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Comparative assessment of fattening qualities of rabbits of different breeds under the conditions of the private farm

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A comparative assessment of the fattening qualities of rabbits of different breeds on a farm with an intensive technology of rabbit meat production was carried. The material for the study was a herd of rabbits of meat and skin breeds: Gray Giant Flander, Californian, Silver Fox. The experiment was carried by the group method. For this purpose, 30 rabbits were selected at 45 days of age and 3 groups of 10 heads were formed. Analogue rabbits were selected by breed, age, live weight, sex. The experimental livestock was housed in a shed-type room equipped with 4 rows of mesh cages arranged in two tiers, in which bunker feeders and nipple drinking bowls were installed.

The animals were fed with pellets compound feed with the addition of leguminous Herbal hay. Compound feed was distributed from bunker self-feeders, Herbal hay – from feeders (mangers). The rabbits were watered from nipple drinkers, which provided the animals with constant access to food and water. In the course of the research, the live weight of rabbits, absolute and average daily gain, relative growth rate and feed costs were studied.

It has been found that the Californian rabbits fulfill their growth potential better than the Silver Fox and Gray Giant Flander rabbits. Average daily gains in rabbits of the Californian breed were 1.8 g higher compared to analogs of the Silver Fox breed and 1.18 g higher than in the Gray Giant Flander. In terms of live weight, at the end of the experiment, the Californian rabbits were dominated by analogs of the Silver Fox breed by 116.7 g and by 90 g of Gray Giant Flander rabbits. The level of profitability of raising young rabbits for meat of the Californian breed was 12.2 %, and the Gray Giant Flander and Silver Fox breeds, respectively – 3.8 and 4.0 %.

Key words: fattening qualities, Gray Giant Flander, Silver Foxy breed, Californian breed, average daily gains, economic efficiency.

Problem statement and analysis of recent researches. Rabbit farming is a dynamic and highly efficient branch of industry. In fact, it is the only one (except for poultry farming) that allows to pay back the invested funds in the shortest possible time and to receive considerable dividends. In some countries it has become an independent livestock industry. As a result of the production concentration the farms with rational technologies, step by step exclude small traditional rabbit shed [1, 2, 3].

Common to all countries where developed rabbit breeding is that at the early stages of the industry's development, the main attention is

paid not only to feeding but also improving of the breeds' nutritional quality and feed-conversion efficiency [4].

Fecundity, high energy of growth, feed-conversion efficiency and considerable demand for rabbit meat lead to a positive trend of rabbit breeding in Ukraine. For the last 10 years, there has been a steady increase in the stock of the main herd [5, 6].

Knowledge and ability to use the biological characteristics of rabbits contributes to the successful breeding and raising for meat [7].

Formation of meat production technology involves the production of rabbit meat at an indus-

trial basis through the fullest use of their valuable biological property - high energy growth during the first 2–3 months of life [8]. This is achieved through year-round keeping of rabbits indoors with complete mechanization of basic painstaking processes, stable optimal microclimate, complete feeding, and selection of the most adapted for this technology breeds [9, 10]. Rabbit skin under this technology is considered as a byproduct [11]. Therefore, analyzing the state of this industrial branch and the prospects for further development of meat rabbit breeding, **the aim of the research** was to make a comparative assessment of the fattening qualities of rabbits of Silver Fox, Gray Giant Flander and California (brush rabbit) breeds.

Material and methods of research. The studies were conducted on the basis of a private

rabbit farm located in the Cherkasy district of Cherkasy region during the period from September 15 till November 15, 2019. The study was based on the stock of rabbits of meat breeds: Gray Giant Flander, Californian (brush rabbit), Silver Fox.

The subject of the study was infant rabbits of the above mentioned breeds. Regularities of growth and development of rabbits were studied in the process of formulation of the experiment. The experiment was carried out by the method of groups according to the scheme shown in table 1. For this purpose, 10 rabbits of each breed of 45-day age, live weight 686–715 g were selected.

