations by AOAC method [6], for dissolved proteins by Lowry method [7], and acid calculation by titration. While the calculation of bioamine by Mahendratta method [8].

3. Result and Discussion

The results of the research include the characteristics of microbiologic and chemical characteristics.

Table 1. Microbiological characteristics of salt fermented meat with starter *Pediococcus* ssp.

Rank	Isolate	Bacteria (CFU/ml)					
		<i>Coliform</i>		Bioamine Producer		Lactic Acid Bacteria	
		Beginning	Ending	Beginning	Ending	Beginning	Ending
1	<i>Pediococcus</i> sp. YDA1	1,8x10 ⁵	3,2x10 ¹	4,2x10 ⁶	3,2x10 ²	3,1x10 ⁶	9,1x10 ⁹
2	<i>Pediococcus</i> sp. YDA3	1,6x10 ⁵	2,2x10 ¹	3,1x10 ⁶	3,1x10 ²	4,1x10 ⁶	8,2x10 ⁹
3	<i>Pediococcus</i> sp. YDA4	1,7x10 ⁵	2,5x10 ¹	3,2x10 ⁶	3,3x10 ²	4,2x10 ⁶	9,3x10 ⁹
4	<i>Pediococcus</i> sp. YDA10	1,9x10 ⁵	2,2x10 ¹	2,6x10 ⁶	2,3x10 ³	2,8x10 ⁶	9,2x10 ⁹
5	<i>Pediococcus</i> sp. YDA11	1,7x10 ⁵	2,3x10 ¹	2,7x10 ⁶	2,4x10 ³	2,6x10 ⁶	8,3x10 ⁹
6	<i>Pediococcus</i> sp. YDA2	1,3x10 ⁵	2,8x10 ²	2,9x10 ⁶	2,8x10 ²	3,2x10 ⁶	8,9x10 ⁹
7	<i>Pediococcus</i> sp. YDA5	1,6x10 ⁵	2,6x10 ²	2,9x10 ⁶	2,9x10 ³	3,2x10 ⁶	3,2x10 ⁸
8	<i>Pediococcus</i> sp. YDA6	1,8x10 ⁵	2,4x10 ²	2,8x10 ⁶	3,2x10 ³	2,9x10 ⁶	3,1x10 ⁸
9	<i>Pediococcus</i> sp. YDA7	1,9x10 ⁵	2,4x10 ²	2,7x10 ⁶	2,8x10 ³	3,4x10 ⁶	3,2x10 ⁸
10	<i>Pediococcus</i> sp. YDA8	1,7x10 ⁵	2,3x10 ²	2,7x10 ⁶	2,7x10 ³	3,2x10 ⁶	6,1x10 ⁸
11	<i>Pediococcus</i> sp. YDA9	1,8x10 ⁵	2,2x10 ²	2,8x10 ⁶	2,6x10 ³	3,2x10 ⁶	9,2x10 ⁸
	Control	2,3x10 ⁵	7,1x10 ²	3,4x10 ⁶	4,2x10 ³	2,7x10 ⁴	4,1x10 ⁵

Description: control without inoculation of lactic acid bacteria

The condition of salty meat fermentation affects the number of coliform members and bacteria producing bioamine that begins fermentation 10⁵ CFU / ml to 10² - 10¹ CFU / ml which means starter *Pediococcus* ssp. can suppress between 4-3 log cycles during fermentation, this is presumably because in addition to producing lactic acid as a metabolic product but also produce other metabolic products that have antagonistic ability, for example pediocin as a result of *coliform* bacteria and bioamine producers will decrease in number [9].

Table 2. Chemical characteristics of fermented meat supplements with starter *pediococcus*.

Rank	Isolate	Dissolved Protein (%)		Bioamine (mg/100g)		TVN (mg/100g)		TMA (mg/100g)	
		Beginning	Ending	Beginning	Ending	Beginning	Ending	Beginning	Ending
1	<i>Pediococcus</i> sp. YDA11	1,7	10,1	2,6	6,1	8,3	44,6	4,2	21,6
2	<i>Pediococcus</i> sp. YDA1	1,7	9,9	2,6	5,8	7,8	48,3	4,1	23,9
3	<i>Pediococcus</i> sp. YDA3	1,7	9,7	2,6	6,1	7,9	46,3	3,6	22,9
4	<i>Pediococcus</i> sp. YDA4	1,8	9,8	2,6	5,9	8,9	47,6	4,2	23,6
5	<i>Pediococcus</i> sp. YDA10	1,7	9,8	2,5	6,3	8,7	45,2	4,1	22,1
6	<i>Pediococcus</i> sp. YDA2	1,7	9,8	2,3	5,1	8,1	47,2	3,9	24,1
7	<i>Pediococcus</i> sp. YDA7	1,7	8,9	2,3	8,8	8,3	63,1	4,2	31,6
8	<i>Pediococcus</i> sp. YDA6	1,7	9,0	2,6	8,9	8,3	65,6	4,3	31,8
9	<i>Pediococcus</i> sp. YDA5	1,7	9,1	2,5	8,1	8,3	66,2	4,1	34,2
10	<i>Pediococcus</i> sp. YDA9	1,7	8,9	2,4	8,9	8,3	68,2	4,2	34,1
11	<i>Pediococcus</i> sp. YDA8	1,7	8,9	2,4	8,9	8,3	68,2	4,2	34,1
	control	1,7	8,7	2,7	10,6	8,9	87,6	4,3	50,1

Measurements of TVN and TMA were performed to determine as a precursor to decay in high-protein foods. It is seen that the use of *pediococcus* ssp starter can reduce the formation of TVN and TMA compared to controls without the use of the starter. This proved that the starter *pediococcus* ssp. affecting the early decay products, it can happens because the starter can suppress the existing spoilage bacteria during the fermentation process [10].

Similarly, in formed bioamines, the using of *pediococcus* ssp. starter. can be suppressed when compared to control, it is suspected because of the the suppressing ability of bacteria bioamine so that the formed bioamine is lower when it is compared to the control without *pediococcus* ssp. starter.

In the dissolved protein, it is seen that the used starter has the same proteolytic ability when it is compared to the control (without starter). It is assumed because of the used starter *pediococcus* ssp. is one a type of lactic acid which has proteolytic ability [11].

4. Conclusion

Starter *pediococcus* ssp influenced the chemical characteristis of salt fermented meat throught the suppression of the coliform group bacteria, bio amine product, TVN and TMA formation. *Pediococcus* ssp can be promising starter for ameliorating off flavor of high protein meat throught the salt fermentation process.

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