



Diversity of Quantitative Characteristics of Sikumbang Jonti Ducks and Peking Ducks

Husmaini , Linda Suhartati * and Yan Heryandi

Department of Animal Science, Faculty of Animal Science Universitas Andalas, West Sumatra, Indonesia

*Corresponding author: lindasuhartati@ansci.unand.ac.id

ABSTRACT

This study aims to determine the diversity of quantitative traits of Sikumbang Jonti (SJ) and Peking (PK) ducks at 24 weeks that are intensively reared. This study used 91 birds including, 59PK ducks, and 32 SJ ducks. The ducks were intensively reared at UPT Faculty of Animal Husbandry, Andalas University. This study used the observation method by calculating the mean \pm SD, and coefficient of variation. Data were analyzed using the t-test to see the effect of sex and duck breed. The variables observed in this study were body weight (BW), chest circumference (CC), beak length (BL), wing bone length (WBL), shank length (SL), shank circumference (SC), femur length (FL), and tibia length (TL). The results showed that sex had a significant effect ($P < 0.01$) on BW and CC in PK ducks and BL in SJ ducks. Duck breed had a significant effect ($P < 0.01$) on BW, CC, BL, SC, and WBL but a significant effect ($P < 0.05$) on TL. Coefficient of variation (CV) in PK ducks was moderate ($> 5-15\%$). The mean of CV in SJ ducks was moderate except in BW, WBL, and TL in female SJ ducks which had relatively high variability ($> 5\%$). The conclusion of this study is that sex and duck breed affect the quantitative characteristics of duck and the CV of Peking ducks and Sikumbang Jonti ducks is moderate to high. In addition, in Indonesia there are also many farmers who cultivate Peking (PK) ducks. PK ducks have fast growth. Peking ducks can be used as meat-type and egg-laying ducks. Therefore, it is necessary to measure the quantitative traits of PK livestock to see the comparison with SJ ducks. The data obtained can be used as a basis for measuring the potential of SJ ducks as meat-type ducks as well as strategies for developing and preserving SJ ducks as local ducks of West Sumatra.

Keywords: Peking Duck, Sikumbang Jonti Duck, Coefficient of Variation, Quantitative.

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INTRODUCTION

West Sumatra has a variety of local livestock, including Sikumbang Jonti (SJ) duck. SJ ducks originate from Payobasung, Payakumbuh City, Indonesia. Currently, SJ ducks have not been designated as native duck by the Ministry of Agriculture Indonesia. Indonesia presents a significant opportunity for the growth of animal enterprises, particularly in the area of poultry production (Fajri et al., 2022). SJ ducks population is currently declining. Sasmalinda (2016) reported that the SJ duck population was 4,446 in Payakumbuh Timur sub-district. The population of ducks in Harau District was 7425 (Ningsih, 2023), and 7245 in Situjuh District (Putra, 2023). However, these populations are local livestock from

outside West Sumatra, namely Mojosari and Raja Ratu ducks. This is because the performance of SJ ducks is lower than that of Mojosari and Raja Ratu ducks. Although, SJ ducks have resistance to heat stress and good adaptability to tropical environments (Subekti et al., 2019; Nova et al., 2020). Improving the performance of SJ ducks can be done through selection. Selection can be done based on duck body size because it affects the growth of ducks related to the growth of the duck skeleton (Ologbose et al., 2020). According to Zhu et al. (2021) there is a correlation between selection for body size and skeletal growth, as evidenced by the positive selection that occurred during duck domestication that favored genes associated to skeletal development, affecting body size and bone morphology.

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MATERIALS & METHODS

Ethical Approval

Animal experiments were conducted following the Republic of Indonesia Law No. 18 of 2009 (section 66), which addressed animal keeping, raising, killing and proper treatment and care.

Material

The number of samples used were 91 individuals, consisting of 59 PK ducks and 32 SJ ducks. PK ducks consist of 49 females and 10 males. SJ ducks consist of 24 females and 8 males. Both types of ducks were 24 weeks old. Ducks were raised intensively at UPT Faculty of Animal Husbandry, Andalas University. The ducks are from Ni Er Payobasung Farm, Payakumbuh City. The feed used during the study was N544 commercial feed from PT Charoen Pokphand. Feed was given as much as 110g/head to Sikumbang Jonti ducks and 120g/head to Peking ducks. Feed is given twice a day at 8:00 am and 4:00 pm. The nutritional content of the rations used can be seen in Table 1. Drinking water is given *ad libitum*. The cages that will be used during this study are colony cages using husks as the base of the cage. The cage used is 360x120x90cm and consists of 8 units with each type of duck using 4 cage units.

