Identification of Genetic on Blood Serum Protein of Prolific Ewes

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Abstract

The aim of the research was to identify the genetic specification of blood plasma protein in ewes that are prolific. The material of study of local sheep in Bawen and Jambu Sub-district of Semarang Regency is 132 which is determined by purposive sampling that have been give lambing three times. Ewes were divided into three groups that always has a single child (L1), ever had twins (L2) and twins more than two (LM2). Blood sampling was performed using dispossible syringe in jugular vein as much as 5 ml per ewe. Blood plasma was analyzed by Polyacrylamide Gel Electrophoresis-Thin Layer (PAGETLE) method in Biochemistry Laboratory of Veterinary Faculty of Gadjah Mada University. Data analysis is using descriptive statistics and the laws of equilibrium Hardy-Weberg. The research parameters were comparison type of ewes and frequency genetic of protein of blood serum. The results showed that the parent comparisons of L1, L2 and LM2 were 66 (50.00%), 49 (37.12%) and 17 (12.88%), respectively. The frequency genes haven a high propensity to relationship of prolificacy nature parent are Pal^2, Alb^B , CP^F, TF^B, PTF^S and Aml^B on pointes, 67.65, 55.88, 91.17, 70.59, 79.41 and 91.18%. Conclusion the mostly LM2 ewes have genotypes Pal^1Pal^2, Alb^BAlb^C, Cp^FCp^F, Tf^ATf^B, Ptf^SPtf^S and Aml^BAml^B whit frequency are 52.94%, 52.94%, 88.24, 47.06, 64.71 and 88.24% respectively.

1. Introduction

The right program to increasing the population and production of sheep in the future is to use prolific ewes parent. The use of prolific ewe parent will both speed up and simplify the production of prolific sheep breeds, as they are more effective and efficient. Prolific ewes are female sheep that have the ability to produce more than two sheep for each birth. The ability to produce lambs over two every birth is the fecundity gene expression of every ewes. According to [1] prolific sheep has the homozygote genotype of the dominant fecundity gene (FF), while those with twin and singular abilities are the genotypes of heterozygote (Ff) and homozygote recessive (ff). The prolificacy Indonesia of sheep occurs due to the mutation of genes B in the indigenous Java sheep [2]. The strategic program breeding was separated between of a group of sheep prolific and non-prolific [3]. The group of productive ewes mated with males of the productive offspring to get more types of prolific [4]. The selection of prolificacy trait in cattle showed a greater effect on the performance of litter size [5]. The problem in the selection of fertile ewe is the number very few and not all female have fecundity genes that can indicate to the litter size. The main factor influencing the nature of sheep prolificacy is genetic of fecundity, but for better performance in the system, it is necessary to consider the supporting factors. [6]. [7] stated that the appearance of fertile ewes can be seen from the maskers associated with the ease of pregnancy and birth process. The prolific ewes should be selected that have the capacity of the uterus to gestation twins, in order to have a survival after birth. [8]

Some researcher are explane that the results of electrophoresis can be used as a supporter of superior livestock selection. Electrophoresis results showed that considerable characteristic differences between the components of minor proteins of semen in cattle and buffalo. [9]. The method of electrophoresis examination of milk proteins can determine the phylogenetic origin of the type of livestock that the results are applied to the industry with respect to the control of the quality of commercial dairy products [10].

2. Material and Methods

The research was conducted by survey method. Sheep management is done traditionally by farmer breeding. Types of feed that is generally given were grass, peanuts or foliage with additional bran or not added. The range of coarse protein content in the feed given is 8.74-11.23% and energy metabolism 1797.00-1859.00 kcal. The research material is 132 local sheep owned by ranchers in Sub-districts of Bawen and Jambu, Semarang Regency. The materials are determined by purposive sampling based on birth type ie sheep that have given birth at least three births.

