

## Identification of Genotype DNA Microsatellite in Association with Performance of Indonesian Aceh Cattle

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### ABSTRACT

The objectives of this research were to evaluate polymorphism of microsatellite DNA through the investigation of microsatellite loci BM1824, SPS115 and ILSTS028 and its possible association with body weight of Aceh cattle. A total of 126 head of DNA samples was collected from 3 local Aceh cattle population, i.e. Banda Aceh, Indrapuri and Saree district. Genetic polymorphism among group of Aceh cattle was calculated in frequency of alleles and genotypes. Association between genotypes and body weight was calculated by general linear model (GLM). Result showed that three loci showed high polymorphism. BM1824 locus had 13 genotypes with 3 highest frequency for BC (31.75), CC (19.84) then BB (14,29), while frequency of the other 10 genotypes providing AB, AC, AD, AF, BD, BE, BF, CD, DD and DF were less than 10 %. SPS115 locus had 10 genotypes with two highest frequency for CE (25.00) and BE (19.23), while the other 8 genotype were less than 14%. ILSTS028 locus had 28 genotypes with three highest frequency for CH (24,37), CC (11,76) and HH (10,08), respectively. It could be verified that Aceh cattle possessing typical genotypes of AF in BM1824 locus and AB in SPS115 locus was apparently related with a higher body weight compared to another genotypes, on the contrary, those possessing BB and BL genotypes in ILSTS028 was seemingly associated with a lower body weight.

**Key Words:** Aceh cattle, microsatellite DNA, genotypes, body weight.

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*Journal of Genetic Engineering and Biotechnology, 2010, 8(1): 43-51*

### INTRODUCTION

Nowadays, Technology and Science of Molecular-Biology has progressed, particularly in the Genetic Chemistry (DNA and RNA), PCR Technology and electrophoreses has invented some series of *genetic matter* as genetic marker to the economical character which has high economical values, morphological character, diseases, genealogy of individual or species of certain livestock.

In this basic genome, among molecular marker that applied to characterize genetic, *microsatellite* was the most favorable marker since it was polymorphic and informative, the composition in this basic genome was relative large and amplifiable through PCR. This marker had been applied to analyze the migration and domestication on the Europe cattle (*Loftus et al. 1994 and Bruford et al. 2003*) and to characterize the cattle population of *Bos Indicus* and *Bos Taurus* (*Moore et al. 1992 and Beja-Pereira et al. 2003*).

The most important molecular marker application was for genetic mapping that was applied to indicate the location of gene which led to the character, i.e. the complex

quantitative on chromosome. Since the molecular marker was at DNA level and that it was free from the epistasis, environment and phenotype, so it could provide the definitive genetic to investigate the varieties of genetic, detect the major genes and research the complex genetic characters (*Muladno 2006*).

Microsatellite marker was massively used as the genetic marker population research and genealogy verification (*Cervini et al. 2006*), particularly it was caused that microsatellite contained information of high polymorphism covering genome eukaryote. Microsatellite was used in *Mukesh et al. (2004)* to investigate the varieties of genetic and determined the association among the three species of Zebu India cattle (*Sahiwal, Hariana and Deoni*). The use of QTL with *microsatellite* to character growth and carcass on cattle had been shown by numbers of researchers, i.e. *Casas et al. (2004)*; *Curi et al. (2005)* and *Mizoguchi et al. (2006)*, while on the other sheep was shown by *Walling et al. (2004)* and *Geldermann et al. (2006)*.

Information about the varieties of microsatellite DNA on Aceh cattle had been shown before (Abdullah 2008), but information about the association between polymorphism microsatellite DNA with body weight of Aceh cattle had never been shown. Therefore, the objectives of this research were to evaluate polymorphism of microsatellite DNA and its possible association with body weight of Aceh cattle. In supporting information data about the genetic characteristic of Aceh cattle before, it was hoped that the basic polymorphism of microsatellite genetic on the three loci could support the accurate and valuable information to the progress and development policies in improving the genetic quality of Aceh cattle.

