

Indicators of meat productivity of turkeys of various crosses

*Elena Arakcheeva*¹, *Elena Golovko*¹, *Nikolay Zabashta*¹, and *Irina Sinelshchikova*^{1*}

¹Krasnodar Research Centre for Animal Husbandry and Veterinary Medicine, 4, Pervomayskaya Street, 350055, Krasnodar, Russia

Abstract. In the raw material zone of baby food producers in the Krasnodar Territory, a large Ermakov farm supplies turkey to the Branch “Plant of canned meat for children Tikhoretsky JSC “Danon Russia”. According to the results of the slaughter of five-month-old turkey of two crosses, White broad-breasted and Hybrid Converter, high indicators of meat productivity were established: slaughter yield (81.2 and 85.0 %), yield of meat suitable for baby food 62 % and 65 % , the yield of white breast meat - 23 and 25 %, respectively, for the White broad-breasted and Hybrid Converter crosses. In terms of meat yield from five-month-old turkeys, the advantage of the Hybrid Converter cross has been proven. On the basis of the studies carried out, it can be concluded that the meat of the turkey of the White broad-breasted and Hybrid Converter crosses have a high biological value in terms of chemical and amino acid composition.

1 Introduction

The market demand for lean turkey meat determines the great potential for increasing the production of dietary poultry meat [1]. According to BusinessStat estimates, from 2015 to 2020, sales of turkey meat in Russia increased by 40 % [3-5]. The rearing of young turkeys for meat deserves serious attention [6]. With relatively low costs in the industrial and farm conditions of the Krasnodar Territory, it is possible to fully satisfy the demand for dietary meat and produce baby food products from the meat of the best adapted crosses.

Most pediatricians recommend the inclusion of turkey meat in the diet of children at an early age (8-10 months) as one of the first foods because of the high levels of protein, haem iron and zinc in muscle tissue [4]. Turkey meat is rich in vitamin B₁₂, folic acid, selenium, potassium, magnesium, iron, phosphorus. The recommended daily (or dietary) allowance (RDA) for selenium for adults is 0.055 mg / day, while the WHO and FAO have set the daily tolerated dose at the rate of 0.4 mg / day [7].

In the United States, meat turkeys are distinguished depending on the age and degree of calcification of the keel bone (sternum). Slaughter weight is reached within 84 - 140 days, depending on gender and season. Males and females are raised separately [8].

Turkey meat in the Krasnodar Territory is produced all year round, and this can become an important source of increasing meat production and expanding its range. Although the

* Corresponding author: ms.basana@list.ru

turkey has a longer period to reach marketable condition compared to broiler chickens, in retail trade, turkey meat is twice as expensive.

White broad-breasted turkeys dominate in our region. They are characterized by excellent meat qualities, high maturity and egg production, good presentation of carcasses. This bird was highly regarded in Russia and became one of the most widespread. At present, manufacturers consider Big-6, Byut-8, and Canadian broad-breasted, Moscow bronze, White broad-breasted and Hybrid converter crosses the best for growing for meat. The Canadian Hybrid Converter is a medium-heavy cross with high productivity in a variety of keeping conditions. The cross Hybrid Converter is based on a bronze broad-breasted, as well as a white Dutch turkey. The hybrid is characterized by unpretentiousness, vitality and endurance.

2 Research methodology

The objects of research were turkeys of two medium crosses Hybrid Converter and White broad-breasted.

The main purpose of our research was to study and compare the meat productivity of the Hybrid Converter and White broad-breasted turkeys at the optimal age of their sale for meat.

Subjects of research - composition and nutritional value of the diet, feed consumption per 1 kg of live weight gain, dynamics of live weight, meat productivity, morphological composition of the carcass, chemical composition and energy value of meat, meat safety indicators in accordance with the standard requirements for baby food [SSRF 52820-2007].

