

Characteristics of Rumen Fluid, pH and Number of Microbia

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Abstract. This research purpose is to determine the characteristics of pH rumen fluid and the amount of microbes in the rumen of Bali cattle. The research sample is healthy bali cattle rumen fluid which is slaughtered at Pesanggaran slaughterhouse Denpasar with a total of 30 samples. The research method uses conventional methods and refers to the method according to [6]. The total population of bacterial and fungal colonies was calculated by the *pour plate* method. Bacterial colonies were cultured on *nutrient agar plates* and fungi colonies were cultured on *sabouraud dextrose agar plates*. The Population of *Enterobacteriaceae* bacterial colonies was calculated by scatter method on *Mac Conkey agar plate* and *Escherichia coli* colony on *Eosin Methylen Blue agar plate*. Rumen liquid pH measurement is directly done with pH indicator strips. The study was conducted observationally and the data obtained were analyzed descriptively. The results showed that the total number of bacteria in the rumen fluid of Bali cattle with an average of 64×10^4 cfu/g, the number of fungal colonies with an average of 161×10^5 cfu/ g, the number of *Coliform* colonies was 23×10^4 cfu/g, the number of *non-Coliform* 28×10^3 cfu/g, *E. coli* 18×10^3 cfu/g and the mean The pH of Balinese cattle rumen fluid 6.9.

Key words: Balinese Cattle Rumen Fluid, *Coliform*, *E. coli*, Fungi, *non-Coliform*, Total Bacteria, pH

I. INTRODUCTION

The Indonesian government has declared self-sufficiency in meat since 2005, with various problems encountered, but until now it has not been achieved. One effort to achieve self-sufficiency in beef is to encourage community farms to increase the quantity of local cattle populations, one of which is Bali cattle. Bali cattle are originating from Bali, so their existence needs to be preserved. Bali cattle have spread to all regions of Indonesia and dominate cattle species in Indonesia,

especially eastern Indonesia. Bali cattle farms cannot be separated from the lives of Balinese peasant communities and have been kept for generations since ancient times [3]. Various efforts have been made by the Ministry of Agriculture Directorate General of Animal Husbandry and Health to boost the population of Bali cattle. One effort is to establish integrated animal husbandry centers. The target to be achieved is to compare bali beef as a producer of premium bali beef with the aim

of increasing product value added and increasing revenue.

Cattle classified as ruminants are a group of mammals known as ruminants. Ruminant livestock such as cattle have four stomach compartments consisting of the *rumen, reticulum, omasum and abomasum*. Each of these compartments has different functions. Each of these compartments has different functions. According to [9] digestive processes in the rumen, reticulum and omasum occur microbially. The role of microbes is very important in breaking food. Whereas in abomasum the digestive process occurs enzymatically because the stomach has many glands. According to [4][7] rumen is the largest compartment and has a diverse microbial community such as bacteria, fungi, protozoa. Rumen microbes have an important role because they can efficiently convert plant nutrients into energy sources. Animal fitness is influenced by the digestive process that occurs in the rumen. Animals that have good posture and a lot of meat production certainly have a good digestive system. In ruminant livestock, especially the types of cellulitic bacteria that can break down cellulose properly, is able to influence fermentation in the rumen and all aspects of feed absorption in livestock [9]. Rumen pH conditions have an important role in determining the life of microbes. Research on the pH of cattle's rumen fluid by [5]

showed that the pH of Javanese cows was 6.83 and Ongole cows 6.67.

The existence of bacteria that are classified as commensal in the digestive tract of cattle has been known to have an important role in the digestive process. Bacteria *Enterobacteriaceae* is one example of a family that is classified as commensal in the digestive tract of cattle. In the digestive tract these bacteria produce vitamins B, E and K, which play an important role in the digestive process. It is similar to cellulite fungi such as *Neocalismatik sp* and *Orpinomyces* have an important role to break down cellulose [9]. Until now, studies of the number of bacterial and fungal microbes in rumen fluid in Bali cattle have not been reported. Therefore this research is important to be carried out with the aim of obtaining information about the characteristics of pH conditions, the number of bacterial and fungal microbes and the number of *Enterobacteriaceae* in the rumen of Bali cattle.

