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Characterization of Qualitative and Quantitative Traits of Four Types of Indonesian Native Chickens as Ancestor of New Strains of Local Super Laying Hens

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Abstract

An important aspect that determines the productivity of native chickens is the genetic factor. Improving the genetic quality of chickens can be done through a breeding program which involves the selection and arrangement of mating lines. The objective of the research project is to find basic information on the ancestor's qualitative and quantitative traits to produce a new Indonesian native chicken laying-hens strain. The ancestors used as the genetic source are four native chicken lines: White, Lurik, Wareng, and Ranupane (male and female). Qualitative traits were analyzed using descriptive statistics, and quantitative data were analyzed with ANOVA of a two-level Nested Classification followed by the Least Significant Difference test. The results showed differences in plumage and shank color in each chicken line. In cocks, there were differences ($P < 0.05$) in body weight, wing length, tail length, head circumference, and front-body width. The height, body circumference, shank length, and beak length differed ($P < 0.05$) between hen lines. Qualitative characteristics (plumage and shank colors) can be used as a marker for native chicken lines. They can be used as a reference for selection according to the objectives of the breeding program. Body conformation (weight and height) can be used as selection criteria for ancestors (male and female) to produce new strains of laying native hens.

Keywords: Breeding native chicken, *Gallus gallus domesticus* (Linnaeus, 1758), Improve genetic quality, Increase productivity, Laying native hens, Morphology, Morphometric, Produce superior lines

1. Introduction

Native chickens have several advantages, including being good foragers, efficient mothers, and requiring minimal care to grow (Sankhyan *et. al*, 2013). Moreover, the meat and eggs of Indonesian native chickens are preferred by consumers because of their better taste. In addition, native chickens are more disease-resistant, cheaply fed, and having simple housing (Sujionohadi and Hendriawan, 2013), simple farming, and being used as a side farm business (Permadi *et al*., 2020). Eggs of native chicken are sought after because consumers believe they could increase stamina and vitality as they are widely used in herbal medication (Hendriyanto, 2019). Multipurpose indigenous village chickens (IVCs), besides meat and eggs, produce decorative feathers, play a recreational role such as cockfighting, and are used for ritual practices and to fulfil social obligations (Desta, 2020). Apart from having several advantages, native chickens still have many disadvantages. One of drawbacks of native chickens in Indonesia is that they generally have lower growth rates and egg production compared to commercial breeds, which can limit their potential as a source of meat and eggs for the market. Their productive performances and reproductive rates are low, yet improvements of native chickens would be beneficial for the development of economic growth in Indonesia (Yuwanta, 2010). The productivity of native chickens is low due to extensive farming, and the chickens are allowed to find their feed, inadequate management, and lack of disease prevention (Suprijatna and Natawihardja, 2005; Tonda *et al*., 2023). In addition, they are more susceptible to diseases and have lower feed conversion efficiency, which can boost production costs.

Native chickens have great potential to be developed as an ancestor of superior lines. Adapting to a tropical environment, which can provide higher income for farmers, is advantageous for local chickens (Kartika *et al*., 2017). The productivity of native chickens is low, but they are essential as a genetic source because of their excellent adaptability in poor farming conditions (Agarwal *et al*., 2020). The genetic diversity of local chickens also has excellent potential in the selection program and genetic engineering efforts to produce superior lines (Depison, 2009). The preservation of genetic diversity becomes a target in the future to improve genetic quality in breeding programs, especially selection activities to produce

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superior native chicken lines (Habiburahman *et al*., 2020). Increasing the productivity of local chickens requires careful attention to breeding, nutrition, and health (Manyelo *et al*., 2020). Many studies have been carried out to increase the productivity of native chickens from the aspect of feed, among others by Widodo *et al.* (2019, 2021) who gave *Curcuma xanthorriza* Roxb., and Tonda *et al*. (2022, 2023) with dried rice leftover treatment to improve the performance of native chickens.