Groups of young animals were formed during their removing from fattening. Age (days), breed, live weight, sex of infant rabbits was taken into

Table 1 – Scheme of the experiment

Indexes	Breeds		
	Silver Fox	Gray giant	Californian (brush rabbit)
Number of rabbits, heads	10	10	10
Age, days:			
– when placing for growing;	45	45	45
– when removing from fattening	120	120	120
Live weight when placing for growing, g	710,2±2,6	686,3±8,1	715,0±10,3

Table 2 – Granulated compound feed recipe for young rabbits (45–120 days old)

Components	Feed composition, %
1	2
Herbal hay	30
Oat	19
Barley	19
Wheat bran	15
Sunflower meal	13
Fish meal made from non-food fish	2
Hydrolyzed yeast	1
Kitchen salt	0,5
Bone meal	0,5
Synthetic lysine	–
100 g of compound feed contains:	
Dry matter, g	86,4
Feed units, g	83,6
Met. energy, MJ	0,88
Crude protein, g	18,4
Digestible protein, g	14,1
Crude fiber, g	11,5
Calcium, g	1,0
Phosphorus, g	0,6
Iron, mg	20,0
Copper, mg	0,74
Zinc, mg	4,56
Manganese, mg	6,35
Carotene, mg	3,1

account. According to the research methodology, 10 rabbits of 45 days of age were selected with a live weight of 686–715 grams. The experimental population was housed in the same premises with the other livestock.

In the course of the studies, the nutritional qualities of the rabbits were studied: live weight, absolute gain, average daily gain, relative growth rate, feed-conversion efficiency.

Feeding is typical for a rabbit farm: full-fledged granulated compound feed (designed for young rabbits aged 45–120 days) with the addition of bean Herbal hay. The granulated compound feed was fed from hopper type feeder, Herbal hay – from feeders (feeding rack). Watering was made from nipple automatic drinking bowls, which provided the rabbits with constant access to feed and water.

One of the main requirements of industrial rabbit production technology is the maximum use of high growth rate during the first three months of infant rabbits' life. This indicator is determined by the maturity, breed and individual features, milk ability of does [12, 13].

The growth rate of the infant rabbits was monitored according to their live weight at the age of 45 days (when removing), 90 days (at the end of growing up), and 120 days (at meat delivery). The rabbits were weighed on electronic scales with an accuracy of 5 grams. Taking

into account separate growing periods: 45–90, 90–120 and 45–120 days – absolute and average daily increments were calculated according to the formulas:

$$A = Wt - Wo ;$$

$$C = \frac{Wt - Wo}{t} ;$$

Where: A is the absolute increase;

C is average daily gain;

Wo is live weight of infant rabbits at the beginning of the period;

Wt is live weight of infant rabbits at the end of the period;

t is the duration of the period, days.

Calculations of the relative growth rate during the period were calculated using the formula suggested by S. Brodie:

$$Rg = \frac{(Wt - Wo) * 100}{(Wt + Wo)/2}$$

Where: Rg is the relative gain, %;

Wo is live weight of infant rabbits at the beginning of the period.

Wt is live weight of infant rabbits at the end of the period.

Feed costs were determined per 1 kg of infant rabbits live weight grown to 120 days of age. For this purpose, the feeding of feed was recorded; their nutrition (in feed units) and the amount spent per 1 kg increase in live weight of rabbits were calculated by the formula:

$$Fc = \frac{\sum q. units}{A}$$

Where: Fc – feed costs per 1 kg of gain, kg. q. units.

$\sum q. units$ – the amount of feeds that was fed, kg q. units.

A is the absolute increase in live weight of animals for the period, kg.

Biometric data processing was performed using MS Excel software and using “Statistica 10” software.

Research results. The intensive technology of rabbit meat production is used at rabbit farm. In particular, they began to feed rabbits with dry type of feeding, and they used automatic drinking bowls for rabbits, as well as mechanized removal of manure.

In accordance with current technology for growing and maintaining of rabbits, the cost of feed and labor is still quite high, respectively –

7.9 c feeding units and 66.4 man-hours per 1 c of weight gain. Because of this, the profitability level is 22.9 %.

The cost-effectiveness of rabbit production depends largely on the system of animal housing. At the rabbit farm the hangar sheds are equipped with 4 rows of double-deck mesh cages (Fig. 1), which have bunker self-feeders (Fig. 2) and nipple automatic drinking bowls (Fig. 3). The KKB–1 bunker self-feeder has a capacity for dry bulk granulated compound feed (tanker) and a feed chute that enters the cage through the hole. With the help of a special device the feeder is attached to the facade wall outside the cage. Self-feeding bunkers are designed for a 1–2-day supply of feed.

