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Production performance of hybrid broiler chickens from two-way crossbreeding between Choi and Luong Phuong chickens

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Abstract

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The purpose of this experiment was to evaluate the production performance of hybrid broiler chickens from two-way crossbreeding between ♂Choi x ♀Luong Phuong and ♂Luong Phuong x ♀Choi chickens. The experiment included 4 treatments (T), namely T1: pure Luong Phuong (LP), T2: pure Choi (C), T3: hybrid broiler chickens of (♂C x ♀LP) and T4: hybrid broiler chickens of (♂LP x ♀C). Each experiment had 70 unsexed one-day old chickens, replicated 5 times, and ended when the chickens were 98 days old. T1 and T2 were arranged to compare the result of hybrid chickens with their parents. Chickens of all treatments were fed *ad libitum* with the same complete mixed feed, and with the same care and feeding regime. Results showed that hybrid broiler chickens of T3 and T4 had livability rate of 95.14%, and 93.71% at 98 days of age, body weight reaching 2070 and 1969 g/bird, the FCR of 3.03 and 3.12 kg/kg weight gain, respectively. Whereas the heterosis of the FCR trait of T3 chickens was less than the average of their parents (negative value). If the FCR trait has a negative value, it is good and expected. Hybrid broiler chickens of T3 and T4 had similar slaughter results and meat quality, except for meat color. The production performance of hybrid broiler chickens was less than that of Luong Phuong chickens, but was much better than Choi chickens, in which hybrid broiler chickens of T3 (♂C x ♀LP) were more improved than T4 (♂LP x ♀C).

Keywords: Choi chickens; Luong Phuong chickens; Hybrid broiler chickens; Production performance

Introduction

Crossbreeding between local chicken breeds with low production performance and other chicken breeds with higher egg and meat production performance has been researched in many countries. Because local chickens have advantage of adapting to harsh local weather and low care and feeding regime, the products have high prices, and are favored by consumers. High-yield chicken breeds have high egg and meat production performance. The purpose of crossbreeding is to create hybrid chickens that inherit the advantages of both parents. Many breeding studies in the above direction have been carried out, including studies by Yin et al. (2013), Hoan Nguyen Duy et al. (2016), Hoan Tran Thi et al. (2020), Isa et al. (2020), Soliman et al. (2020), El-Tahawy and Habashy (2021).

Choi chickens (also called Noi chickens), is a colored feather chicken breed with low meat and egg production performance. However, Choi chicken meat is delicious and the product has a much higher selling price than other colored feather chicken breeds. Therefore, it is still raised in farms. Luong Phuong chicken is an improved breed chicken with

colored feathers, capable of producing meat and eggs higher than Choi chicken. A project of crossbreeding between Choi and Luong Phuong chickens has been carried out since 2022, at Thai Nguyen University of Agriculture and Forestry with the goal of creating hybrids that inherit the advantages of both Choi and Luong Phuong chickens. This experiment is one of the steps of the above project.

Materials and Methods

Pure Luong Phuong (LP), pure Choi (C), hybrid broiler chickens of (♂C x ♀LP) and of (♂LP x ♀C) were used in this experiment.

Choi and Luong Phuong chickens are both slow growing breeds with colored feathers. Choi chicken has low meat yield, but the product has high selling price because its meat is delicious. Luong Phuong chicken has been selected and improved, so it has a higher meat production ability than Choi chickens.

The experiment was conducted at Center for Training and Research on Plant and Animal Breeding, Thai Nguyen University of Agriculture and Forestry, Vietnam.

Scheme of crossbreeding between Choi and Luong Phuong chickens:

♂C × ♀LP	♂LP × ♀C
↓	↓
Hybrid chickens raised for meat (T3)	Hybrid chickens raised for meat (T4)

The experiment included 4 treatments (T), namely T1: pure Luong Phuong (LP), T2: pure Choi (C), T3: hybrid broiler chickens of (♂C × ♀LP), abbreviated as T3(C×LP) and T4: hybrid broiler chickens of (♂LP × ♀C), abbreviated as T4(LP×C). Each experiment had 70 unsexed one-day old chickens, replicated 5 times, and ended when the chickens were 98 days old. T1 and T2 were arranged to compare the result of hybrid chickens with their parents.

