

STUDY ON SELECTION FOR IMPROVEMENT OF THREE GUINEA FOWL LINES' PRODUCTION THROUGH THREE GENERATIONS

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ABSTRACT

In April, 2002, the Thuy Phuong Poultry Research Center imported the 03 Guinea fowl lines from KATKI - Hungary. After 02 years of study, all have developed well.

The 03 lines are highly disease - resistant by the high survivability of 97 - 99.1% through the three stages and of 98.3 - 100% at the laying stage.

At 59 weeks of age, the Large has the highest egg production of 94.18, the Middle 90.74 and the Small 84.52 pieces/hen. The fertility of the Middle is the highest of 96.03%, that of the Middle 89.17% and the Large 80.14%. The hatchability of the Middle is 79.12%, that of the Small 73.19% and the Large 71.12%.

For commercial birds at 1 - 12 weeks old, the body weight of the Large gains 1,880; that of the Middle 1,380 and the Small 1,369.3 g/bird. The carcass of the 03 lines is 76.56 - 77.10%, of which the leg and breast make up 51.13 - 51.7%. The survivability of the 03 lines maintains 95 - 96.67% with the feed consumption/kg of weight gain of 2.81 kg for the Small, 2.77 kg for the Middle and 2.34 kg for the Large.

I. INTRODUCTION

The three Guinea fowl lines of Large, Middle and Small were imported by the Thuy Phuong Poultry Research Center in April, 2002. These are specialties in the world with specifically delicious eggs and meat. Egg production/hen/01 laying cycle is from 66.13 to 98.4 eggs with the feed consumption/10 hatching eggs of 1.9 – 2.59 kg. Broilers at 12 weeks of age gain 1415.1 – 1891.17 g/bird. Feed consumption/kg of weight gain is 2.34 – 2.53 kg.

To maintain and gradually improve the production of this gene pool as well as ensure enough supply of good quality chicks, this research was undertaken.

II. OBJECTIVES

- Determine the production of the three lines for later selection and improvement to quickly produce chicks.
- Gradually complete care procedures to take full advantages of gene potentials.
- Work as a material of crossing to produce good quality chicks for household farming.

III. CONTENTS

Morphological features, production and meat yields of the three Guinea fowl lines.

IV. SUBJECTS AND METHODS

1. Subjects

The three Guinea fowl lines: Large, Middle and Small.

2. Location

The Thuy Phuong Poultry Research Center.

3. Methods

Mass breeding together with oriented selection are applied for improvement of production.

Large line: Selected according to bodyweight.

Middle and Small lines: Selected according to stabilization.

At laying: Selected according to morphology together with secondary sexual characteristics as pinkish white wattles, delicate head, large thigh, smooth feather.

* Caring

Table 1. Nutrition for layers

Stage Parameter	Chick (0 – 6 wks)		Growth, pre-laying (7 – 27 wks)		Laying >27 wks
	(0–3)wks	(4-6) wks	(7–13) wks	(14– 27) wks	
ME (Kcal/kg)	2950	2750	2700	2765	2750
Protein (%)	22	20-18	17 – 15.5	15.0 – 16.5	17.5
Methionine (%)	0.55	0.43	0.30 – 0.35	0.5	0.4
Lysine (%)	1.25	1.0	0.70-0.75	0.8	0.8
Calcium (%)	1.10	1.0-1.1	1.02-1.10	1.2	3.2
Phosphorus (%)	0.8	0.75	0.70	0.6	0.72
Fibre (%)	3.5	6-8	6.5	5.5	4.2

Table 2. Caring for layers

Parameter	Chick		Growth, pre-laying		Laying >27 wks
	0 - 3 wks	4- 6 wks	7- 13 wks	14-27 wks	
Density (bird/m ²)	10 – 15	7 – 9	5 - 6	3 - 4	3
Ratio (male/female)	Combined	Combined	Combined	Separated	1/4 - 1/5
Feeding	Ad libitum	Ad libitum	Limited	Limited	Increase according to laying rate
Lightning	24/24	Natural	Natural	Increase 15-6h per day	16h per day

Table 3. Nutrition and caring for broilers

Parameter	0 - 4 wks	5 - 8 wks	9 wks - slaughter
ME (Kcal/Kg)	3000	3100	3200
Protein (%)	22.0	20.0	18.0
Phosphorus (%)	0.7 – 0.75	0.65 – 0.7	0.6 – 0.65
Calcium (%)	1.2	1.0	0.9
Lysine (%)	1.35	1.15	0.95
Methiomine (%)	0.45 – 0.5	0.4 – 0.45	0.4 – 0.43
Crude fibre (%)	3.5 – 4.0	3.5 – 4.0	3.5 – 4.0
Crude fat (%)	3.0 – 3.5	3.5 – 4.0	3.5 – 4.0
Sodium (%)	0.17	0.17	0.17
Dry matters (%)	87 - 88	87 - 88	87 - 88

Broilers are fed ad libitum with unlimited lightning to call for best genetic potentials.

