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THE EFFECT OF BREED ON REPRODUCTIVE PERFORMANCE IN COMMODITY RABBIT PRODUCTION

WPŁYW RASY NA WYNIKI REPRODUKCYJNE W WARUNKACH TOWAROWEJ PRODUKCJI KRÓLIKÓW

Jadwiga TOPCZEWSKA[1*], Anna ROGOWSKA[1] and Leszek Antoni GACEK[2]

[1]Research of Animal Production and Poultry Products Evaluation, Department of Biological-Agriculture in Rzeszów, University in Rzeszów, ul. Zelwerowicza 4, 35-601 Rzeszów, Poland
*correspondence j.topczewska@gmail.com
[2]Experimental Station of the National Research Institute of Animal Production;
39-331 Chorzelów, Poland

ABSTRACT

The aim of this study was to assess the reproductive rates among different breeds, mostly used in commodity farm conditions. The studies were obtained at fertility level from 6.27 animals in the Californian breed to 8.49 animals in Popielno White. High rate of failures during rearing was observed in the Californian breed. Litter weight was dependent on the number of births and young rearing, lactation and care of female. Kitten weight at 35 day of age ranged from 603.21g (Alaskan) to 736.10g (Giant Chinchilla). The results indicate the usefulness of a Popielno White breed for the livestock production.

KEYWORDS: does, reproductive performance, maternal performance

STRESZCZENIE

Celem badań była ocena wskaźników reprodukcyjnych u różnych ras, najczęściej wykorzystywanych w warunkach fermy towarowej. W badaniach uzyskano płodność na poziomie od 6,27szt u rasy kalifornijskiej do 8,49szt u popielniańskiej białej. Wysoki wskaźnik upadków w okresie odchowu wykazano u rasy kalifornijskiej. Masa miotów uzależniona była od liczby urodzonych i odchowywanych młodych oraz mleczności i troskliwości samicy. Masa królika w 35 dniu życia wahała się w przedziale od 603,21g (alaska) do 736,10g (szynszyl wielki). Uzyskane wyniki wskazują na dużą przydatność rasy popielniańskiej białej do produkcji żywca króliczego.

SŁOWA KLUCZOWE: króliki, reprodukcja, wyniki odchowu

STRESZCZENIE SZCZEGÓŁOWE

Badania przeprowadzono na fermie towarowej królików IZ PIB w Chorzelowie. Stado reprodukcyjne składało się z samic ras alaska, nowozelandzka biała, termondzka biała, kalifornijska, popielniańska biała, szynszyl wielki. Produkcja była prowadzona w pomieszczeniu, w systemie zamkniętym. Stado składało się z grup rodzinowych, które tworzyło 6 samic i 1 samiec. W drugim tygodniu po wykocie samice były kryte ponownie. Okres odchowu przy matkach wynosił 35 dni. Żywienie stada podstawowego oparte było o granulat dla tej grupy produkcyjnej (białko 17%, 14% włókna i 2400kcal energii), zadawane w ilości 120-250g. W celu określenia wyników reprodukcyjnych notowano liczbę młodych żywo i martwo urodzonych w miocie, liczbę upadków w okresie odchowu, masę miotu i królika w 1, 7, 21 i 35 dniu życia.

Przeprowadzone badania wykazały najwyższą płodność u rasy popielniańskiej białej (8,49szt). U pozostałych ras wskaźnik ten wahał się w przedziale od 6,27szt (kalifornijska) do 7,73szt (biała termondzka). Wysoki wskaźnik martwo urodzonych króliczą oraz najwyższy procent upadków w okresie odchowu stwierdzono u rasy kalifornijskiej. Masa sztuki w wieku 35 dni wahała się w przedziale od 603,21g (alaska) do 736,10g (szynszyl wielki). Wykazano średnią i silną korelację między liczbą żywo urodzonych króliczą a masą miotu w ciągu 24godzin u wszystkich analizowanych ras. Ponadto u rasy nowozelandzka biała uzyskano różnice wysoko istotne pomiędzy liczbą żywo urodzonych młodych a masą w 7, 21 i 35 dniu życia.