## MATERIAL AND METHOD

### Time and Place of Research:

Research of DNA for genotyping of microsatellite started on November 10, 2009 to January 4, 2010 in Molecular and Genetic Laboratory CAAS (Chinese Academy of Agricultural Sciences) – ILRI (International Livestock Research Institute) JLLFGR (Joint Laboratory on Livestock and Forage Genetic Resources) Beijing – China. The sampling of Aceh cattle blood was taken from Banda Aceh (17), Saree (54) and Indrapuri (129). Isolation, extraction and purification of DNA totally were performed in Genetic and Livestock Laboratory, Faculty of Livestock, Bogor Agricultural Institute (IPB), Indonesia

### Sampling of Aceh cattle blood:

Sampling of Aceh cattle blood was taken by using venoject (EDTA) 5 ml in vena jugularis.

### Extraction of DNA Genome:

Extraction of DNA genome was taken by the method of Sambrook et al. (1989) which had been modified with buffer lysis cell (400 µl 1 x STE and 40 µl 10% SDS and 10 µl proteinase-K. DNA was purified with fenol-kloroform, that was added 40 µl 5M NaCl and 400 µl phenol and chloroform iso amil alcohol (CIAA). DNA was precipitated with 40 µl 5M NaCl and 800 ul ethanol absolute. Precipitation was purified by adding 800 µl 70% ethanol, dysenteryfugate with 12.000 rpm speed for 5 minutes, ethanol let reduced

and evaporated, then DNA let dissolved with 100 µl 80% TE (Elution buffer).

### Amplification of Microsatellite DNA:

Microsatellite was amplified through Polymerase Chain Reaction (PCR). Each PCR reaction volume 15 µl with PCR reaction composition containing 1.5 µl 1x buffer PCR; 1 µl dNTP; 0.25 µl Taq DNA Polymerase; 0.25 µl Primer; 1.5 µl DNA. and 10.5 µl dH<sub>2</sub>O. PCR engine used for GeneAmp PCR System 9700 Applied Biosystem. The first denaturized at 94°C for 30 seconds, 30 seconds annealing at temperature of 55.5°C–65°C, extension at 72°C for 30 seconds, followed with polymerase at 72°C for 5 minutes and freezing temperature 4°C for 25 minutes. All the process in 33 cycles.

### Primer Microsatellite:

#### Electrophoreses of PCR product:

Prepare a 96-tubed plate and pour 12 µl of composition 25 ul LIZ Size Standard 500 bp and 1200 µ Hi-di Formamide into each tube. Put the sample of PCR product 1 µl into each tube containing the composition of LIZ Size Standard and Hi-di Formamide (12 µl). The plate covered with grey-rubber-lid and denaturize in 95°C for 5 minutes. And then, flank the plate between the black specific tray on the bottom part and the white one on the upper part. Next place it in the ABI 3130x engine. Turn on the software before the engine. When all program features show the gene signal, the import sheet sample start for Plate Manager as the place of electropherogram. Then, the engine is ready to use for ± 6 hours and the engine will show the complete signal when the genotyping process has already done.

The result of electrophoreses ABI engine can be seen and analyzed with the software Gene Mapper version 4.0 after passing the electrophoreses process in Applied Bio system 3130x Genetic Analyzer engine. Software on the monitor screen will show in graph with the particular length in base pairs (bp) on each sample. The one-peak constant graphic showed the amplified sample had an alleles (homozygote) and the two-peak samples showed two alleles (heterozygote). If it showed the disorder graph, it would show no result and if it showed more than two graphic signals, the sample would be contaminated by other DNA.

**Table 1:** Primer microsatellite BM1824 locus, SPS115 locus and ILSTS028 locus.

Primer Sequen	PCRProduct	Annealing Temp	Locus
'F:5'-GAGCAAGGTGTTTTTCCAATC-3	180-194	58 °C	BM1824
'R:5'-CATTCTCCAACCTGCTTCCTTG-3			
'F:5'-AAAGTGACACAACACGTTCTCCAG-3	234-254	65 °C	SPS115
'R:5'-AACGAGTGTCTAGTTGGCTGTC-3			
'F:5'-TCCAGATTTGTACCAGACC-3	131-165	55 °C	ILSTS028
'R:5'-GTCAATGTCATACCTTTGAGC-3			