Table 1: Nutrient content and metabolic energy of commercial ration N544

Nutrient content	N544
Protein (%)	17.5 – 18.5
Crude Fiber (%)	10
Crude Fat (%)	3
Calcium (%)	2.90 – 4.25
Phospor (%)	0.55
Water Content (%)	14
Ash (%)	14
Metabolic Energy (kcal/kg)	2850

Methods and Data Analysis

The equipment used in this study were cameras, stationery, digital scales, measuring tapes, and Vernier calipers. Quantitative trait measurements included body weight (BW), chest circumference (CC), beak length (BL), shank length (SL), shank circumference (SC), wing bone length (WBL), femur length (FL), and tibia length (TL). Measurements are following FAO (2012) recommendations. The quantitative traits measured were then calculated as mean, standard deviation, coefficient of variation (CV), maximum value, and minimum value. T-test was conducted out to see the effect of sex and duck breed.

RESULTS & DISCUSSION

Quantitative of Sikumbang Jonti Ducks

Quantitative characteristics of SJ ducks can be seen in Table 2. Table 2 shows that sex had significant ($P < 0.01$) effect on BL and a significant ($P < 0.05$) effect on SC in SJ ducks. Meanwhile, BW, CC, CL, WBL, FL and TL had no ($P > 0.05$) effect on sex in SJ ducks. Differences in body size between male and female ducks can be caused by different growth patterns of the two sexes. Lapik (2016) stated that the growth curve behavior affects body size, such as body length, chest circumference, and body

weight. Lapik (2016) also added that genetic factors, sex, and maintenance management affect livestock growth patterns. Sex differences also play a role, as males generally exhibit higher performance levels than females in terms of body weight (Moniem et al., 2023).

Table 2: Quantitative characteristics of Sikumbang Jonti ducks

Variables	Male		Female		Sign.
	Mean	CV	Mean	CV	
BW (g)	1399.75±124.70	8.91	1392.00±235.35	16.91	ns
CC (cm)	27.50±2.70	9.83	27.73±2.42	8.74	ns
BL (mm)	61.33±4.02	6.55	56.08±3.14	5.59	**
SL (mm)	58.05±5.80	9.99	55.22±6.89	12.47	ns
SC (mm)	45.75±4.74	10.37	41.50±4.81	11.59	*
WBL (cm)	22.35±2.73	12.23	20.50±3.33	16.25	ns
FL (mm)	66.23±7.40	11.17	65.03±4.88	7.50	ns
TL (mm)	96.00±9.51	9.90	94.28±8.85	9.38	ns

Data are presented as mean±SD or SE. CV=Coefficient of variation; BW= Body Weight, CC = Chest Circumference, BL= Beak Length , SL= Shank Length , SC= Shank Circumference , WBL= Wing Bone Length , FL= Femur Length , TL= Tibia Length.

The 24-week-old SJ raised intensively had a body weight of 1399.75±124.70g in males and 1392±235.35g in females. Arlina et al. (2021) reported that the body weight of SJ ducks in Payakumbuh City was 1430±150 g for males and 1360±140g for females raised semi-intensively. This indicates that the difference between intensive and semi-intensive management does not differ in the body weight of SJ ducks. Siva (2021) reported that SJ ducks had a body weight of 897.8g at 8 weeks of age.

The coefficient of variation in SJ ducks is classified as moderate, except for body weight (16.91%) and wing bone length (16.25%), which have relatively high variation (>15%) in female SJ ducks. Different from the results of research by Arlina et al. (2021), the quantitative characters of SJ ducks are relatively uniform except for femur length which has high variation. The coefficient of variation (CV) is commonly classified into three categories: low, medium, and high, based on the magnitude of variability in different experiments (Vaz et al., 2017). Determination of the classification of the coefficient of variation is based on the opinion of Kurnianto (2010), namely the coefficient of variation is divided into three, namely low (<5%), medium (5-15%), and high (>15%). A moderate to high coefficient of variation indicates that the quantitative characteristics of SJ ducks are still diverse. The high variation could be due to the unselected duck population. Furthermore, it is also suspected that SJ ducks have experienced undirected crosses with other ducks. This can be seen from the feather color phenotype of some ducks that does not match original phenotype. The genetic composition of these ducks cause bone growth in SJ ducks to be diverse. Therefore, selection based on body size should be done to improve the performance of SJ ducks, and purification through feather color selection to eliminate the effects of undirected crosses.

