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ВЕСТНИК

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NAS RK is pleased to announce that Bulletin of NAS RK scientific journal has been accepted for indexing in the Emerging Sources Citation Index, a new edition of Web of Science. Content in this index is under consideration by Clarivate Analytics to be accepted in the Science Citation Index Expanded, the Social Sciences Citation Index, and the Arts & Humanities Citation Index. The quality and depth of content Web of Science offers to researchers, authors, publishers, and institutions sets it apart from other research databases. The inclusion of Bulletin of NAS RK in the Emerging Sources Citation Index demonstrates our dedication to providing the most relevant and influential multidiscipline content to our community.

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НАН РК сообщает, что научный журнал «Вестник НАН РК» был принят для индексирования в Emerging Sources Citation Index, обновленной версии Web of Science. Содержание в этом индексировании находится в стадии рассмотрения компанией Clarivate Analytics для дальнейшего принятия журнала в the Science Citation Index Expanded, the Social Sciences Citation Index и the Arts & Humanities Citation Index. Web of Science предлагает качество и глубину контента для исследователей, авторов, издателей и учреждений. Включение Вестника НАН РК в Emerging Sources Citation Index демонстрирует нашу приверженность к наиболее актуальному и влиятельному мультидисциплинарному контенту для нашего сообщества.

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USE OF ENZYME PREPARATIONS IN COMPOUND FEED FOR DUCKLINGS

Abstract. The paper presents the results of the influence of enzyme (ferment) preparations in various combinations on the dynamics of growth and development and slaughter qualities of ducklings. The scientific and economic experience was conducted in the Chuvash Republic. For carrying out experiments 3 groups of ducklings on 50 heads in everyone were selected and formed. Ducklings of the 1st experimental group received enzyme preparations amylosubtilin in the amount of 0.05 kg/t and protosubtilin in the amount of 0.05 kg/t during the entire period of growing together with feed. Ducklings for the 2nd experimental group of compound feed were enriched with enzyme preparations amylosubtilin in the amount of 0.1 kg/t and celloviridin in the amount of 0.075 kg/t.

It was found that ducklings receiving enzyme preparations in addition to feed had increased growth energy throughout the experiment. By the end of the experiment, the live weight of ducks of the control group was 3,424 kg, the first experimental group receiving in addition to the feed enzyme preparations amylosubtilin in an amount of 0.05 kg/t and protosubtilin in the amount of 0.05 kg/t – 3,712 lbs. In the second experimental group, where the ducks advanced to the feed received enzyme preparations amylosubtilin in the amount of 0.1 kg/t and celloviridin in the amount of 0.075 kg/t, live weight to the end of the experiment amounted to 3,804 kg.

The average daily live weight gain of animals in the control group was 53.52 g, and in the first experimental group - 58,10 g, in the second one - 59,56 g. The inclusion of a mixture of enzyme preparations with a compound feed of the experimental animals have contributed to the increase in body length compared to the control on average by 0.9 cm and 1.6 cm, length of tarsus by 2.5 cm and 4.3 cm, chest girth by 1.8 cm and 2.5 cm, respectively. The increased productivity of ducklings in growth was reflected in the reduction of feed costs and unit costs, which contributed to multiplying profits in the experimental groups.

Key words: ducklings, enzyme preparations, daily average gain, growth and development, meat productivity, efficiency.

Introduction. Poultry farming is one of the most important branches of agriculture, designed to provide the population with dietary foods: eggs and poultry meat, characterized by a high content of animal protein at low calorific value [1].

Farms and private farms can make a big contribution to the scale-up in poultry meat production. Depending on the existing conditions in such farms, it is possible to keep poultry from several birds to several hundred and even thousands. Birds, when feeding with compound feeds give 3-5 times more increase in live weight per unit of consumed feed than other farm animals.

The main goal in the poultry industry at the present stage is the efficient production of industrial products, with the lowest cost and high quality. Achieving this goal is possible by increasing the productivity of birds, which is currently extremely relevant [2,3,4].