### Analyze of Data:

Analyze of allele data was made using software GeneMapper version 4.0 (Applied Bio systems) and the result was inserted to the data tabulation of sheet Excel. The frequency of each alleles of microsatellite locus was calculated based on Nei and Kumar formula (2000):

$$X_i = (2n_{ii} + \sum n_{ij}) / (2N)$$

#### Notes:

- $X_i$  : Alleles frequency (i)  
 $n_{ii}$  : Individual number of genotype AiAi  
 $n_{ij}$  : Individual number of genotype AiAj  
 $N$  : Sample Total

Heterozygote degree (h) was calculated based on the alleles frequency on each locus of microsatellite DNA with Nei and Kumar formula (2000):

$$\hat{h} = 2n(1 - \sum x_i^2) / (2n - 1)$$

#### Notes:

- $x_i$  : Frequency of the first locus alleles  
 $n$  : Amount of sample  
 $\hat{h}$  : Locus heterozygote

Association between genotypes of DNA microsatellite and body weigh was calculated by general linear model (GLM) with procedure of Least Square Means (LSM) (SAS. 1985)

## RESULT AND DISCUSSION

### Frequency and Distribution of Allele:

Allelic polymorphism of the three loci DNA microsatellite, BMI824, SPS 115 and ILSTS028 identified from the three Aceh cattle population showed different level varieties. As shown on Tables (2, 3 and 4); identified that BMI824 locus had 4 alleles (A, B, C and D) by range of 180 – 200 bp. SPS115 locus had 5 alleles (A, B, C, D and E) by range of 170 – 190 bp. And ILSTS028 locus had 8 alleles (A, B, C, D, E, F, G and H) by range of 130 – 145 bp.

Alleles A and B on BMI824 locus were found on the three analyzed loci. While allele A was only found in Indrapuri and Allele D was only found in Saree. Allel C was found with high frequency on Aceh cattle in Indrapuri, about 0.23. High microsatellite allele frequency both each locus and Aceh cattle population in Banda Aceh, Indrapuri and Saree was because of that microsatellite had high polymorphism (Abdullah 2008).

Polymorphism of BMI824 locus was shown on Table (5) that entirely it had 13 genotypes. Polymorphism of the three loci on Aceh cattle population results different polymorphism. Indrapuri cattle had most genotypes compared to the others, there were 11 genotypes. Genotype of BMI824 locus had

less compared to Aceh cattle population in Indrapuri, Saree (7 genotypes: BB, BC, BF, CC, CD, DD and DF) and Aceh cattle population in Banda Aceh had only 4 genotypes, those were BC, BD, CC and CD.

Research on frequency genotype among three local Aceh cattle showed that total genotype of BC had the highest frequency (31.75 %), on the contrary, the lowest frequency were on AF, BE, DD and DF that had the same frequency (0.79%). Genotype of BC, the highest frequency was in Saree (35.14%), followed by Aceh cattle in Indrapuri (30.87%) and Banda Aceh (25,0 %). While genotypes of AF and BE were only found in Aceh cattle in Indrapuri with the fairly same and lower frequency (1.23%). Genotypes of DD and DF were only founded in Aceh cattle in Saree with the fairly same and lower frequency (2.70%). Frequency of genotype of CC (19.84%) was the second highest genotype after BC. Frequency of genotype of CC had high value on Aceh Cattle in Banda Aceh about 37.5%, followed by Saree (21.62%) and Indrapuri (17.28%). The result of the 3 local Aceh cattle populations showed that none of them possessed all typical genotypes (13 genotypes) in BM1824 locus.

### Polymorphism and Distribution of Genotype of Microsatellite DNA:

Polymorphism of DNA microsatellite of SPS115 locus, from the 3 local Aceh cattle population was shown on Table (6), in SPS115 locus were 10 genotypes. In Indrapuri there were only 9 genotypes of SPS115 locus but CD. While the others two population in Banda Aceh had only 2 genotypes, AB and AE. Then, Saree had 6 genotypes of SPS115 locus, they are BB, BC, BE, CD, CE and EE.