Quantitative Peking Duck

Table 3 shows that sex had a significant ($P < 0.01$) effect on BW and CC of PK ducks. The male PK ducks had greater body weight and chest circumference than the female PK ducks. Body weight is closely related to chest

Table 3: Quantitative Characteristics of Peking Ducks

Variables	Male		Female		Sign.
	Mean	CV	Mean	CV	
BW (g)	1893.60±103.80	5.48	1557.20±187.17	12.02	**
CC (cm)	33.24±1.19	3.57	30.20±2.15	7.12	**
BL (mm)	67.54±6.19	9.16	67.10±4.31	6.42	ns
SL (mm)	55.83±5.89	10.56	56.65±6.28	11.09	ns
SC (mm)	46.40±2.88	6.20	45.06±2.73	6.07	ns
WBL (cm)	23.24±2.81	12.08	24.77±2.74	11.04	ns
FL (mm)	68.22±7.51	11.01	66.57±5.38	8.08	ns
TL (mm)	97.39±5.01	5.15	97.45±6.56	6.73	ns

Data are presented as mean±SD or SE. CV=Coefficient of variation; BW= Body Weight, CC = Chest Circumference, BL= Beak Length, SL= Shank Length, SC= Shank Circumference, WBL= Wing Bone Length, FL= Femur Length, TL= Tibia Length.

circumference. A high body weight also means a large chest circumference. Chest circumference indicated breast meat production in ducks. The body weight of PK ducks was 1,699g (Muthmainnah and Jalali, 2022) and 1,646g (Bulkaini et al., 2021) at 8 weeks of age. The body weight obtained was lower compared to study by Tamzil et al. (2023), namely 2226.03±267g in female PK ducks in the Monggelemong

duck farming group, Mataram City. This is because the age of the ducks used by Tamzil et al. (2023) was 12 months old. While in this study it was 24 weeks or six months old.

The coefficient of variation of quantitative traits in PK ducks was moderate (> 5-15%). The PK ducks population used is almost uniform in both males and females. However, there is still potential for selection to improve the performance and uniformity. Selection can be done by culling ducks that have a low weight compared to the average weight of the population. PK ducks are native to China (Qu et al., 2009) and are widely cultivated in Indonesia as meat type of ducks. PK ducks have fast growth compared to other duck livestock. Morphometric characteristics in the duck farming centers of Tolitoli Regency tend to be uniform (Henrik et al., 2021). The body weight of male and female SJ and PK ducks can be seen in Fig. 1. Chest circumference, shank circumference, wing bone length can be seen in Fig. 2, and beak length, shank length, femur length, tibia length of male and female SJ and PK ducks can be seen in Fig. 3.

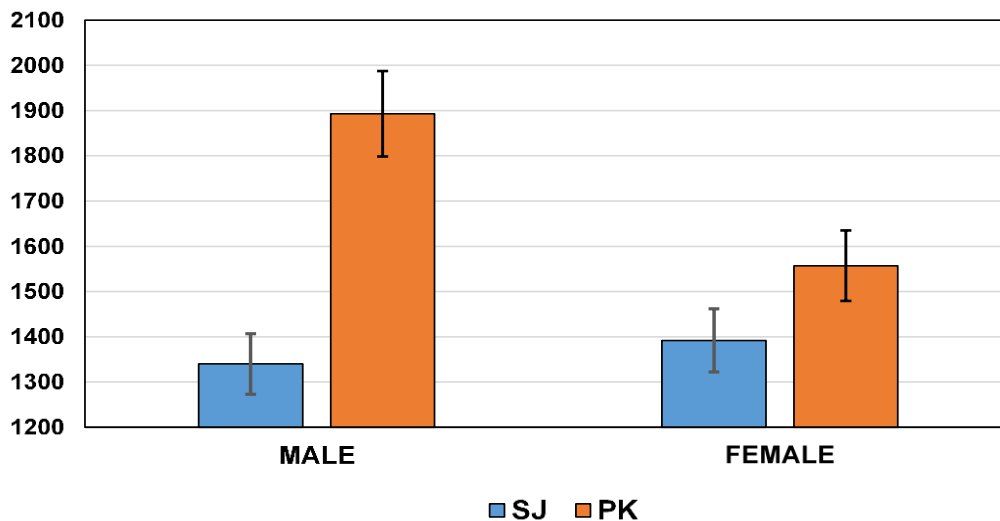


Fig. 1: Body Weight (BW) of Sikumbang Jonti (SJ) and Peking (PK) ducks.