INTRODUCTION

The main direction of rabbits doe performance is meat-procurement. The systematic increase in consumption that was observed, is associated witch lifestyle changes and consumer awareness regarding proper nutrition. Rabbit meat is classified as white meat, with low cholesterol level and nutrient elements absorption at 90%. It is also classified as functional foods (Kowalska 2006, Zotte and Szendro 2011). Profitability of production depends on the reproduction intensity and the number of kits being weaned from one litter (Castellini et al. 2010, Gacek 2010). The decisive issue is the efficiency of mating and litter size. Rabbits are characterized by high production traits, such as high fertility and prolificacy, early puberty and high growth rate of young, good feed efficiency, high dressing percentage and meat quality (Kowalska 2006, Zotte 2002). The breed with the best reproductive parameters, providing the possibility to complement the basic livestock easily should be chosen for production depending on the target.

Medium breeds and their hybrids: New Zealand White, Californian and Blanc de Termonde, are recommended for commodity production (Zajac 2004). Increasing The White Popielno native breed is getting the increasing recognition (Bielanski et al. 2008). The growing interest of farmers has been directed also to furry breeds, which can also provide carcass as a valuable food product (Lapa and Maj 2008).

The objective was to compare the different does breeds reproductive results in commodity production conditions.

MATERIALS AND METHODS

The research material consisted of reproductive rabbits herd, maintained in a commodity farm in Experimental Station of the National Research Institute of Animal Production in Chorzelow. The following breeds were examined: Alaskan, New Zealand White, Blanc de Termonde, Californian, Popielno White, Giant Chinchilla.

The farm run the intensive indoor production system. Animals were kept in single-level individual cages, with the kindling hutch inside (lined with sawdust) placed in the cage before kindling. In the second week after kindling does were mounting again. A herd was kept in family groups, consisting of 6 females and 1 male. Kits were weaned at 35 days, until that time they stayed with their does. Feeding for this reproduction group was based on pellets (containing 17% protein, 14% fiber and 2400 kcal), available in amount of 120 - 250g, depending on the physiological state. The animals had continuous access to water.
In order to determine the reproductive performance following parameters were registered: the number of live kits and still-born in a litter, the number of deaths during the rearing, litter weight and a rabbit weight at 1, 7, 21 and 35 days of age. Ralationships between characteristics were evaluated using Person's correlation coefficient. Calculations were made using Statistica 9.0. Significance was examined using the Tukey test.

RESULTS

Weight of foundation does stock was determined during reproduction indicators measurement (Table 1). Reproductive results are shown in table 2. The results of 596 litters were used for the analysis, where 4343 kits were born. The highest fertility was characterized by a White Popielno breed (8,49 individuals). The number of still-born kits ranged from 2.33 individuals (Alaskan) to 3.34 individuals (New Zealand White). High rate of failures in rearing was observed in Californian and Giant Chinchilla breeds.

Table 1. The weight of females used reproductive
Tabela 1. Masa samic użytkowanych rozpłodowo

Breeds *Rasa*	Characteristics Charakterystyka				
	n	$\bar{x}$	SD	mn	mx
A	70	3,51 bdfg ACDE	0,57	2,16	4,72
NB	157	4,00 ab A	0,45	3,06	5,52
BT	159	4,18 acd BC	0,58	2,96	5,40
K	44	3,74 ce B	0,40	2,74	4,40
SZW	101	4,11 ef D	0,57	3,12	5,44
PB	63	3,94 g E	0,38	3,40	5,70

Breeds: A – Alaska; NB – New Zealand White; BT- Blanc de Termonde ; K – Californian; SZW – Giant Chinchilla; PB – Popielno White
Means with the same letters differ significantly (P≤0.05);
Means with the capitals letters differ highly significantly (P≤0.01)
Rasy: A-alaska; NB - nowozelandzka biała; BT- biała termondzka; K - kalifornijska; SZW – szynszyl; PB – popielniańska biała.
Średnie oznaczone tymi samymi małymi literami różnią się istotnie (P≤0,05);
Średnie oznaczone dużymi literami różnią się wysoko istotnie (P≤0,01)

Rearing results are shown in table 3. Litter weight was dependent on the number of kits. Does fertility in the analyzed breeds ranged from 1 to 14 individuals (Termonde de White and Popielno White). Live weight of kit at the first day ranged from 43.5 g

