Comparison of carcass and non-carcass characteristics of Local and Pekin ducks

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Abstract. The purpose of this study was to evaluate carcass and non-carcass characteristics of local ducks. The research material was carcasses of five local male ducks aged 24 weeks (relative weight of about 1220 g) and five male Pekin ducks of 9 weeks of age (relative weight of about 1440 g) which were kept in the duck cage at the laboratory of Breeding and Genetics, Faculty of Animal Science, Hasanuddin University, Indonesia using intensive housing systems and commercial feed. The research method was all ducks were fasted and rested for 8 hours, slaughtered, carcasses, and parameters analyzed. Parameters measured were weight and percentage of carcass traits (wings, dorsal, thighs, breast, and neck), weight and percentage of non-carcass traits (head, shank, kidney, heart, trachea, esophagus, gizzard, liver, intestine, feathers), three types of weight (live weight, slaughter weight, and carcass weight), percentage of the total carcass, and meat bone ratio (thigh and breast). The results showed that there were no significant differences in all carcass and non-carcass parameters between local ducks and Pekin ducks except for non-carcass parameters, namely head, gizzard, shank, intestine, heart, and trachea. At different ages, Pekin ducks and local ducks showed similar carcass characteristics. These results show that the growth rate of Pekin ducks is faster than that of local ducks. These results become one of the bases and references that local ducks still need a breeding program for improving carcass growth to reach optimum carcass characteristics.

1. Introduction

Duck is one of the fast-growing poultry, efficient as a source of animal protein and has good market potential. The duck population in Sulawesi from 2016 to 2020 tends to fluctuate between 4,780,196 to 6,853,254 birds [1]. At South Sulawesi, ducks are widely needed in people's daily lives to be consumed in the form of traditional dishes such as Palekko Duck cuisine. The development of culinary tourism made from duck meat also increases the demand for duck meat supply. The fulfillment of duck meat for culinary needs in South Sulawesi is mostly supplied by rejected female laying type of Local ducks or male laying type of Local ducks. Therefore, the meat quantity tends to be lean, tough, and less than optimal.

Generally, Local Indonesian ducks are laying types with good production [2]. Local ducks have a relatively slow growth character, low live weight, and a large variety of performance compare with meat-type duck. On the other hand, there is no standard character for meat type of Local ducks. Pekin duck is commonly known as a good meat type duck which has the advantages of characteristics, namely large size and body weight, fast growth, high carcass weight, good carcass quality, but meat characteristics of Pekin duck are less favored by consumers who love Nasu Palekko duck cuisine. Therefore, it is necessary to have a new line of meat-type of Local duck typical from South Sulawesi,
which has high productivity, better meat quantity and quality, and has good adaptability to tropical climatic conditions but still has the characteristics of local duck meat.

The strategy is needed to produce a meat type of South Sulawesi Local duck to increase duck productivity in South Sulawesi. One effective way is through crossbreeding to get duck’s offspring that are better than their parents. The breeding method from different duck breeds (crossbreeding) combined with a grading-up and selection system is a good choice to form a composite duck line with a better growth rate and livestock productivity. So, crossbreeding, grading-up, and selection in local ducks are carried out to improve the genetic quality and performance of local ducks, and these traits will be passed on to their offspring. The formation of meat-type Local duck of South Sulawesi requires some information such as some carcass characteristics of the parent, etc. Therefore, the objectives of this study were to evaluate characteristics of carcass quantity of Local duck compared with Pekin duck on live weight, slaughter weight, carcass weight, non-carcass weight, total carcass percentages, carcasses, and non-carcasses component percentage, and meat bone ration, respectively. The results of this study are expected to be information for formating and developing the meat type Local ducks of South Sulawesi. In addition, meat-type Local duck of South Sulawesi as a new duck line can be a new genetic resource for livestock resource conservation programs. The long-term target to be achieved is to obtain superior breeds of meat-type Local duck of South Sulawesi, which can support the availability of animal protein sources in the regional and national scales.

