

Meat Productivity and Sexual Differentiation of New Zealand White Breed Rabbits

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ABSTRACT--- This article presents materials on the study of feed conversion depending on the age and gender of New Zealand white rabbit breeds from one month to twelve weeks. For the experiment, 30-day-old females and males of 10 animals were selected. Two groups were formed, in which the first group contained females, and the second males in the same condition and feeding. After 84 days of age, rabbits were slaughtered for meat as a broiler. Differences in meat quality, live and slaughter weight, raw fat mass, and slaughter yield of rabbits in groups were studied. The morphological structure of the carcasses was compared.

Keywords--- rabbit, meat, age, sex, granular feed, feed conversion

I. INTRODUCTION

As world populations grow in many developing countries, food demand will also increase. [13]

Today in the world the main part of people's needs for animal protein is provided by pork, poultry and cattle meat. The results of statistical analyzes show that in recent years, farmland for private farms involved in breeding animals has led to a sharp reduction, which requires a lot of space for keeping and breeding them. [22-23]

Rabbit breeding as an unconventional livestock industry plays an important role in providing the population of all countries, including developing countries with high-quality animal protein. Rabbits are characterized by fecundity, early maturity, feed conversion efficiency, a small place for keeping, and other features that distinguish them from other farm animals [17,19].

Rabbit meat is a healthy product with high nutritional value. Due to its dietary and nutritional properties (for example, tender white meat, almost free of cholesterol) in most cases, it can replace chicken. Frequent use of rabbit meat is highly recommended for pregnant women, children and the elderly. [11]

Rabbit meat has valuable nutritional benefits such as moderate lipid content (9 g / 100 g cooked meat). The relatively high selenium content (77 µg / 100 g of boiled meat) is an additional advantage, since selenium in combination with vitamin E limits oxidative stress and lipid peroxidation. Finally, it is meat with a low sodium content (49 mg / 100 g boiled meat), which is consistent with dietary salt restriction guidelines. [sixteen] From the point of view of nutrition and diet, the consumption of more mature rabbit meat is recommended for older people and people suffering from cardiovascular diseases, due to the absence of cholesterol and sodium in the composition, which negatively affects healthy people with increasing age. [21]

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According to FAOSTAT (2012), rabbits are now systematically bred on a large scale; global production of rabbit meat reaches 1.8 million tons per year. The main producer and main exporter of rabbit meat is China (735021 t / year), followed by Italy (262436 t / year); Spain (67775 t / year), Egypt (56338 t / year) and France (52955 t / year), respectively. [14]

An analysis of world production and trade by country rabbit meat shows a greater difference. There are countries that produce rabbit meat because of high domestic consumption, they depend on imports and there are countries that (for example, Hungary) export almost all of their products. In the consumption of rabbit meat per capita, there are also large differences. For example, in France, the average per capita consumption of rabbit meat is approximately 3 kg, while people in China and Hungary consume less than 100 g per capita. The largest amount of consumption in Malta (about 9 kg per capita) [10]. In general, consumption of rabbit meat in the EU is 0.5 kg per capita per year, of which 0.34 kg goes on sale [20]. Different breeds of body size are used for the production of rabbit meat: medium and large, such as New Zealand, California, Dutch gray, English spotted, chinchilla and flanders, are the most suitable in size and are suitable for the production of meat and fur. Breeds of white rabbits, such as New Zealand white and California, are the most prolific and most desirable for commercial and fur production, because white rabbit skins are usually sold at higher prices [9]. These rabbit breeds were imported from the United States of America to Europe. In the middle of the twentieth century in Europe, an explosion of a New Zealand white rabbit and its process of a California rabbit took place. Traditional European breeds (Burgundian, Argentinean, French ram) have undergone regression. As adults, it is difficult to live for these breeds; the paw pads on the mesh floors of the cells are not adapted, like New Zealand white and California rabbits. [eighteen]

