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Original Contribution

EVALUATION OF PRODUCTIVE TRAITS OF CHICKEN LINES FROM THE NATIONAL GENE POOL

M. Lalev, M. Oblakova*, N. Mincheva, P. Hristakieva, I. Ivanova

Institute of Agriculture, Stara Zagora, Bulgaria

ABSTRACT
The issue of avian gene pool preservation should be linked to the development of a new trend in selection allowing rational use of the diversity of breeds and lines. Ten original chickens lines are reared in the Poultry Breeding Unit at the Institute of Agriculture, Stara Zagora: CZ-80 B, CZ-80 M, Line B, Line D, Line G, Line NG, Line E, Line Ss, Line ChS, Line StR controlling their productivity through reproductive traits, live body weight at the age of 1 day, 5 months and 10 months, egg production and survival rate for the production period.
The reproductive traits of chickens from the gene pool are characterized with high egg fertility - from 96.56% for Line NG to 86.98% of Plymouth Rock Line G. Among the egg-type chicken lines, the highest hatchability rate from fertile eggs was observed in Line D - 89.05%.
Chickens of all lines studied exhibited low death rates.
The highest egg mass was that of chickens from Line G – 63.10 g and Line E – 61.73 g The highest egg production over the 180-day period was that of the egg-type Line B – 146 eggs, and Line CZ-80 B – 145.67.

Key words: hens, eggs, way of breeding, live weight, productivity, feed consumption, hatchability

INTRODUCTION

It is acknowledged that contemporary poultry breeding is based upon a limited number of chicken breeds and lines (1). Leghorn and Rhode Island are recognized among commercial egg laying breeds, whereas Cornish and Plymouth Rock – among broiler-type breeds. The main reason is the intensification of poultry industry, the distribution and utilization of highly productive hybrids that have replaced the non-competitive breeds and hence limited the genetic diversity (2, 3, 4). During the last years breeder companies are increasingly concerned about the reduced genetic diversity and the prospective results of selection because of the narrow genetic background of breeds used. As a result from the extensive merging of these companies due to economical reasons, the preservation of diversity among breeds and lines becomes particularly important (5). That is why countries with well developed poultry breeding implement measures for preservation of the existing avian gene pool through development of special breeding programmes.

The term gene pool, in the view of Serebrovski, designates the available poultry breeds thus making an analogy between genes and the deposits of oil, gold and coal (6). (7) divides the gene pool into spare and collection pools depending on what they are aimed at, whereas (8), (9) and (10) – into three groups including also the perspective breeds and lines for production of breeders and hybrids. According to (1) there are four genetic resource categories in poultry breeding – mutant breeds and lines, specialized and inbred stocks, standard breeds and industrial elite pure lines. These resources are of various value for poultry industry but nevertheless, all play important functions.

The general opinion of many investigators (11, 12) is that the future success in avian selection strongly depends on the presence of the diverse gene pool. The available lines and breeds possess some valuable genes that could be utilized to create new highly productive strains. On the background of long-tern studies

***Correspondence to**: *Magdalena Oblakova, Institute of Agriculture, Stara Zagora, Bulgaria, E-mail: moblakova@abv.bg*

of flocks from the gene pool, (8) concluded that many breeds could be used in contemporary poultry breeding industry as carriers of important traits such as resistance to diseases, adaptation to ecological rearing conditions, eggshell colour and hardness, body constitution, meat and egg traits etc. As an example, she points out the Sussex breed that could be used both as maternal form for creation of autosexing hybrids distinguinged by feather colour and brown eggshell and for broiler production because of the excellent meat organoleptic traits and the high protein meat content.

The issue of avian gene pool preservation should be related to the development of a new trend in selection, permitting the rational use of the diversity of existing breeds and strains. The importance of these activities for national poultry industry implies the maintenance and development of production traits of lines and improvement of genetic traits of breeders with regard to their prospective use to create new strains and populations and to improve the existing ones.

The purpose of this study was to describe and characterize the production traits of original lines of chickens reared in the Hybrid Poultry Centre at the Institute of Agriculture in Stara Zagora.

