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Characteristics of fatty acids, in local minahasa pigs, north Sulawesi

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Abstract
Has conducted research that aims to get the content of proximate and fatty acid profiles of local pork Minahasa. The results showed that the carbohydrate content of local pork abdominal fat was 9.26%; protein content of 14.27% and 47.58% fat content. The highest fatty acid content is oleic fatty acid (50.12%), followed by 14.45% palmitic fatty acid, stearic 14.25% and 9.25% linoleic. Arakidat fatty acids (3.16%), Palmioleat (3.12%), myristic (2.1%) and lauric (0.75%). Based on the amount of carbon it is found one chain fatty acids are lauric, 3 medium chain fatty acid) is miritrat, palmioleat and palmitate; 4 long chain fatty acid is oleic, linoleic, stearic and arakidat. Judging from the types of saturated fatty acids and unsaturated, the local pork abdominal fat gained 4 saturated fatty acids (lauric, myristic, palmitic and stearic) and unsaturated fatty acids 4 (palmioleat, linoleic, oleic and arakidat).

Keywords: Local Pig, Minahasa, fatty acids

Introduction
Indonesia has five of the eight species of wild pigs in the world (Rothschild *et al*., 2011) [12]. Local pork in Indonesia, among others, local pork hobo, Krawang local pork, local pork Nias and local pork and pork ground Toraja local Minahasa (Devantoro *et al*, 2015) [2]. The diversity of wild pigs in Indonesia evidenced by the discovery of four different alleles and is the highest number of alleles mitochondria have been found (Choi *et al*. 2014) [1]. Local pig Minahasa is part of the eight sub-species of Sulawesi local pig (Sus celebensis). Pigs are cultivated by the Minahasa community consisted of local pork and pig races, especially race "banpres" (Mege and Mokosuli, 2017) [6]. In a large-scale pig farmer community prefer the race because of large body size so as to provide meat in quantities greater than local pork Minahasa smaller size. Food or feed the pig races are generally in the form of processed pellet mill while the local pig breeding on a small scale because the feed used by farmers are tubers, corn, bran (Konga) rice etc. are generally derived from nature. In biochemistry, animal feed will affect the metabolism of proteins, carbohydrates and lipids organisms (Nelson and Cox, 2005) [10]. Thus the composition or lipid profile local pork and pork can theoretically different races so interesting study because of the case or the incidence of disease caused by hyperlipidemia in Minahasa is currently quite high (Mokosuli *et al*. 2017) [7].
The proximate analysis and analysis of the content of the fatty acid composition of local pork is very rarely done in Indonesia because the majority of people in Indonesia do not eat pork for Muslims. However some sub-ethnic in Indonesia who do not embrace Islam makes pigs as the main source of meat. Thus still very little or no research publications proximate content and fatty acid composition of local pork in Indonesia, more specifically the local pig Minahasa. This study aimed to obtain the composition of protein, carbohydrate and lipid local pigs total adipose tissue Minahasa and get the composition of fatty acids.

Materials and methods
Samples
Pork samples obtained from the Village Ratahan Likupang Southeast Minahasa Regency and North Minahasa Regency. Network abdomen and thighs local pork used in the stage of proximate analysis and analysis of fat content.

Proximate analysis

Local pig proximate analysis using method SNI. Content of Carbohydrates were analyzed by methods SNI 01-2891-1992 item 9, Fat method SNI 01-2891-1992 items 8.1 and carbohydrates with methods SNI 01-2891-1992 item 5.5.

Analysis of Fatty Acid Content

Tools used: GC with autosampler using the machine. Separation is done in a column DB1-MS Restech, 30m x 0:25 mm ID, 0:25 µm, with a stationary phase polymethyl xiloxan, injector temperature 230oC, column temperature of 70 ° C and raised to 300oC with 10oC rise / min flow rate of 1.15 mL / min. Helium gas mobile phase. MS detector used is Multifier Electron Detector (EMD) 70 MeV.

Analysis of short-chain fatty acids using gas chromatography according to the method. minahasa local pork abdominal tissue is cut into small pieces, melted at a temperature of 90 0 C to 1000C for 1-1.5 hours in an oven. Lemakyang had melted filtered with flannel, added anhydrous Na2SO4 and then centrifuged at 3000 rpm for 20 minutes. Didekanter oil layer, filtered with Whatman paper placed anhydrous Na2SO4. The solution was stored in cupboards ice at -20 0C in a test tube rolling. The solution was used for derivatization process. Fatty acid derivatisation aims to transform fatty acids into metal form fatty acid esters (fatty acid methyl ester) using NaOCH3 0.2 N and a solution of BF3. Results derivatisation containing derivatives of fatty acid methyl esters (FAME) is taken and injected into the gas chromatograph system. A total 1µL supernatant was injected into a gas chromatograph-mass spectrometry, replication is performed 3 times (Rohman *et al*, 2012) [11].