In Uzbekistan, rabbit breeding has been a developing sector of livestock breeding since recent times. For the development of rabbit breeding, special attention is paid at the state level. For example, in order to develop rabbit husbandry in 2016, an agreement was reached on the supply of 1,500 heads of New Zealand rabbits from Martini, a company specializing in breeding rabbits in Italy, and delivered. To increase the number of livestock and distribute breeding rabbits throughout the Republic, 114 animals were allocated to agricultural firms.[4]In 2016, there were 14 rabbit-breeding agricultural firms in the republic; as a result of implemented program measures, by the end of 2017, 41 rabbit-growing agricultural firms were additionally created in all regions. In accordance with the agricultural development programs of the Republic, it is planned to bring the number of industrial rabbit-breeding agricultural firms to 60 units, in order to satisfy the needs of the population with highly nutritious and dietary meat products and establish export of rabbit meat [7]. To increase the number of rabbits, the removal of young from the nest is of great importance, which should be no earlier than 25–28 days so as not to adversely affect the growth and development of young [12]. According to [1; 5; 15] rabbits can be planted from the nest at the age of 28–45 days.

In Uzbekistan, much attention is paid to seeing rabbits in meat, fur and down surfacing productivity. According to the results of 2019, the number of rabbits in farms in Uzbekistan reached 112,609 heads, including 66,137 heads of breeding stock. 46.5 tons of dietary meat were produced [8].

In order for the population of Uzbekistan to consume 1 kg of rabbit meat, it is necessary to bring the population of rabbits to 12.6 million heads per capita. So far, many biological and economically useful traits, hygiene and keeping rabbits have been little studied in our republic than the rest of the livestock sector. Feeding plays an

important role in the effective management of the rabbit industry, and feed conversion is an indicator that determines the economic performance of the industry in shaping rabbit productivity.

The aim of the study is to determine the effect of age and gender on feed conversion and slaughter yield of New Zealand white breed rabbits from jigging to slaughter.

Material and methodology. The study was conducted in a multidisciplinary farm named after Ikrom Makhmudov in the Gallaaral district of the Jizzakh region of the Republic of Uzbekistan. The research material was rabbits of the New Zealand White breed. Two groups of rabbits were formed from the precipitated (after 30 days from birth), each of them consisted of ten animals by sex.

Rabbits were kept under the same condition of feeding in the rabbitry cage. During the experiment, the temperature in rabbitry was in the aisles of 16-20 ° C. The experimental groups fed the same amount of granular feed containing: wheat and barley 14.2%, wheat bran 19.0%, sunflower meal 12.3%, grass meal 23.7%, beans 16.1%, table salt 0, 5% and vitamin supplement "Polisamin Fort" 1 g / kg of feed. The live weight of the rabbit and the mass of feed (pellet) were measured at 30, 45, 60, 84 days of age (the morning before feeding) using electronic scales with an accuracy of ± 5 g. Calculation of feed conversion was calculated: by the ratio of the consumed granular feed to the live weight of the rabbit. Slaughter of rabbits was carried out according to GOST after at the age of twelve weeks as a broiler [2-3]. Indicators of slaughter yield, weight, morphological composition of the carcass was determined by the generally accepted technique in zootechnology.

The obtained data during scientific research were processed by methods of variation statistics according to E.K. Merkuriev on a personal computer using the Microsoft Excel-2007 application software package. The level of reliability of the results was determined by the criterion of student [6].

Results and discussion of the study. Before slaughter, rabbits were measured live weight and the mass of feed pellets consumed. During deposition, the average live weight of the first group was 750.5 ± 23.54 g, and that of the second group was 681.5 ± 22.79 g. At this age, the average live weight of females exceeded 69 g, or 10.12%. compared with peers of the second group (see Table 1). From jigging to 45 days of age, a total of 26.7 kg of feed pellets were consumed for each group of 13.35 kg, respectively. At this age, the consumption of average daily feed pellets was 83.4 g / day with a limit of 63-100 g (see Table 2). At this age, the average live weight of females was 1446.5 ± 34.38 g, and in the group of males 1313.5 ± 39.97 g. The difference between the groups was 133.0 ± 52.72 g ($P < 0.05$) or 10.13% were more in the group of females. The absolute increase in live weight in experimental animals was 696.0 ± 41.66 and 632.0 ± 46.01 g, respectively, or 10.13% more in the group of females than the group of males. At 30-45 days of age, the rate of feed conversion in the group of females was 1.92 kg, in males 2.11 kg.