2. Materials and methods
Two breeds of duck used in this study are Local and Pekin. These breeds were identified based on the visual appearance of the plumage color, shape, and color of the shank. A total of five male ducks of each breed were used for the study. Local male ducks come from eggs purchased from duck breeders in Maros district, South Sulawesi, Indonesia, hatched and reared in the Animal Husbandry Unit, Faculty of Animal Science, Hasanuddin University, Makassar Indonesia. Pekin male ducks were purchase from Gowa district South Sulawesi and Polewali Mandar district West Sulawesi, Indonesia. All ducks were kept in colony pens prior to slaughtering (age of 24 weeks for Local duck and nine weeks for Pekin duck). The ducks were reared using an intensive rearing management system on each, separating growing pens that were made safe from predators. The cage floor was a concrete floor with five centimeters of wood shavings covered as a base until the end of the experiment. A feeding and watering space was provided for each pen. Duck feed ration (for 100 kg) contains 33 kg pollard, 30 kg bran, 15 kg corn, 20 kg concentrate dan 2 kg mineral mix. All ducks were allowed 24 h free access to water throughout the study. The cage system is pen-shaped intensive with a length of nine meters, a width of six meters, and a height of 60 cm insulated fence. Feed (200 g per bird/day) is given twice a day (07.00-08.00 am) and in the afternoon (04.00-05.00 pm) with a wet feed system.

The ducks were slaughtered, de-feathered, and eviscerated at Slaughtered House Unit, Faculty of Animal Science, Hasanuddin University, Makassar, Indonesia. Feed was withdrawn 8 h before slaughter, and the duck was given free access to water. At the end of fasting time and prior to slaughtering, the ducks were weighed (live weight). The slaughter procedure involved severing the carotid artery, jugular vein, trachea, and esophagus without decapitating the head permitting [3]. Slaughter weight was obtained after the slaughter procedure was finish. The ducks were subsequently defeated. All blood, skin, head, neck, leg, all digestive tract, and other internal organs were removed from the body cavity during evisceration. After evisceration, the carcasses remainder, which was formed by the skeleton with a certain number of skeletal muscles (intercostal, dorsal, suprascapular, and other), were weighed to obtain the warm carcass weight and continuing with dissection to obtain carcass components weight and non-carcass component weight [4].

The numerical data on live weight, slaughter weight, carcass weight, non-carcass weight, total carcass percentages, carcasses component percentage (wing, thigh, dorsal, breast, and neck), non-carcasses component percentage (head, shank, kidney, heart, trachea, esophagus, gizzard, liver, intestine, and feather), and meat bone ratio (based on breast meat and thigh meat) were statistically analyzed. Arithmetic means and standard deviation of mean were calculated for each trait. The normal
distribution of the studied traits was analyzed with the Shapiro-Wilk test. The homogeneity test was analyzed with the Levene test. Significant differences between the compared breed of ducks were determined by the Independent Simple T-test. The level of significance was at p<0.05.

3. Results and discussion

3.1. Comparison between Local and Pekin Duck

The result of weight (live, slaughter, carcass, and non-carcass), percentages of carcass and non-carcass component, and meat bone ratio of Local duck and Pekin duck are presented in Table 1. Live weight, non-carcass weight, carcass component percentage (dorsal muscle), and non-carcass component percentage (gizzard and intestine) of Local ducks were significantly (p<0.05) lower than Pekin ducks. Non-carcass component percentages (shank, heart, trachea, respectively) of Local ducks had a significantly (p<0.05) higher compared to Pekin ducks.

The present results (Table 1) showed that the analyzed duck breed of Local and Pekin ducks has not differed in slaughter weight, carcass weight, dressing percentage, carcass component percentages (wing, breast, thigh, and neck, respectively), non-carcass component percentage (head, kidney, esophagus, liver, and feather, respectively). Dressing percentage, which is calculated from the ratio of the weight of eviscerated carcass without giblet to the bodyweight of Local ducks, was non significantly (p>0.05) higher than Pekin ducks. The compared breeds of ducks did not differ significantly (p<0.05) in meat bone ratio based on breast and thigh muscles. Those differences are significantly influenced by age and breed. These results indicate that the performance of Local duck at 24 weeks of age is almost similar to the performance of Pekin ducks at 9 weeks of age. The age of 9 weeks is the ideal slaughter age for the meat type of duck breed. This information could be used as one of the basic information for genetic improvement of South Sulawesi Local ducks to have better meat quantity performance.

