Evaluation of the reproductive qualities of geese of Linda breed

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Abstract. This paper presents the results of a study of the paternal and maternal geese reproductive qualities, depending on their age. It has been established that in geese, regardless of their age, at the beginning of the biological cycle of egg-laying, the growth of all reproductive qualities occurs. In the middle of the productive period, stabilization occurs, and by the end of the productive period, there is a decrease in reproductive performance. The mating line gosling rate was higher than the paternal line throughout the egg-laying cycle and on average per season it was 47.87% for the maternal line and 46.1% for the paternal line.

1. Introduction

Geese are a unique and promising bird species, and goose breeding is a highly efficient industry capable of producing substantial profits [1]. Improving the methods of breeding work is one of the main factors that contribute to raising the level of bird productivity. This work is of particular importance in the poultry industry, the effectiveness of which is directly dependent on the quality of the used poultry [2, 3].

The established seasonal goose production contributes to maximum productivity in the spring-summer period. Based on the peculiarities of seasonal production, breeding work was carried out using individual assessment and mass selection of more adapted birds [4].

Currently, one of the most common breeds, competitive on the domestic and foreign markets, is the Linda geese [5, 6]. For the economically feasible production of goose products, it is necessary to breed highly productive breeds and lines of geese [7-9].

At the present stage, an increase in the productive and reproductive qualities of geese is possible on obtaining the effect of heterosis, which is manifested when crossing specialized paternal and maternal lines or forms. The transition to more intensive methods of industry management was made possible by the creation of specialized paternal and maternal lines. The selection of geese paternal and maternal line should be differentiated. In the selection of the paternal line, it is necessary to equalize the mass of hatching eggs for the biological cycle of egg-laying. It should be noted that the age of geese affects the weight of hatching eggs [10].

Currently, selection and breeding work is carried out to enhance the breeding and productive qualities of the geese of the Linda breed. The purpose of this work was to assess the reproductive
qualities of the paternal and maternal lines of geese of the Linda breed.

2. Materials and methods
Research work was carried out in the LLC "Vurnarets" Tsivilsk district of the Chuvash Republic. The objects of research were the Linda breed geese of the parent flock. Improvement of specialized paternal and maternal lines was carried out with the content on the litter in individual sections of 0.9 by 2.0 meters. Reproduction of the bird was carried out by natural mating. Three geese were assigned to each gander. They were placed in individual laying hens section for 2-3 days. The maternal line was selected by egg production and hatching eggs. Selection of the paternal line geese was aimed at improving the growth rate of young birds, increasing the fertilization of eggs and the safety of birds. In the process of selection, an assessment and selection of a bird are carried out according to individual indicators, a culling based on the main features, an assessment of producers by origin and quality of the offspring. The number of eggs laid was taken into account daily, with the identification of eggs suitable for incubation. The egg-laying capacity of the geese was calculated on the average laying hen.

Technological parameters of the birds feeding and keeping corresponded to the recommended norms. Breeding birds after a productive period are kept in unheated rooms with the use of walking.

We studied the egg production and reproductive qualities of the maternal and paternal lines geese of during the biological cycle of egg-laying, depending on the age. Such reproductive qualities of geese as fertility and hatching of eggs, rates, and distribution of fetal mortality, breeding of goslings were evaluated. To do this, incubation eggs were laid for incubation during the productive period. Fertilization of eggs was determined by the number of fertilized eggs from the laid ones, expressed as a percentage. The hatchability of eggs was determined by the number of bred conditioned young from the number of fertilized eggs, expressed as a percentage. The output of goslings was determined by the number of laid eggs, expressed as a percentage. The embryos that died during incubation were divided into the following categories. Blood ring, embryo, dead on the 3-9 day incubation, non-viable embryos, dead at 10-27 days of incubation, zadohlik - embryos died between 28 and 30 days of incubation.

3. Research results and discussion
It was established that the reproductive indicators of 1-year-old geese were characterized by average values. The fertilization of the maternal lines eggs had a positive growth trend by the middle of the productive period and remains stable for 3 months of productivity (March, April, May). The decline was observed towards the end of the egg-laying period - in June. The obtained data on reproductive indicators are presented in table 1.

| Month of year | Hatchability of eggs, % | Hatchability of eggs, % | Dead embryos, % | Breeding of geese, % |
|---------------|-------------------------|-------------------------|----------------|---------------------|
|               | blood | died | addled | eggs | ring | down | eggs |                 |
| II            | 53.21 | 52.41 | 0.5    | ---  | 2.0   |       |
| III           | 68.35 | 58.48 | 7.5    | 18.1 | 8.6   |       |
| IV            | 71.42 | 72.14 | 3.8    | 13.9 | 7.8   |       |
| V             | 64.57 | 81.42 | 3.0    | 8.3  | 2.2   |       |
| VI            | 50.44 | 87.72 | 3.1    | 3.1  | ---   |       |
| On average   | 66.59 | 71.89 | 4.5    | 12.4 | 5.4   |       |

At the beginning of the breeding season, the fertilization of the maternal goose eggs had a minimum value of 53.21%. The maximum value was observed in the middle of the productive period.
(April) - 71.42%. On average, during the breeding season, egg fertilization was 66.59%.