The number of 132 sheep by type of birth ever happened was grouped into three ie single, twin and triplet or more lamb are 66, 49 and 17 respectively. The three groups of ewes are, a. Always single child (L1), b. Once had twins (L2) and c. Once had more than two children (LM2) at their birth. Blood collected as much as 5 ml at 08.00-10.00 pm, through the yugolaris vein of each ewe. The blood samples are stored separately at 0-40C until the electrophoresis process. The electrophoresis of proteins of blood serum using PAGETLE (Polyacrilamide Thin Gel Electrophoresis) in Biochemistry Laboratory of the Faculty of Veterinary Medicine, University of Gadjah Mada Yogyakarta. Parameters of research were locus Per-albumin (P-Alb), albumin (Alb), ceruloplasmin (Crp), transferrin (Tfr), post-tranferrin (P-Tf) and amylase I (Aml). The homozygous genotype frequencies of 1st, 2nd and heterozygous calculated by the principle of Hardy-Weinberg equilibrium [11]. The genotype frequencies in each L1, L2 and LM2 sheep clusters were analyzed descriptively.

3. Result and Discussion

Number and percentage of L1, L2 and LM2 local ewes owned by small farmers, subdistric Bawen and Jambu was 66 (50.00%), 49 (37.12%) and 17 (12.88%) respectively. The comparison of the three groups of mothers is very contrast, and LM2 is the least. The factor that cause the number of LM2 ewes was little likely caused because the farmers do not choosing their sheep on based gen of prolific. According to [5] the selection of productive traits will increase prolific of mother sheep whose effect is on the number of litter size. The number of LM2 ewes is little can be caused by nutritional and body factors that do not support the birth of more than 2 litter sizes. According to [12] nutritional deficiencies in females caused endocrine and follicular disorders in the oogenesis process, so they can not be fertilized. Another factor is the premature death of children in the womb that causes reduced litter size that was born. The embryonic mortality in uteri of cattle repeat-breeder from 16 to 34 day, reached 51.7% [13].

Table 1 show that the genotype of six sheep blood serum proteins are very varied, which means every protein genotypes vary in L1, L2 and LM2 Ewes. The variation was directed to the frequency of homozygous genotype 1st and 2nd and heterozygote with range from 4.08 to 88.24%. The frequency of pre-albumin genotype from blood serum is presented in Table 1 and Figure 1-6.

Appearance of pre-albumin genotype on L1 and LM2 ewes showed a positive interaction between the Pal1 and Pal2 alleles so that the high value of 75.76 and 52.94% (Table 1 and Figure 1). Whereas in the case Ewes L2 the positive trend of frequency genotype from homozygote 1st heterozygote and homozygote 2nd with the highest score was 55.10%. Pre-albumin has an important physiological roles as a transporter of thyroxine and retinolbinding protein. Protein pre-albumin is synthesized in the body a low or decreased concentrations, because of the response of inflammation, stress and to nutritional conditions [14].

Table 1. Frekuensi of Genotype and gen Pre-albumin Albumin Ceruloplasmin Transferrine Post-transferrine and Amylase Protein of Serum Blood from L1, L2 and LM2 Ewes In Sub-district Bawen and Jambu.