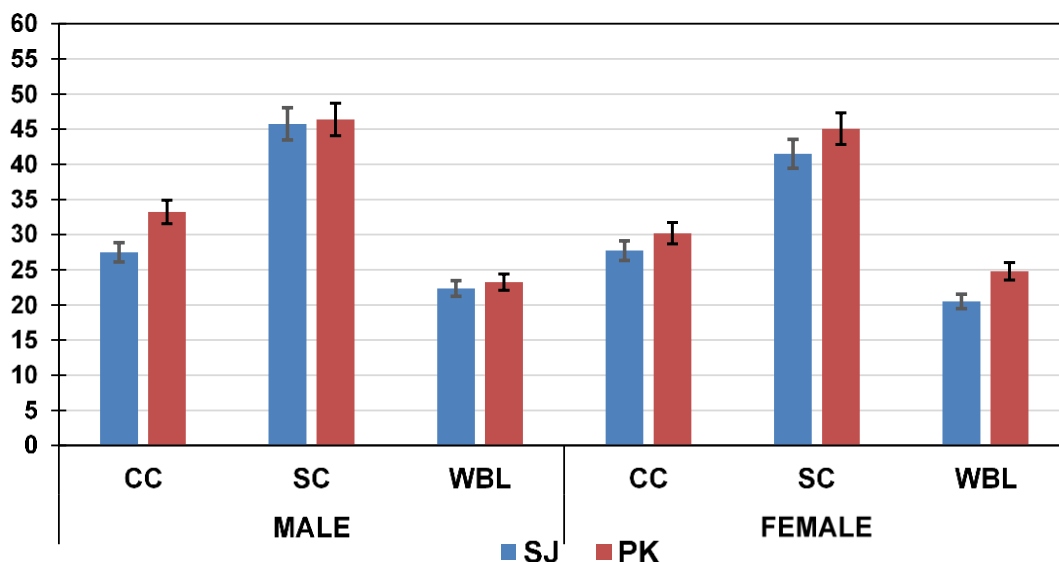


Fig. 2: Chest Circumference (CC), Shank Circumference (SC), Wing Bone Length (WBL) of Sikumbang Jonti (SJ) and Peking (PK) ducks. SC in mm; while WBL and CC and in cm.

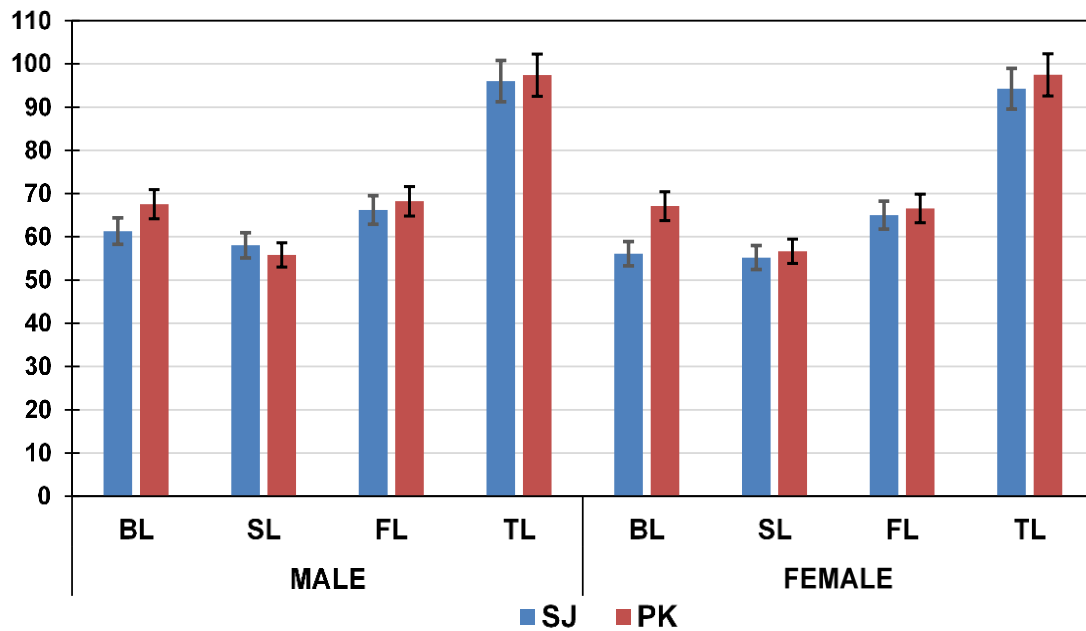


Fig. 3: Beak Length (BL), Shank Length (SL), Femur Length (FL), Tibia Length (TL) of Sikumbang Jonti (SJ) and Peking (PK) ducks. All measurements in mm.