The biochemical composition of meat samples was investigated in the laboratories of the Argus test center of the Krasnodar Research Centre for Animal Husbandry and Veterinary Medicine. The mass fraction of moisture was determined by drying the sample according to the standard procedure. Protein mass fraction - by the Kjeldahl photometric method, fat mass fraction - using a Soxhlet extraction apparatus; mass fraction of ash - by ashing; the mass fraction of calcium - by the method of flame atomic absorption spectroscopy; mass fraction of phosphorus - by spectrophotometric method. The energy value of turkey meat (E kcal / 100 g of meat) was calculated by the formula (1):

$$E = 4.0 P + 9.0 F + 4.0 C \quad (1)$$

B - Is the mass of protein, g / 100 g of meat; F - mass of fat, g / 100 g of meat; C - mass of carbohydrates, g / 100 g of meat. The coefficients for proteins, fats and carbohydrates - are 4.0; 9.0; 4.0.

The Ermakov farm (Kopanskoy khutor, Krasnodar Territory) supplies turkey to the Branch "Factory of children's canned meat Tikhoretsky JSC "Danon Russia ". Scientific and economic studies to study the meat productivity of turkeys of two crosses were carried out in accordance with the experimental scheme (Table 1, Fig. 1).

Table 1. Scheme of the experiment *, n = 50.

Group, cross	Features of poultry feeding in the experiment from 7 to 154 days
1, White broad-breasted	Experimental diet from one week of age
2, Hybrid Converter	

Note: the duration of the experiment is 154 days, the slaughter is at 5 months.



Fig. 1. cross Hybrid Converter and White broad-breasted in Ermakov farm, Kopanskoj (placement of poultry on the farm - 1200 heads per 300 m²; placement in the experiment, 50 heads in two sections, 2-3 heads per m²).

One control and one experimental group of one-week-old turkeys vaccinated against Newcastle disease were formed using the method of analog pairs. The birds were kept in identical conditions of a standard room in separate sections of 50 heads for each group, separated by a net for 25 males and 25 females. The turkey chicks were kept without a run in a dry room, without drafts, on open dry ground, with a replaceable straw bedding (Fig. 2).



Fig.2. Left – weighing of one-week-old chick turkeys; right - two-week-old chick turkeys.

Feeding and drinking took place self-pecking from semi-automatic feeders and conical hanging drinkers. The feeding ration in the experiment was a standard compound feed - groats and granules according to the periods of growth and fattening (start; growth; finish (Table 2).

The diet is nutritionally complete in relation to the needs of turkeys (NRC, 1994) and meets safety requirements for baby food.

In our diet, the content of methionine, which plays an important role in the enrichment of meat with selenium, is 30% higher than the recommended norms. The increased methionine content in the diet, exceeding the NRC (1994) recommendations by 50 %, resulted in higher meat productivity, but reduced the pH and dry matter content to 21 % [1].

Birds were additionally vaccinated in the period up to 2 months of age against smallpox of birds, the second time - against Newcastle disease, and at two months - against cholera. It was found that when using 5-6 hours of food starvation before slaughter, the loss of live weight in poultry is minimal and averages from 0.2 to 0.4 % of live weight per hour (1.8 % per 6 hours).

Table 2. Composition and nutritional value of the turkey mixed feed.

Item	Feeding period (weeks)			
	1-8	9-13	14-22	
Ingredients, %				
Wheat	30.00	40.00	40.00	
Barley	-	15.00	22.00	
Corn	19.00	4.00	3.00	
Oat bran	-	1.00	3.67	
Soybean meal, crude protein 39 % crude protein 52 %	41.52	29.85	20.00	
Sunflower meal	-	4.00	5.00	
Fish meal (State Standard 2116-2000), crude protein 62 %	3.00	-	-	
Soybean oil	2.10	3.00	3.57	
L-lysine HCl	0.38	0.36	0.32	
L-threonine	0.09	0.09	0.06	
L-methionine	0.12	0.09	0.08	
Feed limestone, 38 % calcium	1.41	0.87	0.76	
Sodium sulfate feed	0.14	0.14	0.14	
Salt	0.13	0.13	0.13	
Monocalcium phosphate feed, 18 % calcium, 23% phosphorus	1.61	0.97	0.77	
Vitamin and mineral premix ¹	0.5	0.5	0.5	
Nutritional value of 1 kg of mixed feed				
Metabolizable energy for poultry, kcal	2800	3100	3200	
Dry matter, g	900.0	880.0	870.0	
Crude protein, g	270.0	210.0	180.0	
Including:	Lysine, g	17.5	13.4	11.1
	Threonine, g	12.3	9.4	7.8
	Methionine +Cystine, g	9.6	7.5	6.8
	Arginine, g	17.2	13.0	10.7
Crude fat, g	5.0	75.0	100.0	
Including:	Linoleic acid, g	1.5	2.1	3.0
Crude fiber, g	40.0	50.5	60.5	
Calcium, g	13.0	12.0	10.5	
Phosphorus, g	8.1	6.0	5.5	