II.MATERIALS AND METHODS

Research material is 30 samples of healthy clinical Bali cattle rumen fluid taken aseptically from the Badung Slaughterhouse (RPH) in Badung and Denpasar, Bali. The total population of bacteria and fungi is calculated by the usual

method, *the pour plate method*. Populations of bacterial colonies were cultured on *nutrient agar plates* and fungi cultures were grown on *sabouraud dextrose agar plates*. Population of *Enterobacteriaceae* was calculated by scattering method on *MacConkey agar plate* and *Eosin methylene blue agar plate*. Measurement of the pH of the rumen fluid is carried out with a pH

indicator strips [6]. The research data obtained were analyzed descriptively.

III.RESULTS AND DISCUSSION

Anesthesia time

The results of the characteristics of rumen pH and microbial fluid in the rumen of Bali cattle can be shown in Table 1. below.

Table 1. Karakteristik Cairan Rumen pH dan Jumlah Mikroba dalam Rumen Sapi

Sampel (1-20)	pH	Number of Microbia (CFU/ml)				
		ALTB	Coliform	NonColiform	<i>E. coli</i>	Fungi
Range	6,8-7	11x10 ⁴ - 171x10 ⁴	2x10 ⁴ - 57x10 ⁴	1x10 ³ - 80x10 ³	4x10 ³ - 34x10 ³	58x10 ⁵ -1312x10 ⁵
Average	6,9	64x10 ⁴	23x10 ⁴	28x10 ³	18x10 ³	161x10 ⁵

Information:

CFU: colony forming units

ALTB: bacterial total plate count

Based on the results of the study as in table 1 shows that the rumen pH range of Bali cattle is 6.8-7. The results of the rumen pH of Bali cattle are not much different from the rumen pH of Java cattle and ongole cattle that have been studied by [6], the rumen pH of Javanese cow is 6.83 and the ongole is 6.67. The condition of Bali cattle's pH is close to normal or neutral pH. This pH condition is ideal for the growth of microbes in the rumen, especially facultative anaerobic and fungal microbes. The number of bacteria in the rumen of

Balinese cattle (table.1) shows results with varying amounts of microbes. The range of ALTB 11x10⁴ -171x10⁴ CFU/g with average of 64x10⁴ cfu/g, Coliform number within range of 2-57x10⁴ CFU/g with average of 23x10⁴ cfu/g, Non Coliform bacteria number is 1-80x10³CFU/g and *E.Coli* number is 4-34x10³ with average of 18x10³ CFU/gr. The number of Fungi in Bali cattle rumen is approximately at 58x10⁵ CFU/g-1312x10⁵ CFU/g with average at 161x10⁵ CFU/g. Microbial population in cattle rumen is principally

strongly influenced by age, feed type and geographical conditions. The result from [3] research shows that shows that the microbial population in the digestive tract of Bali cattle that is kept in the lowlands more than in the highlands. According to Purbowati et al. (2011) Javanese cows fed rice straw type and rice bran without concentrates or minerals produced a daily weight growth (PBBBH) of 0.19 kg, whereas those fed rice straw, rice bran, glicirida leaves and minerals produce PBBBH 0.63 kg. The result of [5] research shows that bacteria population in the rumen fluid in Java cattle is $2,7 \times 10^7$ cfu/g, Ongole cow $2,3 \times 10^8$ cfu/g, the fungi population in the rumen fluid of Java cattle is $9,3 \times 10^4$ cfu/g and population of fungi in rumen fluid of the Ongole cattle is $1,9 \times 10^3$ cfu/g. The results showed that the rumen fluid bacterial population of Bali cattle was lower than the rumen fluid bacterial population of Java cattle and Ongole cattle. The population of rumen fluid fungi in Bali cattle is higher than in Java or Ongole cattle. Commensal bacteria found in the digestive tract such as *Enterobacteriaceae* produce vitamins B, E and K which are useful in the digestive process. Other microbes contained in the cow's rumen such as cellulose-digesting bacteria *Bacterioides succinogenes*, *Ruminococcus flavafaciens* dan *Ruminococcus albus*, hemiselulose digesting bacteria