Parameter	Classification genotype	Head % number	Birth Type L1 (n=66)	L2 (n=49)	LM2 (n=17)
Pal	Pal^1Pal^1 : Pal^1Pal^2 : Pal^2Pal^2	(head)	3 : 50 : 13	5 : 17 : 27	1 : 9 : 7
		(%)	04.54:75.76:19.70	10.20:34.70:55.10	05.88:52.94:41.18
	Pal^1 : Pal^2	(number)	56 : 76	27 : 71	11 : 23
		(%)	42.42 : 57.58	27.55 : 72.45	32.35 : 67.65
Alb	Alb^BAlb^B: Alb^BAlb^C: Alb^CAlb^C	(head)	33 : 20 : 13	27 : 17: 5	5 : 9 : 3
		(%)	50.00:30.30: 19.70	55.10:34.70:10.20	29.41:52.94:17.65
	Alb^B: Alb^C	(number)	86 : 36	71 : 27	19 : 15
		(%)	65.15 : 34.85	72.45 : 27.55	55.88 : 44.12
Cp	Cp^FCp^F: Cp^FCp^S: Cp^SCp^S	(head)	30 : 23 : 13	30 : 12 : 7	15 : 1 : 1
		(%)	45.45:34.85:19.70	61.22:24.49:14.29	88.24:05.88:05.88
	Cp^F: Cp^S	(number)	83 : 49	72 : 26	31 : 3
		(%)	62.87 : 47.13	73.47 : 26.53	91.17 : 08.41
Tf	Tf^ATf^A: Tf^ATf^B: Tf^BTf^B	(head)	3 : 56 : 7	2 : 37 : 10	1 : 8 : 8
		(%)	04.55:84.85:10.60	04.08:75.51:20.41	05.88:47.06:47.06
	Tf^A: Tf^B	(number)	62 : 70	41 : 57	10 : 24
		(%)	46.97 : 53.03	41.84 : 58.16	29.41 : 70.59
PTf	Ptf^FPtf^F: Ptf^FPt^S: Ptf^SPtf^S	(head)	23 : 30 : 13	10 : 29 : 10	1; 5; 11
		(%)	34.85:45.45:19.70	20.41:50.18:20.41	05.88:29,41:64.71
	Ptf^F: Ptf^S	(number)	76 : 56	49 : 49	7 : 27
		(%)	57.58 : 42.42	50.00 : 50.00	20.59 : 79.41
Aml	AmI^BAmI^B: AmI^BAmI^C: AmI^CAmI^C	(head)	36 : 20 : 10	34 : 10 : 4	15 : 1 : 1
		(%)	54.55:30.30:15.15	69.39:20.41:08.16	88.24:05.88:05.88
	AmI^B: AmI^C	(number)	82 : 40	78 : 18	31 : 3
		(%)	62.12 : 37.88	79.59 : 02.41	91.18 : 08.02

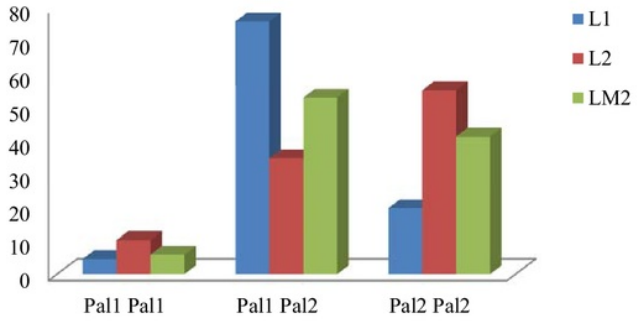

Figure 1. Genotype Frequency of Pre-albumin of Blood Serum On Ewes L1, L2 and LM2

The frequency of albumin genotype from blood serum is presented in Table 1 and Figure 2. The frequency of albumin genotypes on the L1 and L2 ewes shows decreased appearance from homozygote 1st, heterozygote and homozygote 2nd. Therefore, value of the highest frequencies in L1 and L2 ewes the genotype $Alb^{B}Alb^{B}$, which is 50.00 and 55.10%. While the genotype frequency at LM2 ewes are displays indications of interactions between alleles Alb^{B} and Alb^{C}, so that have the highest value 52.94% is $Alb^{B}Alb^{C}$ of genotype. Albumin has a complex structure, which is responsible for a variety of biological functions ,and in case of decreased the albumin molecule is susceptible to modifications that may alter its biological activity [15]. The albumin genotype is responsible for the concentration of albumin protein that ideal for physiology of the livestock body. The results of the study indicated that the requirement of albumin protein in L1 and L2 ewes were fulfilled $Alb^{B}Alb^{B}$, while LM2 by genotype $Alb^{B}Alb^{C}$.

