Scientific Annals of Polish Society of Animal Production - Vol. 13 (2017), No 3, 25-29

The effect of breed on litter size and milk yield in rabbits*

Sylwia Pałka#, Michał Kmiecik, Konrad Kozioł, Agnieszka Otwinowska-Mindur, Łukasz Migdał, Józef Bieniek

University of Agriculture in Krakow, Faculty of Animal Sciences,
Department of Genetics and Animal Breeding,
Al. Mickiewicza 24/28, Krakow, Poland; #e-mail: s.palka@ur.krakow.pl

The aim of the study was to determine the influence of breed on litter size and milk yield in rabbits. The following breeds were analysed in the study: Californian Black (n=16), New Zealand White (n=19), Popielno White (n=24), Blanc de Termonde (n=36) and Grey Flemish Giant (n=14). The study was conducted on three consecutive litters. The litters were weighed up to 24 hours from birth and at 21 days of age to calculate the milk yield. The Grey Flemish Giant females were found to have the largest litters (9.09 pups), while the litters of the New Zealand White rabbits were the smallest (6.47). In the case of the Blanc de Termonde, Californian Black and Popielno White females, the mean litter size was 7.78, 7.50 and 7.46, respectively. The Blanc de Termonde rabbits had the highest milk yield (3.76) and the Grey Flemish Giant females had the lowest (3.18).

KEY WORDS: rabbit / female / breed / litter size / milk yield

One of the most important determinants of the profitability of livestock farming is the number of reared offspring from the female in the production cycle. Rabbits are polyoestrous animals, so young can be obtained throughout the year. This means that the intensity of production can be varied depending on market demand or the preferences of the breeders. Owing to the high prolificacy and fertility and short gestation period (31-33 days) of these animals, the number of individuals in the herd can be quickly increased. Postpartum oestrus one or two days after parturition can be exploited to obtain as many as 70 young rabbits per female in a year. However, it should be borne in mind that achieving such high results is associated with a high rotation of females in the herd (130-150% a year), and the

***This research was financed by the Ministry of Science and Higher Education of the Republic of Poland, DS. 3228.**

feed must be of very good quality and properly balanced to fully meet the doe's needs for the overlapping periods of gestation and lactation. In less intensive breeding variants, the rabbits can be fed on-farm feeds or a diet supplemented with them in order to reduce the cost of raising the does, without negatively affecting their body condition or the fattening of young rabbits.

Choosing the right breed can determine profitability. For this reason, among many important factors, such as the number of young born, their condition, and rearing with their mother should be considered. This will make it possible to predict how the young will grow during fattening and whether the female should continue to be used for breeding [1]. The most commonly used meat breeds include New Zealand White, Californian Black, Blanc de Termonde and Popielno White. Their common characteristics are early maturation and good fertility and prolificacy [1]. Rabbits of the Grey Flemish Giant breed are also very popular, especially in amateur breeding and as a paternal component for the production of crossbreds for slaughter. The major disadvantage of these rabbits is that the males attain maturity at the age of about 6 months and somatic maturity only at the age of 10-12 months, which significantly reduces the production capacity of these rabbits. In addition, they are the only breed that shows some reproductive seasonality, so it is difficult to obtain young year round.

Irrespective of the type of production we focus on (meat, fur or wool), the common denominator ensuring success in breeding is the selection of females with the best maternal characteristics. In addition, the high reproductive rates of females translate into good economic results.

The aim of the study was to determine the influence of breed on the litter size and milk yield of female rabbits.

Material and methods

The study material consisted of female rabbits of the breeds Californian Black (n=16), New Zealand White (n=19), Popielno White (n=24), Blanc de Termonde (n=36) and Grey Flemish Giant (n=14) with their offspring. The animals were obtained in from the same year and season. Pairs for mating were planned using CFC (Contribution, Inbreeding (F), Coancestry) software, Release 1.0 [12]. The study included three successive litters, starting with the does' first litter. Females were fertilized on the 7th day after weaning. They were housed with their young in wooden hutches with shallow litter in a building with a water supply (nipple drinkers), lighting (14L:10D) and forced ventilation. They were fed ad libitum a commercial complete pelleted feed with 15% crude protein, 4.2% crude fat and 17.6% digestible fibre, which satisfied the nutritional requirements for female rabbits given in nutritional standards [3].

To calculate the milk yield, litters were weighed in the first 24 hours after birth and on day 21 of life.

The milk yield coefficient was calculated according to following formula [11]:

$$M = \frac{C2 - C1}{21 \times C2} \times 100$$

where:

M – milk yield of female

$C1$ – litter weight (g) up to 24 hours after birth

$C2$ – litter weight (g) on day 21 after birth

Statistical analysis was performed with the SAS statistics package [13], using the MIXED procedure with a fixed effect included in the model. The significance of the differences between the means was tested by the Tukey-Kramer test, at a significance level of $p \leq 0.05$.

Results and discussion

The analysis showed that females of the breed Grey Flemish Giant had the largest litters (9.09), while New Zealand White rabbits had the smallest (6.47). For Blanc de Termonde, Californian and Popielno White females, the mean litter size was 7.78, 7.50 and 7.46, respectively (Table 1).