V. RESULTS

1. For layers

1.1. Morphological features

The feather of all the three lines is stable throughout generations. Day-old chicks have a lotus-colored feather with stripes running from head to tail. Beaks and legs are pink. There are 4 toes with 2 scales.

Adult Guinea fowls are characterized by a variety of small, round white spots on the dark grey body and distinguished from others in terms of diamond shape, humpback, lowered tail and small head on which there is no comb but a notch expanding throughout their weeks of age with the height of 1.5 – 2 cm in adults. Face and head are nude with a pale skin and a dewlap under the neck. There are no spurs.

1.2. Survival at chick, growth, pre-laying and laying

Table 4. Survival at chick, growth, pre-laying and laying

Generation	0 – 6 wks		7 – 27 wks		>27 wks	
	Starting (bird)	Survival (%)	Starting (bird)	Survival (%)	Starting (bird)	Survival (%)
Small						
1	700	97.0	659	98.5	118	98.3
2	345	98.1	321	99.7	152	100
3	387	98.7	819	99.2	291	99.6
Middle						
1	900	98.1	870	99.1	210	95.5
2	548	98.1	525	99.8	164	100
3	857	98.2	821	98.7	431	99.5
Large						
1	400	98.0	384	98.4	95	100
2	237	98.7	214	100	64	100
3	534	98.5	521	98.3	253	99.6

Despite a wild species mainly characterized by scavenging, Guinea fowls after 3 generations at the Thuy Phuong Poultry Research Center have gained a relatively high survival. Chicks maintain 98.7% survived, growers 98.3-100% and layers 95.5-100%. Deaths occur due to accidents but diseases. This proves their high adaptation to Vietnam’s climate, which is highly appreciated.

1.3. Bodyweight at stages

After 6 weeks of age, birds are fed ad libitum. Bodyweight is rather stable. Small line has the bodyweight of 603.2 – 612.0 g, Middle line has that of 629.9 – 653.0 g, Large line 905.8 – 949 g.

At 27 weeks of age, Small has the bodyweight of 1725.2 – 1870.0 g, Middle 1791.5 – 1936.7 g, Large 1987.7 – 2289.7 g.

Table 5. Bodyweight at stages (g)

Stage	Generation I $\bar{X} \pm m_x$	Generation II $\bar{X} \pm m_x$	Generation III $\bar{X} \pm m_x$
Small			
6 wks	612.0 ± 12.67	609.1 ± 9.43	603.2 ± 10.21
13 wks	1217.9 ± 20.03	1156.9 ± 25.55	1162.7 ± 24.12
21 wks	1697.3 ± 18.53	1562.5 ± 19.60	1570.2 ± 18.68
27 wks	1870.4 ± 24.62	1725.2 ± 21.82	1731.4 ± 20.15
Middle			
6 wks	653.0 ± 14.90	629.9 ± 10.35	632.7 ± 9.82
13 wks	1295.0 ± 27.95	1212.1 ± 24.81	1218.4 ± 22.07
21 wks	1706.7 ± 26.69	1592.6 ± 18.66	1602.7 ± 19.24
27 wks	1936.7 ± 25.25	1791.5 ± 21.89	1805.2 ± 22.16
Large			
6 wks	949.0 ± 20.00	905.8 ± 16.29	912.2 ± 16.22
13 wks	1616.7 ± 31.15	1428.3 ± 29.57	1435.5 ± 27.14
21 wks	2011.2 ± 30.92	1732.7 ± 23.09	1741.3 ± 22.16
27 wks	2289.7 ± 28.13	1987.7 ± 36.17	1991.7 ± 30.24

1.4. Feed consumption at stages

Table 6. Feed consumption at stages (kg/bird)

Stage	Generation I	Generation II	Generation III
Small			
0 – 6 wks	1.07	1.08	1.12
7 – 27 wks	11.03	9.63	9.67
0 – 27 wks	12.10	10.71	10.79
Average	11.2		
Middle			
0 – 6 wks	1.11	1.10	1.29
7 – 27 wks	10.25	9.68	9.75
0 – 27 wks	11.35	10.78	11.04
Average	11.06		
Large			
0 – 6 wks	1.38	1.38	1.32
7 – 27 wks	11.05	10.05	10.12
0 – 27 wks	12.43	11.43	11.44
Average	11.77		

Feed consumption during 0 – 27 weeks of age after generations is 11.2 kg for Small, 11.06 kg for Middle and 11.77 kg for Large.

