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Proportion of Meat, Bone and Fleshing Index of Bali Cattles at Age 2 to 5 Years

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Abstract. Bali cattle (Bossondaicus,Bosjavanicus,Bos/Bibos Banteng) are one of Indonesia's native livestock genetic resources that greatly contribute to the development of the livestock industry in Indonesia The purpose of this study was to compare the proportions of meat, bone and fleshing index of Bali cattles at different ages. This research was conducted in Kendari City Slaughterhouse by observing the slaughter of 89 cattles. The results showed that Bali cattles at different ages showed a significant effect ($P < 0.05$) on the proportion of meat, bones, and fleshing index. It can be concluded that the age of cattles is directly proportional to meat production. Cattles with 5 years of age have a maximum meat content of 27.22% and bones of at least 18.61%, while in terms of fleshing index Bali cattles aged 4 years have the highest fleshing

Keywords: bali cattle, flashing index, proportion of meat

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1. Introduction

The population of cattle in Southeast Sulawesi is dominated by Balinese cattle and a small proportion of Ongole crossbreeds. Bali cattle are one of the most widely maintained types of cattle because they are part of an agricultural system that is inseparable from agricultural activities in rural areas. Bali cattle have the ability to adapt against poor environmental conditions and the ability to produce good meat and carcass. Bali cattle are raised for economic purposes as beef cattle and as seed livestock.

Bali cattle dominate the beef cattle population, especially in Eastern Indonesia and the islands of West Nusa Tenggara and South Sulawesi [1], meanwhile the population of Bali cattle in Southeast Sulawesi for the last 5 years has continued to increase, from 230,363 heads (year 2013) to 360,392 heads (2017) [2]. However, the Balinese cattle population in Southeast Sulawesi has not been able to meet the increasing demand for meat (BPS Southeast Sulawesi, 2018). On the other hand, the supply of meat is still low when compared to demand [3].

The meat commodity produced from a livestock is an important indicator that determines livestock productivity. The most common parameters for assessing carcass production are the proportion of carcass and the flashing index. The percentage of carcass is the ratio of the carcass weight of the livestock to the live weight of the animal multiplied by 100% [4]. ; [5] The ratio of

meat index between carcass weight and carcass length. Thus, the high percentage value of carcass does not necessarily result in a high meat index, because several factors are determined, namely carcass length. The percentage of carcass is influenced by body weight, nation, age, condition of livestock and sex [6]; [7];[8]. The higher the body weight of a livestock, the higher the percentage of carcass weight. Livestock breeds greatly affect the production of carcasses produced, nations with large types will produce more or less fleshy carcasses [9]; [10]; [8].

The productivity of a livestock is strongly influenced by the proportion of carcass, because it is directly proportional to the quality of the meat, especially the tenderness of the meat produced. Age of livestock is one of the factors that influence carcass weight, including the ratio of bones, meat, water content, fat distribution and meat quality [11]. The condition of livestock greatly affects the quality of the meat produced [12]; [7]; [13]. The sex of a livestock is very influential on carcass weight, the area of the rib eye tendon, the thickness of the fat on the 12th back and the percentage of kidney fat [10]; [5]. In this regard, it is necessary to conduct research on the proportion of meat, bone and fleshing index of Bali cattle at the age of 2 to 5 years so that it can meet the increasing demand for meat.

2. Materials and Methods

The material used for this research was Bali cattle regardless of the sex, both male and female who are in the Anggoeya Slaughterhouse (RPH), Poasia District, Kendari City. The age range of cattle was 2-5 years as many as 89 heads. Age determination was based on the condition of the cattle and number of incisors (poel) [14] The tools used in this study were cameras, stationery, knives, measuring tapes, and scales.

The research design used in this study was a completely randomized design (CRD) consisting of 4 treatments with unequal repetitions (umeqwal). Each repetition was the day of the sampling.

P1 = Bali cattle aged 2 years
P2 = Bali cattle aged 3 years
P3 = Bali cattle aged 4 years
P4 = Bali cattle aged 5 years

The research variables observed in this study refer to Hafid and Rugayah [4]; [5]; and [15] are as follows

1. Proportion of meat. Meat weight is the total weight of meat obtained through the weighing process divided by the live weight multiplied by 100%

2. Bone proportion. Bone weight is the total weight of bone obtained by weighing divided by the live weight multiplied by 100%

3. Fleshing index. Fleshing index is the ratio between fresh carcass weight (kg) and carcass length (cm).

The research data were tabulated and analyzed using analysis of variance. If the treatment affects the variables evaluated, it is followed by the smallest significant difference test [16].