Table 4: Quantitative Characteristics of Male Peking Ducks and Sikumbang Jonti Ducks

Variables	Sikumbang Jonti			Peking			Sign
	Min	Max	Mean	Min	Max	Mean	
BW (g)	1207.00	1521.00	1399.75±124.70	1755.00	2100.00	1740.68±173.53	**
CC (cm)	24.80	30.50	27.50±2.70	31.70	35.50	32.02±1.63	**
BL (mm)	55.00	64.30	61.33±4.02	58.00	76.10	67.47±5.73	*
SL (mm)	54.00	67.20	58.05±5.80	46.10	62.30	56.68±6.00	ns
SC (mm)	40.00	51.00	45.75±4.74	41.00	50.00	46.00±3.19	ns
WBL (cm)	20.00	26.50	22.35±2.73	19.80	27.90	23.24±2.83	ns
FL (mm)	59.40	76.00	66.23±7.40	52.50	77.80	67.81±7.21	ns
TL (mm)	81.70	106.00	96.00±9.51	91.00	104.70	97.26±5.71	ns

BW= Body Weight, CC = Chest Circumference, BL= Beak Length, SL= Shank Length, SC= Shank Circumference, WBL= Wing Bone Length, FL= Femur Length, TL= Tibia Length.

Table 5: Quantitative Characteristics of Female Peking Ducks and Sikumbang Jonti Ducks

Variables	Sikumbang Jonti			Peking			Sign
	Min	Max	Mean	Min	Max	Mean	
BW (g)	955.00	2038.00	1392.00±235.35	940.00	2145.00	1539.03±205.82	**
CC (cm)	22.90	33.00	27.73±2.42	21.10	34.10	29.94±2.33	**
BL (mm)	48.00	62.40	56.08±3.14	55.30	76.00	67.10±4.31	**
SL (mm)	41.00	69.40	55.22±6.89	45.20	78.20	54.76±10.13	ns
SC (mm)	34.00	51.00	41.50±4.81	39.00	50.00	44.86±2.45	**
WBL (cm)	17.50	26.80	20.50±3.33	17.70	30.60	25.27±2.50	**
FL (mm)	56.00	72.00	65.03±4.88	55.30	81.00	66.28±4.70	*
TL (mm)	81.20	120.00	90.30±18.98	82.60	109.00	97.55±6.68	ns

BW= Body Weight, CC = Chest Circumference, BL= Beak Length, SL= Shank Length, SC= Shank Circumference, WBL= Wing Bone Length, FL= Femur Length, TL= Tibia Length.

Effect of Duck breed on Quantitative Characteristics

The effect of duck breed on the quantitative characteristics of male SJ and PK ducks can be seen in Table 4 and for female ducks in Table 5.

Table 4 shows that body weight and chest circumference had a significant ($P < 0.01$) effect on duck breed. Male PK ducks had higher body weight and chest circumference than male SJ ducks. Male PK ducks had an average BW of 1740g, with a maximum BW of 2100g and a minimum of 1755g. Meanwhile, male SJ ducks had an average body weight of 1399.75g, with a maximum body weight of 1521g and a minimum of 1207g. The effect of duck breed on the quantitative characteristics of female SJ and PK ducks can be seen in Table 5.

Table 5 shows that BW, CC, BL, SC and WBL had a significant ($P < 0.01$) effect on female duck breed.

Meanwhile, FL had a significant ($P < 0.05$) effect. Female PK ducks have a higher average body weight, chest circumference, beak length, shank circumference, wing bone length, and femur length than female SJ ducks. However, the SJ duck in the observed population had the highest body weight at 2038g. This weight is close to the average weight of female PK ducks. SJ ducks have the potential to improve their performance through selection.

Genetic factors are the cause of differences in the quantitative characteristics of the two types of ducks. Duck body weight is influenced by breed differences, dietary habits, genetic variances, and gender differences (Moniem et al., 2023). PK ducks are classified as meat-type ducks because they have a fast growth pattern compared to other ducks. Tamzil et al. (2023) reported that PK ducks at 12 months reached 2226.03 g. The morphometric size of

the body and body weight of SJ ducks are lower when compared to the Bayang ducks from Arlina et al. (2023), which is 1460g, but higher than the body weight of Kamang ducks, which is 1320g (Arlina et al., 2021).

Conclusion

This study concluded that sex and duck breed affect the quantitative characteristics of Sikumbang Jonti and Peking ducks. The coefficient of variation of quantitative characteristics in Peking ducks is moderate, while that of SJ ducks is medium to high. Therefore, it is necessary to select Sikumbang Jonti ducks.

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