Researches on breeding aspects to produce new final stock (FS) of native chickens have not been widely carried out in Indonesia. After all this time, only a few researchers have been diligent in researching to produce super native chicken strains, such as the KUB (Agriculture Research and Development Agency) line, the IPB D1 strain produced by researchers from Bogor Agricultural University, and the SenSi-1 Agrinak strain produced by produced by researchers from the Bogor Livestock Research, whereas the breeding aspect contributes in determining the productivity of native chicken eggs. Therefore, the authors conducted a study aiming to produce new strains of super-laying native hens through a selection program and mating line arrangement. The ancestors used four native chicken lines as a genetic source from the primary population: White, Lurik, Wareng, and Ranupane native chickens.

Performance improvement in native chickens requires basic information regarding the traits to be selected. The initial selection steps included characterizing several qualitative and quantitative traits. Characterization is the first step in breeding livestock to identify critical economic characteristics such as body weight and growth or characteristics of the relevant livestock family. The application of morphometrics is not only carried out on chickens but also on other livestock such as what was done by Brahmantiyo *et al.* (2021) who applied morphometrics to characterize several types of rabbits. Morphometrics are not only performed on livestock, but also on other species, as done by Rahman *et al.* (2019) who used morphometric as the key to identify catfish. Characterization of traits in native chickens can be carried out through morphometric identification of quantitative traits that can be used as selection criteria to increase productivity (Putri *et al*., 2020). Although several previous research results state that morphology contributes very little to morphometrics and production (Shuaibu *et al*., 2020), it is essential to identify the morphology and morphometrics to support the selection program to produce new native chicken lines, which have high egg and meat productivity.

2. Materials and Methods

This research was conducted starting July 2020 at the Native Chicken Breeding House, Experimental Farm Animal Husbandry Study Program, University of Muhammadiyah Malang. East Java, Indonesia. The native chicken used as a genetic source is White Native Chicken and Wareng (from Malang), Lurik Chicken (from Jombang Regency) and Ranupane Chicken (from the highlands around Bromo-Tengger-Semeru), both male and female. White native chickens have advantages in terms of body resistance from disease attacks. The advantages of Wareng chickens are that they have high egg productivity and are disease resistant. Lurik chickens have advantages in the aspect of good egg production, while Ranupane chickens have a good body composition as a characteristic of laying hens. All of these traits will be combined to produce a new final stock of super-laying native hens.

Chickens were reared in experimental cages with a male: female ratio = 1:5 to keep egg fertility high. This sex ratio refers to research conducted by Singh *et al*. (2020). Management of rearing and feeding were given uniformly to eliminate environmental factors and keep genetic factors as determinants of phenotype.

2.1. Identification of qualitative traits (morphology)

Visual morphological observations were carried out by applying the observation method issued by the FAO: "Draft Guidelines on Phenotypic Characterization of Animal Genetic Resources: Chicken Descriptors" with modifications according to local conditions. The qualitative traits (morphology) observed were in accordance with El-Safty (2012), where the ones stated are coat color, shank color, comb type, head shape, presence of earlobe, and color of earlobe as well as plumage color (body, neck, wings, tail), wattle type, and skin color. The variable of qualitative traits was analyzed using descriptive statistics and compared as percentages to measure the distribution of each qualitative trait (FAO, 2011).

2.2. Identification of quantitative traits (morphometric)

The measured quantitative traits (morphometrics) were: Ten linear body size (chest circumference, wings span, shank length, shank circumference, comb length, comb height, sternum length, beak length, wattle length and body length) and body weight morphometric data (Tareke *et al.*, 2018). The data were analyzed by simple statistical ($\bar{x} \pm \sigma$) and ANOVA of two Levels Nested Classification followed by the Least Significant Difference (LSD 5 %) test to determine which line was better for each trait (Adinurani, 2016, 2022; Tribudi and Prihandini, 2020). This research was conducted with the Description of Ethical Approval No.5.a/048.a/KEPK-UMM/III/2022 issued by the Faculty of Medicine, University of Muhammadiyah Malang.

3. Result and Discussion

3.1. Qualitative traits

3.1.1. The plumage pattern

The results of the plumage color pattern analysis of native chickens are presented in Figure 1, and the distribution data are presented in Table 1 and Table 2.