Chickens of all treatments were fed *ad libitum* with a complete mixed feed, with the same care and feeding regime. Chickens were raised in two stages; the first stage was from 1–28 days old and the second stage was from 29–98 days old. Feed had metabolic energy of 3000 and 3100 kcal/ kg, protein ratio of 20.5 and 18% for two stages, respectively.

Monitoring indicators include livability rate, body weight and weight gain, feed intake, feed conversion, some slaughter indicators, some meat quality indicators and calculation of heterosis.

Monitoring of indicators was applied according to Doan et al. (2011). Statistical processing was applied according to Dzung et al. (2018).

Results and Discussion

Livability rate

The livability rate at 98 days old of Luong Phuong, Choi, T3(C×LP) and T4(LP×C) chickens was 94.86; 87.71; 95.14 and 93.71%, respectively. Other studies show that the livability rate of Luong Phuong chickens at 70 days of age was 95–97% (Trung, 2018; Nhung, 2021), of Choi chickens at 140 days of age was 86.72% (Hoang Pham Cong, 2010), of F1 (Mia x Luong Phuong) and F1 (Ri × Luong Phuong) at 98 days of age was 93.80 and 94.90% (Quyen et al., 2020). It can be seen that chickens in this experiment had a high livability rate, which proved, that chicken care and feeding regime of the experiment was appropriate.

Growth of experimental chickens

Chickens were weighted weekly, however Tables 1 and 2 only presented average results over two weeks.

Table 1 showed that Choi and Luong Phuong chickens are both slow growing breeds. Therefore, their weight and that of hybrids are not high, only reaching about 1600 g to about 2700 g/bird at 98 days of age.

Table 1. Body weight of experimental chickens, g/ bird

D.O.	LP	Choi	T3(C × LP)	T4(LP × C)	SEM	P
1	39^{a}	33^{b}	38^{a}	34^{b}	1.342	0.000
14	242^{a}	188^{b}	217^{ab}	204^{ab}	2.641	0.000
28	624^{a}	389^{c}	482^{b}	446^{b}	6.025	0.000
42	1130^{a}	625^{d}	818^{b}	759^{c}	10.155	0.000
56	1606^{a}	906^{d}	1171^{b}	1096^{c}	16.898	0.000
70	2036^{a}	1183^{d}	1508^{b}	1419^{c}	20.011	0.000
84	2407^{a}	1434^{d}	1816^{b}	1717^{c}	27.638	0.000
98	2718^{a}	1645^{d}	2070^{b}	1969^{c}	34.308	0.000

Note: Numbers with different subscription letters in the same row are significantly different ($p < 0.001$). If the data quoted in the discussion are not included in Table 1 and other tables, they are taken from the original experimental data. D.O. is days old.

The body weight of chickens at all weight periods of T3 and T4 chickens was lower than that of Luong Phuong chickens, but higher than that of Choi chickens with a clear difference ($P < 0.001$), except for the body weight at 1 and 14 days old. Hybrid chickens of T3(C×LP) had a higher weight than T4(LP×C) at all age stages; the difference in weight at the later stage was larger than the previous stage; for example, this difference was 36 g at 28 days old, 75 g at 56 days old, and 99 g at 84 days old. Body weight of the two treatments were statistically different at 42, 56, 70, 84, and 98 days old ($P < 0.001$).

Colored feather chickens are usually sold when their weight reaches about 2 kg. Hybrid chickens reached this weight at 98 days of age, which is the reason why the experiment ended at 98 days of age. At this time (98 days of age), the Luong Phuong chickens had body weight of 2.72 kg (they reached a weight of 2 kg at 70 days of age), while the weight of Choi chickens was 1.64 kg (farms often raise Choi chickens until 140–150 days old to reach a weight of 2 kg).

Studies on Luong Phuong, Choi, and hybrid chickens showed that the weight of Luong Phuong chickens at 70 days of age reached 1861–2059 g (Nhung, 2021), of Choi chickens at 91 days of age was 1410–1508 g (Phuong et al., 2022), of hybrid chickens (Ho x Luong Phuong) reached 1964–2018 g at 91 days of age (Hanh and Nguyen, 2021). In this experiment, the body weight of Luong Phuong chickens at 70 days of age was 2036 g, of Choi chickens at 91 days of age was 1544 g, and of T3(C×LP) and T4(LP×C) chickens at 98 days of age was 2070 and 1969 g, respectively. The body weight of chickens in this experiment was similar to the above experiments. This proved that the chicken care and feeding regime was appropriate, and the chickens have grown well.