MATERIAL AND METHODS

Ten original chicken lines are reared in the Poultry Breeding Unit at the Institute of Agriculture, Stara Zagora: CZ-80 B, CZ-80 M, Line B, Line D, Line G, Line NG, Line E, Line Ss, Line ChS, Line StR. Their productivity is controlled through reproductive traits, lie body weight at the age of 1 day, 5 months and 10 months, egg production and survival rate for the production period. The birds are hatched in June, mated randomly (panmixia) in common breeding groups and sex ratio 1:10 on a deep permanent litter. A selection for exterior traits is made at 3 months of age. Birds are fed with commercial rations according to their production type and age.

According to the methodical requirements, the following productive traits were controlled on an annual basis:

- reproductive traits: the fertility was determined as relative share of fertile eggs from all eggs set in the incubator; the hatchability of eggs set as the relative share of hatched chickens from all eggs set; the hatchability of fertile eggs as the relative share of hatched chickens from all fertile eggs.
- egg production – determined on a hen-day basis over a 180-day period
- average egg mass – measured collectively by weighing all eggs laid daily at the age of 40 weeks
- live body weight – measured collectively at hatching with a technical grade balance (precision of 5 g) and at 5 and 10 months of age.
- death rate (%) until the age of 90 days
- age of egg laying start – when 50% egg production has been reached for each group.

The results were statistically processed by means of ANOVA- 2000.

RESULTS

The results from the biological control of eggs are presented in **Table 1**. The fertility rate, the hatchability rate and the death rate until the age of 90 days were monitored. Among the egg-type chickens, Line D exhibited the highest hatchability rate – 89.05%.

Table 1. *Reproductive traits of breeder lines*

Line	Egg fertility %	Dead embryos at I and II inspection	% Hatchability of eggs set	% Hatchability of fertile eggs	Death rate at 90 days of age %
Egg-type					**0,5**
1.Line D	91,32	350	81,32	89,05	
2. Line B	95,67	130	78,17	81,70	0,6
3. Line CZ -80 M	91,87	74	73,08	83.65	3,00
4. Line CZ-80 B	92	52	71,38	77,59	4,6
Broiler-type					
1. Line G	93,25	95	80,04	85,83	1,26
All-purpose type			69.44		1,76
1. Line NG	**96,56**	97		80,54	
2. Line E	95,60	110	82,88	82,68	0,7
3. Line Ss	95,38	30	65,23	68,39	2,4
4. Line StR	89,23	84	71,79	80,75	2,8
5. Line ChS	95,38	80	59,62	70,45	**7,4**

The death rate was low for chickens from all lines and breeds: between 0.5% in Line D to 7.4% in Line ChS.

The live body weight of hatched chickens is presented in **Table 2.** The absolute values for chickens from Line G – specialized for production of broilers and all-purpose chickens for small farms were higher – 44.00 g and 43.20 g.

Table 2. *Live body weight of 1-day-old chickens, g*

Breed	male	female
1. Line "E"	40,10	40,00
2. Line"D"	37,40	37,00
3. Line "B"	40,20	39,10
4. Line " G"	**44,00**	**43,20**
5. Line NG	40,00	39,50
6. Line StR	40,20	41,20
7. Line CZ -80 M	37,00	36,20
8. Line CZ-80 B	39,00	39,20
9. Line Ss	33,20	33,00
10. Line ChS	31,90	31,50

For egg-type chickens, Line B (sire line for stock layers production) was the heaviest with 40.20 g. The lowest body weight was that in Line Ss – 33.20 g and Line ChS – 31.50 g.

The live body weight of a representative panmictic group of 5-month-old chickens was statistically processed and listed in **Table 3** with differentiation of the three production types. Egg-type laying hens from Line CZ-80 M and Line CZ-80 B had the lowest body weight: 1.65±0.17 kg and 1.65±0.16 kg respectively compared to Line D with 1.82 kg and Line B with 1.76 kg**.** In the broiler production type, Line G had the highest average live body weight at the age of 5 months: 3.42 kg and 4.26 kg.