Table 1. Mean, the standard of deviation, and coefficient of variation of weights and dressing percentages of Local duck and Pekin duck.

| Parameter               | Local duck (n=5 birds, 24 Weeks) | Pekin duck (n=5 birds, 9 Weeks) | T-test |
|-------------------------|----------------------------------|---------------------------------|--------|
|                         | Mean ± S.D. (CV %)               | Mean ± S.D. (CV %)              |        |
| Live weight (gr)        | 1300 ± 100* 7.69                | 1540 ± 194.9 b 12.65            | 0.04   |
| Slaughter weight (gr)   | 1220 ± 130.4 10.69               | 1440 ± 181.7 12.62              | 0.06   |
| Carcass weight (gr)     | 688.7 ± 19.5 2.83                | 738.9 ± 109.3 14.79            | 0.18   |
| Non-carcass weight (gr) | 521.9 ± 77.9 a 14.92            | 672.8 ± 90.3 b 13.43           | 0.02   |
| Dressing percentage     |                                  |                                 |        |
| • Carcass weight/live weight | 53.2 ± 3.7 6.99                  | 48.0 ± 4.4 9.18                | 0.08   |
| • Carcass weight/slaughter weight | 56.9 ± 5.3 9.38                  | 51.3 ± 3.7 7.20                | 0.09   |

n: number of birds

*ab means with different letters are significantly different at P<0.05

3.2. Comparison local with other Local Duck Strain

3.2.1. Live weight, slaughter weight and carcass weight. The studied breeds of Local and Pekin ducks (Table 1) presented lower live weight compared to Pekin ducks evaluated of 3,287 g at 7 weeks of ages [5], 3,400 g at 6 weeks of ages [6], and 2000 g at 10 weeks of ages [7], respectively. In Pekin ducks, the morphological and functional development of the digestive tract is terminated after 7 weeks old [8]. The live weight of ducks is influenced by genotype and age, as well as the genetic selection and crossbreeding [9]. There is a difference in the blood purity of the Pekin duck used. [5] and [6] used pure Pekin ducks, while the Pekin ducks used in this study were F1 derivatives of pure Pekin ducks.

The mean live weight of 24 weeks of ages of Local ducks in our study was lower when compared to 8 weeks of age of laying type’s duck of male Alabio X female Alabio (1,340.4 g), male Cihateup X
female Ciateup (1,343.1 g), male Alabio X female Ciateup (1,350.3 g) and male Ciateup X female Alabio (1,436.4 g), respectively [10]. In comparison to our study, it was found higher live weight (1,579.3 g) of Ciateup Local duck at 10 weeks of age [11]. These results show that Local ducks at a relatively older age have lower live weight. Therefore, Local ducks need genetic improvement to have better performance at the age of 8-10 weeks as the slaughter age of meat type’s ducks. Genetic improvement will affect the ability to grow through genes that determine body weight.

In the current study, the mean of slaughter weight of Local duck of 24 weeks of age (1,200 g) was at an intermediate level of 8 and 10 weeks of age of Ciateup X Alabio crossing ducks (1,122.6 g and 1,354.9 g, respectively) [12]. Lower slaughter weight (1,459 g) on 8 weeks of ages of Bali duck [13] was reported than in Local duck in the current study. Slaughter age greatly affects the slaughter weight and carcass weight of poultry. Higher the slaughter weight will increase carcass production and the percentage of slaughter weight.

The coefficient of variation for live weight, slaughter weight, carcass weight, and non-carcass weight of Local duck showed a low heterogeneity value (CV <15%). It indicates that the genetic diversity of Local ducks for those parameters are low, and the data tended homogeneity.