1.5. Age of laying, egg weight, hen weight at production of 5%, 50% and 38 wks

Table 7. Age at production of 5%, 50%

Age	Unit	Generation I	Generation II	Generation III	Average
Small					
5%	day	210	208	228	215
50%	day	259	225	246	243
Middle					
5%	day	224	211	230	221
50%	day	252	222	248	240
Large					
5%	day	199	202	222	207
50%	day	245	215	234	231

For Small, age of laying at production of 5%, 50% averages 215 and 243 days respectively. For Middle, they are 221, 240 and Large 207, 231. It is shown from the above that at any time of laying, Larger begins to lay earlier than the others.

Table 8. Egg weight at production of 5%, 50% and 38 wks

Age	Generation I	Generation II	Generation III	Average
Small				
5%	39.1± 0.64	36.9± 0.70	38.7± 0.52	38.2
50%	42.8± 0.71	42.1± 0.78	42.9 ±0.45	42.6
38 wks	45.2± 0.63	42.9± 0.47	44.3± 0.42	44.1
Middle				
5%	38.8± 0.44	38.2± 0.61	38.9± 0.46	38.6
50%	44.4± 0.57	42.5± 0.42	43.1± 0.58	43.3
38 wks	46.3± 0.53	43.2± 0.41	45.4± 0.48	45.0
Large				
5%	40.4±0.72	41.1± 0.85	41.7± 0.54	41.1
50%	43.4± 0.74	44.6± 0.72	45.1± 0.55	44.4
38 wks	49.4± 0.74	46.4± 0.63	48.3± 0.52	48.0

For Small, egg weight at production of 5%,50% and 38 wks averages 38.2, 42.6 and 44.1 g respectively. For Middle, they are 38.6, 43.3 and 45.0 g, and Large 41.4, 44.4 and 48.0 g. This weight generally meets the requirement of hatching eggs. The rate to select for incubation is 98%.

Table 9. Hen weight at production of 5%, 50% and 38 wks

Age	Generation I $\bar{X} \pm m_x$	Generation II $\bar{X} \pm m_x$	Generation III $\bar{X} \pm m_x$
Small			
5 %	1905.1±28.31	1993.3± 35.50	2007.2± 24.62
50%	2148.0±29.48	2057.3 ±28.05	2112.2± 30.25
38 wks	2183.7±29.22	2161.3 ±51.67	2167.3± 32.58
Middle			
5%	2003.7±30.18	1950.4± 26.78	1961.2± 28.32
50%	2212.1±29.23	2086.7± 32.25	2089.8± 30.14
38 wks	2233.3±27.77	2207.2± 38.28	2204.4± 26.68
Large			
5%	2133.7±32.53	2122.5± 23.94	2131.2± 21.07
50%	2387.0±28.41	2261.5± 25.39	2258.7± 33.52
38 wks	2584.7±31.29	2420.4± 23.33	2432.5± 35.71

At 38 weeks of age, Small has the bodyweight of 2161.3 – 2183.7 g, Middle 2204.4 – 2233.3 g, Large 2420.4 – 2584.7 g.

1.6. Laying rate, egg production and feed consumption/10 eggs

Table 10. Laying rate, egg production and feed consumption/10 eggs (Small line)

Age	Generation I		Generation II		Generation III	
	% Lay	Egg/hen	% Lay	Egg/hen	% Lay	Egg/hen
1 - 4	4.05	1.13	29.57	8.28	50.19	16.16
5 – 8	13.75	3.85	85.96	24.07	76.50	20.9
9 – 12	46.25	12.95	69.32	19.41	59.82	16.75
13–16	54.54	15.27	73.04	20.45	70.14	19.61
17- 20	57.50	16.10	68.46	19.17	59.71	16.72
21-24	60.11	16.83	25.07	7.02	31.39	8.79
Aver (%)	39.36		58.57		58.89	
Egg no/hen	66.13		98.4		98.93	
FC/10 eggs	2.59		1.76		1.73	

Laying rate, egg production of all lines increase through generations. For Small, laying rate averages 39.36% at generation I, 58.57% at generation II and 58.89% at generation III. Thus, egg production/hen at generations II and III is 32.27 – 32.8 eggs more than generation I. Feed consumption/10 hatching eggs ranges from 1.73 – 2.59 kg.