(*Bacterioides ruminicola*, *Ruminococcus* sp), starch digesting bacteria (*Bacteroides ammylophilus*, *Streptococcus bovis*, *Succinimonas amylolyca*), sugar digesting bacteria (*Lactobacillus ruminus*), and protein-digesting bacteria like *Clostridium sporogenus*, *Bacillus licheniformis* [8].

V. CONCLUSION

Based on the results of the study concluded that the rumen fluid pH of Bali cattle ranged at 6,8-7. ALTB number is 64×10^4 cfu/g, *Coliform* number is 23×10^4 cfu/g, *non-Coliform* number is 18×10^3 cfu/g, jumlah *E. coli* number is 18×10^3 cfu/g and fungi number in rumen fluid of Bali cattle is 161×10^5 cfu/g.

REFERENCES

- [1] Carter G.G. and J.R. Cole Jr. *Diagnostic Procedures in Veterinary Bacteriology and Mycology. 5 th Ed.* Academic Press. Inc Harcourt Brace Jovanovich, 1990. Publishers.
- [2] Chamdi A.N. Karakteristik Sumber Daya Genetik Ternak Sapi Bali (Bos-bibos banteng) dan Alternatif Pola Konservasinya. *Biodiversitas*. 2005. 6(1):70-75.
- [3] Dewantari N.R.A., Besung I N.K. dan Sampurna IP. Pengaruh Pemberian Mineral Terhadap Jumlah Bakteri Escherichia coli dan Coliform Pada Sapi Bali di Dataran Tinggi dan Dataran Rendah. *Buletin Veteriner Udayana*, 2016. 8(1): 71-78.

- [4] Kurniawati A. Pertumbuhan Mikroba Rumen dan Efisiensi Pemanfaatan Nitrogen Pada Silase Red Clover (*Trifolium pretense* cv. Sabatron). *Risalah Seminar Ilmiah Penelitian dan Pengembangan Aplikasi Isotop dan Radiasi*. 2004.
- [5] Purbowati E.R., Adiwinarti,C.M.S., Lestari E., Rianto and M.Arifin. Live Weight Gain and Feed Cost per Gain of Jawa Cattle with Improved Diet. The 3rd International Conference on Sustainable Animal Agriculture for Developing Countries, Schoole of Animal Production Technology, Suranaree University of Tecnhonology, Nakhon Ratchsima 3000, Thailand. 2011
- [6] Purbowati E., E. Rianto, W.S. Dilaga, C.M.S. Lestari dan R. Adiwinarti. Karakteristik Cairan Rumen, Jenis dan Jumlah Mikrobia Dalam Rumen Sapi Jawa dan Peranakan Ongole. *Buletin Peternakan*, . 2014. 38(1):21-26.
- [7] Sari N.F. Mengenal Keragaman Mikroba Rumen Pada Perut Sapi Secara Molekular. *BioTrends*. 2017.8(1):5-9.
- [8] Sulaksana K.A., I G.k. Suarjana dan I N.K.Besung. Perbandingan Jumlah Bakteri Non-Coliform Pada Feces Sapi Bali Berdasarkan Tingkat Kedewasaan dan Tipe Pemeliharaan. *Buletin Veteriner Udayana*, 2017. 9(2):139-144.
- [9] Swandi. Peranan Mikroba Rumen Pada Ternak Ruminansia. *Lokakarya Fungsional Non Peneliti*.1997.