With the dry type of feeding, the constant access of rabbits to water is of particular importance. The most advantageous are nipple automatic drinking bowls, in which water is flowing and always clean. They are attached to a water pipe that is laid on the top of the cage. It consists of a case and a stem with a diameter of 3 mm mounted into the socket to move the hole in the case.

Thus, the basic labor-intensive processes at the rabbit farm are mechanized, which requires additional material costs and obliges to intensify the growing of rabbits in order to increase productivity and increase production volumes [14]. Only a greater number of kindling and growing of infant rabbits in a shorter time will ensure profitability of rabbit production. Therefore, the problem of the choice of the breed of rabbits has become top-of-the-agenda, because the breed must at most correspond to the technology that exists at the rabbit farm and helps to realize its productive and reproducible qualities.

With this aim, it has been decided to study the nutritional qualities of three breeds of rabbits: Silver Fox, Gray Giant Flander, California. We did not focus our attention on white giant rabbits, because these animals have a somewhat reduced constitution, they often suffer from pododermatitis, and there is a significant withdrawal of rabbits during the suckling period and after breaking in to milk. That's why the purpose of the farm is to refuse from breeding of this breed [15, 16].

The growth and development of infant rabbits were determined by weighing them at the age of 45 (weaning), 90 and 120 days. The results of the studies are shown in table 3.

Analysis of the data in the Table 3 shows that at the time of weaning the infant rabbits had almost the same live weight. By 90 days of age, different growth of energies caused significant

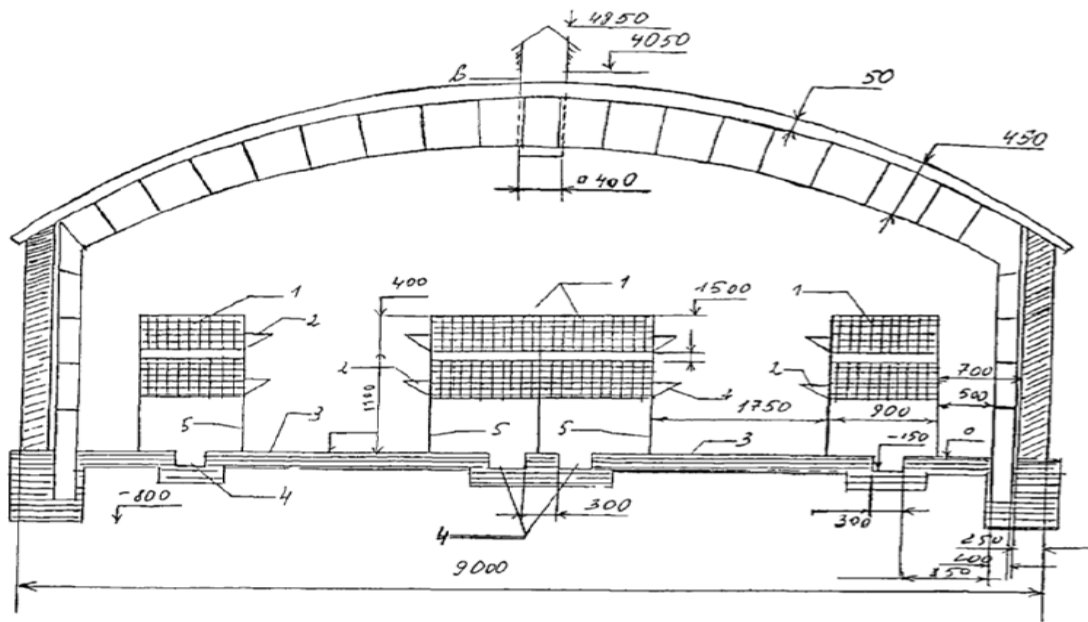


Fig.1. The rabbit house of hangar type:
 1 – cages; 2 – feeders; 3 – a passage for feeding; 4 – a dung channel.; 5 – supports;
 6 – an inflow and exhaust ventilation.

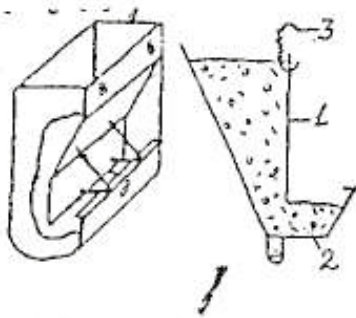


Fig. 2. Bunker self-feeder:
 1 – a tanker; 2 – a feed chute;
 3 – an attachment device.