Table 2. Reproductive performance of different races females
Tabela 2. Wskaźniki reprodukcyjne samic różnych ras

Specification Wyszczególnienie		Breeds Rasy					
		A	NB	BT	K	PB	SZW
No. of live born rabbits per litter (head) Liczba królików żywych urodzonych w miocie (szt)	$\bar{x}$	7,41	6,99 a	7,73	6,27 b A	8,49 abc AB	6,73 c B
	SD	3,11	2,76	2,86	2,90	2,61	2,67
No. of stillborn rabbits per litter (head) Liczba królików martwo urodzonych w miocie (szt)	$\bar{x}$	0,70	0,68	0,50	1,14	0,54	1,07
	SD	1,34	1,52	1,34	1,77	1,41	1,70
No. of rabbits dead to 35 days of age (%) Liczba królików padłych do 35 dnia życia	%	18,69	11,94	15,05	26,45	14,58	22,56

For explanations in Table 1. / Objaśnienia w tabeli 1

Table 3. The reading results of different rabbits breeds
Tabela 3. Wyniki odchowu królików różnych ras

Specification Wyszczególnienie		Breeds / Rasy					
		A	NB	BT	K	PB	SZW
Litter weight within 24 hours (g) Masa miotu w ciągu 24h (g)	$\bar{x}$	348	546 c C	530 b B	160abc ABC	572,5a A	350
	V%	24,16	33,38	13,34	9,54	26,14	36,36
Weight of newborn (g) Masa noworodka (g)	$\bar{x}$	43,50 a	76,06 a	58,45	53,33	58,4	53,5
	V%	9,07	18,59	24,48	18,65	10,25	3,96
Rabbit weight at 7 days of age (g) Masa królika w 7 dniu życia (g)	$\bar{x}$	99,80 b B	104,41	109,61	84,42 abc A	123,13a AB	111,74 c
	V%	30,41	26,67	25,66	23,03	18,62	25,68
Litter weight at 21 days of age (g) Masa miotu w 21 dniu życia (g)	$\bar{x}$	2110,00c	2235,56a A	2185,00 b B	1126,67abc AB	1920,00	1900,00
	V%	50,82	47,11	48,21	24,23	91,33	24,37
Rabbit weight at 21 days of age (g) Masa królika w 21 dniu życia (g)	$\bar{x}$	326,74	338,14	356,18 a	298,33 ab	328,00	342,67 b
	V%	48,20	23,60	30,41	29,23	5,17	13,78
Litter weight at 35 days of age (g) Masa miotu w 35 dniu życia (g)	$\bar{x}$	4023,33	4405,52 c	4449,41 b	3732,00 abc	4513,75 a	3953,89
	V%	21,94	34,83	35,09	15,04	25,24	37,20
Rabbit weight at 35 days of age (g) Masa królika w 35 dniu życia (g)	$\bar{x}$	603,21 ab AB	658,70	678,33	681,35	726,86 b B	736,10 a A
	V%	21,93	18,51	22,06	23,61	18,21	17,82

For explanations in Table 1. / Objaśnienia w tabeli 1

Table 4. Correlation of selected characteristics
Tabela 4. Korelacje wybranych cech

		Correlation Korelacje											
		BT		NB		A		K		PB		SZW	
	litter age wiek miotu	litter weight masa miotu	kit weight masa królika	litter weight masa miotu	kit weight masa królika	litter weight masa miotu	kit weight masa królika	litter weight masa miotu	kit weight masa królika	litter weight masa miotu	kit weight masa królika	litter weight masa miotu	kit weight masa królika
No. of live born rabbits per litter Liczba królików żywo urodzonych w miocie	within 24h w ciągu 24h	0,650	-0,337	0,810	-0,359	0,571	0,325	0,608	0,202	0,676	-0,683	0,733*	0,408
	7 days 7 dni	0,704*	-0,271	0,705*	-0,236	0,681	0,608	0,545	-0,008	0,676	-0,683	0,867*	0,669*
	21 days 21dni	0,421	-0,373	0,906*	-0,376*	0,691	0,512	0,225	-0,526	0,691	0,512	0,626	0,043
	35 days 35dni	0,634*	-0,168	0,487*	-0,124	0,057	-0,441	-0,225	-0,526	0,556	-0,908*	0,263	-0,172

For explanations in Table 1; *differ highly significantly (P≤0.01)
Objaśnienia w tabeli 1; * różnice wysoko istotne (P≤0,01)

(Alaskan) to 76.06 g (New Zealand White). The rapid growth of kits indicates the high milk yield of does, especially Popielno White and Blanc de Termonde breeds. The average weight of rabbit at 35 days of age ranged from 603.21g (Alaskan) to 736.10g (Giant Chinchilla).