3.2.2. Dressing percentage. The results (Table 1) showed that there were no observed significant differences (p>0.05) among the different genotypes and ages of Local and Pekin ducks in terms of dressing percentage. The differences in age effect on dressing percentages are consistent with the results of an earlier study on 8,10, 12 weeks of ages of Ciateup X Alabio ducks [12]. Carcass weight showed the same pattern as for slaughte.

Dressing percentage for 56.9% of Local duck in the current study which is less than in crossing duck [12]. In this study, dressing percentage of Local duck was higher than the results found by 45.5-48.7% of reject duck at the local market at Central Java ([15], 54.25% of reject crossing ducks of Peking X Mojosari [16], 53.51% of 10 weeks of age of Tegal duck [17], 56.1% of 12 weeks of age of crossing Ciateup X Alabio ducks [12], 62.0% of Mojosari reject duck and 39.3% of 120 weeks of age of local Kendari reject male duck [18], respectively. Those variances of carcass percentage are caused by slaughter weight, carcass weight, or carcass proportion of ducks which can differ according to age and live weight [19,20]. Increasing the age of livestock will increase the growth of carcass organs, especially fat and the percentage of muscle and bone components. These results confirm that older ducks tend to show a decreasing percentage of the carcass.

The coefficient of variation for dressing percentages of Local duck showed a low heterogeneity value (CV <15%). It indicates that the genetic diversity of Local ducks for that parameter is low, and the data tended homogeneity.

3.2.3. Percentage of Carcass Component. The percentage of carcass components is obtained by comparing the weight of each carcass component with carcass weight multiplied by 100%. The carcass components of duck that are of concern to consumers are the proportions of the chest, thighs, dorsal, and wings. Ducks have more meat on the chest and thighs. Most of the meat in the carcass was deposited on the breast, upper thigh (thighs) and lower thigh (drumstick) [21]. Duck carcass meat deposits were mostly found in the chest and thighs [12]. Those meat deposit locations have high economic value [22].

Table 2. Mean, the standard of deviation and coefficient of variation of carcass and non-carcass component of Local duck and Pekin duck.

| Parameter | Local duck (n=5 birds, 24 Weeks) | Pekin duck (n=5 birds, 9 Weeks) | T-test |
|-----------|---------------------------------|---------------------------------|--------|
|           | Mean ± S.D (CV %)               | Mean ± S.D (CV%)                |        |
| Percentages of carcass component | | | |
Regardless of duck genotypes, breast percentage of studied ducks (Table 2) was higher compared to Kendari local duck reject male of 34.1% [18], reject Mojosari duck of 23.0% [2], Cihateup duck of 31.42% and Alabio duck of 25.67% [23], respectively. Similar results were reported in 10 weeks of age of Magelang duck of 12.9%, 10 weeks of age of Mojosari duck of 11.1%, 10 weeks of age of Tegal duck of 13.9% and 10 weeks of age of Manila duck of 9.5%, respectively [17].

The high percentage of breast carcass value of the studied ducks is probably associated with age of local South Sulawesi ducks, which have reached 24 weeks and breed or line differences that will affect genetics and carcass weight. Getting older the age of the duck will affect higher the breast percentage [24]. The breast component grows slower than the growth in general [14]. The breast component of poultry is a place of thick meat with a small percentage of bone. The thorax ratio is still small in the younger age of duck and will increase with increasing age. Generally, increasing age will trigger a decrease of bone growth and an increase of muscle growth. This will lead to an increasing percentage of breast components.