During the productive period, hatchability and hatching are subject to change. The hatchability of eggs increased during the productive period from 52.41% to 87.72%. The highest rates of hatchability of goose eggs were at the end of the productive period. Breeding of goslings changed in different directions and the average for the season was 47.87%.

The incubation quality of the eggs of the paternal 1-year-old geese is characterized by average values (table 2).

**Table 2. Reproductive qualities of paternal 1-year-old geese.**

| Month of year | Hatchability of eggs, % | Hatchability of eggs, % | Dead embryos, % | Breeding of geese, % |
|---------------|-------------------------|-------------------------|-----------------|---------------------|
|               |                         |                         | blood ring | died down | addled eggs |               |
| II            | 53.82                   | 49.91                   | ---       | 0.7       | 2.2        | 52.16         |
| III           | 65.81                   | 65.54                   | 5.78      | 14.1      | 8.4        | 43.13         |
| IV            | 70.11                   | 73.03                   | 5.1       | 11.8      | 6.8        | 51.2          |
| V             | 53.62                   | 82.52                   | 1.9       | 5.7       | 3.8        | 44.25         |
| VI            | 32.75                   | 89.29                   | ---       | 2.9       | 0.9        | 29.24         |
| On average    | 62.04                   | 74.32                   | 3.9       | 9.9       | 5.5        | 46.10         |

Fertilization of the paternal line eggs increased to the third month of oviposition and in April it was 70.11%. At the end of the productive period (June), this figure fell to 32.75%.

The hatchability of eggs increased during the productive period and by the end of the biological cycle of egg laying in June, it was 89.29%. The rate of hatching throughout the entire egg-laying cycle varies from 52.16% to 29.24%. The minimum values were obtained in June, which was associated with a low fertility rate of eggs at the end of the productive period. On average, for a productive period, the breeding of goslings was 46.1%.

The data obtained indicated that all reproductive indicators of the maternal and paternal lines geese showed a positive growth trend by the middle of the productive period. The highest rates of fertilization and hatching eggs of the goose were at the peak of productivity - in April: maternal goose 71.42% and 72.14%, paternal goose 70.11% and 73.03%, respectively. The maternal geese hatch rate was higher than the paternal one throughout the biological egg-laying cycle, averaging 47.87% for the maternal and 46.10% for the paternal line, which was lower by 1.77% compared to the maternal one.

The maternal line 2-year-old geese were characterized by higher indicators of productivity (table 3).

**Table 3. Reproductive qualities of the maternal line 2-year-old geese.**

| Month of year | Hatchability of eggs, % | Hatchability of eggs, % | Dead embryos, % | Breeding of geese, % |
|---------------|-------------------------|-------------------------|-----------------|---------------------|
|               |                         |                         | blood ring | died down | addled eggs |               |
| II            | 54.01                   | 69.59                   | ---       | ---       | 6.3        | 51.09         |
| III           | 77.32                   | 75.43                   | 3.5       | 12.4      | 14.0       | 58.32         |
| IV            | 81.57                   | 81.16                   | 2.9       | 9.3       | 17.4       | 66.21         |
| V             | 83.70                   | 83.72                   | 8.2       | 4.1       | 8.5        | 70.07         |
| VI            | 72.68                   | 81.03                   | 6.5       | 4.8       | 9.2        | 58.90         |
| On average    | 78.46                   | 80.76                   | 4.6       | 7.8       | 12.2       | 63.36         |
At the beginning of the breeding season, egg fertilization and egg hatching were low at 54.01% and 69.59%, respectively. The maximum values for these indicators were obtained in the middle of the breeding season. Fertilization and hatchability of eggs averaged 78.46% and 80.76% respectively during the productive period. The rate of hatching during the cycle of egg production varied from 51.09% to 58.9%. The maximum values for hatching goslings were noted in the middle of the breeding season.

The maternal line 2-years-old geese significantly increased the output of goslings compared to the first year of use. On average, for the productive period, this indicator was 63.35%, which is 15.49% higher than the indicator of geese of the maternal line of the 1st year of use.

Reproductive indicators of paternal goose of the 2nd year of use have lower values compared to reproductive indicators of the maternal line throughout the entire biological cycle of egg production (Table 4).

Table 4. Reproductive qualities the paternal line 2-years-old geese.

| Month of year of year | Hatchability of eggs, % | Hatchability of eggs, % | Dead embryos, % | Breeding of geese, % |
|----------------------|-------------------------|-------------------------|----------------|---------------------|
|                      |                         |                         | blood ring     | died down           | addled eggs         |                 |
| II                   | 41.79                   | 68.45                   | ---            | ---                 | ---                 | 41.79           |
| III                  | 59.62                   | 77.85                   | 1.1            | 9.4                 | 6.5                 | 46.42           |
| IV                   | 77.45                   | 79.12                   | 3.0            | 11.5                | 7.5                 | 61.28           |
| V                    | 71.69                   | 70.06                   | 3.7            | 17.4                | 1.6                 | 50.23           |
| VI                   | 43.48                   | 75.00                   | 2.2            | 8.7                 | ---                 | 32.61           |
| On average           | 65.50                   | 77.06                   | 2.3            | 11.3                | 4.2                 | 50.48           |

The data in the table show that the paternal geese eggs fertility was 65.50%, which was 12.96% lower than that of the maternal geese. Further, this “gap” in the indications was present both in the hatchability of eggs and in the hatching of goslings, where the geese of the maternal line had the advantage. The highest indicators of the main features in both lines were observed in the middle of the season - from April to May.