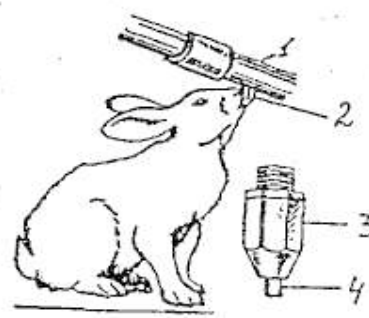


Fig. 3. Nipple Automatic drinking bowl:
 1 – a water pipe; 2 – a drinking bowl;
 3 – a drinking bowl case; 4 – a stem.

differences in live weight: 1357.1 g of Silver Foxs, 1465 g of Gray Giant Flanders and 1515.4 g of California. That is, the live weight of California rabbits was dominated by Silver Foxs by 158.3 g and Gray Giant Flanders by 50.4 g.

Next month, growing benefits of Californians continue to increase (up to 116.7 g over Silver Foxs and 90.0 g over Gray Giant Flanders) and at 120 days of age they reach the live weight of 1993.0 g. This energy of rabbits' growth is quite satisfactory.

After all, the California breed is a specialized meat breed and is characterized by high growth energy during the first 2–3 months of life. Under broiler breeding infant rabbits of this breed reach a live weight of 1.8–2.0 kg at 70 days of age, which indicates a sufficiently high genetic potential of their fattening qualities.

This is confirmed by our calculations of absolute and average daily weight gain of individual growing periods.

The absolute increase at infant rabbits of all breeds is the highest in the period from 45 to 90 days, which is the biological pattern of infant rabbits. After reaching the age of 3 months, the growth rate of rabbits decreases by almost the same level by 32–40 %. However, Silver Fox rabbits retained higher growth energy for longer and decreased it (by 32 %) in the fourth month of life, while Californians increased their live weight by 37 % and Gray Giant Flanders by 40 % more slowly.

The dynamics of average daily increments of live weight have a similar pattern: the highest average daily increments in California rabbits are 17.79 g. In the first growing period (45–90

Table 3 – The Growth and development of infant rabbits

Age	Breed			Advantages		
	Silver Fox	Gray Giant Flander	California	Gray Giant Flanders over Silver Fox ones	California over	
					Silver Foxs	Gray Giant Flanders
Live weight, g.						
45 days	710,2±2,65	686,3±8,1	715,0±10,30	-23,9	+4,8	+28,7
90 days	1357,1±20,23	1465,0±12,56	1515,4±62,12	+107,9	+158,3	+50,4
120 days	1876,3±31,86	1903,0±82,32	1993,0±105,30	+26,7	+116,7	+90,0
Complete gain, g						
45–90 days	646,9 ±17,72	778,7 ± 14,23	800,4 ±18,94	+131,8	+153,5	+21,7
90–120 days	519,2 ±18,33	438,0 ±12,53	477,6 ±23,28	-81,2	-41,6	+39,6
45–120 days	1166,0 ±39,37	1216,7±28,35	1278,0 ±38,53	+50,7	+112	+61,8
Daily live weight gain, g						
45–90 days	14,38 ±0,352	17,30 ±0,317	17,79 ±0,571	+2,92	+3,41	+0,49
90–120 days	17,31 ±0,463	14,6 ± 0,351	15,92±0,238	-2,71	-1,39	-1,32
45–120 days	15,55 ±0,285	16,22±0,347	17,40 ±0,516	+0,67	+1,85	+1,18

days) Silver Foxs had the lowest growth energy of 14.38 g per day; Gray Giant Flanders occupied an intermediate position of 17.31 g. However, during the next period their growth decreased and amounted to 14.6 g. However, the practice of previous economic use of Silver Foxs and Gray Giant Flanders proved that after 3 months age young rabbits continues to grow intensively up to 4 or even 5 months. At California rabbits, growth slows down, indicating that they are intensively grown for meat only up to 100–120 days of age.

When growing rabbits for meat, an important indicator is the outgoing of feed, because their cost determines the cost of growing young animals for meat production per 55–56 %. In our farm, rabbits are fed with complete diet pellet

forage with low Herbal hay content. The experimental animals were fed in the same way.