One of the precocious branches in meat poultry farming is utensil farming, which in recent years, like other branches of poultry farming, has been gradually increasing the production. The duck meat in its chemical composition is featured by a high content of protein, mineral elements, vitamins. Due to the relative unpretentiousness of ducks to the conditions of maintaining and feeding, they are easy to breed in

any climatic zone of the country. The production of duck meat is recognized as one of the promising areas in this branch. The current level of duck breeding in Russia and countries with a market economy is characterized by a continuous concentration of production process, deepening of its specialization, improving the technology of keeping and conditions for feeding poultry, as well as mechanization and automation of labor-intensive processes. Also relevant are issues of improving the technology of growing and keeping poultry, rational use of feed, saving material and labor resources [5,6,7].

To reduce the production cost, poultry farmers are tasked with increasing live weight at the end of growing with a relative reduction in their terms.

To save the production cost everywhere the composition of the compound feed includes components of local production, such as grain cereals, oilcake and meal, sunflower and many others. However, due to the significant content of fiber and non-amyloidal polysaccharide they have low nutritional value and poor digestibility. Studies by many authors show that this problem is solved by the inclusion of biologically active substances (BAS) in the composition of compound feeds, and enzymes play a great role in this, helping to increase the efficiency of feed nutrient use [8].

In poultry farming, as in other branches of animal husbandry, there is some experience in the use of enzymes, but some questions on their use in animal husbandry have not been studied enough. Therefore, to increase the gain in live weight and meat productivity, there is a need to study them and is an urgent problem of modern livestock and practice [9].

The work aims to study the impact of using a mixture of domestic enzyme preparations in compound feeds for ducklings on their productive qualities.

Materials and research methods. The experimental part of the work was carried out using the purebred young stock of ducks of the cross Agidel. The materials were normally developed healthy ducklings. For experiments, three groups of young ducklings were formed according to the principle of analog groups.

The age of ducklings was 1 day. The duration of the experiment is 63 days. Birds of the control group received ПК 21-2 compound feed from days 1 to 20, ПК 22-2 feed - from days 21 to 56, and ПК-23-1 feed - from 57 to 63 days. The formula and nutritional value of compound feed for ducks are presented in table 1.

Table 1 – Composition and nutritional value of feed for ducklings by age, %

Components	Age of ducklings in weeks		
	1-3 (ПК-21-2)	4-8 (ПК-22-2)	9-22 (ПК-23-1)
1	2	3	4
Corn	15.0	40.8	20.5
Wheat	45.0	30.0	15.0
Barley	17.45	9.50	25.0
Oat	–	–	4.0
Pea	–	–	3.0
Wheat bran	–	–	15.0
Sunflower meal	7.0	5.0	3.6
Hydrolyzed yeast	3.0	3.0	2.0
Fish flour	7.0	5.0	1.0
Meat and bone meal	–	2.0	2.0
Grass meal	4.0	3.0	5.0
Defluorinated phosphate	–	–	0.8
Chalk	1.4	1.5	2.6
Salt	0.15	0.2	0.5
For 1 ton of compound feed added, g:			
Lysine	1200	–	250

Table continuation			
1	2	3	4
Methionine	500	400	800
Antioxidants	150	150	150
Antibiotics	20	–	–
100 g of compound feed contains, %:			
Metabolizable energy (MJ)	1.197	1.241	1.240
Crude protein	18.09	16.47	14.62
Crude fiber	4.6	3.8	6.0
Calcium	1.17	1.16	1.44
Phosphorus	0.84	0.76	0.78
Sodium	0.39	0.35	0.36
Lysine without supplement (mg)	888.7	776.8	628.7
Methionine + Cystine without supplement (mg)	685.0	567.9	450.7

The microclimate conditions in the poultry house during the scientific and economic experiments corresponded to the specified zoohygienic standards. The experimental bird was fed with loose full diet compound feed, twice a day (morning and evening).

Productivity control was carried out by studying live weight and daily average gains by individually weighing at the beginning, at the end, and during the experiment at each defined time intervals.

To better understand the proportionality of the physique, the mutual development of different parts of the body relative to each other, typicality of birds, it was used the method of analysis and comparison of physique indices, which are the ratio of one measurement to another measurement anatomically associated with it, expressed in percentage.

Ducklings of the 1st experimental group during the entire growing period along with compound feed received amylosubtilin enzymes in the amount of 0.05 kg/t and protosubtilin in the amount of 0.05 kg/t. For the 2nd experimental group, the feed was enriched with amylosubtilin enzymes in the amount of 0.1 kg/t and celloviridin in the amount of 0.075 kg/t.