In comparison with the 1-year-old geese the output of paternal line 2-years-old goslings considerably increased. On average for the productive period, this figure was 50.48%, which was 4.38% higher than the index of geese of the paternal line 1-year-old geese.

The reproductive qualities of the geese of the maternal line 3-years-old geese at the beginning of the breeding season were low (Table 5).

Table 5. Reproductive qualities of the maternal line 3-years-old geese.

| Month of year | Hatchability of eggs, % | Hatchability of eggs, % | Dead embryos, % | Breeding of geese, % |
|---------------|-------------------------|-------------------------|----------------|---------------------|
|               |                         |                         | blood ring     | died down           | addled eggs         |                 |
| II            | 43.45                   | 68.24                   | ---            | ---                 | 3.7                 | 41.38           |
| III           | 67.63                   | 73.28                   | 4.5            | 9.6                 | 12.0                | 49.56           |
| IV            | 76.23                   | 74.66                   | 4.5            | 12.6                | 9.6                 | 56.91           |
| V             | 72.94                   | 74.84                   | 11.8           | 4.6                 | 7.4                 | 54.59           |
| VI            | 61.71                   | 67.47                   | 12.3           | 4.1                 | 9.7                 | 41.64           |
| On average    | 69.91                   | 74.37                   | 7.0            | 8.1                 | 9.3                 | 51.99           |
Thus, fertilization of eggs and hatchability of eggs amounted to 43.45% and 68.24%, respectively. The maximum values for these indicators were obtained in the middle of the breeding season. Fertility and egg hatching averaged over the productive period were 69.91% and 74.37%, respectively.

As for the maternal line 3-years-old geese, compared to the 2-years-old, the rate of hatching had significantly decreased. On average, for the productive period, the breeding of goslings was 51.99%, which was 11.37% lower compared to geese in the 2nd year of use. Also, the maximum values for hatching goslings were noted in the middle of the breeding season.

The reproductive qualities of the paternal line 3-years-old geese were characterized by better performance compared to the maternal goose (table 6).

Table 6. Reproductive qualities of the paternal line 3-years-old geese.

| Month of year | Hatchability of eggs, % | Hatchability of eggs, % | Dead embryos, % | Breeding of geese, % |
|---------------|-------------------------|-------------------------|----------------|---------------------|
|               |                         |                         | blood ring     | died down | addled eggs |                     |
| II            | 61.74                   | 68.22                   | ---            | 2.7       | 8.8        | 55.70               |
| III           | 73.84                   | 75.36                   | 4.0            | 10.2      | 15.0       | 55.65               |
| IV            | 80.51                   | 75.04                   | 6.3            | 10.8      | 15.5       | 60.41               |
| V             | 70.60                   | 76.78                   | 5.8            | 7.9       | 9.2        | 54.20               |
| VI            | 61.61                   | 85.38                   | 1.9            | 5.7       | 3.7        | 52.61               |
| On average   | 73.38                   | 76.93                   | 4.8            | 9.0       | 11.7       | 56.46               |

The same dynamics of changes in reproductive qualities during the breeding season was typical for the paternal line 3-years-old geese. Indicators of the eggs fertility, hatchability and hatching of goslings also tended to grow by the middle of the productive period. Fertilization, eggs averaged 73.38%, hatchability - 76.93%, hatching - 56.4%.

In the maternal and paternal lines geese, starting from the 3-years-old, eggs fertilization, hatchability and hatching of goslings sharply reduced.

4. Conclusion
Reproductive indicators of the maternal and paternal lines 1-year-old geese were characterized by minimal values. With age, fertility, and hatchability of eggs, the hatching of goslings increased both in the paternal and maternal line. The maximum values were observed for 2-year-olds.

The hatchability index of eggs had a minimum value for 1-year olds, which averaged 71.89 - 74.32%. The maximum value was noted for 2-year-olds - 77.06– 80.76%. For 3-years-olds this indicator was 74.37 - 76.93%. Breeding of goslings directly depended on the hatchability of eggs. The higher the hatchability of eggs, the higher the breeding of geese.

All reproductive indicators of the maternal and paternal lines geese of 1, 2 and 3 years of age during the biological cycle of egg-laying had a positive tendency to grow by the middle of the productive period and remained stable for 3 months of productivity (from March to May). The decline was observed towards the end of the egg-laying period.

Thus, as a result of long-term breeding work to improve the geese of Linda breed in LLC "Vurnarets"obtained maternal and paternal lines, as a result of crossing which can be obtained interline hybrid to produce marketable products.

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