Table 3. *Live body weight of 5-month-old laying hens, kg*

line	female		male	
	n	x ± Sx	n	x ± Sx
Egg-type 1.Line D	51	1,82±1,89	33	2,09±0,19
2. Line B	46	1,76±0,17	36	2,52±0,25
3. Line CZ -80 M	30	1,65±0,17	26	2,33±0,21
4. Line CZ-80 B	32	1,65±0,16	29	2,40±0,19
Broiler-type 1. Line G	47	3,42±0,37	41	4,26±0,337
All-purpose type 1. Line NG	45	2.23±0,13	34	2,71±0,23
2. Line E	36	2,26±0,19	46	3,19±0,24
3. Line Ss	30	1,81±0,19	20	2,34±0,17
4. Line StR	27	2,30±0,21	21	2,40±0,16
5. Line ChS	36	1,38±0,22	26	1,97±0,12

The highest egg mass was that of chickens from Line G – 63.10 g. Among egg-type lines, the highest egg mass was observed in Line D (59.33 g), followed by Line CZ-80 B. The differences were not statistically significant.

Table 4. *Live body weight of 10-month-old laying hens, kg*

Line	n	x ± Sx
Egg-type 1.Line D	30	1,84±0,10
2. Line B	30	2,05±0,16
3. Line CZ -80 M	30	2,03±0,10
4. Line CZ-80 B	30	1,97±0,13
Broiler-type 1. Line G	30	3,75±0,16
All-purpose type 1. Line NG	30	2,08±0,10
2. Line E	30	2,69±,11***
3. Line Ss	30	1,77±0,52
4. Line StR	30	2,04±0,08
5. Line ChS	30	1,47±0,08

*** p< 0.001

Among all-purpose type lines **(Table 5)**, Line E with 61.73 g was significantly superior to Line StR (57.43 g) at p<0.001.

The highest egg production over the 180-day period was that of the egg-type Line B – 146 eggs, Line CZ-80 B – 145.67 eggs and the all-purpose Line NG (138.70 eggs).

Table 5. *Egg production of 10-month-old laying hens and start of egg laying*

Breed	Average egg production for 180 days	Average egg mass x ± Sx	Age of sexual maturity, days
Egg-type 1.Line D	131,92	**59,33±1,02**	196
2. Line B	146	58,00±1,25	191
3. Line CZ -80 M	137,36	57,33±0,80	176
4. Line CZ-80 B	145,67	58,16±0,74	182
Broiler-type 1. Line G	120,70	**63,10±1,86**	180
All-purpose type 1. Line NG	138,70	57±0,78	182
2. Line E	125	61,73±0,86***	180
3. Line Ss	116,67	54,4±5,63	202
4. Line StR	129,57	57,43±0,72	181
5. Line ChS	119,67	50,90±0,79	186

*** p< 0.001

DISCUSSION

The reproductive traits of chickens from the gene pool are characterized with high egg fertility varying from 96.56% in Line NG to 86.98% in Line G. Among egg-type strains, Line B was distinguished by the highest fertility – 95.67%.

The hatchability from eggs set varied within a broad range suggesting that the conditions of storage and incubation had influenced the outcome.

The body weight at hatching did not differ from that recorder throughout the preceding years and showed a tendency towards stabilization as it is relayed to incubation egg mass. The variations of data are due to the different production types of investigated lines.

At the age of 10 months **(Table 4)**, Line B attained the highest body weight of 2.05 kg.

The aim was to select chickens of higher live body weight and higher egg mass in order to perform the reproduction of the respective groups.

As the age of sexual maturity was controlled by groups, it was assumed as the age for reaching 50% egg production. It ranges between 176 days for Line CZ-80 M and 202 days for Line Ss. This is the natural sexual maturity age because the birds were not stimulated with artificial light during the winter months.

CONCLUSIONS

The reproductive traits of chickens from the gene pool are characterized with high egg fertility – from 96.56% for Line NG to 86.98% of Line G. Among the egg-type lines, the highest hatchability rate from fertile eggs was observed in Line D – 89.05%.

Chickens of all lines studied exhibited low death rates.

The highest egg mass was that of chickens from Line G – 63.10 g and Line E – 61.73 g The highest egg production over the 180-day period was that of the egg-type Line B – 146 eggs, and Line CZ-80 B – 145.67.

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