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«ИННОВАЦИОННОЕ ИСПОЛЬЗОВАНИЕ АЛЬТЕРНАТИВЫ АНТИБИОТИКОВ ДЛЯ ПРОФИЛАКТИКИ И ЛЕЧЕНИЯ ИНФЕКЦИОННЫХ ЗАБОЛЕВАНИЙ ЖИВОТНЫХ»

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STUDY OF THE EFFECT OF DIETS SUPPLEMENTING WITH VERMICULITE TO THE PRODUCTIVITY OF BROILER CHICKENS

Summary

There were investigated the effects of basal diets supplemented with a feed additives based on Kazakhstan field's vermiculite on growth performance, productivity of one-day old broiler chickens for 42 days. In the experiment 100 chickens were divided into 5 groups with 20 chickens each. Four experimental groups were fed with supplementing of 3%, 5% vermiculite and 3%, 5% vermiculite with fish meal and control group - the basal diet. It was established that supplementation of vermiculite could increase significantly body weight gain, productivity and feed conversion but higher level of these indices were obtained when the 5% vermiculite with fish meal was fed. All dosages of the mineral didn't morphologically change of internal organs.

Key words: *vermiculite, broiler chicken, feed additive, quality of meat.*

Introduction

In recent years, the attention of researchers is directed to the use of non-traditional types of feed additives in feeding animals and poultry. Therefore, the technology of production and experimental research of functional feed additives based on vermiculite for animal husbandry and poultry farming is relevant and contributes to the sustainable development of the agro-industrial sector. Vermiculite was discovered in the beginning of the XIX century, industrial application was received only after 100 years [1].

Vermiculite is a silicate mineral that is obtained from volcanic magma resources. High heat treatment creates an expantion in volume, an increase in permeability and a decrease in weight. The obtained product is very light and sterile. With thermal insulated and fire-resistant features, vermiculite is used as the land regulator in agriculture. The chemical composition of vermiculite is: $SiO_2$38-46%, $AL_2O_3$10-17%, MgO 16-35%, CaO 1-5%, K_2O 1-6%, $Fe_2O_3$6-13%, $TiO_2$1-3% and H_2O 8-16% [2, 3].

Due to its physic-chemical, ion-exchange and sorption properties, vermiculite is a biologically active agent for increasing productivity and natural resistance, preventing diseases and toxic, and improving the quality of the end products of poultry farming.

The expanded vermiculite is used in veterinary medicine as: the main component of feed; an inert carrier of fats, vitamins and nutrients in feeds; a carrier of medicinal products; a sorption additive in feed for animals and poultry; a source of microelements; to improve digestion; to increase appetite; for removing radionuclide and heavy metals from the body; a bedding material for animals and birds, expanded vermiculite saves heat, absorbs moisture and gases, protects the litter from mold and rot; for incubating eggs; for germination of seeds for feeding birds.

Due to its physic-chemical, ion-exchange and sorption properties, vermiculite is a biologically active agent for increasing productivity and natural resistance, preventing diseases and toxic, and improving the quality of the products of poultry farming. Possessing a high capacity for liquid substrates, vermiculite retains its bulk properties. This allows the preparation of bulk concentrate containing vermiculite, which can be impregnated with various feed additives, vitamins, probiotics and medicines and contain up to 70% of the mass of the liquid ingredient: (fat, vitamins and other medicaments). Many experiments have shown that feeding of this feed additive into basal diet of will result in a significant increase in meat productivity and improved product quality [4, 5].

At present, the largest deposits of vermiculite are found in forty countries of the world (USA, Japan, Italy, Canada, Bulgaria, and Hungary). There are deposits of vermiculite in many parts of the world, but only a limited number of sources have industrial development. Large deposits of vermiculite are discovered in central Asia. Also, the basic deposits of vermiculite are concentrated in the USA, the South African republic, Russia and other countries such as the Republic of Kazakhstan [6].

Vermiculite is a new material for the Kazakhstan, although it is used in other countries. Kazakhstan is rich in large deposits of vermiculite raw materials such as Iirsu, Zhylandy and Kulantau of the South Kazakhstan region.

Preliminary results of comparative studies, physical and chemical, technological properties, vermiculite samples from various regions of Kazakhstan, Russia and far abroad have shown that the most optimal parameters for feed preparation are the raw materials of the Kulantau deposit, which reserves amount to more than 3,5 million tons [7]. The economic competitiveness of the Kulantau vermiculite plant is due to the proximity of the resource base and the availability of cheap energy sources; low infrastructure costs and a convenient transportation.

Thus, the production technology, experimental research and introduction of bioactive feed additives for poultry farming, based on natural mineral - vermiculite, are relevant and contribute to the sustainable development of the agro-industrial sector.

Materials and methods

The experimental part of the work was carried out in between 2014 – 2016 at the departments "Veterinary-sanitary examination and hygiene", "Biological safety", in the Kazakhstan-Japan Innovation Center of Kazakh National Agrarian University and in the "Saru Bulak" LLP.

The subject of the research were broiler chickens the "Arbor Acres" breed, which were randomly allocated to ten-tier battery birds of 20 birds each, under conventional conditions of ventilation, temperature (17-19°C) and lighting (16 h light d^{-1}). Birds were kept in isolated sections on deep litter with a partial mesh floor. Chickens were grown to 42 days of age. All birds had a free access to diets and water and fed with a standard industrial diet.