The biometric processing of digital data obtained in the studies was carried out according to the variational-statistical method described by N. A. Plokhinsky.

Research results. Recording of the consumption of the given feed and their residues showed that during the tested period the experimental ducklings had no difference in the amount of eaten feed, they willingly ate the given feed.

During the entire growing period, the safety of ducklings in the control group was 94.0%, in the experimental group I - 96.0% and in the experimental group II - 98%. The live weight of ducklings when feeding was almost the same and varied within 52 g.

The highest gain in live weight in all studied groups was noted in the 6th week of the experiment. In the control group, on average, 680 g of gain was obtained per bird during this period, in the 1st experimental group - 706 g, which is 103.8% of the control group. In the 2nd experimental group for the same period, 714 g of gain was obtained, which concerning the control group is 105% and, accordingly, 101.1% compared with the 1st experimental group.

By the end of the experiment, the live weight of the ducklings of the control group was 3.424 kg, in the first experimental group - 3.712 kg, in the second experimental group - 3.804 kg. At the end of the growing, the live weight of ducklings of the experimental groups was higher compared to the control by 8.4 and 11.27%.

In the first weeks of growing (3.5 weeks of age) in all groups of experimental birds, a sharp increase in the average daily gain in live weight was observed, the next 2 weeks were more stable (a slight increase from 3.5 to 4.5 weeks and a slight decrease from 4.5 to 6.5 weeks). In general, during the growing period, the average daily gain in live weight of birds in the control group was 53.52 ± 4.6 g, and in the first experimental group – 58.10 ± 4.9 g, in the second one – 59.56 ± 4.9 g.

After that, a sharp decrease in productivity occurs, which is reflected in the diagram in figure. In general, during the growing period, the average daily gain in live weight of birds in the control group was 53.52 ± 4.6 g, and in the first experimental group - 58.10 ± 4.9 g, in the second one - 59.56 ± 4.9 g.

In the scientific and economic experiment, the parameters of body development at the age of 63 days in the studied groups corresponded to the cross standard and were better in ducks of the second experimental group relative to the control and the first experimental group. The measurement results of the ducklings are presented in table 2.

The inclusion of the mixture of enzyme preparations in compound feed in experimental animals contributed to the increase in body length, compared with the control, by an average of 0.9 cm in the 1st experimental group and 1.6 cm in the 2nd experimental group, the tarsus length was 2.5 cm and 4.3 cm, chest girth - 1.8 cm and 2.5 cm, respectively. A similar pattern took place like changes in the width of the pelvis and the length of legs of birds of the compared groups. Therefore, the introduction of enzyme preparations into the compound feed of ducklings has a positive effect on their growth and development.

Table 2 – Exterior measurements of ducklings (on average per 1 bird in groups), cm

Indicators	Group		
	Control	I experimental	II experimental
Body length	43.4±0.61	44.3±0.49*	45.0±0.52*
Width of pelvis	9.7±0.32	11.6±0.44	12.1±0.50
Keel length	16.8±0.29	17.4±0.4*	17.7±0.44*
Tarsus length	11.9±0.21	14.4±0.33	16.2±0.34
Leg length	17.4±0.33	20.3±0.41*	21.9±0.38*
Chest girth	38.8±0.51	40.6±0.51*	41.3±0.49*
*P≥0.01.			

Table 3 – Body indices of ducklings (on average per 1 bird in groups), %

Indicators	Group		
	Control	I experimental	II experimental
Massiveness (Body Weight/Body Length)	78.85±0.52	83.71±0.51*	84.47±0.53*
Body width (Pelvis width (in hook bones) x 100/body length)	22.35±0.33	26.19±0.31*	26.89±0.34*
Shortening of the lower body part (Keel length x 100/Body length)	38.70±0.42	39.28±0.43*	39.33±0.43*
Long-leg (Tarsus length, thigh (lower leg) x 100/Total leg length)	68.39±0.55	70.93±0.54*	73.97±0.55*
Eirisomy (Keel length/body length x 100)	89.40±0.58	91.65±0.57*	91.7±0.56*
*P≥0.01.			