Table 1
Effect of breed on litter size

Breed	n	Mean	Sd
Californian Black	16	7.50[a]	1.97
New Zealand White	19	6.47[a]	1.93
Popielno White	24	7.46[a]	2.36
Blanc de Termonde	36	7.78[a]	2.11
Grey Flemish Giant	14	9.09[b]	2.12

a, b – means in columns with different letters are significantly different at $p \leq 0.05$

The results obtained were higher than those reported by the National Animal Breeding Centre (KCHZ) for the years 2012-2016 [6, 7, 8, 9, 10], where the average number of young born in the litter of Grey Flemish Giants ranged from 5.2 in 2015 to 6.2 in 2013 and 2014, which was up to 3.89 fewer than in our results. For Blanc de Termonde, the average number of rabbits per litter ranged from 5.6 in 2012 to 7.3 in 2015, which was lower by

0.48-2.18. For Popielno White rabbits, the litter size ranged from 6.3 to 6.6, for Californian Black 6.2 to 6.7, and for New Zealand White 5.2 to 5.6. These values were lower than those presented in Table 1, by 0.86-1.16, 0.8-1.3 and 0.87-1.27, respectively.

Bielański et al. [2] reported an average litter size of 5.15 and 5.61 for New Zealand White and Popielno White rabbits, which was lower than the results of our study by 1.32 and 1.85. Kołodziejczyk et al. [4], in an analysis of the prolificacy of female New Zealand White and Blanc de Termonde rabbits, showed an average 7.77 rabbits born per litter for Blanc de Termonde and 7.39 for New Zealand White. The results of these authors are consistent with those of the present study for Blanc de Termonde (7.78), while in the case of the New Zealand White breed they are higher by 0.92 per litter. Kowalska [5] reported a mean litter size of New Zealand White rabbits of 7.41, which was 0.94 higher than in our study and as much as 2.21 higher than the data presented by KCHZ for 2015-16 [9, 10].

Table 2
Effect of breed on milk yield

Breed	n	Mean	Sd
Californian Black	16	3.63[a]	0.31
New Zealand White	19	3.72[a]	0.25
Popielno White	24	3.73[a]	0.25
Blanc de Termonde	36	3.76[a]	0.20
Grey Flemish Giant	14	3.18[b]	0.62

a, b – means in columns with different letters are significantly different at $p \leq 0.05$

The highest milk yield was found for females of the Blanc de Termonde breed (3.76), and the lowest for the Grey Flemish Giant breed (3.18) (Table 2).

According to Niedźwiadek [11], milk yield coefficients ranging from 3.5 to 4.5 are found in by females with good milk yield, which determines proper rearing of young rabbits. Kowalska [5] reported a mean milk yield coefficient of 3.71 in New Zealand White rabbits, which was only 0.01 lower than that obtained in our experiment.

It can be concluded from our research that the highest milk yield coefficient and large litter size noted for Blanc de Termonde female rabbits are indicative of this breed's very good maternal characteristics.

REFERENCES

1. BARABASZ B., BIENIEK J., 2003 – Króliki – towarowa produkcja mięsna. PWRiL, Warszawa.
2. BIELAŃSKI P., KOWALSKA D., WRZECIONOWSKA M., 2011 – Wykorzystanie rodzimej rasy królików popielniańskich białych i ich mieszańców do produkcji mięsa. ***Roczniki Naukowe Polskiego Towarzystwa Zootechnicznego*** 7, 3, 67-73.
3. GUGOŁEK A. (praca zbiorowa), 2011 – Zalecenia żywieniowe i wartość pokarmowa pasz. Zwierzęta futerkowe. Instytut Fizjologii i Żywienia Zwierząt PAN, Jabłonna.
4. KOŁODZIEJCZYK D., SOCHA S., PIEŃKOWSKI Ł., GACEK L., GONTARZ A., 2012 – The analysis of female fertility in New Zealand White rabbit and Termond White rabbit. ***Acta Scientiarum Polonorum Zootechnica*** 11, 4, 61-68.
5. KOWALSKA D., 2003 – Czynniki żywieniowe wpływające na użytkowość rozpłodową królic. Rozprawa doktorska. IZ Kraków.
6. Krajowe Centrum Hodowli Zwierząt – Hodowla zwierząt futerkowych w 2012 roku. Warszawa 2013.
7. Krajowe Centrum Hodowli Zwierząt – Hodowla zwierząt futerkowych w 2013 roku. Warszawa 2014.
8. Krajowe Centrum Hodowli Zwierząt – Hodowla zwierząt futerkowych w 2014 roku. Warszawa 2015.
9. Krajowe Centrum Hodowli Zwierząt – Hodowla zwierząt futerkowych w 2015 roku. Warszawa 2016.
10. Krajowe Centrum Hodowli Zwierząt – Hodowla zwierząt futerkowych w 2016 roku. Warszawa 2017.
11. NIEDŹWIADEK S., 1982 – Zasady hodowli królików. PWRiL, Warszawa.
12. SARGOLZAEI M., IWAISAKI H., CPLLEAU J.J., 2006 – CFC (Contribution, Inbreeding (F), Coancestry) Release 1.0 A software package for pedigree analysis and monitoring genetic diversity.
13. SAS Institute Inc. The SAS System for Windows. Realise 13.2. Cary, NC, USA 2014.