The thigh percentage of Local duck (22.5%) from analyzed ducks was lower than Local Kendari reject male duck of 32.2% [18], Mojosari rejects duck of 34.9% [23], Cihateup duck of 28.15% [23], Alabio duck of 21.33% [23], crossing Alabio X Alabio ducks of 25.2% [23], crossing Cihateup X Cihateup ducks of 27.2% [23], crossing Alabio X Cihateup ducks of 28.9% [23], crossing Cihateup X Alabio ducks of 26.6% [23], respectively. A similar lower value of thigh percentages of the ducks from this study was found for 10 weeks of age of Magelang duck (14.2%) [17], Mojosari ducks (13.0%) [17], Tegal duck (13.3%) [17] and Manila duck (16.2%) [17], respectively. Duck has a fleshy character on the thigh and chest, which are quite large compared to other body parts. Duck thigh is a carcass component that has a relatively constant growth to the addition of carcass weight [25]. The difference in thigh carcass percentage may be influenced by age and breed factors. Breed factor had a very significant effect on the weight of the carcass (thigh and back) and had a significant effect on the wings but had no effect on the chest [17]. Wings are not the main place for muscle meat deposition [26]. Wings are part of the carcass, which contains more bone tissue than muscle tissue [24]. Wing percentage in this study accounted for 14.4%, which is less than Local Kendari reject male duck (11.6%) [18]. It is similar result account for Magelang duck (9.2%), Mojosari duck (8.5%), Tegal duck (9.9%), and Manila duck (9.2%), respectively on 10 weeks of age [17]. Wing percentage accounted for 20.6% of Mojosari reject duck Local duck [2] is less than in ducks studied in the current experiment (14.4%). Wing percentages in crossing ducks of Alabio X Alabio is 18.0%, crossing ducks of Cihateup X Cihateup is 19.3%, crossing ducks of Alabio X Cihateup is 17.1%, and crossing ducks of Cihateup X Alabio is 17.4% on 8 weeks of age, respectively [10]. In our study, we found that various weights

### Table 2: Percentages of non-carcass component

| Component | Mean ± SD  
|-----------|-----------
| Head      | 15.79 ± 3.1 |
| Shank     | 8.64 ± 1.2 a |
| Kidney    | 1.36 ± 0.2  |
| Heart     | 2.27 ± 0.4 a |
| Trachea   | 2.08 ± 0.4 a |
| Esophagus | 2.69 ± 0.4  |
| Gizzard   | 8.65 ± 0.3 a |
| Liver     | 5.44 ± 0.8  |
| Intestine | 10.63 ± 1.8 a |
| Feather   | 41.9 ± 4.5  |

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| Liver     | 5.44 ± 0.8  |
| Intestine | 10.63 ± 1.8 a |
| Feather   | 41.9 ± 4.5  |

Means with different letters are significantly different at P<0.05.
and carcass percentages in Local duck (aged 24 weeks) were relatively similar or smaller than other local duck at a younger age. These results indicate that genetic improvement is needed in Local ducks to increase the desired meat quantity.

The coefficient of variation for a percentage of carcass component of Local duck showed a low heterogeneity value (CV<15%). It indicates that the genetic diversity of Local ducks for those parameters are low, and the data tended homogeneity.

3.2.4. Percentage of Non-Carcass Component. The non-carcass percentage was obtained by dividing the non-carcass parts, including the head, neck, shank, and offal, by the slaughter weight and multiplied by 100%. The stages of internal offal growth were significantly affected by age. The liver, gizzard, and intestine could therefore be classified as early maturing [7,22]. The results obtained in this study (Table 2) showed that the shank, heart, trachea, gizzard, and intestine of Pekin duck were significantly different (p<0.05) from Local duck.

The non-carcass percentage is influenced by breed and organs performance. Duck breed differences can cause different anatomical shapes and influence body weight. Breed differences have a significant effect on heart and gizzard percentages as a result of duck body size differences [17]. Genetic differences from breeds will affect character activity, body size, performance, and size of organs, especially the heart-liver-gizzard. Larger body size will make an enlarger of size and heart cells. Liver weight is influenced by liver performance, while gizzard performance when crude fiber processing in the feed will affect gizzard weight [17]. The heart-liver-gizzard organ has a constant growth when it reaches mature age.

3.2.5. Meat bone ratios, meat and bone weights. In our study (Table 3), we also determined thigh meat weight (143.2 g) and thigh bone weight (38.2 g) of Pekin duck which showed a significant difference with those of Local duck of 118.1 g and 31.7 g, respectively. These differences are caused by breed and age differences. These results indicate that Pekin ducks have a fast growth rate in thigh meat. However, the meat bone ratio of the thighs in local ducks (3.8) was not different from that of Pekin ducks (3.8).