Table 11. Laying rate, egg production and feed consumption/10 eggs (Middle line)

Age	Generation I		Generation II		Generation III	
	% Lay	Egg/hen	% Lay	Egg/hen	% Lay	Egg/hen
1 - 4	2.25	0.63	16.04	4.49	46.39	12.99
5 – 8	7.72	2.16	72.4	20.33	69.21	19.38
9 – 12	57.32	16.05	65.32	19.24	57.79	16.18
13–16	63.57	17.80	63.50	18.29	61.50	17.22
17- 20	55.54	15.55	47.26	16.88	51.25	14.35
21-24	55.36	15.50	23.11	6.47	22.18	6.21
Aver (%)	40.98		51.01		51.39	
Egg no/hen	68.85		85.7		86.33	
FC/10 eggs	2.36		2.18		2.12	

For Middle, laying rate averages 40.98% at generation I, 51.01% at generation II and 51.39% at generation III. Egg production/hen at generations II and III is 16.85 – 17.48 eggs more than generation I. Feed consumption/10 hatching eggs ranges from 2.12 – 2.36 kg.

Table 12. Laying rate, egg production and feed consumption/10 eggs (Large line)

Age	Generation I		Generation II		Generation III	
	% Lay	Egg/hen	% Lay	Egg/hen	% Lay	Egg/hen
1 - 4	12.75	3.57	29.57	8.28	68.68	19.23
5 – 8	28.71	8.04	81.82	22.91	67.71	18.96
9 – 12	52.18	14.61	70.29	19.68	68.64	19.22
13–16	54.64	15.30	68.82	19.27	61.29	17.16
17- 20	49.11	13.75	61.71	17.28	54.32	15.21
21-24	59.11	16.55	9.75	2.73	15.54	4.35
Aver (%)	45.51		53.6		56.03	
Egg no/hen	76.46		90.15		94.13	
FC/10 eggs	2.26		1.99		1.90	

For Large, laying rate averages 45.51% at generation I, 53.6% at generation II and 56.03% at generation III. Egg production/hen at generations II and III is 13.69 – 17.67 eggs more than generation I. Feed consumption/10 hatching eggs ranges from 1.90 – 2.26 kg.

1.7. Examination of egg quality

Table 13. Examination of egg quality (38 weeks of age)

Parameter	Small (n = 30)		Middle (n = 30)		Large (n = 30)	
	$\bar{X} \pm m_x$	CV %	$\bar{X} \pm m_x$	CV %	$\bar{X} \pm m_x$	CV %
Egg weight (g)	44.58± 0.417	5.12	45.43± 0.483	5.82	46.79± 0.519	6.07
Length/Width	1.28± 0.0087	3.72	1.28± 0.0083	3.47	1.30± 0.0075	3.15
Shell thickness (mm)	0.521± 0.0088	9.21	0.518± 0.0077	8.15	0.512± 0.0087	9.36
Force resistance (kg/cm ²)	>5		>5		>5	
Shell weight (g)	7.57± 0.128	9.24	8.13± 0.0926	6.24	7.92± 0.141	9.72
Shell ratio (%)	17.99± 0.280	9.14	17.96± 0.296	9.03	16.93± 0.252	8.15
Yolk ratio (%)	31.47± 0.403	7.25	31.90± 0.488	8.38	31.86± 0.346	6.14
White ratio(%)	50.54± 0.408	4.25	50.15± 0.718	7.84	51.21± 0.309	3.24
Haugh unit	82.15± 0.959	6.24	82.40± 0.071	4.41	82.55± 0.899	5.76
Yolk index	0.43± 0.0032	4.12	0.42± 0.0049	6.49	0.43± 0.0041	5.27
White index	0.097± 0.009	5.25	0.095± 0.0022	5.12	0.10± 0.009	5.14
Yolk color	8.54		8.86		8.78	

Guinea fowl eggs are rather small with a blunt large end and a very sharp small end. Shell is very thick: 0.512 – 0.521 mm. Force resistance is > 5 kg/cm², easier for long transportation

without being broken. Yolk index is 0.42 – 0.43 whereas white 0.095 – 0.10. Haugh unit is 82.15 – 82.55, considered to be high quality. The rate to select for incubation is 98%.

1.8. Hatchability through generations

Table 14 states that Small and Middle have a relatively high fertility. Small line has the fertility of 89.17 – 94.8% whereas the Middle 92.6 – 96.03%. The Large, which used to be said to have low fertility and need artificial insemination, has now an increasing fertility of 80.14% at generation I, 91% at generation II and 93% at generation III. Hatchability/total hatched increases from 6.35 – 15.03%. This is an outstanding advance in caring Guinea fowls.