Note: ¹ - in 1 kg of mixed feed: vitamin A (retinol acetate) – 1.000 IU, vitamin D₃ (cholecalciferol) - 5.000 IU, vitamin E (α-tocopheryl acetate) - 100 mg, vitamin K₃ - 4 mg, vitamin B₁ - 5 mg, vitamin B₂ - 15 mg, vitamin B₆ - 6 mg, niacin - 100 mg, biotin - 0.35 mg, pantothenic acid - 32 mg, nicotinic acid - 100 mg, folic acid - 4 mg, choline chloride - 700 mg, Mn - 100 mg, Zn - 80 mg, Fe - 60 mg, Cu - 20 mg, I - 1.55 mg, Se - 0.32 mg, Ca - 1.07 g.

At the age of five months (154 days), after 6 hours of starvation, a control slaughter was carried out for birds with a live weight as close as possible to the average for the group (15 ♀ and 15 ♂ from each group, n = 30). Cutting and boning of gutted turkey carcasses was carried out according to the standard methodology of the All-Russian Research Institute of the Poultry Processing Industry. We determined: live weight, carcass weight, slaughter yield, chemical composition of meat, quality characteristics of turkey meat, including the muscle and bone index - the ratio of muscle tissue without skin to bone and the ratio of muscle tissue with skin to bone, safety (the content of residual amounts of toxic substances of a technogenic and biological nature).

3 Research results and discussion

When studying the chemical composition of compound feeds of the ration, their high nutritional value was established (Table 2).

In the period from the beginning of the experiment for 3 months, in the first group, the daily live weight gain was 79.0 g for females, 105.0 g for males. In the second group, the live weight gain of the Hybrid Converter was 101.0 and 136.0 g respectively.

From three to five months in the first group, the daily live weight gain was 64.0g for females, 140.0 g for males. In the second group, the increase in live weight of the Hybrid Converter was 64.9 and 186.0g, respectively. Thus, the daily live weight gain of the birds under the age of three months was 30 times more intense in comparison with the growth rate from 3 to 5 months (Table 3).

Table 3. Dynamics of poultry live weight in the experiment, (feed consumption), kg, n=50.

Age, weeks	1, White broad-breasted		2, Hybrid Converter	
	females	males	females	males
1, start of experiment (7 days)	0.14	0.16	0.15	0.16
4 (28 days)	1.03 (40.0)	1.22 (55.1)	1.16 (39.8)	1.28 (59.0)
8 (56 days)	3.30 (150.0)	4.10 (258.7)	4.05 (152.5)	4.84 (274.6)
13 (91days, 3 months)	6.80 (327.2)	8.96 (458.6)	8.66 (330.45)	11.55 (491.5)
17 (119 days)	9.34 (357.9)	12.97 (468.0)	11.40 (360.1)	17.40 (510.9)
22 (154 days, 5 months)	10.84 (548.6)	17.79 (655.0)	12.75 (545.0)	23.24 (858.3)
22 (154 days, 5 months), after 6 hours of starvation before slaughter, kg	10.69 (0.0)	17.56 (0.0)	12.57 (0.0)	22.94 (0.0)

The feed consumption for the entire experiment period per head in the first group was 28.5 kg for females and 37.9 kg for males. In the second group, the feed consumption per experiment per head for females and males was 28.6 and 43.9 kg, respectively. Feed consumption per 1 kg of live weight gain was 2.6 and 2.1 kg for females and males of the first group, and 2.2 and 1.9 kg for the second group. According to the authors' data, for Big-6 turkeys, the average feed conversion rate was 2.8 [9].