3. Result and Discussion

3.1. Number of Cattles Observed

Data on the number of Bali cattles slaughtered by the Kendari Slaughterhouse (RPH) during the study is presented in "Table 1" as follows.

Table 1. Number of Bali Cattles Slaughtered at the Slaughterhouse (RPH) of Kendari City

Cattles Age	Total	Percentage
2 years	13	14,60
3 years	48	53,93
4 years	16	17,98
5 years	12	13,35
Total	89	100

The distribution of food derived from animals, especially meat that circulates in the community starting from the Slaughterhouse (RPH) which functions as a gateway for the supply of meat. In addition to serving as a place to provide meat, the RPH also has a role as a place for selection and control of slaughtering female cattle who are still productive. Kendari city slaughterhouse is the only slaughterhouse in Southeast Sulawesi and the average number of slaughtered is 20-25 tails per day. Considering the large number of cows being slaughtered in this slaughterhouse, the slaughtering activity should receive closer supervision and attention [17]. Suardana and Swacita reported that there was an indication of the practice of productive cattle slaughter. [17]. In his research, it was found that the slaughter of female bali cattle was higher than male one.

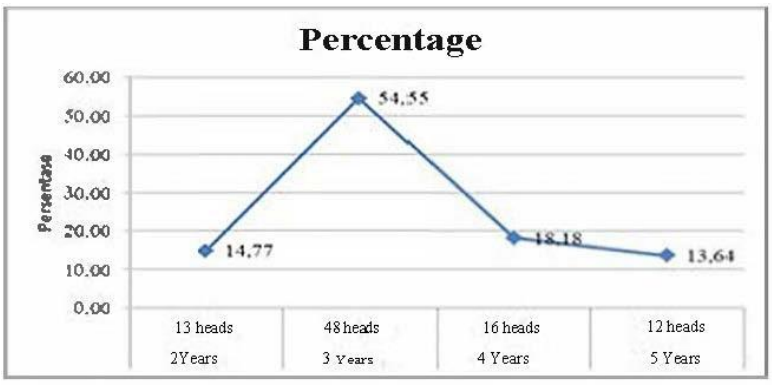

Figure 1. Graph of the Percentage of Cattle Slaughter in Kendari Slaughterhouse at Different Ages

“Figure 1” shows that the results of the research carried out in the Kendari city slaughterhouse were the number of cattle slaughtered by 88 cows, the largest percentage of slaughtered age was 54.55% at the age of 3 years, then 18.18% at 4 years old years as much as 14.77% and at least 5 years old as much as 13.64%.

Apart from functioning as a chain controller for the sustainability of livestock availability in an area through the selection of productive slaughterhouses, another function of an RPH is to ensure the production of good quality meat. Theoretically, good quality meat will be obtained from cattle that are healthy and not stressed. Poor treatment of cattle during transportation and when lowering cattle in the slaughterhouse often results in injuries such as abrasions, bruises, and fractures. As a result, cattle become stressed, slaughtering cattle in this condition will result in poor quality meat. This is because cattle that have been injured are generally under stress, so that the amount of glycogen in the muscles when slaughtered will decrease, which will lead to reduced lactic acid in the meat [17].

3.2. Proportion of meat

Meat produced from a livestock is very much determined by the nation or type of livestock itself, age, sex and carcass weight, which in turn will affect the percentage of each type of cut of meat produced. The average percentage of cut Bali cattle meat at different ages is presented in “Table 2”.

Table 2. Average Percentage of Bali Cattle Meat Age 2 to 5 Years

(Repetition)	Treatment (Age of Cattle)					
	U1 (2 years)	U2 (3 years)			U3 (4 years)	U4 (5 years)
	25,33	27,00	27,14	26,84	26,55	25,29
	25,88	27,50	25,00	26,50	26,67	27,41
	24,38	25,65	23,20	26,32	26,67	28,85
	21,43	26,67	21,43	28,33	26,57	27,71
	25,56	25,91	28,00	27,37	25,08	28,34
	25,32	23,20	26,67	25,71	26,91	26,56
	23,03	25,22	22,92	26,00	26,51	28,71
	25,26	21,85	22,80	25,91	26,13	26,98
	25,29	22,92	22,92	24,76	25,08	25,38
	24,00	25,00	26,50	28,42	25,47	25,45
	26,11	23,04	20,74	25,71	25,63	26,97
	25,00	24,76	28,00	25,50	26,09	29,00
	24,38	25,45	22,50	26,32	26,45	27,22
		20,38	21,15	27,78	27,67	
		24,35	20,36	26,32	26,42	
		28,00	23,83	25,24	25,83	
Number (n)	13	48			16	12
Total	320,97	1203,09			419,72	353,88
Average	$24,69^{c}$	$25,06^{bc}$			$26,23^{ab}$	$27,22^{a}$
SD	1,29	2,24			0,69	1,30

