

Characteristics of Traditional Food ‘Pedetan’ in Jembrana Regency

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Abstract— ‘Pedetan’ is a Balinese traditional food which is in the same sort with dried fish or *dendeng* (more familiar and well-known variety of sweet dried meat or fish in Indonesia) that is produced in Jembrana Regency, Bali. ‘Pedetan’ is commonly processed by passing certain traditional process, and supported only by traditional kitchenware. Each village in Jembrana Regency has certain characteristic in the way of producing ‘pedetan’, therefore the final product would be different for each village. This research is aimed to investigate the best processing procedure for resulting a qualified and safe-consumed ‘pedetan’ product that could be a good alternative for food security. The research was conducted from January until August 2014 by taking samples of ‘pedetan’ from six villages of Jembrana Regency, in which the researchers picked four producers from each village as representations. The observation steps were conducted descriptively toward the data from biochemical analysis (water contents, protein contents, fat contents, and ash contents), total of microbe and also organoleptic (smell, taste, color, texture, and overall acceptance). The result showed that the best ‘Pedetans’ *lemuru* among the 6 villages (producers) were the ‘pedetans’ which were produced by Melaya village with water contents 15.398%, protein contents 55.5704%, fat contents 1.2361%, ash contents 8.5731%, and total microbial count 11.76 10³, also based on organoleptic valuations, the product was preferred by panelists.

Keywords— ‘Pedetan’, Traditional Food, Jembrana Bali

I. INTRODUCTION

Jembrana Regency is one of *lemuru* (kind of sardines) supplier which could earn and supply *lemuru* abundantly during *lemuru* season. However, *lemuru* is considered not really tasty, besides the smell is extremely stinking. Therefore, is not really preferred by inhabitant there. Caused by abundant earn and supply of *lemuru*, the inhabitant attempt to process it into a food product which is still in the same sort with dried fish or *dendeng* (more familiar and well-known variety of sweet dried meat or fish in Indonesia) that is called as ‘pedetan’. There are two common ways that done by the inhabitant in processing ‘pedetan’, which are first by drying the fish under sunlight, or second by drying it above a furnace, further redrying it under sunlight.

‘Pedetan’ is made from *lemuru* and combined with salt and spices (pepper, red chili, coriander, galangal, garlic, and brown coconut sugar), then dried under sunlight about 3 up to 5 days, and finally kept in room temperature. Various processing procedures of ‘pedetan’ in each village have

formed such different characteristics of ‘pedetan’ for each village. These also brings different quality and food safety. For storing process, inhabitant usually pack the product in a *besek* (a plaited traditional bamboo basket) or just simply keep it on a *nyiru* (a plaited traditional bamboo tray) in open condition, therefore the storability of ‘pedetan’ is relatively low. Considered as a traditional food which is truly loved by Balinese and also domestic tourists, then the quality and safety of ‘pedetan’ should be increased.

The various processing procedures without considering both of packaging and storing processes would be a problem which is considered as background for conducting this research, in order to investigate the best processing procedure that could produce qualified and safe-consumed product. Thus, inhabitant would consider ‘pedetan’ as a source of protein that could be an alternative food for food security.

II. RESEARCH METHOD

The research was conducted from January up to August 2014 with descriptive method, in which the data were collected by applying survey, interview, questionnaire, and 'pedetan' lemuru collection which would be analyzed objectively and subjectively. The data were gained from 6 villages where 4 processing groups were chosen from each village. The villages were Pengambengan village, Air Kuning village, Yeh Sumbul village, Banyu Biru village, Perancak village, and Melaya village.

The Objective test with biochemical analysis was conducted based on SNI-01-2891-1992 foods and beverages test method, in which water contents were analyzed by oven heating method [9], protein contents by Gunning method [9], fat contents by gravimetric method using Soxhlet [9], ash contents [9], and microbiology analysis (total microbial count analysis). The microbiology analysis method was from Pusat Pengujian Obat dan Makanan Nasional (PPOMN) (National Food and Medicine Test Center) [1].

The Subjective test was conducted by sensory test (hedonic method/organoleptic test, [8]) with 7 hedonic and numeric scales. Further, the data analysis from the research result was analyzed descriptively and showed on the following tables and charts.

III. OBJECTIVE OBSERVATION DATA OF 'PEDETAN' LEMURU FISH

According to research result the objective observation data were obtained as the following Table 1.