Figure 1. Physical performance of four lines native chicken as genetic sources

Table 1. Plumage colors of White and Lurik native chickens

Traits	White Chicken		Lurik Chicken	
	Cocks (%)	Hens (%)	Cocks (%)	Hens (%)
Body	White (100.00)	White (100.00)	Red black brown (100.00)	Brown-black spots (100.00)
Wings	White (100.00)	White (100.00)	Red black (100.00)	Brown-black spots (100.00)
Neck	White (100.00)	White (100.00)	Red (100.00)	Yellow (100.00)
Head	White (100.00)	White (100.00)	Red (100.00)	Brown (100.00)
Tail	White (100.00)	White (100.00)	Black red (100.00)	Brown black (100.00)

Table 1 shows that for the cocks, the color of white chicken plumage can be used as a marker because it is 100 % white plumage and very different from other chickens. For the cocks Lurik, Wareng, and Ranupane, the color of the plumage cannot be used as a single marker, but it is necessary to look at the type of comb and the color of the shank. All male Lurik chicken comb is the single and wide type with greenish gray shank. In contrast to the Wareng and Ranupane chickens, the comb types are single, pea and walnut. The color of the shank in male Ranupane is yellow (> 80 %), while the color of male Wareng shank is white (> 70 %). Other characteristics such as wattle, neck and wing plumage color, beak, and skin cannot be used as a marker in cocks, because the relative color patterns spread equally between the lines.

Table 2. Plumage colors of Wareng and Ranupane native chickens

Traits	Wareng Chicken		Ranupane Chicken	
	Cocks (%)	Hens (%)	Cocks (%)	Hens (%)
Body	Red black (80.00)	Black (70.59)	Black yellow (20.00)	Light brown (40.91)
	Red black brown (20.00)	Black brown spots (70.59)	Red black (80.00)	Light brown black (31.82)
				Light brown white (22.73)
				Dark brown black (4.54)
Wings	Red black (60)	Black (82.35)	Yellow black (20.00)	Black brown (9.09)
	Red black brown (40)	Black brown spots (17.65)	Red black (60.00)	Light brown black (63.64)

Continued on the next page

Table 2. Continued

Traits	Wareng Chicken		Ranupane Chicken	
	Cocks (%)	Hens (%)	Cocks (%)	Hens (%)
			Red black white (20.00)	Light brown white (9.09)
				Light brown white black (9.09)
				Light brown black yellow (4.54)
				Red black (4.54)
Neck	Red (60.00)	Black (52.94)	Yellow (20.00)	Black brown spots (22.73)
	Red black (20.00)	Black red (17.65)	Red black (20.00)	Light brown black (45.45)
	Red black white (20.00)	Black white (17.65)	Red (20.00)	Brown white (9.09)
		Black brown (11.76)		Brown black white (4.54)
				Red (9.09)
				Light brown (9.09)
Head	Red (100.00)	Black (100.00)	Yellow (20.00)	Black (9.09)
			Red (80.00)	Black brown (54.54)
				Black brown white (27.27)
				Red (9.09)
Tail	Black (40.00)	Black (100)	Black (60.00)	Black brown (95.45)
	Black white (60.00)		Black brown (20.00)	Black red (4.55)
			Black red white (20.00)	

Table 2 shows that for the hens, the overall plumage color can be used as a marker between lines because the plumage color of the hens of the four strains is strikingly different. The comb type is only specific to female Lurik chickens, a 100 % single type. The color of the shank can also be used as a marker for Lurik (100 % greenish-gray) and Wareng (80 % blackish-gray) chickens. Other characteristics, such as the color of the beak, shank, and skin, cannot be used as a marker for the hens.

3.1.2. The comb type

The types of comb found in all lines are single, pea, and walnut, both male and female (Table 3 and Figure 2).