Note: Different superscripts on the same line indicate very significant differences (P <0.01)

The results of the analysis of variance showed that there was a very significant effect (P <0.01) on the percentage of Bali cattles meat that slaughtered in Kendari slaughterhouses at different age levels.

“Table 2” shows the average percentage of meat by weight, which ranges from 24.69% - 27.22%. The highest percentage of meat was found in balicattles aged 4 and 5 years, while the lowest average percentage was found in balicattles aged 2 and 3 years. This is because the age of cattle at the time of growth has a very good growth rate and is able to respond to available feed compared to cows that are under 3 years of age. The percentage of meat in this study is lower than in the study [15]. Which states that the percentage of Bali cattles meat is between 32.42% -38.53%. [18] explained that the growth of young animals is mostly caused by the growth of muscles, bones and vital organs.

The comparison of the percentage of Bali cattles meat with different ages slaughtered at the Kendari Slaughterhouse can be seen in “Figure 2”.

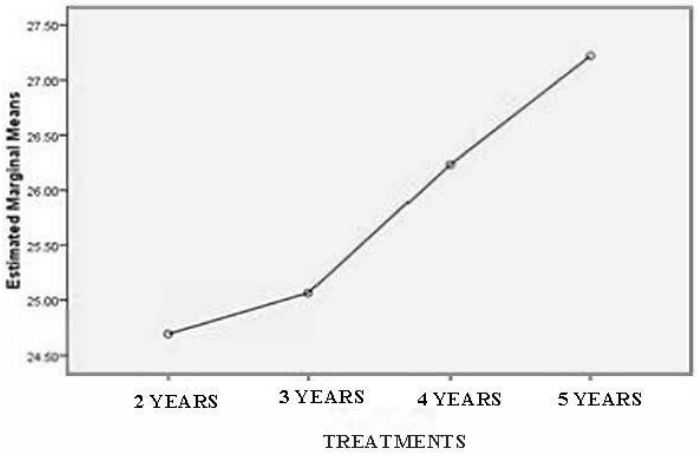

Figure 2. Graph of Comparison of Percentage of Bali Cattle Meat at Different Age Slaughtered in Kendari City Slaughterhouse (RPH)

"Figure 2" shows that the highest percentage value of Bali cattles meat produced in this study was found in Bali cattles aged 5 years (27.22%), while the lowest average percentage was found at 2 years old (24.69%). This is because at the age of 4 and 5 years Bali cattles are already at their peak growth, so that bone and meat growth is slow and weight gain is only due to the growth of fat carried by the skin (subcutaneous) and fat in the stomach (abdomen).

Manurung (2008) states that the weight gain of young cattle will increase at a high rate of increase until puberty is reached and ultimately there will be no increase in body weight after reaching maturity. If the body weight is still increasing, it is only due to the accumulation of fat under the skin (subcutaneous) and fat in the belly (abdomen) not bone and meat growth.

3.3. Bone Proportions

Bone is not the most important part in producing carcass components. But bones are very important in weighing the conformation of the body. Lean cattle have a higher percentage of bone compared to fat cattle, because fat cattle have a greater percentage of meat than leaner cattle. The percentage of Bali cattle bones slaughtered at the Kendari City Slaughterhouse with different ages is presented in "Table 3".