Body weight gain of chickens

The average weight gain of each two-week period and the entire experimental period is presented in Table 2.

Table 2 showed that Choi, Luong Phuong and their hybrid chickens are slow growing broilers. Therefore, their average weight gain was not high, only reaching about 16.45 g to about 27.34 g/bird/day for all periods (from 1–140 days of age).

The weight gain of T3 and T4 chickens was lower than Luong Phuong, but higher than Choi chickens at all age stages with statistically significant difference ($P < 0.001$), except for stage of 1–14 days old. Weight gain of treatments at different stages was different. The highest weight gain of Luong Phuong chickens was at 29–42 days of age (exactly at 29–35 days of age with 36.43 g/bird/day), of T3 and T4 chickens was at 43–56 days of age (exactly at 43 – 49 days of age with 25.43 and 24.29 g/bird/day, respectively), of Choi chickens was also at the stage of 43–56 days of age, but one week later than that of hybrid chickens (exactly at 50–56 days of age with 20.86 g/bird/day). After the above stages, the weight gain of chickens gradually decreased; the decreasing speed of different treatments was different. The decreasing speed of Luong Phuong chickens were the fastest, followed by T3 chickens, thenT4 chickens. The slowest were Choi chickens. The average weight gain in the stage of 85–98 days old compared to the highest weight gain of the above stages of Luong Phuong was 61.45, of T3 was 71.95, of T4 was 74.78%, and of Choi chickens was 75.08%.

The weight gain of T3(C×LP) was greater than that of T4(LP×C) chickens in most stages, but only had statistically significant difference ($P < 0.001$) in the stage of 29–42 days old. However, the gap in weight gain of the two treatments was different at different stages. At stages 1–14; 15–28 and 29–42 days old, the gap increased from 0.65 to 1.64 g/bird/day, but at stages 43–56; 57–70; 71–84 and 85–98 days old, it decreased from 1.14–0.14 g/bird/day. Thus, cross-breeding a Choi roosters with Luong Phuong hens will give the hybrid an advantage in weight gain at early stages, then this advantage gradually decreases. Meanwhile, cross-breeding a Luong Phuong roosters with Choi hens will give the hybrid an advantage in weight gain at later stages.

Table 2. Body weight gain of experiment chickens, g/bird/day

Period (D.O.)	LP	Choi	T3(C × LP)	T4(LP × C)	SEM	P
1–14	14.50^{a}	11.07^{b}	12.79^{b}	12.14^{b}	0.108	0,000
15–28	27.29^{a}	14.36^{c}	18.93^{b}	17.29^{b}	0.257	0,000
29–42	36.14^{a}	16.86^{d}	24.00^{b}	22.36^{c}	0.740	0,000
43–56	34.00^{a}	20.07^{c}	25.21^{b}	24.07^{b}	1.066	0,000
57–70	30.71^{a}	19.79^{c}	24.07^{b}	23.07^{b}	1.257	0,000
71–84	26.50^{a}	17.93^{c}	21.93^{b}	21.29^{b}	1.388	0,000
85–98	22.21^{a}	15.07^{c}	18.14^{b}	18.00^{b}	1.589	0,000
1–98	27.34^{a}	16.45^{c}	20.73^{b}	19.74^{b}	1.869	0,000

Note: Numbers with different subscription letters in the same row are significantly different ($p < 0.001$)

Feed intake of chickens

The average feed intake of each two-week period and the entire experimental period is presented in Table 3.

Feed intake increases as the chicken's weight gain increases and feed intake increases sharply at the growth spurts of chickens (for example, stages 29–42 or 43–56 days old). After this period, the chicken's weight gain will decrease, so feed intake will not increase much.

The average feed intake over the entire period (1–98 days old) of the treatments ranked from high to low was T1, T3, T4 and T2 with clear differences ($P < 0.001$). Hybrid chickens of T3 consumed more feed than that of T4, because their weight gain was higher, however this difference was not statistically significant ($P > 0.05$), except for periods of 15–28 and 29–42 days old.