Table 3. Comb and wattle types in native chicken

Traits	**White**		**Lurik**		**Wareng**		**Ranupane**		**Overall**
	Cocks	**Hens**	**Cocks**	**Hens**	**Cocks**	**Hens**	**Cocks**	**Hens**	
Comb									
Pea (%)	40.00	4.00			100.00				8.83
Walnut (%)	20.00	60.00				76.47		59.09	43.75
Single (%)	40.00	36.00	100.00	100.00		23.53	100.00	40.91	47.92
Wattle									
Small (%)	40.00	38.00			40.00	29.41		40.91	29.16
Medium (%)		20.00			20.00	23.53		4.54	11.46
Large (%)	40.00	12.00	100.00	100.00	20.00		100.00	27.27	35.42
No wattle (%)	20.00	40.00			20.00	47.06		27.27	23.96

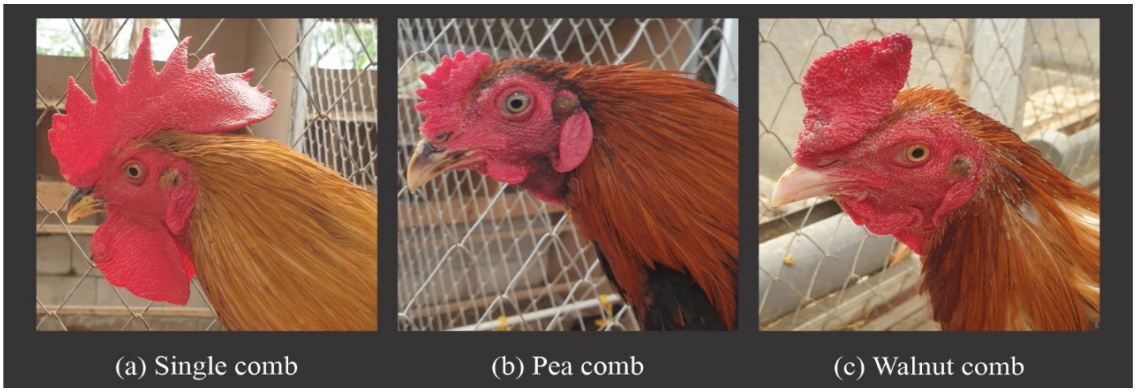

Figure 2. Comb and wattle types in native chicken

Table 3 shows the overall mean of all male and female lines obtained by pea (8.83 %), walnut (43.75 %), and single (47.92 %). Male and female Lurik chickens and male Ranupane chickens have uniform comb types, 100 % single combs. The results of this study are in line with those reported (Bugiwati *et al*., 2020a) that Gaga chickens (South Sulawesi) have more single comb types (males > 86 %), while the hens are more walnut type. Several studies of local chickens abroad reported (Agarwal *et al*., 2020; Bibi *et al*., 2021; Machete *et al*., 2021; Shuaibu *et al*., 2020; Wario *et al*., 2021) that the single comb type is most commonly found in local chickens. The results of this study differ from the research reported (Iskandar and Sartika, 2018) in that the pea comb type is more commonly found in male and female Agrinak chickens (> 89 %), and the rest are single types. Research conducted (Abadi, 2020) on local chickens in Lasusua Sub-District, North Kolaka District, South Sulawesi also produced different percentages, where the most common types of combs are pea (42 %), followed by single (35.5 % and rose 22.5 %).

Most wattle types (Table 3) are large (35.42 %), followed by small (29.16 %), no-wattle (23.96 %), and medium (11.46 %). This wattle size differs from the research results (Mahmood *et al.,* 2017) on Pakistani Aseel chickens that the no-wattle type is the most common (male: 80.3 % and female: 97 %). Similar results are reported by (Qureshi *et al.,* 2018) that most Aseel chickens have a no-wattle type. Comb and wattle size have a relationship with body weight. Ovariectomized chickens showed a larger size of the body, comb, and wattle (Guo *et al*., 2017). Comb and wattle are essential traits for selection in laying hens because they can reflect egg production. Healthy, normally, and bright red combs and wattles reflect a healthy, rich variety and high egg productivity.

3.1.3. The beak, shank and skin color

The results of the beak, shank and skin lolor analysis of native chickens are presented in Table 4 and Figure 3.

