ASPECTS OF SEX BREEDING AND SEGREGATION IN RABBITS

Tatiana Mardari[1], Doina Leonte[2]

[1]State Agrarian University of Moldova, Republic of Moldova
[2]Faculty of Veterinary Medicine, University of Agricultural Sciences and Veterinary Medicine of Iaşi, Romania

Abstract

This research study presents some indices of reproductive and sexual heredity in rabbits. The investigation subject was a rabbit flock that had the same raising conditions and the same experimental period. The largest prolificacy was obtained in October (7.6 animals) and August (7.55 heads); the lowest prolificacy was recorded in the winter months, and namely in December (5.8 heads), January (6.05 heads) and February (6.8 heads). This proves the doe-rabbits' dependence on the day length and influence on the reproduction. The closest gender segregation ratio is 1: 0.9 in July and the farthest one is 1:1.5 in December in favor of males, which are born more often than females.

Key words: rabbits, reproduction, prolificacy, gender segregation

INTRODUCTION

Knowing the genetic mechanism of sex determination, there is a question - how can we get the animals of the desired sex? In some cases, there is a need to raise more females (at dairy and poultry farms specialized in egg production, etc.) and in other cases we may need to have more males (beef cattle, broiler chickens, etc.), because males have a higher weight gain. To some extent, this regulation may be possible when the male sex is heterogametic and therefore produces two types of gametes - spermatozoa containing the X chromosome and the ones that include the Y chromosome [1].

Depending on the environment, it was noticed that when the diet was poor, more males were born, and when there was very much fodder, more females were born. It was also found out that older parents give birth to more males than females, the same change was noticed when temperatures were low, though such deviation from the ratio of 1: 1 is not essential and cannot be applied with the purpose to change this ratio.

In rabbits as well as in other mammals, sex chromosomes (heterosomes) are found to be differentially assigned to the chromosomal seal depending on the sex; in females - in the form of chromosome pair (XX) and in the males the pair is made up of chromosomes different in shape and function (XY). Due to this fact, the female sex behaves like a homozygote, forming the only type of gametes as a result of meiotic reduced division, which contain one chromosome Y, which is why it is called a homogametic sex. In males allosomes are different (XY), therefore there are produced two types of gametes as a result of meiotic division (50% will contain allosome X and 50% - allosome Y) and this gender is called heterogametic.

Bura M. [2] specifies that gender determination should be interpreted as a genetic phenomenon because chromosomes behave like characters in backcrossing, producing a gender segregation ratio of 1: 1 (50% females and 50% males), the major oscillations of these values may be due to the differentiated mortality of the embryos of one sex compared to the other.

During meiosis (division) *homozygotes* can produce one type of gametes, which is called *homogametic* and *allosomes* are *heterogametic,* producing 2 different types of gametes (N and A), each in proportion of 50% by means of gene segregation.

*Corresponding author: tatianadabija@rambler.ru
The manuscript was received: 05.06.2018
Accepted for publication: 21.11.2018

These systems are associated with a chromosomal constitution that is different in the two sexes. One sex is homogametic (they produce gametes which contain one type of sex chromosomes or gonosomes) and the other is heterogametic (producing two types of gametes, 50% with a gonosome and 50% with the other gonosome). In the fertilization process the gametes that come from the heterogeneous sex determine the sex of the zygote and ensure a 1: 1 ratio between the two sexes. Two sets of sex determination systems have been identified:

- sex determination systems where the female sex is homogametic:
- the XY sex determination system;
- the X0 / XX sex determination system.
- sex determination systems where the male sex is homogametic.

The diversification process is not accidental because the existence of sex chromosomes maintains a constant natural ratio between genders (sex ratio 1: 1). Theoretically, sperm cells with X and sperm cells with Y are produced in equal proportions, have equal viability and mobility in the uterine tract, and the ovary surface is equally responsive for both types of sperm cells. In fact, studies [4] have proved the predominance of the male sex among fetuses. Difference is reduced during pregnancy, at birth the ration between sexes is on average 51 males: 49 females.