TABLE I
OBJECTIVE OBSERVATION DATA OF 'PEDETAN' LEMURU

Villages	Water contents	Protein contents	Fat contents	Ash contentt	Total microbial count
Pengambengan	17.37	55.28	1.22	8.42	15.55 10^3
Air Kuning	15.83	55.15	1.21	8.42	8.38 10^3
Yeh Sumbul	14.60	55.73	1.24	8.40	12.75 10^3
Banyu Biru	14.20	55.67	1.21	8.71	10.90 10^3
Perancak	14.96	56.08	1.24	8.72	13.33 10^3
Melaya	15.44	55.52	1.30	8.78	9.68 10^3
Average	15.40	55.57	1.24	8.57	11.76 10^3

A. Water Contents

Table 2 and Fig.1 showed that the highest water contents were found in 'pedetans' that were produced by the processing group from Pengambengan village which attained 17.37%, while the lowest percentage was found from Banyu Biru village, that was 14.20%, in which the average of water contents was 15.40%. The percentages were lower than the percentage of water contents of dried salted fish which was 40% and dried anchovy which was 37.8% [6]. Lower percentage value was caused by the use of lemuru that was processed by rubbing salt, vinegar, and seasoning which could lower the water contents more than others dried salted

fishes or dried anchovies. In lower water contents condition, dried fish could be stored longer [4].

TABLE II
OBSERVATION DATA OF WATER CONTENTS (%)

Sample Villages	Producer 1	Producer 2	Producer 3	Producer 4	Average
Pengambengan	13.02	14.17	28.88	13.41	17.37
Air Kuning	12.02	13.18	24.24	13.87	15.83
Yeh Sumbul	12.11	13.86	20.18	12.23	14.60
Banyu Biru	12.58	13.97	18.25	11.99	14.20
Perancak	13.02	14.25	19.89	12.67	14.96
Melaya	12.77	14.19	20.90	13.90	15.44
Average					15.40

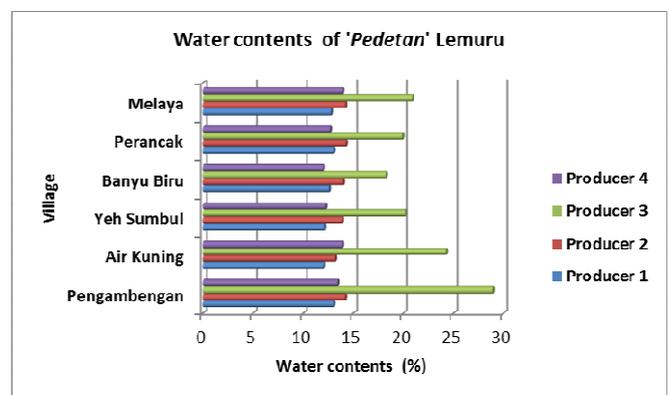


Fig.1. Chart of Water Contents of 'Pedetan' Lemuru

B. Protein Contents

From Table 3 and Fig. 2 could be seen that the highest protein contents were found in 'pedetans' which were produced by Perancak village which attained 56.08% and the lowest result was found in Air Kuning village, which was 55.15%. The average of protein contents was 55.57%. The percentages were higher than the percentage of protein contents of dried salted fish which was 42% or dried anchovy which was 33.40% [6]. Higher protein contents were caused by lemuru fish (before being dried) contained higher protein which was 20% than anchovy did, which was 10.3% [6],[7]. This condition showed that 'pedetan' lemuru had higher protein contents compared with others dried fishes. Therefore, the traditional food 'pedetan' could diversify food products in providing food consumption, and also establish national food security [5].