Table 14. Hatchability

Generat ion	Small			Middle			Large		
	Total (egg)	Fertil ity (%)	Hatch/ total (%)	Total (egg)	Ferti lity (%)	Hatch / total (%)	Total (egg)	Fertil ity (%)	Hatch / total (%)
I	1117	89.17	73.14	1887	96.03	79.12	841	80.14	71.12
II	1779	94.8	83.0	2057	92.6	81.3	1875	91.0	79.8
III	1752	94.2	87.04	866	93.3	85.45	650	93.0	86.15

2. For broilers

Meat yields, feed consumption/kg of weight gain, survival (1 – 12 wks)

Table 15. Meat yields, feed consumption/kg of weight gain, survival (1 – 12 wks)

Parameter	Small	Middle	Large
Live weight (g)	1415.10	1420.24	1891.17
Carcass weight (g)	1104.4	1087.4	1455.3
Carcass ratio (%)	76.16	76.57	76.95
Thigh weight (g)	270.26	272.82	371.10
Thigh ratio (%)	24.47	25.09	25.49
Breast weight (g)	287.43	292.12	398.13
Breast ratio (%)	26.03	26.86	27.35
Meat yield (thigh+breast) (g)	557.69	564.94	769.14
Meat ratio (thigh+breast) (%)	50.50	51.95	52.85
Abdominal fat ratio (%)	0.57	0.78	1.06
Feed consumption/kg of weight gain (kg)	2.53	2.52	2.34
Feed cost/kg of weight gain (VND)	12,093.4	12,045.6	11,185.2
Survival	96.6	98.3	98.3

Bodyweight at 12 weeks of age is 1415.10 g for Small, 1420.24 g for Middle and 1891.17 g for Large. Feed consumption/kg of weight gain is from 2.34 – 2.53 kg.

Carcass ratio is 76.16% for Small, 76.575% for Middle and 76.95 for Large. Thigh+breast ratio of the three lines is fairly high: 50.50 – 52.85%, nearly half times Luong Phuong and Tam Hoang chickens. This is an advantage of Guinea fowls.

Abdominal fat ratio is low: 0.57% for Small, 0.78% for Middle and 1.06% for Large.

2.2. Meat composition

Table 16. Meat composition

No	Parameter	Unit	Thigh	Breast
1	Dry matters	%	24.62	27.06
2	Crude protein	%	21.16	24.32
3	Crude fat	%	1.02	0.43
4	Crude minerals	%	1.28	1.32

The protein level in the thigh of Guinea fowls is very high: 21.16% in thigh and 24.32% in breast, averaging 22.74%.

Crude fat is 1.02% in thigh and 0.43% in breast, averaging 0.73%. Mineral is 1.28% in thigh and 1.32% in breast, averaging 1.30%.

The reasearch proves the good quality of Guinea fowls, thus it is probably rated as one of the specialities in Vietnam nowadays with the price of 1.5 – 2 times others.

With a nice shape, ease to farm, high adaptability and high disease resistance, every year more than 30,000 day-old chicks are sold out to such provinces as Hanoi, Namdinh, Socson, Vinhphuc, Thanhhoa, Yenbai, Danang, etc.

VI. CONCLUSION

* For layers

1. All the three Guinea fowl lines are stable in morphology and color. Survival is high. Chicks maintain 97 – 98.7% survived, growers 98.3 – 100%, and layers 95.5 – 100%.
2. Laying rate and egg production increase in comparison with earlier generations. At generations II and III, Small has 32.27 – 32.8 eggs more than generation I with decreasing feed consumption/10 eggs of 2.59 – 1.73 kg. The repective are 16.85 – 17.48 eggs with 2.36 – 2.12 kg for Middle and 13.69 – 17.67 eggs with 2.26 – 1.9 kg for Large.
3. Hatchability increases throughout generations. Large has an outstanding increase in fertility. The fertility of generation III is 12.86% higher than that of generation I. Hatchability/total hatched is 15.03%. Egg quality is good.

* For broilers

4. At the end of 12 weeks old, the bodyweight of Small is 1415.1 g, Middle 1420.24 g and Large 1891.17 g. For feed consumption/kg of weight gain, Small consumes 2.53 kg, Middle 2.52 kg and Large 2.34 kg. Survival is from 96.6 to 98.3%.
5. Protein is 21.16% in thigh anf 24.32% in breast. Crude fat is 0.34 – 1.02%. Thigh and breast accounts for 50.5 – 52.85%.

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