Table 4. Slaughter indicators of female ♀ turkey carcasses, n = 15.

Indicator	Group, cross	
	1, White broad-breasted	2, Hybrid Converter
Pre-slaughter weight, kg	10.69±0.19	12.57 ±0.14*
Semi-gutted carcass weight with giblets and neck, kg	8.59±0.09	10.43±0.11*
slaughter yield, %	80.4 %	83.0 %
Gutted carcass weight, kg	7.47±0.06	9.28±0.09 *
including breast, kg	2.61±0.08	3.44±0.08*
%	35.0	37.1
including thigh, kg	1.24±0.06	1.60±0.07*
%	16.6	17.2
including drumstick, kg	1.10±0.05	1.35±0.06*
%	14.7	14.6
including backs, kg	1.49±0.04	1.72±0.08*
%	20.0	18.5
including wings, kg	0.90±0.06	1.02±0.02
%	12.0	11.0
including rumps, kg	0.13±0.04	0.15±0.02
%	1.7	1.6

Note: * - p <0.05

In terms of fatness and quality, the carcasses of both crosses were classified as Class I [IS 31473-2012]. The anatomical cut values are shown in Table 4.

The Hybrid Converter turkeys outnumbered the White Broad-breasted turkeys in the following indicators: Pre-slaughter weight - by 17.6; the mass of a semi-gutted carcass - by 21.4; slaughter yield - by 2.6; gutted carcass weight - by 24.2 %. Breast with skin and bone accounted for 35.0 % and 37.1 % in gutted turkeys of the White broad-breasted and Hybrid Converter crosses, respectively.

Turkeys of the Hybrid Converter cross also surpassed the White broad-breasted cross in terms of Pre-slaughter weight - by 30.6; the weight of a semi-gutted carcass - by 36.7; slaughter yield - by 3.8 %; gutted carcass weight - by 38.3 %. Breast with skin and bone accounted for 34.5 and 37.2 % in gutted turkey carcasses of the White broad-breasted and Hybrid Converter crosses, respectively (Table 5).

Table 5. Slaughter indicators of the carcass of male ♂ turkey, n = 15.

Index	Group, cross	
	1, White broad-breasted	2, Hybrid Converter
Pre-slaughter weight, kg	17.56 ±0.21	22.94 ±0.26*
Semi-gutted carcass weight with giblets and neck, kg	14.26±0.11	19.50±0.15*
Slaughter weight, %	81.2 %	85.0 %
Gutted carcass weight, kg	11.84±0.06	16.38±0.09*
including breast, kg	4.18±0.08	6.10±0.08*
%	34.5	37.2
including thigh, kg	2.06±0.06	2.93±0.07*
%	17.7	17.9
including drumstick, kg	1.60±0.05	2.09±0.06*
%	13.6	12.8
including backs, kg	2.50±0.05	3.24±0.07*
%	21.4	19.8
including wings, kg	1.33±0.03	1.79±0.02*
%	11.3	10.9
including rumps, kg	0.17±0.05	0.23±0.03
%	1.5	1.4

Note: * - p <0.05

Table 6. The morphological composition of females ♀ carcasses of two crosses, n = 15.

Index	Group, cross	
	1, White broad-breasted	2, Hybrid Converter
Gutted carcass weight, kg	7.47±0.06	9.28±0.09 *
The flesh (muscles, skin and connective tissue), kg	5.55±0.04	7.05±0.06*
Meat (muscle tissue), kg	4.64±0.03	6.03±0.04*
Skin and connective tissue, kg	0.91±0.03	1.02±0.03
Bones, kg	1.92±0.04	2.23±0.04
Flesh yield, %	62.10	64.97
Breast weight, kg	2.61±0.06	3.44±0.07*
Including breast flesh, kg	2.07±0.03	2.78±0.04*
Including breast meat (muscle tissue), kg	1.75±0.02	2.37±0.04*
Including skin and connective tissue of the breast, kg	0.33±0.02	0.41±0.02*
Including breast bones, kg	0.54±0.03	0.66±0.03
Meat and bone index (the ratio of flesh to the bone)	2.89	3.16
White breast meat yield, %		
- muscle and bone index (ratio of muscle tissue to bone)	2.42	2.70
- breast bone and muscle index (ratio of breast muscle to bone)	3.24	3.59