Table 3. Mean, the standard of deviation and coefficient of variation of meat and bone weight and ratio of Local and Pekin duck.

| Parameter          | Local duck (n=5 birds, 24 Weeks) | Pekin duck (n=5 birds, 9 Weeks) | T-test |
|--------------------|----------------------------------|---------------------------------|--------|
|                    | Mean ± S.D (CV %)                | Mean ± S.D (CV %)               |        |
| Thigh meat weight  | 118.1 ± 6.8 a (5.78)            | 143.2 ± 17.8 b (12.45)         | 0.02   |
| Breast meat weight | 134.5 ± 10.0 (7.47)             | 137.0 ± 30.6 (22.31)           | 0.43   |
| Thigh bone weight  | 31.7 ± 4.1 a (12.94)            | 38.2 ± 3.6 b (9.51)            | 0.03   |
| Breast bone weight | 16.0 ± 2.6 a (16.54)            | 20.2 ± 2.3 (11.15)             | 0.03   |

| Meat bone ratio    |                                 |                                 |        |
|--------------------|----------------------------------|---------------------------------|--------|
| • Breast           | 8.6 ± 1.8 (21.07)               | 6.8 ± 1.1 (16.95)              | 0.09   |
| • Thigh            | 3.8 ± 0.5 (14.29)               | 3.8 ± 0.6 (15.36)              | 1.00   |

n: number of birds

*abcd* means with different letters are significantly different at P<0.05.

In terms of breast meat (Table 3), Local and Pekin duck was similar of 134.5 g Vs 137.0 g, which is contrary to the bone weight of 16.0 g Vs 20.2 g. Those results indicate that Pekin ducks at the age of 9 weeks have not yet reached body maturity and affected to bone and meat growth is not optimal. However, there are no differences of the meat bone ratio of the chest or thigh between South Sulawesi local ducks and Pekin ducks.

The coefficient of variation from the parameter of the percentage of meat weight (breast and thigh) in Local ducks shows a low heterogeneity value (CV <15%) on compared to Pekin ducks, whose
diversity is relatively more homogeneous, especially at breast meat weight. It indicates that the genetic diversity of Local ducks for meat weight is low and mating system is one way to improve the genetic quality and quantity of Local duck. These results become references that Local ducks still need a breeding program to accelerate carcass growth to have optimum carcass characteristics.

4. Conclusion
Based on all the analysis, it was concluded that Pekin ducks have a faster growth rate than Local ducks. At different ages, Pekin ducks and local ducks showed the same carcass characteristics. Differences in breed and age of Local and Pekin ducks affected live weight, dorsal carcass percentage, and non-carcass percentage (shank, heart, trachea, gizzard, and intestine). A mating system (crossbreeding) is recommended for improving the genetic quality and quantity of Local duck.