Previous studies showed that feed intake (g/bird/day) of Luong Phuong chickens at 15–70 days old was 84.27–85.93 g (Nhung, 2018), of Choi chickens at 21–98 days old was 65.36–67.53 g (Thuy, 2020), of hybrid chickens (Ho x Luong Phuong) at 35–91 days of age was 64.66–65.01g (Hanh and Nguyen, 2021). In this experiment, the feed consumption of Luong Phuong chickens (at the same stage of 15–70 days old) was 81.09 g, of Choi chickens (the same stage of 21–98 days old) was 62.79 g, of T3(C×LP) and T4(LP×C) hybrid chickens (the same stage of 35–91 days old) was 77.60 and 76.57 g/bird/day. Thus, the feed consumption of chickens in this experiment was slightly lower or higher than the above results but that was normal because chicken's feed consumption depends on several factors and the most important thing is whether the chickens grow well or not.

Chicken feed conversion

The average Feed Conversion Ratio (FCR) of each two-week period and the entire experimental period is presented in Table 4.

Table 4 showed that the average FCR of the experimental chickens are high, ranging from about 2.85 kg to about 3.28 kg for all periods (from 1–98 days of age).

Feed conversion for 1 kg weight gain of T3 and T4 hybrid chickens was lower than Choi chickens, but higher than Luong Phuong chickens at all stages with a statistically significant difference ($P < 0.01$ and 0.001), except for periods indicated in Table 4. This indicator of T3 was smaller than T4 chickens, but was not significantly different ($P > 0.05$).

The previous research results of cross-breeding between Luong Phuong chickens and other chicken breeds showed that FCR of hybrid chickens (Ri × LP) and hybrid chickens (Mia × LP) at 98 days of age was 3.09 kg and 3.15 kg/kg (Quyen et al., 2020). The FCR of hybrid chickens (Ho × LP) at 91 days of age was 3.12 – 3.19 kg/kg (Hanh and Nguyen, 2021). The FCR of T3 and T4 hybrid chickens in this experiment at 91 days of age was 2.90 and 2.99 kg, and at 98 days

Table 3. Feed intake of experimental chickens, g/bird/day

Period (D.O.)	LP	Choi	T3(C × LP)	T4(LP × C)	SEM	P
1–14	21.40^{a}	18.22^{b}	19.77^{b}	19.25^{b}	0.246	0.000
15–28	51.21^{a}	30.77^{d}	37.40^{b}	35.20^{c}	2.360	0.000
29–42	83.50^{a}	45.58^{d}	60.53^{b}	58.10^{c}	2.924	0.000
43–56	92.46^{a}	62.40^{c}	72.81^{b}	71.24^{b}	3.657	0.000
57–70	97.19^{a}	69.12^{c}	78.31^{b}	77.17^{b}	4.811	0.000
71–84	98.80^{a}	73.91^{c}	84.03^{b}	83.70^{b}	5.103	0.000
85–98	100.31^{a}	77.02^{c}	86.24^{b}	86.68^{b}	5.872	0.000
1–98	77.84^{a}	53.95^{c}	62.73^{b}	61.62^{b}	2.516	0.000

Note: Numbers with different subscription letters in the same row are significantly different ($p < 0.001$)

Table 4. Feed conversion ratio for weight gain, kg/kg

Period (D.O.)	LP	Choi	T3(C × LP)	T4(LP × C)	SEM	P
1–14	1.48^{b}	1.65^{a}	1.55^{ab}	1.59^{ab}	0.016	0.001
15–28	1.88^{b}	2.14^{a}	1.98^{ab}	2.04^{ab}	0.098	0.005
29–42	2.31^{c}	2.70^{a}	2.52^{b}	2.60^{ab}	0.105	0.001
43–56	2.72^{c}	3.11^{a}	2.89^{b}	2.96^{b}	0.130	0.000
57–70	3.16^{c}	3.49^{a}	3.25^{bc}	3.34^{b}	0.167	0.000
71–84	3.73^{c}	4.12^{a}	3.83^{bc}	3.93^{b}	0.202	0.000
85–98	4.52^{c}	5.11^{a}	4.75^{b}	4.82^{b}	0.234	0.000
1–98	2.85^{c}	3.28^{a}	3.03^{b}	3.12^{b}	0.270	0.000

Note: Numbers with different subscription letters in the same row are significantly different ($p < 0.01$ or 0.001)

of age was 3.03 and 3.12 kg/kg. Thus, hybrid chickens of T3(C×LP) and T4(LP×C) had a FCR similar to that of hybrid chickens between Luong Phuong chickens and other chicken breeds but there was a slight improvement.