Table 3. Average Percentage of Balinese Cattle Bone Age 2 to 5 Years

(Repetition)	Treatment (Age of Cattle)					
	U1 (2 years)	U2 (3 years)			U3 (4 years)	U4 (5 years)
	20,00	20,00	20,00	22,63	15,86	18,24
	17,65	21,00	19,55	20,50	17,00	20,87
	20,00	18,70	16,40	22,11	15,79	20,33
	19,05	19,52	15,00	24,44	16,78	19,11
	17,78	19,09	22,00	22,63	17,29	18,89
	19,48	17,60	20,48	19,52	17,28	18,44
	19,39	18,70	17,08	23,50	16,11	18,06
	16,84	15,19	18,80	20,91	17,74	18,73
	19,41	19,58	19,17	19,05	18,41	18,13
	19,43	19,17	20,00	21,58	18,87	18,26
	19,44	17,39	15,19	19,05	20,00	16,97
	21,88	19,52	20,00	20,50	17,70	17,33
	21,88	18,18	17,08	22,11	18,06	
		15,77	16,15	22,78	15,67	
		18,26	14,29	21,05	19,50	
		20,00	17,87	20,00	20,20	
Number (n)	13	48			16	12
Total	252,22	929,08			282,26	223,36
Average	19,40[a]	19,36[a]			17,64[b]	18,61[ab]
SD	1,45	2,32			1,46	1,11

Note: Different superscripts on the same line indicate very significant differences (P <0.05)

The results of the analysis of variance showed that there was a significant effect (P <0.05) on the percentage of Bali cattles bones slaughtered in Kendari slaughterhouses at different ages. The results of the analysis of variance showed that the percentage of Bali cattles bones that were cut at the age of 2 years (19.40%) and 3 years (19.36) was significantly higher than the average percentage of bones that were cut at the age of 4 years (17.64%) and 5 years (18.61%).).

There is a tendency that the increase in body weight of Bali cattles does not have an impact on the increase in the percentage of bone weight, so it can be concluded that the thinner a Bali cattle is, the higher the bone percentage is compared to fat Bali cattle. The factors that influence carcass production are the ratio between meat (muscle), fat and bone which changes during the growth of livestock and the increase in body weight [20]. weight and chemical composition of the body's constituent components, including bone. Bones are also the body's skeleton and carcass components that develop the earliest, then muscle and fat tissue [11].

The comparison of the percentage of Bali cattle bones with different ages that are slaughtered at the Slaughterhouse (RPH) of Kendari City can be seen in “Figure 3”.

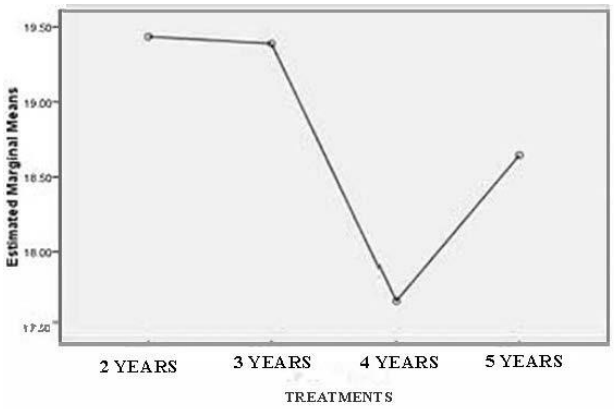

Figure 3. Graph of Comparison of Percentage of Bali Cattle Bones with Different Age Slaughtered at Slaughterhouse (RPH) Kendari City

3.4. Fleshing Index

The muscular index or fleshing index (FI) is one of the carcass characteristics or objective carcass assessment criteria which is an option to replace the subjective visual assessment of the carcass conformation. The fleshing index (FI) value of Bali cattle slaughtered at Kendari City Slaughterhouse at different ages is presented in "Table 4".

The results of the analysis of variance showed that there was a very significant effect ($P < 0.01$) on the fleshing index (FI) value of Bali cattle slaughtered in kendari slaughterhouses with different ages. The results showed that the fleshing index (FI) value of balicattles at the age of 4 years (1.21) was significantly higher than that of Bali cattles aged 2 years (0.63), 3 years (0.69) and 5 years (1.05).

From "Table 4", it can be seen that the highest fleshing index is found in Bali cattles aged 4 years (1.21) then followed by Bali cattles aged 5 years (1.05) and the lowest is in Bali cattles aged 2 years and 3 years (0.63 and 0.65). This difference in 5 year old Bali cattle has high body weight and short carcass. This causes the flesing index value to increase. This is in line with the statement of [21] which states that the higher the carcass weight per unit length, the better or more desirable the carcass conformation is. Based on the measurement of the meat index, it can be seen that a shorter carcass length with a high carcass weight will have a higher meat index. Conversely, if the carcass weight is low while the carcass is longer, it will have a lower meat index [22];[15];[23].