Gender ratio values are always very close to 1: 1 or 50% for each sex, insignificantly oscillating in animals around these values. According to [3], in rabbits the percentage of males compared to the total number of births is 51.1%.

The purpose of research is to study the reproductive features and sexual heredity in domestic rabbits.

MATERIAL AND METHOD

Rabbits of the White New Zealand breed from a peasant farm were used to accomplish the purpose and objectives planned as a research object.

The rabbit breed is part of the middle-to-large waist breed group, weighing on average 4.5 kg, with the extremes between 3.5 and 5.5 kg. The conformation is smooth, characteristic of the meat type, having a stumpy body, with the corresponding shape and well-developed muscles. The back is large, muscles are well-developed. The members are short and strong with pigmented claws. The head is well-developed, attached to the trunk, with large eyes of the red matte color and red bright pupils. Strong ears, covered with hair, 10-11 cm long and vertical. The body is covered with thick fur of medium length that does not exceed 3 cm, strong ears and thick down, which makes the fur structure dense and filled. The fur is pure white, without any shades, including the head and ears.

Sexual maturity is early enough (4.5-5 months), it is better in selected material and hybrids. Prolificacy is very good, reaching 9-12 chickens per calf. Doe rabbits are highly capable for nursing, which reveals animal performance, which equals to 0.6 kg at the age of 1 month old, 2.2 kg at 3 months old and 4.1 kg at 6 months old.

The biological material that we used was represented by 30 female animals. The number of offspring was determined at birth, the variation of different indices was analyzed throughout the year.

Rabbits had the same maintenance conditions and the same experiment period. During the experiments some breeding skills were studied, for example: female prolificacy, viability of the offspring, dynamics of the offspring body mass.

Statistical analysis was performed using Windows Excel 5, edited with the help of Microsoft 2000; N. Bucataru statistical method was applied [1].

RESULTS AND DISCUSSIONS

The baseline was composed of healthy animals that were of the same race, age, weight, and favorable maintenance status.

Investigations started with the selection of 30 females from the base stock from a certain household that meet the necessary qualities; prolificacy was analyzed depending on the month and the number of calves per year. The research data are shown in Table 1.

Table 1 The prolificacy of doe rabbits depending on the month, n = 30

Studied indices	Month of the year					
	January	February	March	April	May	June
$\bar{X} \pm s_{\bar{x}}$	6.05±0.32	6.85±0.45	7.31±0.46	7.00±0.72	7.40±0.29	7.50±0.42
V,%	22:19	17.71	29.93	27,35	18.46	13.98
Min. - max.	4-8	5 - 8	4 - 11	4-9	4-9	6 - 9
Studied indices	July	August	September	October	November	December
$\bar{X} \pm s_{\bar{x}}$	7.20±0.32	7.55±0.37	7.41±0.44	7.66±0.48	7.13±0.48	5.84±0.49
V,%	19.95	14.96	24.81	21.77	26.42	30.31
Min. - max.	5 - 10	6 - 9	4 - 10	5 - 11	4 - 10	3 - 10

The analyzed number of rabbits is exploited in the intensive system, reaching 5-6 calving periods per year, the biggest number of rabbits per year was 49 animals and the smallest - 29 heads, on average about 39 heads per year from a rabbit.

The data obtained from the doe rabbits prolificacy analysis depending on the season shows an average annual prolificacy of 7.07 heads, ranging between 5.84 and 7.66 animals.

The highest prolificacy was obtained in October (7.6 heads) and August (7.55 heads), the lowest prolificacy was recorded in winter months, namely in December (5.8 heads), January (6.05 heads) and February (6.8 heads); this demonstrates the dependence of doe rabbits on the daytime and influence on the breeding function.

Figure 1 shows the ratio between genes. The ratio between genes is a genetic phenomenon, in literature gender segregation ratio is 1: 1, i.e. 50% females and 50% males.