Table 1: Spent feed pellet for rabbits

Forest, day	General, n=20	By groups		
		kg	lim	g / day
30-45	26,7	13,35	67-116	83,4
46-60	36,48	18,24	116-127	121,6
61-84	69,18	34,59	127-167	144,1

The study of the mass of spent granular feed when feeding at 46-60 days of age shows that in this period rabbits consumed 36.48 kg of granulated feed in total, which corresponds to 18.24 kg for each group. The average daily intake at this age was 121.6 g / day. In this period, feeding, the daily amount of feed consumed per head in the aisles ranged from 116 to 127 g.

At two months of age, the live weight of rabbits in the first group was 2041.5 ± 41.67 g, and in rabbits of the second group only 1937.5 ± 46.21 g. The difference between the groups was 104 g in favor of the first group i.e. live weight of females was 5.36% more than males. The absolute increase in live weight from 46 to 60 days of age in females was 595.0 ± 54.02 g, and in males 624.0 ± 61.10 g, it should be noted that the opposite tendency was observed in this period i.e. the absolute increase in live weight in males was 4.87% more than the compared groups of females. In this period, the rate of feed conversion was 3.07 kg for females and 2.92 kg for males.

Table 2 : Dynamics of live weight of experimental rabbits, g

Forest, day	Groups					
	I			II		
	$\bar{X} \pm S_x$	$C_v \%$	lim	$\bar{X} \pm S_x$	$C_v \%$	lim
30	750,5 $\pm$ 23,54	9,92	650-855	681,5 $\pm$ 22,79	10,58	600-775
45	1446,5 $\pm$ 34,38*	7,52	1310-1580	1313,5 $\pm$ 39,97	9,62	1120-1460
60	2041,5 $\pm$ 41,67	6,45	1860-2250	1937,5 $\pm$ 46,21	7,54	1775-2150
84	3051,5 $\pm$ 64,64*	6,70	2800-3350	2802,0 $\pm$ 67,27	7,59	2610-3200

Note: *- ($P < 0,05$)

II. RESULTS

Results a study of the mass of spent pellets of 61-84 days of age shows that in this period 69.18 kg of granulated feed was consumed in total, for each group 34.59 kg, respectively. In this period, in rabbits, the fluctuation in the average daily consumption of granules in the aisles amounted to 144.1 g / day (lim 127-167). After 84 days of age, the average live weight in the first group was 3051.5 ± 64.64 g, and in the second group 2802.0 ± 67.27 g. Live weight of females was 249.5 ± 93.29 g ($P < 0,05$), or 8.9% more than in comparison with the group of males. In this growth period, the feed conversion rate was 3.42 kg for females and 4.00 kg for males.

During the period from 30 to 84 days of age, only 66.18 kg of granular feed was consumed for each group of rabbits. As a result, for 1 kg of weight gain, the body spent for the group of females is 2.88 kg, and for the group of males, 3.12 kg or 8.3% more than the granulated feed.

The data on the study of slaughter indicators and the morphological composition of the carcass of experimental rabbits are shown in table 3.

Table 3 : Rabbit slaughter rates

Indicators	Groups	
	I	II

	$\bar{X} \pm S_x$	lim	$\bar{X} \pm S_x$	lim
Before slaughter weight	3051,5±64,64	2800-3350	2802,0±67,27	2610-3200
Slaughter weight	1729,5± 39,51**	1552,5-1900	1521,8±47,53	1394-1774,5
Wounding %	56,67	55,45-57,72	54,31	52,60-55,45
Steam carcass	1575,0±35,14	1430-1725	1467,0±45,54	1360-1720
Carcass, %	51,60±0,16	50,85-52,50	52,79±0,29**	51,32-53,99
Raw Fat Weight	154,5±5,04***	140,5-167	41,3± 2,52	31,5-54,5
Raw Fat Yield, %	5,06**	4,38-5,50	1,47	1,19-1,75

Note: *- ($P < 0,05$), **-($P < 0,01$), ***-($P < 0,001$).