Based on the research of the 3 Aceh cattle population, Aceh cattle possessing typical genotypes of CE had higher frequency compared to the others, it was 25 %, followed by genotype of BE (19.23%), genotype of BC and CC with same frequency (13.46%). Genotype of CE had high frequency on Aceh cattle population in Indrapuri, about 30%, followed by Saree (11.11%). In Banda Aceh, Aceh cattle possessing typical genotypes of AE had very high frequency (66.66%) while in Indrapuri had only 2.5%. Genotype of BE, in Saree had higher frequency compared to Indrapuri (20.0%). Polymorphism of DNA microsatellite of SPS115 locus, from the 3 local Aceh cattle population showed that there were only 4 genotypes (CE, BE, BC and CC) which possessing higher frequency than 10 %. While the other 6 genotypes (AB, AE, BB, BD, CD, EE) had only less than 10 % of genotypes frequency.

Polymorphism of DNA microsatellite of ILSTS028 locus, from the 3 local Aceh cattle population (Banda Aceh, Saree and Indrapuri) was shown on Table (7).

In ILSTS028 locus, Aceh cattle possessing typical genotypes of CH (24.36%) was the highest frequency compared to the other 27 genotypes, followed by genotype of CC (11,76%) and genotype of HH (10.08%). While the other genotypes had frequency less than 10%. Generally, the three genotypes of CH, CC and HH, belonged to the three local Aceh cattle population. In Saree, genotype of CH had the highest frequency (28.58%), followed by Indrapuri (24.69%) and Banda Aceh (22.26%)

#### Association between the Genotypes of DNA Microsatellite with Body Weight:

The association between the genotypes of DNA microsatellite with body weight of the 3 local Aceh cattle population (Banda Aceh, Saree and Indrapuri) was shown on Table (8). Aceh cattle possessing typical genotypes of AD, AF, BD and CD in BM1824 locus, had same average weight about 203, 25 – 250.00 kg. while BE had the highest average body weight compared to 12 other genotypes in BM1824 locus.

Aceh cattle possessing typical genotypes of BE had the highest body weight average compared to 12 other genotypes with 300.00 kg. On Table (5), Aceh cattle possessing four genotypes, AD, AF, BD and CD were in Indrapuri, while BD and CD were in Banda Aceh and CD was in Saree.

In SPS115 locus, Aceh cattle possessing typical genotypes of CD had average body weight 250.00 kg higher than 9 other genotypes. This genotype, CD was in Saree. While BC had lower body weight average compared to the others with 175.00 kg in Saree and Indrapuri (Table 9).

**Table 2:** Allele Frequency Locus BM1824 and average heterozygosity value in Aceh cattle.

Population	Type and allele size(bp) and heterozygosity ( $\hat{h}$ ) locus				
	BM1824				
	A	B	C	D	(h)
	171	179	181	183	
Banda Aceh	0	0.0119	0.0317	0	1.000
Saree	0	0.115	0.0793	0.0119	0.9937
Indrapuri	0.0555	0.2341	0.1349	0	0.9297
Average Heterozygosity ( $\hat{H}$ )					0.9744

**Table 3:** Allele Frequency Locus ILSTS 028 and average heterozygosity value in Aceh cattle.

Population	Type and allele size (bp) and heterozygosity ( $\hat{h}$ ) locus								
	ILSTS028								
	A	B	C	D	E	G	H	I	(h)
	129	133	137	139	141	143	145	151	
Banda Aceh	0.0042	0	0.0168	0	0	0	0.0168	0.0042	1.000
Saree	0.0084	0.0378	0.0588	0.0084	0.0084	0.0042	0.0378	0	1,000
Indrapuri	0.0084	0.0504	0.2268	0.0042	0.0126	0.0336	0.0756	0	0.9448
Average Heterozygosity ( $\hat{H}$ )									0.9816

Table (10) showed that Aceh cattle possessing typical genotypes of CE and CI had higher body weight compared to the other 27 genotypes, with 290.00 kg. These two genotypes belonged to Aceh cattle in Indrapuri. Aceh cattle possessing typical genotypes of AE, AF, CD and DD had same average body weight with 200.00 kg and both AE and CD were only in Indrapuri, while AF and DD were in Saree Table (7). In ILSTS028 locus, Aceh cattle possessing typical genotypes of BB had the lowest body weight compared to 27 other genotypes with 130 kg and it was only in Saree.