Table 4. Beak, shank and skin color in native chicken

Traits	White		Lurik		Wareng		Ranupane	
	Cocks	Hens	Cocks	Hens	Cocks	Hens	Cocks	Hens
Beak Color								
White (%)	60	32			20			
Yellow (%)	40	68	25				40	40.91
Black (%)			25	23.08		58.82		
Black white (%)				76.92		5.88		
White black (%)			50					
White brown (%)								36.36
Yellow black (%)					40		60	4.54
Yellow brown (%)					40			
Brown (%)						5.88		13.64
Black yellow (%)						17.65		
Black brown (%)						11.76		
Shank Color								
White (%)	100	100						45.45
Greenish-grey (%)			100	100				
Blackish-grey (%)					100	100		9.1
Yellow (%)							100	45.45
Skin Color								
White (%)					20			
Dark white (%)	20	40	50	76.92	60	76.48	60	68.18
Red (%)	80	40	50	23.08				
Light red (%)		20				11.76	40	22.73
Dark-red (%)					20	11.76		9.09

Figure 3. Shank color in native chicken

Table 4 above shows that beak color is varied and is not strain-specific. The color of the shank obtained different results between the lines (Figure 3): 100 % white (White chicken), 100 % greenish-grey (Lurik), and 100 % blackish-grey (Wareng). The shank color of the male Ranupane is 100 % yellow, while the color of the shank varies (white 45.45 %, yellow 45.45 %, and blsckish-grey 9.10 %). Skin color contrasted in all strains, so it is not specific to any distinct strain. The skin colors are white, dark white, red, dark red, and bright red. The color of the shank and skin is an essential characteristic of native chickens and is significantly related to consumer preference. Shen *et al*. (2019) stated that shank color in local chickens plays an essential role in market competition.

3.2. Quantitative traits

The measurements of several quantitative traits are presented in Table 5 (cocks) and Table 6 (hens).

Table 5. The average of quantitative traits (morphometric) of cocks native chickens

Quantitative Traits	White	Lurik	Wareng	Ranupane	Overall*
BW (kg) **	2.00±0.47^{a}	1.96±0.39^{ab}	1.59±0.24^{b}	2.31±0.22^{ab}	1.97±0.33^{s}
BH (cm)	29.84±3.00	28.00±5.28	27.24±2.99	31.20±3.51	29.07±3.70^{ns}
BL (cm)	20.60±2.19	19.75±1.32	19.30±2.28	21.50±2.40	20.29±2.05^{ns}
BC (cm)	26.40±7.27	26.13±1.65	28.50±2.35	30.10±1.14	27.78±3.10^{ns}
WL (cm) **	17.75±2.18^{ab}	19.00±1.00^{b}	17.10±1.67^{a}	21.50±1.73^{ab}	18.84±1.65^{s}
SL (cm)	23.54±3.54	22.13±3.07	20.40±0.65	23.40±1.52	22.37±2.19^{ns}
TL (cm)	13.40±2.16	12.25±2.50	10.80±0.76	11.50±0.91	11.99±1.58^{ns}
BeL (cm)	2.80±0.37	2.90±0.18	2.86±0.22	2.84±0.40	2.85±0.29^{ns}
HC. (cm) **	12.50±1.06^{ab}	10.95±1.20^{c}	11.22±0.54^{b}	12.60±1.14^{a}	11.82±0.99^{s}
TC (cm)	10.70±0.97	11.50±1.35	11.02±1.58	12.30±1.57	11.38±1.37^{ns}
NL (cm)	12.40±2.88	12.25±3.40	13.50±2.32	13.80±3.25	12.99±2.96^{ns}
NC (cm)	11.60±1.82	10.88±0.85	10.30±1.04	12.20±0.91	11.24±1.15^{ns}
HL (cm)	5.30±0.67	4.88±0.25	4.70±0.76	5.20±0.45	5.02±0.53^{ns}
HW (cm)	3.45±0.34	3.30±0.25	3.23±0.23	3.47±0.26	3.36±0.27^{ns}
BeW (cm)	1.44±0.27	1.22±0.23	1.58±0.06	1.60±0.30	1.46±0.21^{ns}
TaL (cm) **	27.66±8.93^{ab}	20.63±3.59^{b}	30.40±7.31^{ab}	38.60±10.57^{a}	29.32±7.60^{s}
FBW(cm) **	5.54±0.57^{ab}	4.66±0.97^{b}	6.25±0.78^{ab}	5.48±0.51^{a}	5.48±0.71^{s}
RBW(cm)	7.57±0.26	7.70±0.93	7.07±0.96	7.64±0.90	7.50±0.76^{ns}

* s: siginificant ($P < 0.05$); ns: non-significant ($P > 0.05$).