TABLE III
OBSERVATION DATA OF PROTEIN CONTENTS (%)

Sample Villages	Producer 1	Producer 2	Producer 3	Producer 4	Average
Pengambengan	61.28	66.49	52.07	41.26	55.27
Air Kuning	61.28	66.35	50.79	42.17	55.15
Yeh Sumbul	61.90	66.24	52.23	42.56	55.73
Banyu Biru	60.91	65.79	52.87	43.13	55.67
Perancak	61.23	65.91	53.79	43.39	56.08
Melaya	60.77	66.20	53.13	41.98	55.52
Average					55.57

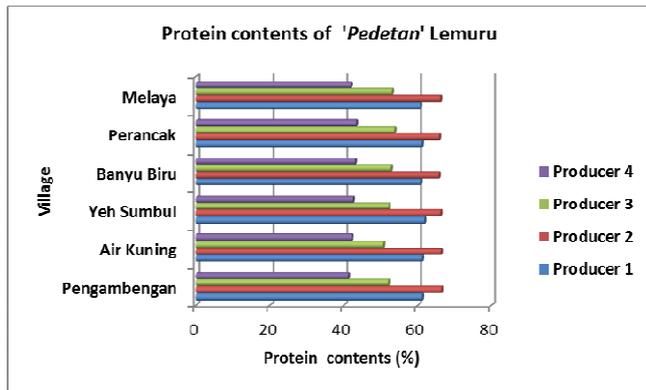


Fig. 2. Chart of Protein Contents of 'Pedetan' Lemuru

C. Fat Contents

Based on Table 4 and Fig. 3 could be seen that the highest fat contents were found in 'pedetans' that were produced by the processing group from Melaya village, which attained 1.30%. Then the lowest was from Banyu Biru village, which was 1.21%, in which the average of fat contents was 1.24%. Those fat contents were still lower compared with fat contents of dried salted fish generally, which were 1.5% or dried anchovy which were 3% [6]. These showed that 'pedetan' lemuru could be stored longer than the common dried salted fish because high fat condition could be a cause of rancidity for long stored food [4]. The free fatty acids (FFA) in fish could influence its nutrition and also cause the rancidity. Addition of 3% acetic acid could minimize the fat contents, even more prevent the rancidity of dried fish product [14],[15].

TABLE IV
OBSERVATION DATA OF FAT CONTENTS (%)

Sample Villages	Producer 1	Producer 2	Producer 3	Producer 4	Average
Pengambengan	1.31	1.46	0.94	1.16	1.22
Air Kuning	1.29	1.44	0.98	1.14	1.21
Yeh Sumbul	1.28	1.50	1.02	1.15	1.24
Banyu Biru	1.30	1.39	1.00	1.15	1.21
Perancak	1.29	1.40	1.10	1.15	1.24
Melaya	1.31	1.44	1.00	1.46	1.30
Average					1.24

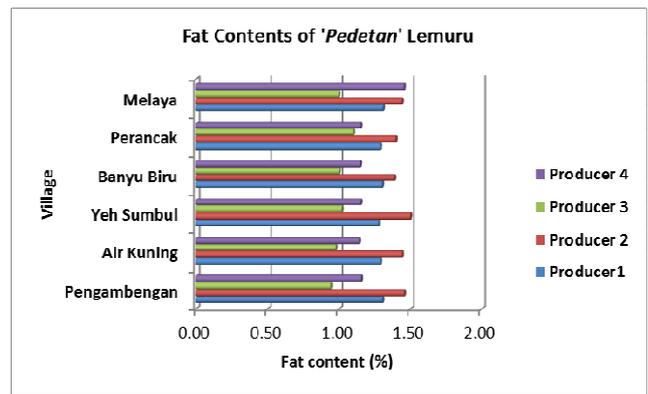


Fig. 3. Chart of Fat Contents of 'Pedetan' Lemuru

D. Ash Contents

According to Table 5 and Fig. 4 could be seen that the highest ash contents were found from 'pedetans' that were produced by the processing group from Melaya village, which attained 8.78% and the lowest result was found in Yeh Sumbul village, which was 8.40%. The obtained average of ash contents was 8.57%, therefore it was still lower than the average of ash contents of dried salted fish which was 16.5% or dried anchovy which was 25.8% [6]. These showed that 'pedetan' lemuru contained little insoluble minerals such as Phosphor (P), Ferrum (Fe), and Calcium (Ca) ([7]. Ash contents in fish were influenced by the minerals contents which would not be lost easily because of heating processes. Ash contents were considered as a parameter of the products' nutrition, which were produced by components of inorganic substances in fish, in which ash is one of inorganic substances which is produced from combustion of organic substances [9],[13]. The low ash contents of 'pedetan' lemuru might be caused by removal of the head, viscera, and backbones of lemuru while the processing of 'pedetan'.