According to the research of the 3 local Aceh cattle population (Banda Aceh, Saree and Indrapuri) for 3 loci (BM1824, SPS115 and ILSTS028), Aceh cattle possessing typical genotypes of DF in BM1824, Aceh cattle possessing typical genotypes of BC in SPS115 and Aceh cattle possessing typical genotypes of BB in ILSTS028 were Aceh cattle which possessed lower body weight than the other genotypes. The three genotypes were found in Saree. While Aceh cattle possessing typical genotypes of BE in BM1824 and CE in ILSTS028 led to possess higher body weight and only in Indrapuri and CD in SPS115 was only found in Saree.

Apparently, positive heterocyst caused the high body weight average on 3 genotypes of each locus which showed more average than old average (*Bourdon 2000*). It could be verified that the high coefficients of polymorphism was apparently that there was a relationship between genotypes of DNA microsatellite with body weight (*Sumantri et al. 2008*).

**Table 4:** Allele Frequency Locus SPS115 and average heterozygosity value in Aceh cattle.

Population	Type and alele size (pb) and heterozygosity ( $\hat{h}$ ) locus					
	SPS115					
	A	B	C	D	E	(h)
	242	244	246	250	252	
Banda Aceh	0.0384	0	0	0	0	1.000
Saree	0	0.0576	0.0192	0	0.0384	1,000
Indrapuri	0.0192	0.1538	0.2500	0	0.0769	0.9190
Average Heterozygosity ( $\hat{H}$ )						0.973

**Table 5:** Genotype frequency of DNA microsatellite, BM1824 locus on Aceh Cattle.

Genotype	BANDA ACEH	SAREE	INDRAPURI	Total
	(n)/(%)	(n)/(%)	(n)/(%)	(n)/(%)
AB	0(0,0)	0(0,0)	7(8,64)	7(5,55)
AC	0(0,0)	0(0,0)	4(4,94)	4(3,17)
AD	0(0,0)	0(0,0)	2(2,47)	2(1,58)
AF	0(0,0)	0(0,0)	1(1,23)	1(0,79)
BB	0(0,0)	6(16,22)	12(14,82)	18(14,28)
BC	2(25,0)	13(35,14)	25(30,87)	40(31,75)
BD	1(12,5)	0(0,0)	7(8,64)	8(6,35)
BE	0(0,0)	0(0,0)	1(1,23)	1(0,79)
BF	0(0,0)	4(10,81)	2(2,47)	6(4,76)
CC	3(37,5)	8(21,62)	14(17,28)	25(19,84)
CD	2(25,0)	4(10,81)	6(7,41)	12(9,52)
DD	0(0,0)	1(2,70)	0(0,0)	1(0,79)
DF	0(0,0)	1(2,70)	0(0,0)	1(0,79)
Total	8(100)	37(100)	81(100)	126 (100)

**Table 6:** Genotype frequency of DNA microsatellite, SPS115 locus on Aceh Cattle.

Genotype	BANDA ACEH	SAREE	INDRAPURI	Total
	(n)/(%)	(n)/(%)	(n)/(%)	(n)/(%)
AB	1(33,33)	0(0,0)	1(2,50)	2(3,85)
AE	2(66,66)	0(0,0)	1(2,50)	3(5,77)
BB	0(0,0)	1(11,11)	1(2,50)	2(3,85)
BC	0(0,0)	2(22,23)	5(12,5)	7(13,46)
BD	0(0,0)	0(0,0)	1(2,5)	1(1,92)
BE	0(0,0)	2(22,22)	8(20,0)	10(19,23)
CC	0(0,0)	0(0,0)	7(17,5)	7(13,46)
CD	0(0,0)	1(11,11)	0(0,0)	1(1,92)
CE	0(0,0)	1(11,11)	12(30,0)	13(25,0)
EE	0(0,0)	2(22,22)	4(10,0)	6(9,61)
Total	3(100)	9(100)	40(100)	52 (100,0)