The slaughter weight of rabbits of group I was 1729.5 ± 39.51 g, which was 207.7 g more ($P < 0.01$) compared to group II. According to the lethal yield, rabbits of group I exceeded their peers by 2.36%. The weight of the pair carcass was also superior to group I rabbits by 108.0 g than the group II, but in terms of the yield of the pair carcass, on the contrary, group II rabbits exceeded their peers in group I by 1.19%.

The study of the content of raw fat in the carcass of experimental animals shows that the tendency to raw fat in females was greater, which can be determined even visually.

In the first group of rabbits, the weight of the raw fat was 154.5 ± 5.04 g, and the second 41.3 ± 2.52 g, i.e. the weight of raw fat in females was 113.2 g more ($P < 0.001$) than group II rabbits. The same trend was also observed in the yield of raw fat, the yield of raw fat in group I was 5.06%, which was 3.59% more ($P < 0.001$) than rabbits in group II.

An analysis of the data on the morphological composition of the carcasses of experimental rabbits shows that sexual differentiation is also observed by this indicator. The data obtained by studying the morphological composition of the carcasses of experimental rabbits are shown in table 4.

Table 4: Morphological composition of carcasses of rabbits

Indicator	Group			
	I		II	
	$\bar{X} \pm S_x$	lim	$\bar{X} \pm S_x$	lim
The composition of carcasses, g				
Cooled carcass	1698,5±38,33	1527,5-1860	1507,9±44,09	1382-1760,5
Fat	154,5±5,04	140,5-167	41,3± 2,52	31,5-54,5
Pulp	1273,6±30,8	1160-1392	1187,20±36,6	1076-1384
Bones,	217,8±4,17	195-240	220,1±5,43	200-255
Tendon	52,6±1,36	47-59	59,3±1,52	54-67
Выход, %				
Fat	9,09±0,16	8,02-9,86	2,74±0,11	2,35-3,18
Pulp	74,98±0,28	73,32-75,86	78,72±0,27***	77,72-80,36

Bones,	12,83±0,23	11,59-13,78	14,59±0,15	13,65-15,34
Tendon	3,10±0,08	3,31-4,01	3,95±0,11	3,32-4,58
Ratio				
Pulp / bone	5,85±0,13*		5,40±0,09	
Pulp / Fat	8,24±0,17		28,75±1,19	

Note: *- (P<0,05),***-(P<0,001).

The pulp yield in group I was 1273.6 ± 30.8 g, i.e. 86.4 g or 7.28% more than group II rabbits. But the opposite tendency was observed for the yield of carcass flesh. In the second group, it amounted to $78.72 \pm 0.27\%$, which was 3.74% more (P <0.001) than rabbits of group I.

In the carcass of rabbits of group II, the content of bones and tendons was higher by 2.3; 6.7 g, respectively, compared with group I rabbits. The same tendency was also observed in the yield of bones and tendons, i.e. the proportion of bones and tendons in the carcass of group II was greater by 1.66% and 0.85% (P <0.001), respectively.

The ratio of bone mass to pulp mass largely determines the level of meat productivity of rabbits. According to the meat index, rabbits of group I had an advantage compared to colic of group II by 0.45 units. The ratio of flesh to fat determines the dietary level of meat. This ratio of pulp to fat in experimental animals shows that the advantage was in the carcass of rabbits of group II by 20.51 units.

III. FINDINGS

Based on the data obtained, the following conclusions can be drawn:

- to obtain a gain in live weight, the degree of feed conversion increases with age.
- not only age, but also gender affects the conversion of rabbit food.
- females have less feed conversion than males.
- males accumulate less fat than females
- yield% carcasses of males more than females

Consideration of age and gender for feeding rabbits is an important factor affecting feed conversion.

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