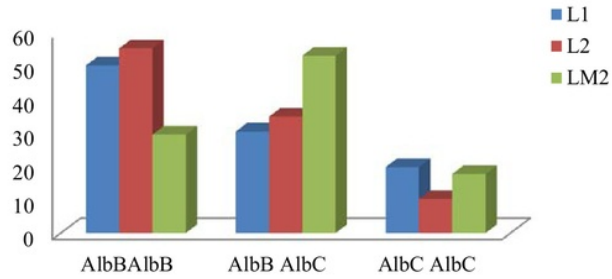

Figure 2. Genotype Frequency of Albumin Blood Serum Ewes L1, L2 and LM2

The frequency of Ceruloplasmin genotype from blood serum is presented in Table 1 and Figure 3. All frequencies in L1, L2 and LM2 ewes show a downward trend. Appearance of frequency genotype $Cp^{F}Cp^{F}$, $Cp^{F}Cp^{S}$ and $Cp^{S}Cp^{S}$ on LM2 ewes were 88.24, 05.88 and 05.88%, respectively. Ceruloplasmin or caeruloplasmin is a ferroxidase enzyme whose work helps transport it in plasma with respect to transferrin controlled by the genotype CpCp. The plasma ceruloplasmin is increase highly significant ($P<0.001$) in uterine after mating, therefore fluctuations in levels of the above

parameters point to their important role in the female reproductive system [16]. Physiology in the uterus after insemination is prepare pregnancy, that was the characterized by the growth of the uterine gland and produce the uterine milk. Therefore, the works of ceruloplasmin was greatly contributed to the occurrence of pregnancy.

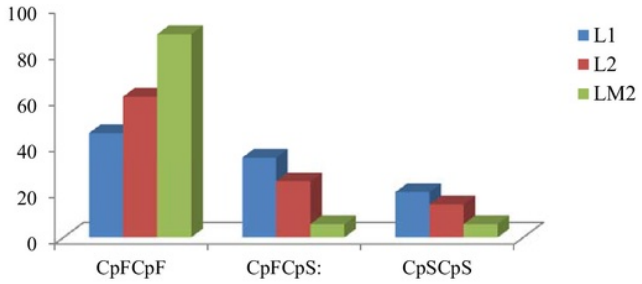

Figure 3. Genotype Frequency of Ceruloplasmin Blood Serum On Ewes L1, L2 and LM2.

The genotypes data of transferrin of blood serum are presented in Table 1 and Figure 4. Display data of frequency of transferrin genotype on figure 4 is shows that allele of Tf^{A} and Tf^{B} alleles have indicated events of positive interaction so that value of heterozygote ($Tf^{A}Tf^{B}$) looks different and higher than homozygote ($Tf^{A}Tf^{A}$ and $Tf^{B}Tf^{B}$). Frequency genotype $Tf^{A}Tf^{A}$, $Tf^{F}Tf^{S}$ and $Tf^{B}Tf^{B}$) on LM2 ewes are 05.88, 47.06 and 47.06% respectively. According to [18], the highest fertilization rate in Botosani Karakul sheep is found in Tf^{C} allele in combination with Tf^{A} and Tf^{B} alleles of 100%, while for the highest prolificacy rate is found in heterozygous allele that is on $Tf^{B}Tf^{C}$ genotypic. The heterozygous genotype of the ewes transferrin allele tends to have better production performance than homozygote so it can be used for the selection of genetically in order to increase the productivity of sheep [17].