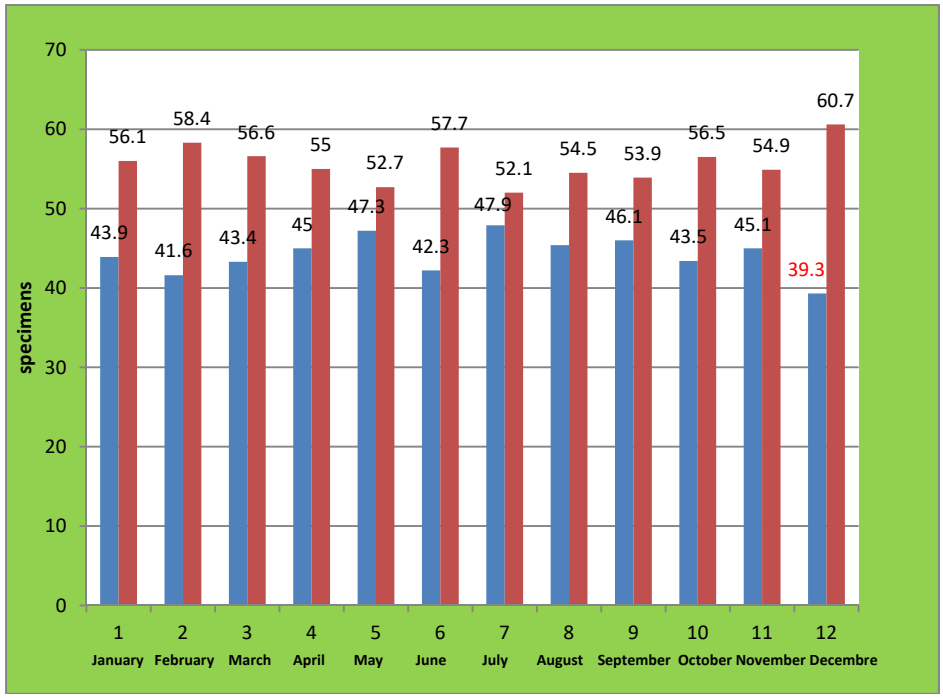

Fig. 1 Evidence of the ratio between males and females, during the year %

Oscillations of these values are small, and the data presented in Figure 1 show that the ratio between genes varies between 47.9% females : 52.1% males in July and somewhat higher in December, i.e. 39.3% females : 60.7 % males. The closest gender segregation ratio is 1: 0.9 in July and the farthest is 1: 1.5 in December in favour of males, which are born in a higher percentage than females.

The higher number of males is obtained in cold months of the year, which shows the dependence on the temperature of the environment and the year period.

Oscillations between the gender segregation ratio depend on the year period, nutrition, age of the animal, etc.

CONCLUSIONS

Having studied productive and reproductive qualities of the rabbit herd, we can state the following conclusions:

1. The studied doe rabbits are characterized by a higher proliferation of about 7.09 heads, ranging between 5.16 and 8.6 heads.

2. We have proved the dependence of females on the day length and influence on the breeding function, the lowest prolificacy was recorded in winter months, namely in December (5.8 heads), January (6.05 heads) and February (6.8 heads).

3. Oscillations between the gender segregation ratio depends on the year period, nutrition, age of the animal and low temperatures. As a result, the biggest oscillation was recorded in December (39.3 females/60.7 males) and the slightest oscillation was noticed in July (47.9 females / 52.1 males).

The studied rabbit population is characterized by good breeding indices and is recommended for households.

REFERENCES

[1] N. Bucataru, 1993: Genetica. Chisinau Universitas, p. 94 – 107.

[2] M. Bura, 2003: Ameliorarea genetica a iepurilor de casa. Timisoara, Ed. Mirton, p. 25-194.

[3] St. Creanga, 1999: Elemente fundamentale ale ereditatii animale, Iaşi Ed. „Ion Ionescu de la Brad", p. 228.

[4] N. Pipernea, et al., 1980: Genetica animală. Bucuresti, Ed. Didactica si pedagogica, p. 102.