**Table 7:** Genotype frequency of DNA microsatellite, ILSTS028 locus on Aceh Cattle.

Genotype	BANDA ACEH	SAREE	INDRAPURI	Total
	(n)/(%)	(n)/(%)	(n)/(%)	(n)/(%)
AB	0(0,0)	0(0,0)	1(1,23)	1 (0,84)
AE	0(0,0)	0(0,0)	1(1,23)	1(0,84)
AF	0(0,0)	1(3,32)	0(0,0)	1(0,84)
AH	1(14,28)	1(3,22)	0(0,0)	2(1,68)
BB	0(0,0)	1(3,22)	0(0,0)	1(0,84)
BC	0(0,0)	4(12,9)	6(7,42)	10(8,4)
BG	0(0,0)	2(6,46)	1(1,23)	3(2,52)
BH	0(0,0)	0(0,0)	4(4,94)	4(3,36)
BK	0(0,0)	0(0,0)	1(1,23)	1(0,84)
BL	0(0,0)	1(3,22)	0(0,0)	1(0,84)
CC	1(14,28)	2(6,46)	11(13,59)	14(11,76)
CD	0(0,0)	0(0,0)	1(1,23)	1(0,84)
CE	0(0,0)	0(0,0)	1(1,23)	1(0,84)
CF	0(0,0)	0(0,0)	1(1,23)	1(0,84)
CG	0(0,0)	2(6,46)	3(3,70)	5(4,2)
CH	2(28,58)	7(22,6)	20(24,69)	29(24,36)
CI	0(0,0)	0(0,0)	1(1,23)	1(0,84)
CJ	0(0,0)	1(3,22)	2(2,47)	3(2,52)
CK	0(0,0)	0(0,0)	3(3,70)	3(2,52)
DD	0(0,0)	1(3,22)	0(0,0)	1(0,84)
DH	0(0,0)	0(0,0)	1(1,23)	1(0,84)
EH	0(0,0)	2(6,46)	3(3,70)	5(4,2)
GH	0(0,0)	1(3,22)	7(8,66)	8(6,72)
GK	0(0,0)	0(0,0)	1(1,23)	1(0,84)
HH	2(28,58)	4(12,9)	6(7,42)	12(10,08)
HJ	0(0,0)	1(3,22)	4(4,94)	5(4,2)
HK	0(0,0)	0(0,0)	2(2,47)	2(1,68)
IK	1(14,28)	0(0,0)	0(0,0)	1(0,84)
Total	7(100)	31(100)	81(100)	119 (100)

Based on the research of ILSTS 028 locus on the 3 local Aceh cattle (Banda Aceh, Saree, and Indrapuri), it showed that Indrapuri had 22 genotypes, Saree had 15 genotypes, and Banda Aceh had only 5 genotypes (AH, CC, CH, HH, and IK).

**Table 8:** Association between microsatellite genotype, in BM1824 locus with body weight of Aceh cattle.

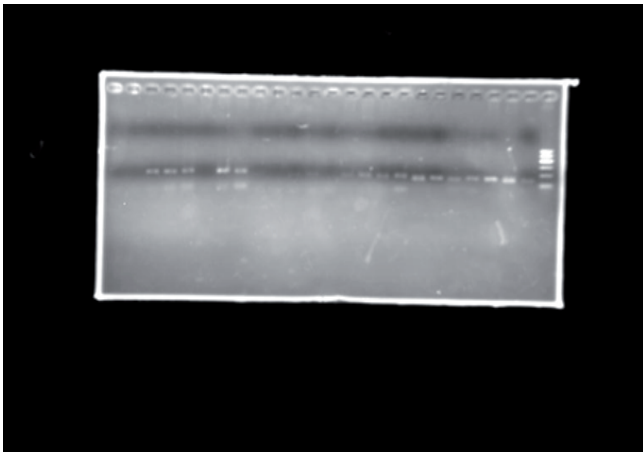
Genotype	Individu	Frequensi (%)	Body Weight	KV (%)
AB	7	5.56	152,85 ± 61,02	39,92
AC	4	3.17	180,00 ± 8,16	4,53
AD	2	1.59	205,00 ± 7,07	3,45
AF	1	0.79	250,00 ± 0,00	0,00
BB	18	14.29	186,39 ± 42,41	22,75
BC	40	31.75	198,25 ± 55,49	27,99
BD	8	6.35	214,38 ± 48,06	22,42
BE	1	0.79	300,00 ± 0,00	0,00
BF	6	4.76	161,67 ± 35,49	21,92
CC	25	19.84	177,00 ± 50,84	28,72
CD	12	9.52	203,25 ± 50,46	24,82
DD	1	0.79	180,00 ± 0,00	0,00
DF	1	0.79	130,00 ± 0,00	0,00
Total	126	100		