Results and discussion

Proximate analysis

Abdominal fat is used for the local pig proximate analysis and fatty acid content. Carbohydrate, protein and fat to do with the method of SNI. The results of the analysis of carbohydrate content of local pork abdominal fat was 9.26%; protein content of 14.27% and 47.58% fat content (Figure 1).

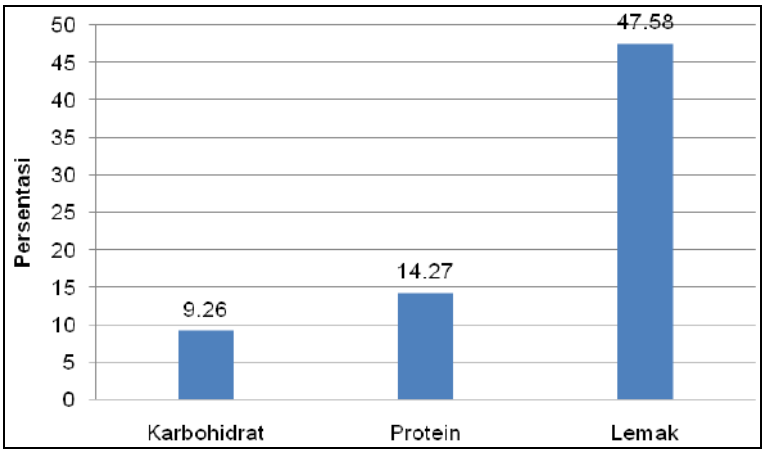


Fig 1: Percentage content of carbohidrat, Protein and Fat Pig Fat Abdomen Local

Analysis of fatty acid content

Analysis of fatty acid content, pork fat samples taken using an oven where the temperature and time controlled so that the fat content is maintained. Oven method can also prevent the loss of volatile komponenj contained in lard, yield earned more, simple and relatively cheap because it does not use any synthetic chemicals. Analysis standard fatty acid methyl esters are used in the form of Fatty acid methyl ester (FAME) using gas chromatography mass spectroscopy. Results of analysis of fatty acid content of local pork is shown in Figure 3. The highest fatty acid content is oleic fatty acid (50.12%), followed by 14.45% palmitic fatty acid, stearic 14.25% and 9.25% linoleic. Arakidat fatty acids (3.16%), Palmioleat (3.12%), myristic (2.1%) and lauric (0.75%) (Figure 2).

When viewed from the grouping fatty acid based on the amount of carbon it is found one short chain fatty acids (short chain fatty acid: SCFA) are lauric, 3 medium chain fatty acids (medium chain fatty acid: MCFA) is miritrat, palmioleat and palmitate; 4 long chain fatty acids (long chain fatty acid; LCFA), namely oleic, linoleic, stearic and arakidat. Judging from the types of saturated fatty acids and unsaturated, the local pork abdominal fat gained 4 saturated fatty acids (lauric, myristic, palmitic and stearic) and unsaturated fatty acids 4 (palmioleat, linoleic, oleic and arakidat).