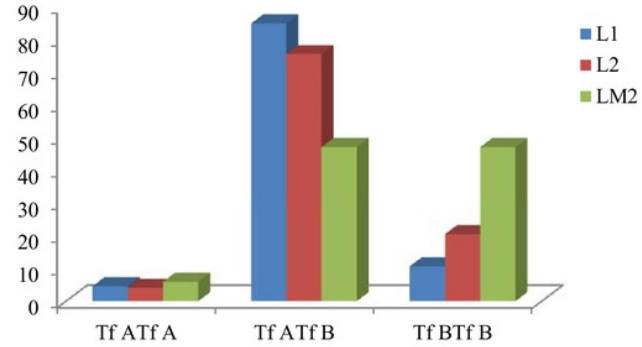

Figure 4. Genotype Frequence of Transferein Blood Serum On Ewes L1,L2 and LM2

The post-transferrin genotype in sheep serum Blood in Table 1 and Fig. 5 shows a positive interaction between alleles of Ptf^F and Ptf^S so that the Frequency of Ptf^FPtf^S on L1, and L2 ewes have the level high 45.45 and 50.18% respectively. Whereas in LM2 ewes showed a positive trend of genotype Ptf^FPtf^F, Ptf^FPtf^S, and Ptf^SPtf^S whose sequential frequency is 05.88, 29.41 and 64.71%. Post transferrin genotype of all groups of ewes have the level of high on the heterozygote, meaning they produce best protein levels in the process of reproducing local sheep in Bawen and Jambu Sub-districts.

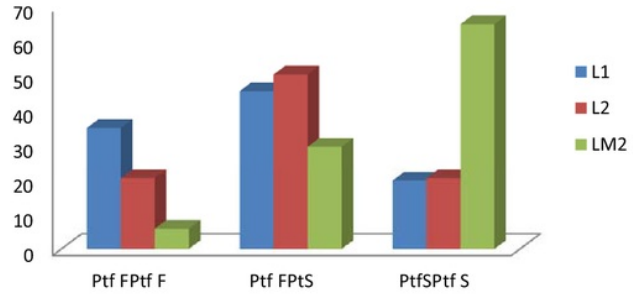

Figure 5. Genotype Frequency of Post-transferrin Blood Serum On Ewes L1, L2 and LM2.

The genotypes data of amylase of blood serum are presented in Table 1 and Figure 6. The all frequency of genotype from homozygote 1st, heterozygote and homozygote 2nd showed a decreasing trend on L1, L2 and LM2 ewes. Frequency genotype Aml^BAml^B, Aml^BAml^C dan Aml^CAml^C on LM2 ewes are 88.24, 05.88, 05.88% respectively. Amylase-I is an enzyme protein in the blood that are useful in increasing the rate of metabolism, which can used in the determination of gene loci of amylase through electrophoresis protein serum [19]. Amylase levels in the serum and urine is coupled with other laboratory tests such as liver enzymes, can be significant in important in predicting intra-abdominal injury [20].

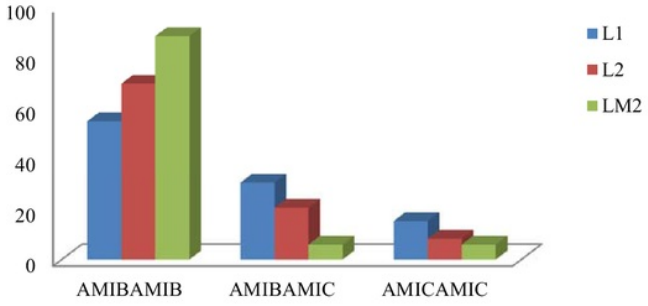

Figure 6. Genotype Frequency of Amylase I Blood Serum On Ewes L1, L2 and LM2

4. Conclusion

The mostly LM2 ewes have genotypes $Pal^{1}Pal^{2}$, $Alb^{B}Alb^{C}$, $Cp^{F}Cp^{F}$, $Tf^{A}Tf^{B}$, $Ptf^{S}Ptf^{S}$ and $Aml^{B}Aml^{B}$ whit frequency are 52.94%, 52.94%, 88.24, 47.06, 64.71 and 88.24% respectively.

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