** different letters (a, b, and c) in the same row are significant (LSD test, $P < 0.05$).

BW: body weight; **BH**: body height; **BL**: body length; **WL**: wing length; **SL**: shank length; **TL**: thigh length; **BEL**: beak length; **HC**: head circumference; **TC**: thigh circumference; **BC**: body circumference; **NL**: neck length; **NC**: neck circumference; **HL**: head length; **HWT**: head width; **BEW**: base-beak width; **TAL**: tail length; **FBW**: front-body width; **RBW**: rear-body width.

For the cocks, the ANOVA results show that the characteristics of body weight, wing length, head circumference, tail length, and front-body width are significantly different between lines ($P < 0.05$). Other traits are relatively the same between lines ($P > 0.05$). The body weight is relatively the same, except for Wareng chickens, which show the lowest body weight and differ from the other three strains. Ranupane chickens have longer wings and a larger head circumference than other chickens. Based on the appearance of several quantitative characteristics, the body conformation of the cocks can be described because Wareng chickens tend to be shorter and have wider bodies. In contrast, Lurik cocks are taller and narrower.

Table 6. The average of quantitative traits (morphometric) of hens native chickens

Quantitative Traits	White	Lurik	Wareng	Ranupane	Overall*
BW (kg)	1.45±0.28	1.75±0.28	1.42±0.28	1.45±0.29	1.52±0.28^{ns}
BH (cm)**	25.16±1.50^{a}	22.52±4.97^{b}	23.74±2.01^{b}	24.11±2.28^{b}	23.88±2.69^{S}
BL (cm)	18.74±1.95	16.94±2.25	17.96±1.82	18.30±2.13	17.99±2.04^{ns}
BC (cm)**	26.35±2.02^{a}	24.48±2.27^{b}	26.47±2.63^{a}	26.78±2.39^{a}	26.02±2.33^{S}
WL (cm)	16.08±2.06	15.88±1.78	17.09±1.99	16.72±1.77	16.44±1.90^{ns}
SL (cm)**	19.88±1.28^{b}	18.81±1.70^{c}	21.09±1.73^{a}	21.14±1.64^{a}	20.23±1.59^{S}
TL (cm)	11.51±1.34	10.62±1.06	11.28±1.10	11.25±1.15	11.16±1.16^{ns}
BeL (cm)**	2.80±0.39^{a}	2.40±0.37^{b}	2.64±0.31^{ab}	2.73±0.31^{a}	2.64±0.35^{S}
HC. (cm)	11.10±1.20	10.72±1.00	11.00±0.88	10.92±0.65	10.94±0.93^{ns}
TC (cm)	10.43±2.57	8.58±1.29	9.10±2.25	9.23±2.23	9.33±2.08^{ns}
NL (cm)	12.02±2.12	11.65±2.45	12.56±2.16	12.81±1.81	12.26±2.14^{ns}
NC (cm)	8.54±1.03	7.77±1.11	8.18±1.17	8.11±1.09	8.15±1.10^{ns}
HL (cm)	4.74±0.67	4.36±0.70	4.71±0.88	4.83±0.75	4.66±0.75^{ns}
HW (cm)	3.13±0.34	3.31±1.13	3.10±0.26	3.13±0.30	3.17±0.51^{ns}
BeW (cm)	1.34±0.19	1.35±0.17	1.43±0.19	1.49±0.24	1.40±0.20^{ns}
TaL (cm)	15.24±2.56	15.42±0.79	16.15±1.84	15.78±2.06	15.65±1.81^{ns}
FBW(cm)	5.55±0.81	4.73±0.47	5.06±0.59	5.24±0.58	5.14±0.61^{ns}
RBW(cm)	7.53±0.70	11.70±18.50	6.97±0.64	6.78±0.80	8.24±5.16^{ns}

* s: siginificant ($P < 0.05$); ns: non-significant ($P > 0.05$).