Table 4. The Value of Fleshing index (FI) for Bali Cattle Aged 2 to 5 Years

	Treatment (Age of Cattle)					
(Repetition)	**U1 (2 years)**		**U1 (2 years)**		**U1 (2 years)**	**U1 (2 years)**
	0,63	0,66	0,64	0,64	1,15	1,11
	0,63	0,68	0,69	0,67	1,22	1,05
	0,60	0,68	0,70	0,67	1,22	1,02
	0,64	0,68	0,70	0,64	1,23	0,97
	0,66	0,69	0,66	0,66	1,21	0,96
	0,64	0,72	0,68	0,68	1,24	1,05
	0,62	0,71	0,70	0,65	1,21	1,05
	0,66	0,74	0,73	0,75	1,22	1,04
	0,62	0,77	0,76	0,73	1,21	1,15
	0,65	0,68	0,64	0,70	1,22	1,11
	0,65	0,69	0,75	0,71	1,14	1,05
	0,61	0,66	0,68	0,63	1,16	1,00
	0,62	0,67	0,66	0,65	1,19	
		0,71	0,74	0,63	1,23	
		0,70	0,74	0,68	1,31	
		0,70	0,73	0,68	1,14	
Number (n)	13		48		16,000	12
Total	8,23		33,09		19,289	12,572
Average	$0,63^{d}$		$0,69^{c}$		$1,21^{b}$	$1,05^{a}$
SD	0,02		0,04		0,04	0,06

Note: Different superscripts on the same line indicate very significant differences (P <0.05)

The comparison of the fleshing index value of Bali cattles with different ages slaughtered at the Slaughterhouse (RPH) of Kendari City can be seen in “Figure 4”.

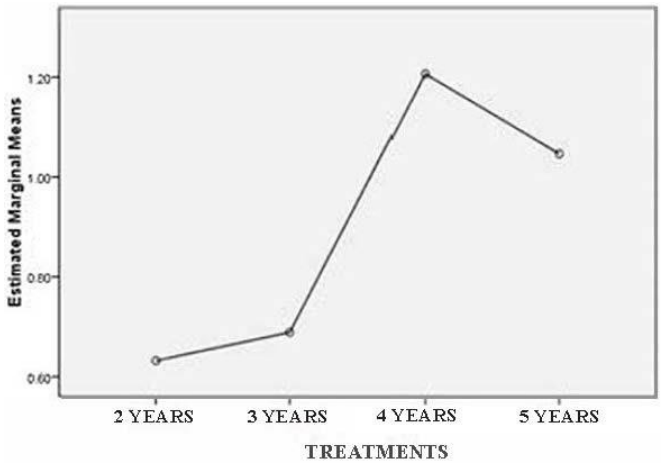

Figure 4. Graph of Comparison of Fleshing Index Value for Bali Cattles with Different Ages Slaughtered at the Slaughterhouse (RPH) of Kendari City.

4. Conclusion

Based on the results of research on the characteristics of Bali cattle carcass at different ages, it showed a significant effect (P <0.05) on the proportion of meat, bones and flesing index. In terms of age, it is directly proportional to meat production. Where cattles with 5 years of age have a maximum meat content of 27.22% and bones of at least 18.61%, while in terms of fleshing index, Bali cattles aged 4 years have the highest fleshing index of 1.21.

REFERENCES

[1] Rachma, S. dan L. Rahim. Penggunaan lebar kelangkang, lebar punggung, lebar tulang tapis dan panjang kelangkang untuk menduga berat badan sapi bali. Jurnal Sains dan Teknologi, 9 (2) ; 119-124. 2007.

[2] Dinas Tanaman Pangan dan Peternakan Sultra. Populasi Sapi di Sulawesi Tenggara. 2017.

[3] Nuryadi dan S Wahjuningsih S. Penampilan reproduksi sapi peranakan onggole dan peranakan limosin di kabupaten malang. Universitas brawijaya. Malang. 2010.

[4] Hafid.H. dan Rugayah. Persentase karkas sapi bali pada berbagai berat badan dan lama pemuasaan sebelum pemotongan. Jurnal ilmiah. Jurusan Peternakan. Fakultas Pertanian. Universitas Haluoleo. Kendari. 2009.

[5] Hafid, H.. Pengantar evaluasi karkas.Cetakan Pratama. Penerbit Unhalu Press. Kendari. 2010.

[6] Riyanto, E. Dan E. Purbowati. 2010. Panduan Lengkap Sapi Potong. Penebar Swadaya. Anggota IKAPI. Jakarta. 2011.