Correlations of chosen indicators were collated in Table 4. In all investigated breeds middle and strong correlation between the number of live born rabbits and litter weight within 24 hours was shown. The New Zealand White breed shown highly significant difference for number of live born rabbits and litter weight at 7, 21, and 35 days. Highly significant difference between live born rabbits and litter weight within 24 hours was shown in Giant Chinchilla breed.

DISCUSSION

The study shows the usefulness of analyzed breeds in the mass production of rabbit carcass. The Popielno White native breed, which showed the highest fertility rate and low rate of kit deaths during rearing, deserves attention. These studies confirm the results obtained by Bielański et al. (2008). They demonstrated a similar quality of Popielno White and New Zealand White rabbits meat. According to Kowalska (2006) too numerous litters are not desirable due to lower weight of newborn kits, a slower growth rate and a high percentage of deaths. A numerous litter size also weakens the rabbit doe. It should also mentioned that does of many breeds are good foster mothers, that why the farmer intervention could help to increase the number of reared progeny in situation of too numerous litters and lactation disorders.
The low level of reproductive rates, especially in herds used intensively and semi-intensively, may also be the result of irregular feeding, energy deficit and minerals and vitamins deficiency (Castellini et al. 2010, Fortun-Lamothe 2006, Kowalska 2006, Pascual et al. 1999).

According to Gacek (2010) in the rabbit hoof production the kindling place term should be in use, from which farmer should obtain at least 40 rabbits in one year. This means kindling every 1.5 months, high fertility and rearing of kits. The obtained results are affected by many factors, including thermal conditions in the rabbit houses, season, amount of light, the herd health status, the genetic value of does and many others [2]. Similarly, the season impact, when applying insemination and preparations provocative ovulation, fertility and growth rate of rabbits confirmed Tůma et al. (2010) in the study.

The high percentage of deaths in the Californian breed (26.45%) and Giant Chinchilla (22.56%) occurred in our research. In case of the New Zealand White breed a very similar result to these obtained by Bielanski et al. (2008) was shown, but significantly lower in the White Popielno (28.33% authors cited, 14.58% in our study).

Large losses during rearing may also be the result of young freezing, pulled out from nests by the hyperactive does. In the study conducted by Kowalska and Gugołka (2008) authors showed significantly lower production results in the individuals classified as sensitive to stress. Thus, results worse than an average for the breed may be an indication for improving the welfare on the farm or elimination of hyperactive animals from the herd.

The litters weight during next measurements were different, strictly dependent on the number of kits in the litter. They showed an upward trend. Rabbit weight at 35 days of age ranged from 603.21g (Alaskan) to 736.10g (Giant Chinchilla) (Table 3). In the

case of Popielno White a higher weight (726.86g) and a lower in New Zealand White (658.70g) was obtained in relation to research conducted by Bielański et al. [1] (respectively 610.30g and 742.50g). Higher rabbit body weight at 35 days received Zając [10] for the New Zealand White hybrid does mixed with Belgian Giant, Checkered Giant, French Lop, but in these studies, the best indicators of reproductive performance were obtained from the combination with Checkered Giant. Researches of Tüma at al. (2010) showed high negative correlation between gestation period and litter size.

The study showed the highest fertility in the Popielno White breed (8.49 individuals), in the remaining races from 6.27 individuals (Californian) to 7.73 individuals (Blanc de Termonde). In Californian breed high rate of still-born and the highest percentage of deaths to 35 days of rearing were shown. Individual body weight at 35 days of rearing ranged from 60,3,21g (Alaskan) to 736.10g (Giant Chinchilla).

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