** different letters (a, b, and c) in the same row are significant (LSD test, ($P < 0.05$).

BW: body weight; **BH**: body height; **BL**: body length; **WL**: wing length; **SL**: shank length; **TL**: thigh length; **BEL**: beak length; **HC**: head circumference; **TC**: thigh circumference; **BC**: body circumference; **NL**: neck length; **NC**: neck circumference; **HL**: head length; **HWT**: head width; **BEW**: base-beak width; **TAL**: tail length; **FBW**: front-body width; **RBW**: rear-body width.

For the hens, almost all the quantitative characteristics of hens are not different ($P > 0.05$) between lines, except for body height, shank length, beak length, and body circumference, which show differences ($P < 0.05$) between lines. The size of the White chicken is the highest and different ($P < 0.05$) from other strains. The Shank length of Ranupane and Wareng chickens is higher ($P < 0.05$) than White and Lurik chickens. The body circumference of Lurik chicken is the smallest and most different ($P < 0.05$) compared to other lines.

Identification of quantitative traits in native chickens has been mostly carried out by previous researchers with genetic sources from local Indonesian chickens (Abadi, 2020; Bugiwati, 2020b; Iskandar and Sartika, 2018; Rofii *et al*., 2020; Sophian *et al.*, 2020; Zurahmah, 2019), as well as local chickens from other countries (Agarwal *et al.*, 2020; Brito *et al.*, 2021; Mahmood *et al.*, 2017; Perini *et al.*, 2020; Qureshi *et al.*, 2018; Shuaibu *et al*., 2020; Wario *et al.*, 2021). The average bodyweight of the four strains of native chicken from the study (male: 1.97 kg ± 0.33 kg and female 1.52 kg ± 0.28 kg) is relatively the same as reported (Rofii *et al.*, 2020) in Kedu and Bali chickens, with an average of 1.05 kg ± 1.15 kg. The average body weight of this study is lower than that of several local chicken lines outside Java: Manokwari-Papua local chickens 2 368.5 g ± 626.3 g (male) and 1 876 g ± 1 413.8 g (female) (Zurahmah, 2019); local chicken Kolaka 1 681.92 g ± 342.76 g (male) and 1 305.45 g ± 410.93 g (female) (Abadi, 2020), and local chicken Gorontalo 1.33 kg ± 1.79 kg (Sophian *et al*., 2020). However, the weight of some local chickens from abroad is higher than the results of this study. Some data on the weight of local foreign chickens include female Aseel chickens 1.96 kg ± 0.8 kg (Qureshi *et al.*, 2018), female Pakistani Aseel chickens 2.0 kg ± 0.9 kg (Mahmood *et al*., 2017), local Portuguese chickens 2 852 g and female 2 066 g (Brito *et al*., 2021), local chickens Nigerian normal feathers 1.72 kg ± 0.11 kg (Shuaibu *et al*., 2020), Spanish native chickens 1 293.3 g ± 219.2 g (female) and 1 695 g ± 128.1 g (male) (Perini *et al*., 2020), and Ethiopian local chicken 1.313 kg ± 0.186 kg (female) and 1.23 kg ± 0.229 kg (male) (Wario *et al*., 2021).

The main trait used as selection criteria for hens is egg production, but information on weight, height and other quantitative traits is also required. The layer native chicken lines that will be made have high egg production and a

healthy body condition and are efficient in using the feed. These quantitative traits are needed as supporting selection criteria because they are related to productivity. As the primary line used by ancestors, the quantitative trait performance must be reasonable and reflect healthy chickens and high productivity. This selected hen as a parent depends on the ability of the egg production of the offspring.

4. Conclusion and Recommendation

Qualitative traits of Indonesian native chickens, especially the plumage pattern, comb type, beak color, shank color, and skin color show differences between lines. In the same chicken lines, the variation in the appearance of qualitative traits was relatively low. Several important quantitative traits indicate differences between lines. Based on the conformation of the body, Lurik and Wareng chickens can be recommended as the female line while White and Ranupane chickens should be the male line to produce the Parent Stock of laying hens.

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