Note: * - p <0.05

In general, the results of anatomical dressing showed that males and females of the Hybrid Converter had higher slaughter rates.

The morphological composition of the carcasses of females and males of two crosses was assessed in terms of the yield of edible and inedible parts, as well as the meat-and-bone index for carcasses and the muscle-bone index for carcasses and breasts (Tables 6 and 7).

Table 7. The morphological composition of male carcasses ♂ of two crosses, n = 15.

Index	Group, cross	
	1, White broad-breasted	2, Hybrid Converter
Gutted carcass weight, kg	11.84±0.06	16.38±0.09*
Flesh (muscles, skin and connective tissue), kg	8.92±0.05	12.58±0.07*
Meat (muscle tissue), kg	7.47±0.08	10.81±0.08*
Skin and connective tissue, kg	1.44±0.09	1.77±0.06
Bones, kg	2.92±0.07	3.80±0.07*
Breast weight, kg	4.18±0.08	6.10±0.08*
Including breast flesh, kg	3.39±0.04	4.95±0.05*
Including breast meat (muscle tissue), kg	3.03±0.04	4.56±0.05*
Including skin and connective tissue of the breast, kg	0.35±0.02	0.39±0.02
Including breast bones, kg	0.79±0.05	1.15±0.07*
Meat and bone index (the ratio of flesh to the bone)	3.05	3.31
Muscle-bone index (ratio of muscle tissue to bone)	2.56	2.84
Breast bone and muscle index (ratio of breast muscle to bone)	3.84	3.97

Note: * - p < 0.05

The morphological analysis of carcasses and the indices for assessing the meat qualities of the studied crosses indicate a significant advantage of the Hybrid Converter cross in terms of such indicators as gutted carcass weight, flesh, meat (see Tables 6, 7).

The chemical composition of the total minced meat from white and dark meat of males and females (for the production of canned baby food) is shown in Table 8.

Table 8. Chemical composition and caloric content of meat of two crosses (total minced meat), n = 15.

Index, g/100 g of meat	White broad-breasted	Hybrid Converter
Hydrogen ion activity, pH *	5.9	5.9
Mass fraction of moisture	69.98±0.13	69.25±0.12**
Mass fraction of fat	8.73±0.02	7.29±0.01**
Mass fraction of protein	22.15±0.03	23.87±0.03**
Mass fraction of ash	0.94±0.03	0.95±0.01
Mass fraction of total phosphorus	0.15	0.16
Mass fraction of nitrogen-free extractive substances	0.14±0.01	0.14±0.01
Caloric content, kcal / 100 g of meat	155.12±4.15	151.12±4.50

Note: * - negative decimal logarithm of hydrogen ion concentration;

** - p < 0.05

In the total minced meat from the carcasses of males and females of the White broad-breasted and Hybrid Converter crosses, the fat content amounted - 8.73 ± 0.02 and $7.29 \pm 0.01\%$, respectively. In the total minced white and dark meat of males and females of the Hybrid Converter cross, suitable for the production of canned food for children, there is 7.7% more protein mass fraction compared to the White broad-breasted cross. However, according to other authors [7, 10 -17], the average mass fraction of protein in turkey meat (16.87%) was significantly lower than in our experiment (22.15 ± 0.03 and 23.87 ± 0.03 g / 100 g of natural meat) for crosses White broad-breasted and Hybrid Converter, respectively

[9]. The need for digestible protein, primarily for essential amino acids, is higher in a child's body than in an adult [4]. The results of research on the protein value of total minced meat from white and dark meat of the White broad-breasted and Hybrid Converter crosses showed that it is optimally balanced in terms of amino acids (Table 9).