Slaughter and meat quality

Colored feather chickens are usually sold when their weight reaches about 2 kg. At the end of the experiment (98 days old), T3(C×LP) và T4(LP×C) chickens had reached this weight, but the weight of Luong Phuong chickens had far exceeded it, and that of Choi chickens had not yet reached it. Comparing the slaughter results of T3 and T4 hybrid chickens with those of Luong Phuong and Choi chickens was not appropriate. Therefore, Table 5 only showed the slaughter results of T3 and T4 hybrid chickens.

Table 5 showed that the proportions of carcass, thigh and breast meat of T3 and T4 hybrid chickens were not significant different (P > 0.05). According to Hofmann (1988), Bruce and Ball (1990), the pH of meat has a great influence on meat storage and transportation. The results showed that the pH of meat after 15 minutes slaughter (pH_{15}) and after 24 h of storage at 2–4°C (pH_{24}) was completely normal (pH_{15} was above 6.0 and pH_{24} was above 5.5). The pH of meat of two treatments was not significantly different (P > 0.05). The toughness of meat, and the rate of dehydration after storage and processing were also not significantly different (P > 0.05). The T3 chicken meat had a brighter and more yellowish, but less red color than T4 chicken meat with a statistically significant difference (P < 0.001). According to standards of Barbut et al. (2005) for pH and brightness of chicken meat, the meat of T3(C×LP) and T4(LPxC) chickens was of good quality. According to standards of Schiling et al. (2008), the chicken meat of both treatments was not tough.

Heterosis of some straits

The heterosis of some straits, such as body weight at 1 and 98 days of age, weight gain, feed intake and FCR of T3 and T4 hybrid chickens from 1–98 days of age were calculated, the results were presented in Table 6.

Table 6. Heterosis of some straits of hybrid chickens

Criteria	T3(C x LP) **(1)**	T4(LP x C) **(2)**	**(1)** + **(2)/ 2**
Body weight at 1 day old	+5.55	-5.55	0.00
Body age at 98 days old	-5.11	-9.74	-7.43
Weight gain from 1–98 days old	-5.32	-9.84	-7.58
Feed Intake from 1–98 days old	-4.80	-6.49	-5.65
FCR from 1–98 days old	-1.14	+1.79	+0.33

The heterosis of the weight trait of T3 chickens at 1 days old was greater than the average of their parents, while that of T4 chickens was smaller. This explains why the body weight and weight gain of T3 were greater than those of T4 chickens. The heterosis of the weight trait at 98 days old, and feed intake of both treatments were lower than the average of their parents. However, these values of T3 were closer to the average of the parents, while those of T4 chickens were father away. On the contrary to the above traits, if the FCR trait has a negative value, it is good and vice versa. The heterosis of the FCR trait of T3 chickens had negative value, while that of T4 chickens had a positive value. The above results showed that T3(C×LP) hybrid chickens were more improved than T4(LP×C) hybrid chickens in most traits.

Conclusion

The hybrid broiler chickens of T3(♂C×♀LP) and T4(♂LP×♀C) had livability rate of 95.14% and 93.71%,

Table 5. Some slaughter and meat criteria of hybrid broiler chickens

Criteria	T3(C × LP)	T4(LP × C)	SEM	P
A.some slaughter criteria	–	–	–	–
Carcass ratio, %	73.69	73.31	2.686	0.055
Breast meat ratio, %	19.51	19.19	1.134	0.637
Thigh meat ratio, %	21.65	21.29	1.101	0.581
Abdominal fat ratio, %	2.27	2.09	0.209	0.810
B. some meat criteria	–	–	–	–
pH_{15}	6.15	6.07	0.628	0.052
pH_{24}	5.85	5.76	0.342	0.198
L* (bright colours)	49.76^{a}	48.48^{b}	1.219	0.000
a* (red colours)	9.42^{b}	10.97^{a}	0.617	0.000
b* (yellow colours)	12.96^{a}	11.45^{b}	0.862	0.000
The toughness of the meat, kg	3.93	4.12	0.429	0.146
DOM after storage, %	1.86	1.98	0.290	0.402
DOM after processing,%	19.12	19.56	1.029	0.064

Note: Numbers with different subscription letters in the same row are significantly different (p < 0.001). DOM is Dehydration of meat

body weight reaching 2070 and 1969 g/bird at 98 days old, and a FCR of 3.03 and 3.12 kg, respectively. The heterosis of the FCR trait of T3 chickens was smaller than the average of their parents, which is expected. Slaughter criteria and meat quality of T3 and T4 chickens were similar, except for meat color. The production performance of hybrid broiler chickens was less than that of Luong Phuong chickens, but was much better than Choi chickens, in which hybrid broiler chickens of T3 were more improved than T4.