TABLE V
OBSERVATION DATA OF ASH CONTENTS (%)

Sample Villages	Producer 1	Producer 2	Producer 3	Producer 4	Average
Pengambengan	8.86	10.48	2.04	12.29	8.42
Air Kuning	9.14	10.72	1.90	11.90	8.41
Yeh Sumbul	9.02	10.34	2.33	11.91	8.40
Banyu Biru	8.98	11.24	2.76	11.86	8.71
Perancak	9.11	11.01	1.80	12.95	8.72
Melaya	8.99	11.07	2.17	12.88	8.78
Average					8.57

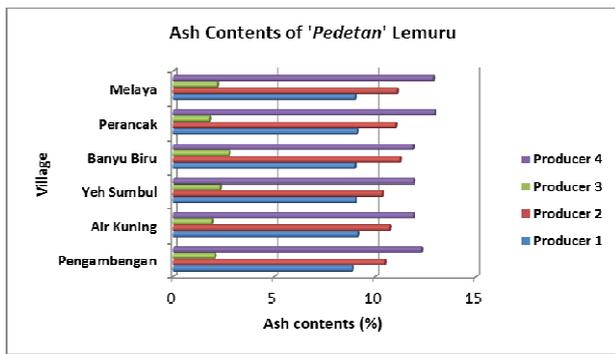


Fig. 4. Chart of Ash Contents of 'Pedetan' Lemuru

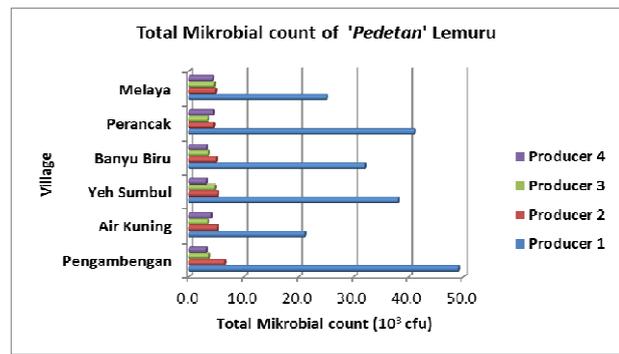


Fig. 5. Chart of Total Microbial Count of 'Pedetan' Lemuru

E. Total Microbial Count

Based on Table 6 and Fig. 5 could be seen that the highest total microbial count was attained by 'pedetans' which were produced by the processing group from Melaya village, that was 15.55 10³ cfu, and the lowest result was found from Pengambangan village, which was 10.55 cfu, in which the average of the total microbial count was 11.76 10³ cfu. This total microbial count was lower than microbial contamination of total plate count (TPC) which is required by SNI 2721-1:2009, maximally 1.0 10⁵. These showed that the 'pedetans' fishes were processed with good hygiene sanitation in resulting qualified and safe-consumed products, in order to bring 'pedetans' as source of protein and good alternative for food security. Spices that were rubbed and smeared on the 'pedetans' such as garlic, salt, and sugar could be also functionated as antimicrobial compounds for suppressing the growth of microbes. The drying process under sunlight was done for preservation reason, therefore would be obtained a safe-consumed product, whether in terms of microbiological quality and organoleptic [5].

TABLE VI
OBSERVATION DATA OF TOTAL MICROBIAL COUNT (CFU)

Sample Villages	Producer 1	Producer 2	Producer 3	Producer 4	Average
Pengambangan	4.9 10 ⁴	6.5 10 ³	3.6 10 ³	3.1 10 ³	15.55 10 ³
Air Kuning	2.1 10 ⁴	5.1 10 ³	3.4 10 ³	4.0 10 ³	8.38 10 ³
Yeh Sumbul	3.8 10 ⁴	5.2 10 ³	4.7 10 ³	3.1 10 ³	12.75 10 ³
Banyu Biru	3.2 10 ⁴	4.9 10 ³	3.5 10 ³	3.2 10 ³	10.90 10 ³
Perancak	4.1 10 ⁴	4.5 10 ³	3.4 10 ³	4.4 10 ³	13.33 10 ³
Melaya	2.5 10 ⁴	4.8 10 ³	4.6 10 ³	4.3 10 ³	9.68 10 ³
Average					11.76 10 ³

According to research result the subjective observation data were obtained as the following Table 7.