[7] Hafid. H. R. E. Gurnadi. R. Priyanto dan A. Saefuddin. Identification of carcass charaeteristic for estimating the compotion of beef cross. J. Indonesia Trop. Anim. Agric. 35 (1): 22-26. 2010.

[8] Hafid. H., Hasnudi. H.A. Bain. F. Nasiu., Inderawati. P. Patriani and S.H. Ananda. Effect of fasting time before slaughtering on body weight loss and carcass percentage of bali cattle. *IOP Conf. Series Earth and Environmental Science*. Page 1-7. 2019a.

[9] Williams, R. E., J. K. Bertrand, S. E. Williams, and L. L. Benyshek. Biceps femoris and rump fat as additional ultrasound measurements for predicting retail product and trimmable fat in beef carcasses. J. Anim. Sci. 75: 7-13. 1992.

[10] Hafid, H. H. dan R. Priyanto. Pertumbuhan dan distribusi potongan komersial karkas sapi Australian Commercial Cross dan Brahman Cross hasil penggemukan. Media Peternakan 29: 63-69. 2006.

[11] Soeparno. Ilmu dan Teknologi Daging. Cetakan ke-2. Gadjah Mada University Press, Yogyakarta. 2009.

[12] Ngadiyono, N. Beternak Sapi. Citra Aji Pratama. Yogyakarta. . 2007.

[13] Hafid. H. Nuraini. Inderawatidan W. Kurniawan. Beef cattle characteristic of differant butt shape condition. IOP Conf. Series Earth and Environmental.Page 1-6. 2018.

[14] Hafid, H. Kinerja produksi sapi Australia commercial cross yang di pelihara secara feedlot dengan kondisi bakalan dan lama penggemukan berbeda.Tesis. Progress Pascasarjana. IPB. Bogor. 1998.

[15] Hafid. H. Nuraini. A. M. Tasse. Inderawati. Dan. Hasdar. Karakteristik karkas sapi bali pada kondisi tubuh yang berbeda. Prosiding. Seminar ruminansia 2014. Fakultas peternakan dan pertanian. Universitas Diponegoro. Semarang. Halaman 41-45. 2014.

[16] Mattjik AA, Sumertajaya IM. Perancangan Percobaan dengan Aplikasi SAS dan Minitab Jilid I. Edisi ke-2.Bogor : IPB Press. Hlm 63-72, 88-89. 2002.

[17] Suardana, I. W. M. Sukadana. I. K. Suada And D.A Widiasih. Analisisj umlahah dan umur sapi bali betina produktif yang dipotong Di Rumah Pemotongan Hewan Pesanggaran dan Mambal Provinsi Bali. J. SainsVeteriner. ISSN :1026-0421. 2013.

[18] Parakkasi. A. Ilmu makanan dan ternak ruminansia. UI Press. Jakarta. 1999.

[19] Manurung. L. Analisis ekonomi uji berbasis pelepah daun sawit. Lumpur sawit dan jerami padi fermentasi dengan phanerochatechyso sporium pada sapi peranakan ongole. Skripsi Jurusan Peternakan FakultasPertanian Universitas Sumutra Utara Medan. 2008.

[20] Hafid, H.. Pengaruh pertumbuhan kompensasi terhadap efisiensi pertumbuhan sapi Brahman Cross kebiri pada penggemukan *feedlot*. Jurnal Ilmu-ilmu Pertanian Agroland 9:179-185. 2002.

[21] Saka. I. K.B. Mantra. I. N.T. Ariana. A. A. Oka. Ni.L. P. Sriyani dan Sentenaputra. Karakteristik karkas sapi bali jantan dan betina yang dipotong umum pesanggaran. Denpasar.The Excellange Research Universitas Udayana 2011. PP. 39-47. 2011.

[22] Yosita, M. U, Santosa, dan E. Y, Setyowati. Persentasekarkas, tebal lemak punggung dan indeks perdagingan sapi bali, peranakan ongole dan Australian commercial cross. Jurnal Ilmiah. Fakultas Peternakan. Universitas Padjadjaran, Sumedang. 2011.

[23] Hafid H, Patriani P, Irman, Aka R. Indeks Perdagingan Sapi Bali Jantan dan Betina dari Pemeliharaan Tradisional di Sulawesi Tenggara. Prosiding Seminar Nasional Teknologi Peternakan dan Veteriner 2019.-p.74-82. 2019b.