Table 4 – Slaughter qualities of ducklings, g

Indicators	Group		
	Control	I experimental	II experimental
Pre-slaughter live weight	3424±4.6	3712±4.9*	3804±4.9*
Uneviscerated carcass weight	3111.0±4.4	3378.6±4.6*	34658±4.6*
Uneviscerated carcass output, %	90.86±4.1	91.02±4.2	9111±4.4
Semi-eviscerated carcasses weight	2968.9±4.3	3229.0±4.3*	3331.9±4.5**
Semi-eviscerated carcasses output, %	86.71±4.1	87.26±4.2	87.59±4.4
Eviscerated carcass weight	2320.1±4.1	2671.5±4.2*	2751.4±4.3**
Eviscerated carcass output, %	67.76±4.2	71.97±4.4	72.33±4.3
The output of eviscerated carcasses by grade, %			
1 grade	92	94	96
2 grade	8	6	4
*P<0.05, ** P<0.01.			

Based on the taken measurements, body indices were calculated. The results of the body indices of ducks are presented in table 3. Each of these indices allows evaluating one or another productivity of the bird.

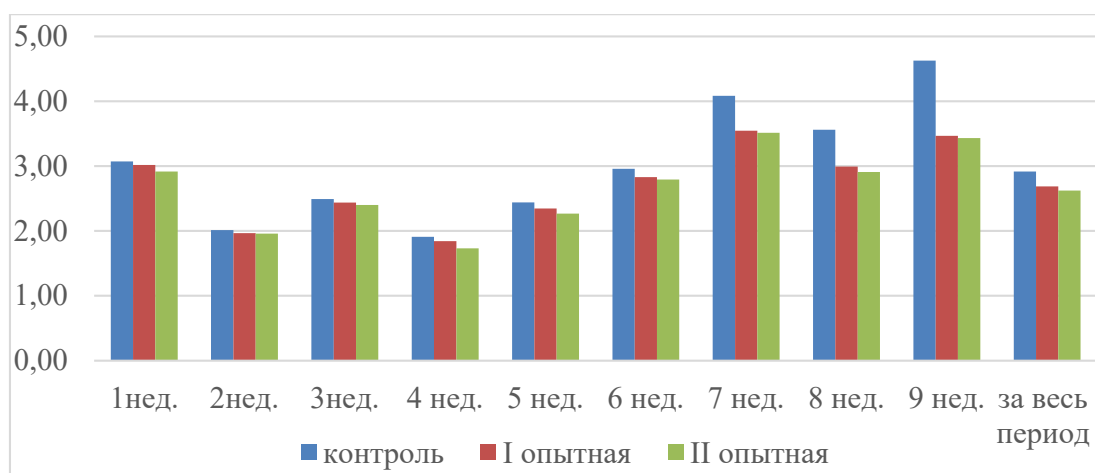
The research results of the slaughter qualities of ducklings are given in table 4. It was found that the use of the mixture of enzyme preparations in compound feed in experimental birds contributed to an increase in slaughter qualities of ducks. Pre-slaughter live weight in the first experimental group was higher by 8.4%, and in the second experimental group by 11.1% than in the control group.

As a result of the carcass deboning, it was established (table 5) that, according to the absolute muscle tissue output of the carcasses of ducklings in the 1st experimental group were higher than in the control group by 228.6 g (114.7%) and in the 2nd experimental group by 297.3 g (119.2%) ($P < 0.05-0.01$), and the output of skin with fat was 35.0 and 45.3 g, respectively. The yield of edible parts in the second group was higher than in the control by 15.0%, and in the first group by 11.0%. The yield of inedible parts (bones) in the control group was 9.05%, in the 1st experimental group - 9.31%, and in the 2nd experimental group - 9.49%.

Table 5 – The ratio of the edible and inedible parts of the carcass

Indicators	Group		
	Control	I experimental	II experimental
Edible parts:			
Muscles, g.	1547.6±14.7	1776.2±16.3*	1844.9±17.1**
%	45.20	47.85	48.50
skin with subcutaneous fat, g.	681.3±4.6	716.3±4.7	726.6±4.8
%	19.90	18.30	19.10
Kidneys+Fat+Lungs	104.4±1.3	110.2±1.5	111.0±1.45
%	3.05	2.97	2.92
Total, g.	2335.2	2592.8	2685.6
%	68.20	69.85	70.60
Inedible parts:			
Bones, g.	309.8±3.2	345.6±3.4*	360.9±3.6**
%	9.05	9.31	9.49
The ratio of the edible and inedible parts	7.54	7.50	7.44
The ratio of muscle mass to bone mass	4.99	5.14	5.11
* $P < 0.05$, ** $P < 0.01$.			