TABLE VII
SUBJECTIVE OBSERVATION DATA OF 'PEDETAN' LEMURU

Village	Color	Smell	Taste	Texture	Overall Acceptance
Pengambangan	4.62	5.05	4.82	4.37	5.07
Air Kuning	5.02	5.07	5.28	5.23	5.38
Yeh Sumbul	5.10	5.37	5.27	5.23	5.03
Banyu Biru	5.15	5.22	5.42	5.27	5.12
Perancak	5.33	5.60	5.40	5.02	5.18
Melaya	5.45	5.62	5.55	5.12	5.43
Average	5.11	5.32	5.29	5.04	5.20

F. Valuation toward the Color of 'Pedetan'

According to Table 8 Fig. 6 could be inferred that the highest organoleptic valuation toward color was attained by 'pedetans' which were produced by the processing group from Melaya village, that was 5.45 and the lowest was from Pengambangan village, that was 4.62, in which the average of organoleptic valuation toward color was 5.11. Various colors of 'pedetan' were influenced by different kinds of spices and seasoning that were used by each processing group, such as certain kind of sugar would produce certain color. Based on this observation, addition of brown coconut sugar would make darker color than the addition of granulated sugar. Panelists assessment toward the color varieties was based on their taste, though generally they preferred the brighter one to the darker one, besides considering clean and not dull product.

TABLE VIII
TABULATION OF VALUATION DATA TOWARD COLOR OF 'PEDETAN' LEMURU

Sample Villages	Producer 1	Producer 2	Producer 3	Producer 4	Average
Pengambangan	4.53	4.67	4.53	4.73	4.62
Air Kuning	4.67	4.93	5.07	5.40	5.02
Yeh Sumbul	5.00	5.20	5.40	4.80	5.10
Banyu Biru	4.67	4.87	5.47	5.60	5.15
Perancak	5.67	5.13	5.47	5.07	5.33
Melaya	5.33	5.73	5.40	5.33	5.45
Average					5.11

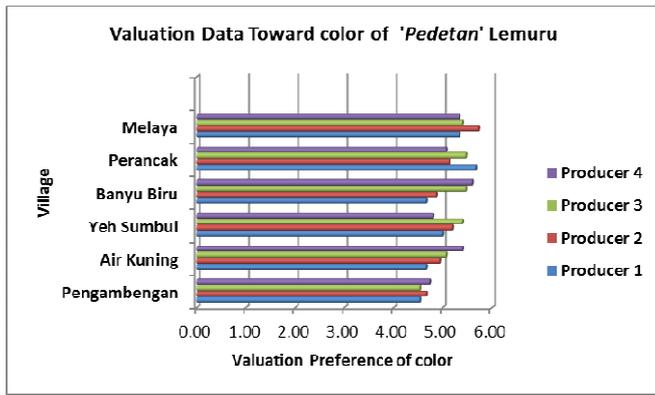


Fig. 6. Organoleptic Color Chart of 'Pedetan' Lemuru

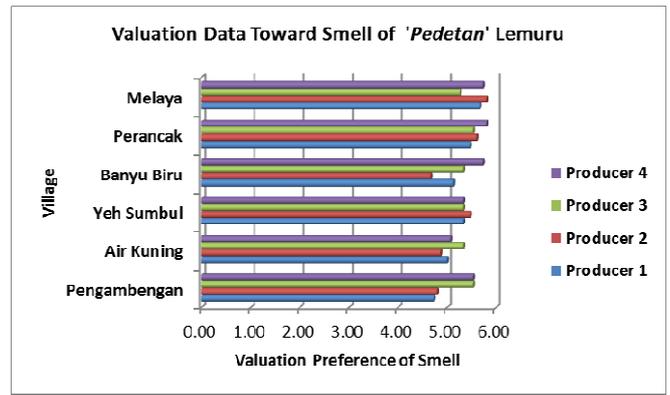


Fig. 7. Organoleptic Smell Chart of 'Pedetan' Lemuru

G. Valuation toward the Smell of 'Pedetan'

From Table 9 and Fig. 7 could be inferred that the highest organoleptic valuation toward smell was gained by 'pedetans' which were produced by the processing group from Melaya village, which was 5.62, and then the lowest value was from Pengambangan village, that was 5.05, in which the average of organoleptic valuation toward smell was 5.32. Different smells of 'pedetans' that were produced by each processing group, were also influenced by different spices and seasonings which were used by each group while processing them. Processing could influence the smell of product, in which each raw ingredient or processed product would have its own smell or flavor composition as an effect from the chemical constituents of the raw ingredient or the processing process that caused such chemical reaction [11]. Volatile aromatic compounds could arise from the result of enzymatic reaction, autooxidation of fats, thermal reaction process, result of microbial activity, and environment around the product [12].