References

Isa, A. M., Sun, Y., Shi, L., Jiang, L., Li, Y., Fan, J., Wang, P., Ni, A., Huang, Z., Ma, H. and Li, D. & Chen, J. (2020). Hybrids generated by crossing elite laying chickens exhibited heterosis for clutch and egg quality traits. *Poultry Science, 99*(12), 6332 – 6340. https://doi.org/10.1016j.psj. 2020.08.056.

Barbut, S., Zhang, L. & Marcone, M. (2005). Effects of pale, normal, and dark chickens breast meat on microstructure, extractable protein, and cooking of marinated fillets. *Poultry Science, 84*, 792 – 802.

Bruce, H. L. & Ball, R. O. (1990). Postmortern interactions of muscle temperature, pH and extension on beef quality. *Journal of Animal Science, 68,* 4167 – 4175.

Doan, B. H., Mai, N. T., Son, N. T. & Dat, N. H. (2011). Indicators Used In Poultry Research. *Hanoi Agricultural Publishing House* (Viet.).

Dzung, T. H., Tham, P. D. & Thang, T. V. (2018). Research methods in Animal Husbandry and Veterinary Medicine. *Hanoi Agricultural Publishing House* (Viet.).

El-Tahawy, W. S. & Habashy, W. S. (2021). Genetic effects on growth and egg production traits in two-way crosses of Egyptian and commercial layer chickens. *South African Journal of Animal Science, 51*(3), 349 – 354.

Hanh, H. Q. & Nguyen, T. X. (2021). Effects of farming methods and hybrid combinations on livestock productivity and commercial chicken meat quality. *National Conference on Animal Husbandry and Veterinary Science*, 352 – 360 (Viet.).

Hoan, N. D., Hien, T. Q. & Hoan, T. T. (2016). Egg production performance of local Ri hens and its crossbreeds with ISA-brown strain in semi-intensive conditions. *Bulg. J. Agric. Sci., 22*(1), 87 – 91.

Hoan, T. T., Kien, T. T., Son, B. N. & Hoa, N. H. (2020). Performance of F1(Dong Tao x LV) chickens raised at Thai Nguyen. *Journal of Animal Science and Technics, 257*, 22 – 27 (in Viet.).

Hoang, Ph. C. (2010). Research on some bio – characteristics and production performance of Choi chickens raised in Tan Yen, Bac Giang province. Master Thesic, Thai Nguyen University of Agriculture and Forestry. (Viet.).

Hofmann, K. (1988). pH – a quality for meat. *Fleischwirtsch, 68*, 65 – 69.

Nhung, H. T. H. (2021). Planting and using Moringa forage crops in raising colored chickens. PhD thesis, Thai Nguyen University (Viet.).

Nguyen, Th. Th. (2020). Effects of garlic powder and juice on the growth ability of Noi chickens raised for meat. *Journal of Animal Science and Technics,* 261, 28 – 33 (Viet.).

Phuong, L. T., Du, P. N. & Tu, T. T. (2022). Survey on the growth of Ben Tre Noi chickens (*Gallus gallus*) according to flock size. *Can Tho Journal of Science, 58*(4b), 71 – 77 (in Viet.).

Soliman, M. A., Khalil, M. H., El-Sabrout, K. & Shebl, M. K. (2020). Crossing effect for improving egg production traits in chickens involving local and commercial strains. *Veterinary World, 13*(3), 407 – 412.

Trung, T. Q. (2018). Using cassava, leucaena leaf and Stylo grass meals in raising broiler chickens and laying hens on farms in the northern midlands and mountainous areas. PhD thesis, Thai Nguyen University (Viet.).

Quyen, D. H., Tuan, L. V., Huong, D. T. T. & Vinh, N. T. (2020). Evaluate the productivity and meat quality of Ri x LP and Mia x LP chickens raising by biosecurity. *Journal of Animal Science and Technics, 261*, 16 – 22 (in Viet.).

Yin, H. D., Gilbert, E. R., Chen, S. Y., Wang, Y., Zhang, Z. C., Zhao, X. L., Zhang, Y. & Zhu, Q. (2013). Effect of hybridization on carcass traits and meat quality of Erlang mountainous chickens. *Asian Australian Journal of Animal Science, 26*(10), 1504 – 1510.

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