Since the accounting for the given feed was carried out across the group, not individually, and statistical processing of indicators on the use of feed was not possible. Since the highest gains in live weight were noted in the first 6 weeks of growing, respectively, and during these growing periods, the lowest feed costs per 1 kg of gain were observed (figure).



Feed costs by growing periods in groups

At the end of the growing period, when there was a decline in average daily gain, feed costs increased.

In general, 9.835 kg of compound feed in each group was consumed during the experiment (figure). 2.91 kg of feed were spent per 1 kg of gain in the control group, while in the first experimental group – 2.64 kg or 9.28% less than in the control group and the second experimental group – 2.62 kg or 9.97% less than in the control group and 2.26% less than in the first experimental group.

Conclusion. Analysis of the results shows that under the influence of enzyme preparations in compound feed for ducklings of the Agidel cross, the growth and development are accelerated during the growth period. This leads to their higher slaughter and meat qualities and, as a result, the output of the mass of uneviscerated, semi-eviscerated and eviscerated carcasses, as well as the output of eviscerated carcasses of grade 1 and muscle tissue. It has been experimentally proved that the use of enzyme preparations in feed for ducklings helps to achieve higher absolute and average daily gains in live weight and increases the economic efficiency of its production. Since the growth intensity of ducklings after 7 weeks of age decreases, the optimal period of their growth, in our opinion, should not exceed 8 weeks. The obtained research results indicate that when choosing enzyme preparations, a mixture of amylosubtilin and celloviridin should be preferred.

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ҮЙРЕКТЕР ҮШІН АРАЛАС АЗЫҚТАРДА ЭНЗИМДІ ПРЕПАРАТТАРДЫ ҚОЛДАНУ

Андатпа. Жұмыста энзимді (ферментативті) препараттардың түрлі үйлесімде үйректедің өсуі мен дамуына және сойыс шығымы сапасына әсер ету нәтижелері келтірілген. Ғылыми тәжірибиелер чубаш мемлекетінде іске асырылған. Тәжірибие үшін 3 топ таңдалып құрастырылды. Әр топта 50 бас үйректен болды. 1-топтағы үйректер жетілу барысында аралас азықпен бірге 0,05 кг/тмөлшерде амилосубтилин және 0,05 кг/т протосубтилин алып отырды. 2-тәжірибиелі топтың үйректерінің аралас азықтарын 0,1 кг/т мөлшерде амилосубтилин және 0,075 кг/т мөлшерде целловиридин энзимді препараттармен байытылды.

Үйректерді өсіру барысында ферментті препараттар амилосубтилин және протосубтилин амило-субтилин және целлолюксінді жасалған сьзба нұсқаға сәйкес қолдану тәжірибиелі жануарлардың өсуі мен дамуына оң әсер етті.

Аралас азыққа қосымша энзимді препараттар алып отырған үйректер тәжірибие барысында қарқынды өсу қабілетіне ие болды. Тәжірибие соңында бақылау тобындағы үйректердің тірі салмағы 3,424 кг, бірінші тәжірибиелі тобындағы аралас азығына қосымша 0,05 кг/т мөлшердегі амилосубтилин және 0,05 кг/т мөлшерінде протосубтилин алған үйректің тірі салмағы 3,712 кг құрады. Аралас азығына қосымша 0,1 кг/т мөлшерде амилосубтилин және 0,075 кг/т целловиридин алған үйректердің тірі салмағы – 3,804 кг құрады.

Бақылаумен салыстырғанда, бірінші бақылау тобындағы амилосубтилин және протосубтилин қоспасын алған тәжірибиелі жануарлардың өсімі 8,54%, ал амилосубтилин және целлолюкс қоспасын алған екінші бақылау тобындағы жануарлардың орташа тәуліктік өсімі 11,3 % басым болды. Екінші топта абсолютті өсім бірінші топтан 2,76 % үстем болды.