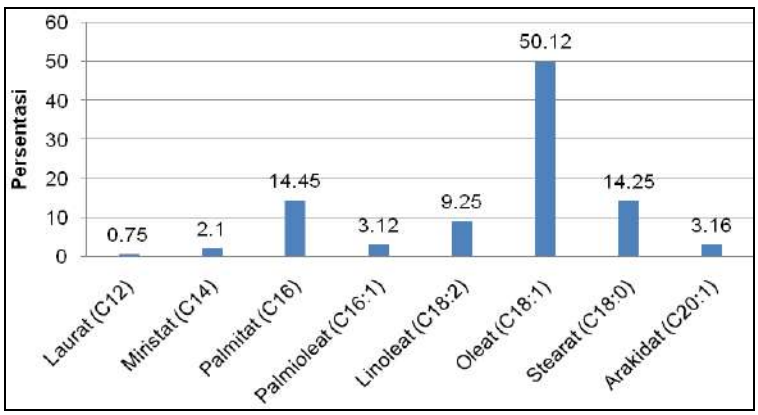
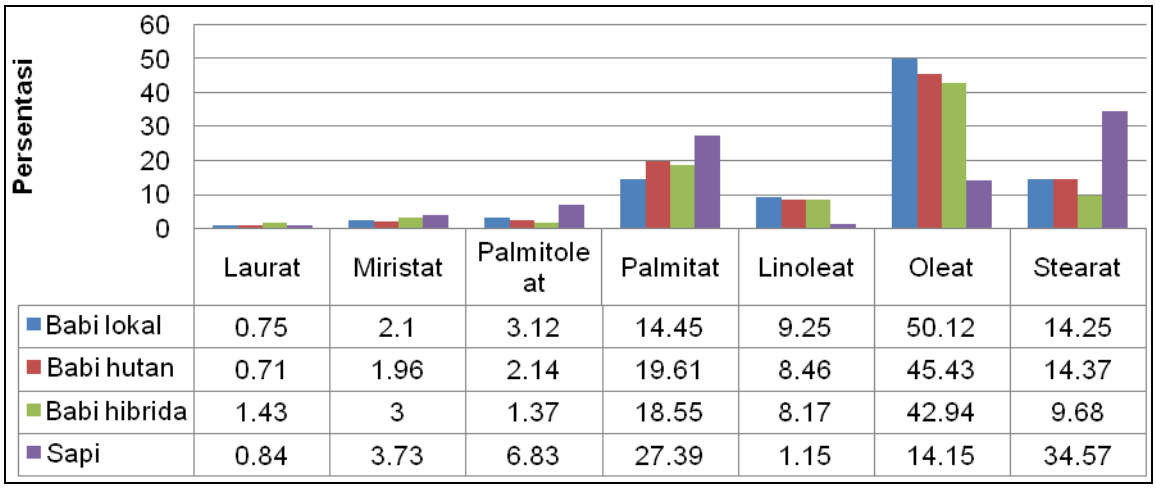


Fig 2: Content (Percent) fatty acids on Abdominal Fat Pig Local

The percentage of local pork fatty acid content as compared to wild boar, pig and cow hybrid are shown in Figure 3. The data referred fatty acid content of In the three types of pork highest percentage of fatty acid content is oleic acid, while the cows as a comparison the highest is stearic fatty acids. Oelat fatty acid and stearic fatty acids have the amount of carbon 18 but oleic fatty acids have one double bond so categorized unsaturated fatty acid stearic fatty acids while not having the double bond thus categorized saturated fatty acids (Nelson and Cox, 2005) [10]. For palmitic acid content of the three types of pigs, wild boar has the highest content (19.61%), then the pig hybrids (18.55%) and 14.45% local pork; whereas palmitic acid content in the cow 27.39%. When viewed from the saturated fatty acid content of the highest are cows (66.29%), then the pig (36.92%), pig hybrids (32.66%) and the least in the local pigs (Figure 3).



	Laurat	Miristat	Palmitoleat	Palmitat	Linoleat	Oleat	Stearat
Babi lokal	0.75	2.1	3.12	14.45	9.25	50.12	14.25
Babi hutan	0.71	1.96	2.14	19.61	8.46	45.43	14.37
Babi hibrida	1.43	3	1.37	18.55	8.17	42.94	9.68
Sapi	0.84	3.73	6.83	27.39	1.15	14.15	34.57

Fig 3: Comparison of Fatty Acid Content in Pigs and Cows

Conclusion

From these results it can be concluded

1. The carbohydrate content of local pork abdominal fat is 9.26%; protein content of 14.27% and 47.58% fat content.
2. The highest fatty acid content is oleic fatty acid (50.12%), followed by 14.45% palmitic fatty acid, stearic 14.25% and 9.25% linoleic. Arakidat fatty acids (3.16%), Palmioleat (3.12%), myristic (2.1%) and lauric (0.75%).
3. Based on the amount of carbon it is found one short chain fatty acids (short chain fatty acid: SCFA) are lauric, 3 medium chain fatty acids (medium chain fatty acid: MCFA) is miritrat, palmioleat and palmitate; 4 long chain fatty acids (long chain fatty acid; LCFA), namely oleic, linoleic, stearic and arakidat. Judging from the types of saturated fatty acids and unsaturated, the local pork abdominal fat gained 4 saturated fatty acids (lauric, myristic, palmitic and stearic) and unsaturated fatty acids 4 (palmioleat, linoleic, oleic and arakidat).

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