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References
[1] Kementerian Pertanian 2019 *Livestock and Health Statistics* (Direktorat Jenderal Peternakan dan Kesehatan Hewan Kementerian Pertanian RI)
[2] Amaludin F and Suswoyo I Bobot dan persentase bagian–bagian karkas itik Mojosari afkir berdasarkan sistem dan lokasi pemeliharaan *J. Ilm. Peternak*. 1 924–32
[3] Soeparno 2009 *Ilmu dan Teknologi Daging* (Yogyakarta: Gadjah Mada University Press)
[4] Ziołecki J and Doruchowski W 1989 Evaluation methods of poultry slaughter value *Poult. Res. Cent. Poznań* 1–22
[5] Pingel H and Germany L 2011 Waterfowl production for food security *Lohmann Inf.* 46 32–42
[6] Xie M, Jiang Y, Tang J, Wen Z G, Huang W and Hou S S 2014 Effects of stocking density on growth performance, carcass traits, and foot pad lesions of White Pekin ducks *Poult. Sci.* 93 1644–8
[7] Leclercq B and Carville H de 1986 Growth and body composition of Muscovy ducks *Duck production: science and world practice: proceedings of a workshop at Cipanas, Bogor, Indonesia, November 18-22, 1985/editors, David J. Farrell and Paul Stapleton* (Armidale: University of New England)
[8] Kenyon I B P, Watkins E J and Butler P J 2004 Posthatch growth of the digestive system in wild and domesticated ducks *Br. Poult. Sci.* 45 331–41
[9] Kokoszyński D 2011 *Evaluation of meat traits in commercial crossbreds of Pekin type ducks*
[10] Matitaputty P R, Noor R R, Hardjosworo P S and Wijaya C H 2011 Performance, carcass percentages and heterosis values, Alabio and Cihateup line and crossbreeding on eight week old *J. Ilmu Ternak dan Vet*. 16 90–7
[11] Lestari D, Rukmiasih S T and PS H 2017 Performa itik lokal (Anas platyrhynchos Javanica) yang diberi tepung daun beluntas atau kenikir sebagai sumber pakan aditif *J. Ilmu Produksi dan Teknol. Has. Peternak*. 5 34–40
[12] Putra A, Rukmiasih R and Afnan R 2015 Persentase dan kualitas karkas itik cihateup-alabio (ca) pada umur pemotongan yang berbeda *J. ilmu produksi dan Teknol. Has. Peternak*. 3 27–32
[13] Wiyardan I P G, Siti N W and Sukmawati N M S 2020 Effect of Replacement of Commercial Ration with Mung Bean Sprout Waste Flour to the Male Bali Duck Digestion System *J. Trop. Anim. Sci.* 8 422–34
[14] Prihady W A 2008 *Produksi karkas angsa (Anser cygnoides) pada berbagai umur pemotongan* (Institut Pertanian Bogor)
[15] Wileote D 1990 Usaha pemotongan ternak itik dan penyerapan dagingnya di Jawa Tengah *Dalam Pengemb. usaha ternak itik di Jawa Tengah. Klepu Sub Bali Penelit. Peternak.*
[16] Suparyanto A 2006 Karakteristik ukuran karkas itik genotipe peking x alabio dan peking x mojosari Pros. Lokakarya Nas. Inov. Teknol. Dalam Mendukung Usahatarmak Unggas Berdayasaing 92–6

[17] Armissaputri N K and Ismoyowati M S 2013 Perbedaan bobot dan persentase bagian-bagian karkas dan non karkas pada itik lokal (Anas plathyrrinco) dan Itik Manilia (Cairinamoschata) J. Ilmu Pernernak. 1 1086–94

[18] Hafid H 2015 Potensi produksi karkas itik lokal afkir yang berasal dari peternakan rakyat di sulawesi tenggara Prosiding Seminar Nasional Teknologi Peternakan dan Veteriner pp 443–7

[19] Pribady W A 2008 Produksi karkas angsa (Anser cygnoides) pada berbagai umur pemotongan (Institut Pertanian Bogor)

[20] Sudaryati S, Sasongko H and Harimurti S 1998 Relationship of sex, age, and body weight to local duck carcass yield

[21] Summers J D 2004 Broiler Carcass Composition

[22] Omojola A B 2007 Carcass and organoleptic characteristics of duck meat as influenced by breed and sex Int. J. Poult. Sci. 6 329–34

[23] Matitetuputty P R, Noor R R, Hardjosworo P S and Wijaya C H 2011 Performa, persentase karkas dan nilai heterosis itik alabio, cihateup dan hasil persilangannya pada umur delapan minggu J. Ilmu Ternak dan Vet. 16 90–7

[24] Erisir Z, Poyraz O, Onbasilar E E, Erdem E and Oksuztepe G A 2009 Effects of housing system, swimming pool and slaughter age on duck performance, carcass and meat characteristics. J. Anim. Vet. Adv. 8 1864–9

[25] Anggraeni 1999 Pertumbuhan Alometri dan Tinjauan Morfologi Serabut Otot Dada (Muscullus Pectoralis dan Muscullus Supracoracoracorideus) pada Itik dan Entok Lokal (Program Pasca Sarjana Institut Pertanian Bogor)

[26] Sudiyono P T H 2007 Pengaruh penambahan enzim dalam ransum terhadap persentase karkas dan bagian-bagian karkas itik lokal jantan.[Skripsi] Fak. Pertan. Univ. Sebel. Maret. Surakarta 32 270–6