**Table 9:** Association between microsatellite genotype, In SPS115 locus with body weight of Aceh cattle.

Genotype	Individu	Frequensi (%)	Body Weight	KV (%)
AB	2	3.85	222,50 ± 53,02	23,83
AE	3	5.77	206,67 ± 119,3	57,72
BB	2	3.85	190,00 ± 14,14	7,44
BC	7	13.46	175,00 ± 58,95	33,68
BD	1	1.92	200,00 ± 0,00	0,00
BE	10	19.23	195,00 ± 55,17	28,29
CC	7	13.46	185,71 ± 45,49	24,5
CD	1	1.92	250,00 ± 0,00	0,00
CE	13	25.00	184,61 ± 35,02	18,97
EE	6	11.54	223,33 ± 71,18	31,87
Total	52	100		

**Table 10:** Association between microsatellite genotype, in ILSTS028 locus with Body Weight of Aceh cattle.

Genotype	Individu	Frequensi (%)	Body Weight	KV (%)
AB	1	0.840	185,00 ± 0,00	0,00
AE	1	0.840	200,00 ± 0,00	0,00
AF	1	0.840	200,00 ± 0,00	0,00
AH	2	1.681	160,00 ± 0,00	0,00
BB	1	0.840	130,00 ± 0,00	0,00
BC	10	8.403	187,50 ± 87,95	46,90
BG	3	2.521	213,33 ± 80,82	37,89
BH	4	3.361	197,50 ± 12,58	6,37
BK	1	0.840	199,00 ± 0,00	0,00
BL	1	0.840	130,00 ± 0,00	0,00
CC	14	11.765	177,14 ± 54,73	27,46
CD	1	0.840	200,00 ± 0,00	0,00
CE	1	0.840	290,00 ± 0,00	0,00
CF	1	0.840	185,00 ± 0,00	0,00
CG	5	4.202	169,00 ± 48,78	28,86
CH	29	24.370	193,28 ± 93,34	47,67
CI	1	0.840	290,00 ± 0,00	0,00
CJ	3	2.521	228,33 ± 62,51	27,37
CK	3	2.521	153,33 ± 37,87	24,70
DD	1	0.840	200,00 ± 0,00	0,00
DH	1	0.840	210,00 ± 0,00	0,00
EH	5	4.202	182,00 ± 20,49	11,26
GH	8	6.723	182,50 ± 62,27	34,12
GK	1	0.840	190,00 ± 0,00	0,00
HH	12	10.084	185,83 ± 53,51	28,79
HJ	5	4.202	156,00 ± 43,01	27,57
HK	2	1.681	210,00 ± 14,14	6,73
IK	1	0.840	220,00 ± 0,00	0,00
Total	119	100		



**Figure 1:** Result of electroforesis of BM 1824 dan ILSTS 028.

## CONCLUSION

Allele C in BM1824, SPS115 and ILSTS028 showed very high frequency on Aceh cattle population in Indrapuri. The high frequency of allele A from the three loci could be verified as Aceh cattle in Indrapuri. Based on the research of 3 local Aceh cattle population (Banda Aceh, Saree and Indrapuri) from the 3 loci (BM1824, SPS115 and ILSTS028), Aceh cattle possessing typical genotypes of BE in BM1824 locus and CE in ILSTS028 led to possess high body weight and were only found in Indrapuri. While Aceh cattle possessing typical genotypes of CD in SPS115 locus was only found in Saree.

### Acknowledgement:

This research was done with the support of the Research Fund of Program Sandwich DIKTI 2009/2010. The writer also gives special thanks to Prof. Han Jianlin for the chance in using some facilities of molecular laboratory in CAAS (Chinese Academy of Agricultural Sciences) – ILRI (International Livestock Research Institute), JLLFGR (Joint Laboratory on Livestock and Forage Genetic Resources) Beijing – China (as the “visiting scientist”).

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