Table 9. Amino acids and quality indicators of total minced meat protein from natural white and red turkey meat of two crosses, g / kg (n = 12).

Amino acids	White broad-breasted	Hybrid Converter
Essential		
Lysine	17.7641	19.3795*
Threonine	10.0328	11.7633*
Methionine +Cystine	9.3181	10.8655*
Isoleucine	8.8591	9.6647*
Leucine	13.9785	15.8042*
Valine	8.7650	10.9257*
Phenylalanine + tyrosine	15.6178	17.9916*
Tryptophan	3.2957	3.5954*
Arginine	6.7411	7.7178*
Histidine	7.1931	8.3928*
Nonessential		
Proline	7.6472	8.34273
Asparaginic acid	34.0318	31.1266
Serine	14.0827	15.3634
Glutaminic acid	30.1026	29.8401
Glycine	15.9372	17.3865
Alanine	18.3707	20.1322
Mass fraction of crude protein (N*6.25)	211.88	231.15
The amount of essential amino acids (EAA)	98.5653	113.1005
The amount of nonessential amino acids (NAA)	120.1722	122.19153
Sum of amino acids (SAA)	218.7375	235.292
EAA / NAA ratio	0.82	0.93
EAA / SAA ratio	0.45	0.48
Oxyproline	0.4590	0.5007
PQI	7.1	7.2

Note: * - p < 0.05

Table 10. Amino acid rate of total minced turkey meat in relation to ideal protein for children under 3 years old (n = 12).

Amino acid	Ideal protein for children from 1 to 3 years old, g / 100 g of protein, FAO WHO	White broad-breasted		Hybrid Converter	
		g/100 g of protein	Rate, %	g/100 g of protein	Rate, %
Lysine	5.80	5.91	101.9	5.96	102.8
Threonine	3.40	3.01	88.5	3.29	96.8
Methionine +Cystine	2.50	2.77	110.8	3.01	120.4
Isoleucine	2.80	2.62	93.6	2.65	94.6
Leucine	6.60	4.66	70.6	4.83	73.2
Valine	3.50	2.92	83.4	3.34	95.4
Phenylalanine+ tyro-sine	6.30	5.20	82.5	5.49	87.1
Tryptophan	1.10	1.09	99.1	1.10	100.0
Arginine	2.50	2.25	90.0	2.36	94.4
Histidine*	2.60	2.66	102.3	2.87	110.4

Note * - histidine is an essential amino acid for children at early age

The amino acid rate relative to the ideal protein for young children (FAO WHO) is higher than 82 %, with the exception of leucine (in the meat protein of two crosses, the leucine deficiency is about 30 %). The amino acid rate of tryptophan is set at 100 %, and that of lysine, histidine, and methionine is more than 100 % (Table 10).

Studies of samples of total minced meat of the cross White broad-breasted and Hybrid Converter showed that the residual amounts of toxic substances of a technogenic and biological nature, antibiotics, pesticides and toxic microorganisms, are at the lower permissible levels and detection limits (Table 11).

Table 11. Residual amounts of toxic substances in the total minced meat of white and dark turkey meat of two crosses (n = 12).