Аралас азыққа ферментті препараттардың қоспасын қосу тәжірибиедегі жануарлардың бақылаумен салыстырғанда көкірек ұзындығының 0,9 см и 1,6 см, жіліншектің 2,5 см және 4,3 см, көкірек орамының 1,8 см и на 2,5 см ұлғаюына әсер етті. Бақылаумен салыстырғанда, индекс бойынша: массивтілік – біріншіде 4,86 %, екіншіде – 5,62 %, сүйек жалпақтығы бойынша біріншіде – 3,84 % және екіншіде – 4,54 %, аяқ ұзындығы бойынша біріншіде 2,54 % және екіншіде 5,58 % және эйрисоми бойынша сәйкесінше 2,51 % және 2,66 % басым болды.

Үйректерді өсіру технологиясында түрлі қатынвстағы энзимді препараттарды қосу ет сапасының жақсаруына оң әсер етті. Сойыс алдындағы тірі салмағы бақылауға қарағанда, бірінші топта 8,4 %, ал екінші топта 11,1 % басым болды. Амилосубтилин және протосубтилин энзимдерін алған бірінші тәжірибиелік топтағы тазаланбан үйректе бақылаудағы аналогтық көрсеткіші 267,6 г пайыздық көрсеткіші – 8,6 %, амилосубтилин және целловиридин ферменттерін алған екінші топта – 354,8 г сәйкесінше 11,4 % басым.

Бірінші тәжірибиелі топтағы үйректердегі ұша етінің абсолютті шығымы бақылаумен салыстырғанда 228,6 (114,7 %) және 2-тәжірибиелі топта 297,3 г (119,2 %) ($P < 0,05-0,01$), сәйкесінше майлы терінің шығымы

35,0 және 45,3 г басым болды. Жеуге жарамды бөлшектерінің шығымы бақылаумен салыстырғанда екінші топта 15,0 % және бірінші топта 11,0 % үстем болды. Жеуге жарамсыз бөліктер (сүйектер) бақылау тобында 9,05%, 1-тәжірбиелі топта 9,31 % және 2-тәжірбиелі топта 9,49 % құрады.

Энзимді препараттарды үйректерді өсіру технологиясына қолдану азыққа кететін шығындарды азайтуға мүмкіндік береді. Бақылау тобында 1 кг өсімге 2,91 кг аралас азық, бақылаумен салыстырғанда, 1-бақылау тобында 2,64 немесе 9,28 % аз шығын жұмсалды. 2-бақылау тобында біріншімен салыстырғанда 2,26 % және бақылаумен салыстырғанда қаражат 9,97 %-ға кем жұмсалды.

Аралас азықтардың қоректік заттарының сіңімділігін және етті және өнімділікті арттыру үшін «Агидель» кросс үйректеріне энзимді препараттарды келесідей нұсқамен беру керек: амилосубтилин Г3х және протосубтилин, амилосубтилин Г3х в количестве 0,1 кг/т және целловиридин.

Үйрек етінің өндіріс тиімділігін арттыру мақсатында оларды 50-60 күндік жасқа дейін өсіру ұсынылады. 60 күннен кейін үйректерде түлеу басталады, өсу қарқындылығы төмендейді және азыққа шығындар көбейеді.

Ферментті препараттарды таңдауда амилосубтилин Г3х 0,1 кг/т мөлшерде + целловиридин 0,075 мөлшерде кг/т алған тиімді.

Түйін сөздер: үйректер, энзимді препараттар, орташа тәуліктік өсім, өсу мен даму, ет өнімділігі, тиімділік.

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ИСПОЛЬЗОВАНИЕ ЭНЗИМНЫХ ПРЕПАРАТОВ В КОМБИКОРМАХ ДЛЯ УТЯТ

Аннотация. В работе приведены результаты влияния энзимных (ферментных) препаратов в различных сочетаниях на динамику роста и развития, и убойные качества утят. Научно-хозяйственный опыт проведен в Чувашской Республике. Для проведения опытов были отобраны и сформированы 3 группы утят по 50 голов в каждой. Утята 1-й опытной группы в течение всего периода выращивания вместе с комбикормом получали энзимные препараты амилосубтилин в количестве 0,05 кг/т и протосубтилин в количестве 0,05 кг/т. Утятам для 2-й опытной группы комбикорма обогащали энзимные препараты амилосубтилин в количестве 0,1 кг/т и целловиридин в количестве 0,075 кг/т.