When feeding rabbits with full-feed granulated compound feeds, the feeding ration of young animals is 100 g of pellets and 20 g of Herbal hay during the period of 45–90 days and 120 pellets and 30 g of Herbal hay from 91 to 120 days of growing. Therefore, for the whole period, per 1 head it was spent 8.85 kg of pellets and 1.80 kg of Herbal hay, which constitutes 8.14 feed units. The farm buys granulated compound feed at 10.80 UAH per 1 kg and the cost of 1 kg of Herbal hay feed units costs about 30.00 UAH. Therefore, the calculation of outgoing feed cost shows that it is at the level of 146.34 UAH for the whole period per 1 head.

Table 4 – Feed outgoing per head by growing periods

Age	Duration of the period, days	Feed outgoing per 1 head				For all period	
		For 1 day, g		For the period, kg		Cost of feed, UAH	
		pellets	Herbal hay	pellets	Herbal hay	pellets	Herbal hay
45–90 days	45	110	20	4,95	0,9	53,46	27
91–120 days	30	120	30	3,6	0,9	38,88	27
45–120 days	75	–	–	8,85	1,8	92,34	54

The intense growth of California rabbits provides outgoing feed per 1 kg of live weight at the level of 3.9 feed units. Outgoing feed for Silver Fox and Gray Giant Flanders are 12.4–6.5 % higher, but are within the recommended range (4.0–4.5 feed units).

From the perspective of the comparative study of the breeding of rabbits of Silver Fox, Gray Giant Flander, Californian breeds, it is possible to conclude that under the conditions of private rabbit farm for production of meat it is possible to use rabbits of these three breeds. However, given that California rabbits are more mature, capable of realizing high growth rates up to 120 days of age and high feed costs, it is advisable to raise rabbits for meat up to 100–120 days of age by selling them with a live weight of 2,0–2,1 kg.

Gray Giant Flander breed rabbits and Silver Fox ones grow slower, larger ones, retain their growth ability for up to 4–5 months, but they are slightly less adaptable to conditions of industrial technology. Therefore, it is best to use them semi-intensively and to obtain heavy carcasses and large skins at 120–150 days of age.

The calculation of the production efficiency of rabbit meat in the study groups is presented in Table 5.

In the farm, expenditures for forage constitute 55 % of the total cost of production.

The analysis of the data in Table 5 confirms that under breeding of infant rabbits for meat up to 120 days of age, the Californian breed was more effective. During the specified period, 10.94 kg of meat was produced per experiment for 10 breeds of California breed, which is higher than Silver Fox and Gray Giant Flanders. The profitability of the production of California rabbit meat was 12.20 % that is above the Gray Giant Flanders per 8.82 % and Silver Fox per 8.20 %.

So, from the perspective of the executed calculations, we can conclude that among the three breeds - the Silver Fox, Gray Giant Flander and California, the California infant rabbits realize better their growth potential. The average daily increase of infant rabbits of the Californian breed was greater per 1.8 g from Silver Fox and per 1.18 g from Gray Giant Flanders. The live weight of infant rabbits of 120 days is greater than Silver Fox per 116.7 g and more than Gray Giant Flander Flanders per 90 g. The profitability level of growing the Californian breed rabbits for meat is 12.2 % and that of Gray Giant Flanders and Silver Fox ones is 3.8–4.0 %, respectively.

Table 5 – Industrial efficiency of production of infant rabbit farming (one head on the average)

Indexes	Breed			Advantages		
	Silver Fox	Gray Giant Flander	Californian	Gray Giant Flander over Silver Fox	Californian over Silver Fox	Californian over Gray Giant Flander
Number of animals, heads	10	10	10	–	–	–
Duration of the experiment, days	75	75	75	–	–	–
Gross live weight gain, kg	1166,0	1216,7	1278,0	+50,7	+112	+61,3
Live mass at the realization, g	1876,3	1903,0	1993,0	+26,70	+116,7	+90
Slaughter-weight, g	1013,2	1008,6	1094,2	-4,6	+81	+85,6
Prime-cost of 1 Carcass, UAH	146,34	146,34	146,34	–	–	–
The selling price of 1 kg of live weight, UAH	75	75	75	–	–	–
Sales value of the carcass, UAH	150	150	150	–	–	–
Proceeds, UAH	151,98	151,29	164,13	-0,69	+12,15	+12,84
Profit, UAH	5,64	4,95	17,79	-0,69	+12,15	+12,84
Profitability level %	4	3,38	12,2		+8,16	+8,82

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Порівняльне оцінювання відгодівельних якостей кролів різних порід в умовах приватного господарства Ластовська І.О., Пірова Л.В., Косіор Л.Т., Борщ О.О., Борщ О.В.