TABLE IX
TABULATION OF VALUATION DATA TOWARD SMELL OF 'PEDETAN'

Sample Villages	Producer 1	Producer 2	Producer 3	Producer 4	Average
Pengambangan	4.73	4.80	5.53	5.53	5.05
Air Kuning	5.00	4.87	5.33	5.07	5.07
Yeh Sumbul	5.33	5.47	5.33	5.33	5.37
Banyu Biru	5.13	4.67	5.33	5.73	5.22
Perancak	5.47	5.60	5.53	5.80	5.60
Melaya	5.67	5.80	5.27	5.73	5.62
Average					5.32

H. Valuation toward the Taste of 'Pedetan'

Based on Table 10 and Fig. 8 could be seen that the highest organoleptic valuation toward taste was gained by 'pedetans' which were produced by the processing group from Melaya village, that was 5.55, whereas the lowest one was from Pengambangan village, which was 4.82. Then the average of organoleptic valuation toward taste was 5.29. As explanation above that spices and seasoning involved importantly to the color and smell of the product, they also absolutely did toward taste, in which each processing group used various spices and seasoning to arise various tastes. Addition of spices and seasoning in processing fishes could increase the taste of the fishes and also preserve or extend shelf life of the products. Salt and sugar particularly could reduce the water contents besides as flavorings [5].

TABLE X
TABULATION OF VALUATION DATA TOWARD TASTE OF 'PEDETAN'

Sample Villages	Producer 1	Producer 2	Producer 3	Producer 4	Average
Pengambangan	4.40	5.13	4.47	5.27	4.82
Air Kuning	5.40	5.27	5.33	5.13	5.28
Yeh Sumbul	5.13	5.20	5.40	5.33	5.27
Banyu Biru	5.33	5.47	5.33	5.53	5.42
Perancak	5.40	5.33	5.33	5.53	5.40
Melaya	5.60	5.53	5.53	5.53	5.55
Average					5.29

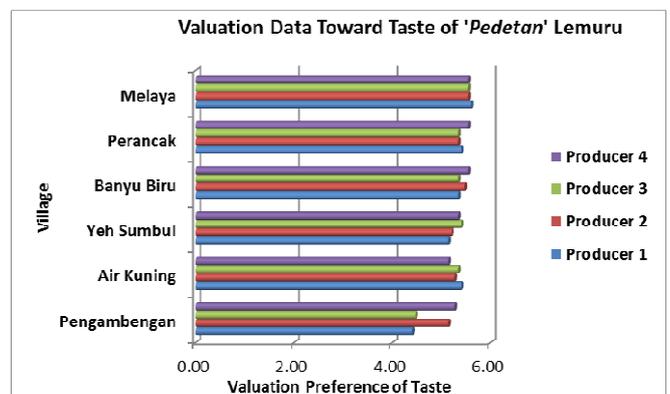


Fig. 8. Organoleptic Taste Chart of 'Pedetan' Lemuru

I. Valuation toward the Texture of 'Pedetan'

From table 11 and Fig. 9 could be inferred that the highest organoleptic valuation toward texture was attained by 'pedetans' that were produced by Banyu Biru village, which was 5.27, whereas the lowest result was from Pengambangan village. The average of organoleptic valuation toward texture was 5.04. Texture of fish could be influenced by several factors, such as composition of ingredients also processing and environment factors. In this case, the texture of 'pedetan' was influenced very much by the water contents of the raw ingredients. The lower the water contents of the ingredients, the harder texture of 'pedetan' would be got. Drying process and temperature while drying the product were also influencing the final texture. Then the environment factor, particularly the storage environment was also involving in creating the final texture. A humid environment with low temperature would change the texture into slightly moister.