Regulatory document on the test method	Indicator name	MPL***	Analysis result	
			White broad-breasted	Hybrid Converter
Toxic elements, mg / kg:				
SS (State Standard) 30178-96	Lead, mg / kg	≤ 0.1	0.042±0.02	0.048±0.02
SS 26930-86	Arsenic, mg / kg	≤ 0.1	< 0.0025**	< 0.0025**
SS 30178-96	Cadmium, mg / kg	≤ 0.03	< 0.005	< 0.005
Guideline № 5178-90; SS 26927;	Mercury, mg / kg	≤ 0.02	< 0.005**	< 0.005**
Pesticides:				
Methods for the determination of trace amounts of pesticides in food, feed and the environment. Ed. M.A. Klisenko, vol. 1, 1992. Ed. "Kolos"	Hexachlorocyclohexane - HCH (α, β, γ-isomers), mg/kg	≤ 0.02	< 0.005**	< 0.005**
	DDT and its metabolites, mg/kg	≤ 0.01	≤ 0.005**	≤ 0.005**
	Other pesticides (aldrin, dieldrin, hexachlorobenzene, heptachlor, endrin, 2,4-D, thiram mg / kg	≤ 0.01	not detected	
Radionuclides Bq / kg:				
Guideline 2.6.1.1194-03	Cesium-137	200	2,2	2,4
Antibiotics:				
Guideline 4.1.1912-04	Levomycetin (mg / kg)	≤ 0.01	≤ 0.0003**	<0.0003**
SS 31903-2012	Tetracycline group (units/g)	≤ 0.01	< 0.01	< 0.01
	Bacitracin (units / g),	≤ 0.02	< 0.01	< 0.01
Microbiological indicators:				
SS 10444.15-94	MAFAM, CFU / g	≤ 2.0 x 10 ⁵	2.0 x 10 ²	2.8 x 10 ²
SS 31747-2012	Coliform bacteria (coliforms) in 0.01 g	not allowed	not detected	not detected
SS 31659-2012	Pathogenic microorganisms, incl. salmonella in 25.0 g	not allowed	not detected	not detected
SS 32031-2012	L. monocytogenes in 25gr	not allowed	not detected	not detected
SS 28560-90	Proteus bacteria, in 1.0 g	not allowed	not detected	not detected

Note: * - activity of hydrogen ions or negative decimal logarithm of the concentration of hydrogen ions; ** - lower detection limit; *** - TR CU 021/2011 "On food safety", approved by the decision of the Technical Council Committee dated December 09, 2011 No. 880; TR CU 034/2013 Technical regulations of the Customs Union "On the safety of meat and meat products."

When studying the microelement composition of the meat of turkeys of two crosses, it was found that in terms of the content of macro- and microelements, it corresponds to the needs of the child's body in macro- and microelements (Table 12).

Table 12. Content of chemical elements in the total minced meat of white and dark turkey meat of two crosses, mg / kg (n = 12).

Item	White broad-breasted	Hybrid Converter
Cu (copper)	1.42±0.4	1.42±0.4
Zn (zinc)	28.05±1.2	25.10±1.2
Fe (iron)	20.55±0.2	24.12±0.2*
Se (selenium)	0.32±0.02	0.35±0.01
I2 (iodine)	0.04±0.01	0.06±0.02
K (potassium)	2500.00±11.0	2415.00±11.0
P (phosphorus)	1600.00±16.5	1645.00±13.5
Na (sodium)	1904.45±12.0	1898.22±15.5
Mg (magnesium)	212.5±1.5	234.5±7.2*
Ca (calcium)	112.10±0.02	114.06±0.06

Note: * - p < 0.05*

An increased content of the essential microelement selenium was found in the turkey meat of the White broad-breasted and Hybrid Converter crosses 0.32 ± 0.02 and 0.35 ± 0.01 mg / kg, respectively. The permissible level of selenium in raw meat for baby food has not yet been regulated. The selenium requirement for a child under 1 year old is 0.012 mg / day; 1-3 years - 0.015 mg / day; from 3 to 12 years old - 0.020 mg / day. Thus, for a three-year-old child, 46 g of turkey meat from the White broad-breasted cross or 43 g of turkey meat from the Hybrid Converter will provide the daily requirement for selenium.

4 Conclusion

In the raw material zone of baby food producers in the Krasnodar Territory, a large Ermakov farm supplies turkey to the Branch "Plant of canned meat for children Tikhoretsky JSC "Danon Russia". According to the results of the slaughter of five-month-old turkey of two crosses, White broad-breasted and Hybrid Converter, high indicators of meat productivity were established: slaughter yield (81.2 and 85.0 %), yield of meat suitable for baby food – 62 % and 65 % , the yield of white breast meat - 23 and 25 %, respectively, for the White broad-breasted and Hybrid Converter crosses. In terms of meat yield from five-month-old turkeys, the advantage of the Hybrid Converter cross has been proven. On the basis of the studies carried out, it can be concluded that the meat of the turkey of the White broad-breasted and Hybrid Converter crosses have a high biological value in terms of chemical and amino acid composition. Turkey meat of both crosses had a high protein quality indicator (PQI - 7.1 and 7.2), optimal in relation to the need of young children for essential amino acids.