Проведено порівняльне оцінювання відгодівельних якостей кролів різних порід на фермі з інтенсивною технологією виробництва кролятини. Матеріалом для дослідження було поголів'я кролів м'ясошкуркових порід: сірий велетень, каліфорнійський, сріблястий. Дослід проводили методом груп. З цією метою було відібрано 30 кроленят 45-добового віку, з яких сформовано 3 групи по 10 голів. Кроленят-аналогів підбирали за породою, віком, живою масою, статтю. Дослідне поголів'я було розміщено в приміщенні шедового типу, обладнаному 4-ма рядами сітчастих кліток, розміщених у два яруси, у яких встановлено бункерні годівниці та ніпельні автонапувалки.

Годували тварин гранульованими комбікормами з додаванням трав'яного сіна. Комбікорм згодовували з бункерних самогодівниць, сіно – з годівниць (ясел). Напували кроленят з ніпельних автонапувалок, що забезпечувало тваринам постійний доступ до корму та води. Під час досліджень вивчали живу масу кроленят, абсолютний і середньодобовий прирости, відносну швидкість росту та затрати кормів.

Встановлено, що кроленята каліфорнійської породи краще реалізують свій потенціал росту, порівнюючи з тваринами порід срібляста та сірий велетень. Середньодобові прирости у кроленят каліфорнійської породи були на 1,8 г вищими проти аналогів сріблястої породи та на

1,18 г – сірий велетень. За живою масою наприкінці дослідного періоду кролячата каліфорнійської породи переважали аналогів сріблястої породи на 116,7 г, та на 90 г – кролячата сірих велетнів. Рівень рентабельності вирощування кролячат на м'ясо каліфорнійської породи становив 12,2 %, а породи сірий велетень і срібляста – 3,8 і 4,0 % відповідно.

Ключові слова: відгодівельні якості, сірий велетень, срібляста порода, каліфорнійська порода, середньодобової природи, економічна ефективність.

Сравнительная оценка откормочных качеств кроликов разных пород в условиях частного хозяйства

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Проведена сравнительная оценка откормочных качеств кроликов разных пород на ферме с интенсивной технологией производства крольчатины. Материалом для исследования было поголовье кроликов мясошкурковых пород: серый великан, каліфорнійський, сріблястий. Опыт проводили методом групп. С этой целью были отобраны 30 крольчат 45-суточного возраста, и сформировано 3 группы по 10 голов. Крольчат-аналогов подбирали по породе, возрасту, живой массе, полу. Опытное поголовье было размещено в помещении шедового типа, оборудованном 4-мя рядами сетчатых клеток, расположенных в два яруса, в которых установлены бункерные кормушки и nippleные автопоилки.

Кормили животных гранулированными комбикормами с добавлением бобового сена. Комбикорм скармливали с бункерных кормушек, сено – из кормушек (яслей). Поили крольчат с nippleных автопоилок, что обеспечивало животным постоянный доступ к корму и воде.

Во время исследований изучали живую массу крольчат, абсолютный и среднесуточный приросты, относительную скорость роста и затраты кормов. Установлено, что крольчата каліфорнійської породи лучше реализуют свой потенциал роста по сравнению с животными пород сріблястий и сірий великан. Среднесуточные приросты у крольчат каліфорнійської породи были на 1,8 г выше по сравнению с аналогами сріблястої породи и на 1,18 г – серый великан. По живой массе крольчата каліфорнійської породи в 120 суток преобладали аналогов сріблястої породи на 116,7, и на 90 г – крольчат серых великанов. Уровень рентабельности выращивания крольчат на мясо каліфорнійської породи составлял 12,2 %, а породы серый великан и сріблястий – 3,8 и 4,0 % соответственно.

Ключевые слова: откормочные качества, серый великан, срібляста порода, каліфорнійська порода, среднесуточные приросты, экономическая эффективность.



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