Использование при выращивании уток смеси ферментных препаратов амилосубтилина и протосубтилина, амилосубтилина и целлолюкса согласно разработанной схеме оказало положительное влияние на рост и развитие подопытных животных.

Установлено, что утята, получавшие дополнительно к комбикормам энзимные препараты, обладали повышенной энергией роста на протяжении всего опыта. К концу опыта живая масса утят контрольной группы составляла – 3,424 кг, первой опытной группы, получавшие дополнительно к комбикормам энзимные препараты амилосубтилин в количестве 0,05 кг/т и протосубтилин в количестве 0,05 кг/т – 3,712 кг. Во второй опытной группы, где утята дополнительно к комбикорму получали энзимные препараты амилосубтилин в количестве 0,1 кг/т и целловиридин в количестве 0,075 кг/т, живая масса к концу опыта составила – 3,804 кг.

Абсолютный прирост живой массы у подопытных животных в первой опытной группе, получавших смесь амилосубтилина и протосубтилина был выше на 8,54%, а во второй опытной группе, получавших смесь амилосубтилина и целлолюкса на 11,3 %, чем в контрольной группе. Во второй опытной группе абсолютного прироста было получено больше, чем в первой опытной группе на 2,76 %.

Включение смеси ферментных препаратов в комбикорма у подопытных животных способствовало увеличению длины туловища, по сравнению с контрольным в среднем на 0,9 см и 1,6 см, длины плюсны на 2,5 см и 4,3 см, обхват груди на 1,8 см и на 2,5 см соответственно. По индексам: массивности – на 4,86 % в первой и 5,62 % – во второй, по широкотелости – на 3,84% в первой и 4,54% – во второй, по длинноногости – на 2,54 % в первой и 5,58 % – во второй и по эйрисомии соответственно – на 2,51% и 2,66% по сравнению с контролем.

Включение в технологию выращивания утят энзимных препаратов в различных сочетаниях способствует улучшению мясных качеств. Предубойная живая масса в первой опытной группе была выше на 8,4%, а во второй опытной группе на 11,1 %, чем в контрольной группе. Масса непотрошенной тушки превосходила в первой опытной группе, получавшие энзимы амилосубтилин и протосубтилин аналогичские показатели в контроле на 267,6 г, т.е. на 8,6 %, во второй опытной группе, получавшие ферменты амилосубтилин и целловиридин на 354,8 г, соответственно на 11,4%.

Абсолютный выход мышечной ткани туши утят 1-й опытной группы был выше, чем в контрольной группе на 228,6 (114,7%) и во 2-й опытной группе на 297,3 г (119,2%) ($P < 0,05-0,01$), а по выходу кожи с жиром, соответственно – на 35,0 и 45,3 г. Выход съедобных частей во второй опытной группе был выше, чем в контрольной на 15,0 %, и в первой опытной группе на 11,0 %. Выход несъедобных частей (костей) в контрольной группе составил 9,05%, в 1 опытной группе 9,31% и во 2 опытной группе 9,49%.

Применение энзимных препаратов в технологии выращивания влияет на снижение затрат корма на единицу продукции. На 1 кг прироста в контрольной группе затрачено 2,91 кг комбикорма, а в первой опытной группе 2,64 или на 9,28 % меньше, чем в контрольной группе и во второй опытной группе 2,62 кг или на 9,97 % меньше, чем в контрольной группе и на 2,26 %, чем в первой опытной группе.

Для увеличения усвояемости питательных веществ комбикормов и продуктивных и мясных качеств утят кросса «Агидель» рекомендуем применять энзимные препараты в сочетании амилосубтилин ГЗх и протосубтилин, и амилосубтилин ГЗх в количестве 0,1 кг/т и целлюлозагин.

В целях повышения эффективности производства мяса утят рекомендуем выращивать до 56-60-дневного возраста, так как в 60-дневном возрасте у утят начинается линька и у них заметно снижается интенсивность прироста, и повышаются затраты кормов.

При выборе ферментных препаратов предпочтение должно быть отдано смеси амилосубтилин ГЗх в количестве 0,1 кг/т + целлюлозагин в количестве 0,075 кг/т.

Ключевые слова: утята, энзимные препараты, среднесуточный прирост, рост и развитие, мясная продуктивность, эффективность.

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