TABLE XI
TABULATION OF VALUATION DATA TOWARD TEXTURE OF 'PEDETAN'

Sample Villages	Producer 1	Producer 2	Producer 3	Producer 4	Average
Pengambangan	4.37	4.47	4.53	4.53	4.37
Air Kuning	5.23	5.20	5.33	5.40	5.23
Yeh Sumbul	5.23	5.00	5.47	5.40	5.23
Banyu Biru	5.27	5.20	5.33	5.33	5.27
Perancak	5.02	5.27	4.87	5.27	5.02
Melaya	5.12	5.13	4.67	5.53	5.12
Average					5.04

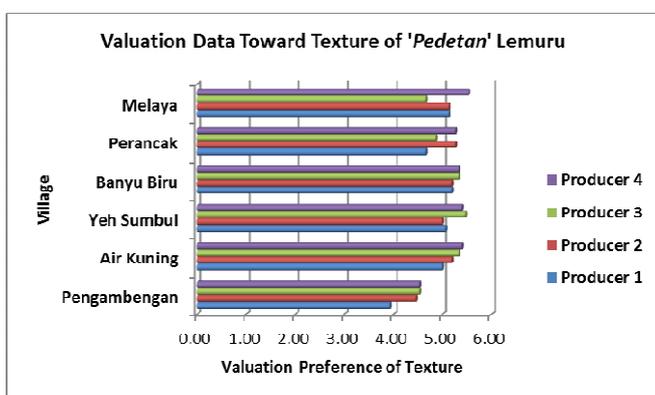


Fig. 9. Organoleptic Texture Chart of 'Pedetan' Lemuru

J. Valuation toward the Overall Acceptance of 'Pedetan'

According to Table 12 and Fig.10 could be seen that the highest organoleptic valuation toward overall acceptance was attained by 'pedetans' which were produced by the processing group from Melaya village, that was 5.43 (rather like-like) and the lowest was from Yeh Sumbul village. The average of organoleptic valuation toward overall acceptance was 5.20 (rather like-like). The overall acceptance toward 'pedetans' lemuru which were produced by the 6 villages as the producers of 'pedetans', was rather like-like evenly. This

overall acceptance was the combination of valuations toward color, smell, taste, and texture.

TABLE XII
TABULATION OF VALUATION DATA TOWARD OVERALL ACCEPTANCE OF 'PEDETAN'

Sample Villages	Producer 1	Producer 2	Producer 3	Producer 4	Average
Pengambangan	5.00	5.33	4.67	5.27	5.07
Air Kuning	5.60	5.40	5.47	5.07	5.38
Yeh Sumbul	4.80	5.20	5.13	5.00	5.03
Banyu Biru	5.20	5.07	5.07	5.13	5.12
Perancak	5.33	4.93	5.13	5.33	5.18
Melaya	5.40	5.20	5.40	5.73	5.43
Average					5.20

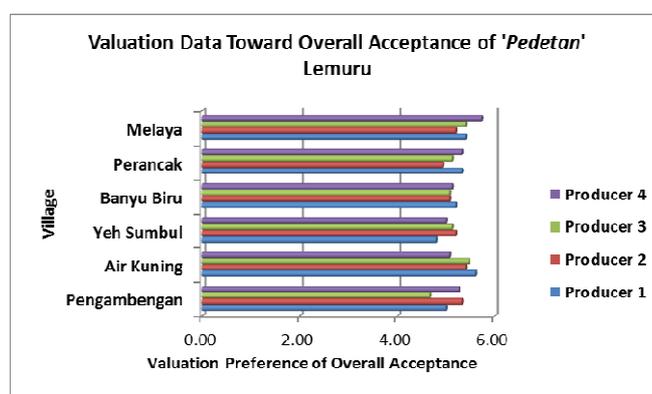


Fig. 10. Organoleptic Overall Acceptance Chart of 'Pedetan' Lemuru

IV. CONCLUSION AND SUGGESTION

The best 'Pedetans' lemuru among the 6 villages (producers) were the 'pedetans' which were produced by Melaya village with water contents 15.398%, protein contents 55.5704%, fat contents 1.2361%, ash contents 8.5731%, and total microbial count 11.76 10³, also based on organoleptic valuations, the product was preferred by panelists. The traditional food 'Pedetan', especially which made from lemuru, could diversify food products for fulfilling food consumption and also national food security.

Trainings are needed for providing better processing technology by concerning to sanitation and hygiene, in order to improve the quality and safety of 'pedetan' lemuru. Researches should be continued in term of the use of packaging materials in attempting to extend the shelf life and guarantee the food safety of 'pedetan' lemuru.

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