In terms of safety indicators, turkey meat of the White broad-breasted and Hybrid Converter crosses met the SSRF 52820-2007 requirements for meat raw materials for baby food.

References

1. D. Murawska, M. Kubińska, M. Gesek, Z. Zdunczyk, J. Jankowski, *Annals of Animal Science* **18(2)**, (2018) Doi: 10.2478/aoas-2018-0007.

2. K. Amirkhanov, A. Igenbayev, A. Nurgazezova, et al., *Pakistan Journal of Nutrition*, **16(6)** 412-416 (2017) doi: 10.3923/pjn.2017.412.416
3. B. Söğüt, T. Ayasan, Ş. Çelik, et al., *Journal of the Institute of Science and Technology*, **6(2)**, 151-151 (2016) doi: 10.21597/jist.2016218858
4. Z.Y. Belyakova, I.A. Makeeva, N.V. Stratonova, et al., *Foods and Raw Materials*, **6 (1)**, 4–13 (2018) doi: 10.21603/2308-4057-2018-1-4-13.
5. V.I. Fisinin, M.I. Selionova, L.A. Shinkarenko, N.G. Shcherbakova, L.V. Kononova, *Sel'skokhozyaistvennaya Biologiya* **52 (4)**, 739-748 (2017)
6. E.P. Lisovitskaya, N.Y. Sarbatova, O.V. Sycheva, L.V. Kononova, *Research Journal of Pharmaceutical, Biological and Chemical Sciences* **T. 10. № 1**, 995-999 (2019)
7. R. Tóth, J. Csapó, *Acta Universitatis Sapientiae Alimentaria*, **11(1)**, P.128-144 (2018) doi: 10.2478/ausal-2018-0008
8. M. Darrin Karcher, J. A. Mench, *Advances in Poultry Welfare*, 29-48 (2018) Doi: 10.1016 / b978-0-08-100915-4.00026-9
9. S. Gibril, H.A. Hassan, O.E. Yassin, and R.M. Shamseldin, *U. of K. J. Agric.*, **21(1)**, 99-115 (2013)
10. M.H. Rostagno, *Journal of Animal Science*, **090**, 98(4) (2020) doi: 10.1093/jas/skaa090
11. B.N. Aguanta, A.L. Fuller, M.C. Milfort, S.M. Williams, R. Rekaya, S.E. Aggrey, *Avian Diseases*, **62 (4)**, 345-350 (2018) doi: 10.1637/11907-052818-Reg.1
12. A. Alhenaky, A. Abdelqader, M. Abuajamieh, A.-R. Al-Fataftah, *Journal of Thermal Biology*, **70**, 9-14 (2017) doi: 10.1016/j.jtherbio.2017.10.015
13. R.M. Bilal, F. Hassan, M. Saeed, T. Ayasan et al. *Indian Journal of Animal Sciences*, **9007-83-4**, 495-505 (2020)
14. M.N. Alloui, W. Szczurek, S. Świątkiewicz, *Annals of Animal Science*, **1**, 17-32 (2013) doi: 10.2478/v10220-012-0055-x
15. T.J. Applegate, V. Klose, T. Steiner, A. Ganner, G. Schatzmayr, *Journal of Applied Poultry Research*, **19 (2)**, 194-210 (2011)
16. K. E. Nachman, D. C. Love, P. A. Baron, et al., *Environmental Health Perspectives*, **125(3)** (2016) doi: 10.1289/EHP225
17. R. Uauy, A. Kurpad, G.E. Otoo, K. J. Tano-Debrah of *Nutr. Sci. and Vitaminology*. **61**, 192-194 (2015) doi: 10.3177/jnsv.61.S192.