For experimental studies used expanded vermiculite M-150 from Kulantau deposit, fraction 0,5-3,0 mm. Vermiculite of this deposit had a high content of macro and microelements, as previously described above. Vermiculite with fish meal was used as a feed additive in a ratio of 30:70, which showed good results and highly effective during storage compared with other relations. For the feeding of broiler chickens were used the starting (PK-5) and finishing (PK-6) variants of mixed fodders. Feed mixtures contained the same components, the only difference was that the mixtures designed for the experimental groups were supplemented with vermiculite: (A experimental group) a basal diet (BD) without vermiculite (V), (B) 97% of BD supplemented 3% V, (C) BD supplemented with 5% V, (D) 97% BD+3% v+ fish meal (1% v and 2% fm) and (e) 95% basal diet and 5% v+ fish meal (1,5% v and 3,5% fm).). The research scheme of use the feed additives are given in Table 1.

Table 1 - Scheme of the feeding experiment of birds

Groups	Conditions
A (control)	100% BD
B (experimental)	97% BD + 3% V
C (experimental)	95% BD + 5% V
D (experimental)	97% BD + 3% V+FM (1%V+2% FM)
E (experimental)	95% BD + 5% V+FM (1,5%V+3,5% FM)

*Abbreviation: BD – The basal diet, V–vermiculite, FM – fish meal

Veterinary and sanitary examination of slaughter products was carried out according to the current GOST. The subjects of the study were broilers of the same batch; the conditions of their maintenance were the same with observance of optimal parameters of the microclimate. The following were used GOSTs: GOST 18292-85 «Slaughter poultry. Specifications», GOST 7702.0-74 «Poultry meat. Methods of sampling. Organoleptic methods of quality assessment», GOST 31962-2013 «Chicken meat (carcasses of chickens, broiler-chickens and their parts). Specifications». At 1, 14, 28 and 42 d of age, birds were weighed. The statistical analyses were performed using ANOVA. A significance level of $p<0.05$ was used during analysis.

Results and discussion

There are several measures that can be used to evaluate the performance of a flock of chickens – growth rate, days to market, mortality, and feed efficiency. This results indicated that an average weight of the all experimental groups fed with vermiculite feed additives was higher than the control group (Table 2).

Table 2 - Effects of feed additives on growth performance and body weight changes of broiler chickens

Groups	Period (days)				Growth		
	Initial weight,g	BWG,g			Relative growth,g	Average daily gain, g	Growth rate
	1	14	28	42			
A	47,4±1,2	786,73±25,6	1502,10±46,2	2007,30±65,1	1959,9	46,66	42,35
B	46,2±1,1	793,71±31,0	1531,07±59,2	2158,00±14,0	2110,82	50,25	45,72
C	44,6±2,6	796,05±24,3	1529,16±16,4	2204,21±20,8	2156,61	51,35	46,31
D	47,3±1,3	805,35±15,5	1638,47±24,2	2403,31±20,8	2356,01	56,09	50,81
E	45,4±2,2	812,21±14,3	1644,30±57,0	2506,50±53,8	2459,1	58,55	52,88

In an experimental group E, where chickens fed with vermiculite plus fishmeal, the weight gain was more on average 19% than in the control group. Addition of vermiculite and vermiculite plus fishmeal to broiler's feed had a significant impact on absolute average daily gain (ADG) and relative growth (GR). Table 2 shows that the difference in weight of the broiler chickens at the beginning of experiment in all groups was not more than 0,4g, after 42 days average daily gain ADG of the C group was 51,35g; D 56,09g, E 58,55g while the control ranged from 47,2g to 47,4g. The growth rate in the control group was 42,3g, in the D group 50,81g and was higher about 10,53g than in the control in the E group 52,88g (V+FM).

As a result, feed efficiency was much better in the first weeks up to one month (about 75% of body weight) of broiler chicken production. Body weight gain of birds for the first 14 days of age given a diet supplemented with vermiculite with fishmeal was higher than those given only vermiculite. The body weight gain was not affected by the dietary treatments from 28 to 42 days. This observation is in agreement with the results of [8], who observed no differences in body weight gain of broiler chickens supplemented with different natural feed additives as alternatives to antibiotic growth promoters.

In this report, the results demonstrated that broiler chickens fed with the 5%V+FM diets had significantly greater body weight, better average daily gain, relative growth gains and growth rate than birds fed a control diet during the experimental period (Table 3).

Table 3 - Meat yield of broiler chickens

Group	Indicators, n=20		
	Preslaughter weight , g	Postslaughter weight , g	Slaughter yield, %
A	2002,50±0,31	1362,31±1,32	68,03±2,31
B	2146,12±2,35	1459,32±1,32	68,04±0,51
C	2198,21±3,21	1516,41±2,33	68,98±0,41
D	2397,31±0,62	1636,12±2,31	68,25±0,35
E	2501,41±0,41	1750,71±0,53	70,07±3,21

The maximum values of weight were recorded in broiler chickens of the third and fourth experimental groups – 2397,31-2501,41g, which is 16,1-19,2% more than in the control (Table 3). The weight of the gutted carcass of broiler chickens of the control group was 1362,31 ± 1,32 g, which is by 6,6% less than of the first test group, by 10,1% less than in the chicks of the second experimental group, 16,7% less than in the poultry of the third test group and 22,1% less than in the fourth test group. The yield of gutted carcass of broiler chickens fed with feed additives was higher than in control group.

The results of weighing the internal organs of broiler chickens showed that the values of liver, heart, lung, spleen, muscle and kidney weight in broiler chickens of the control group and the first test group differed insignificantly (Table 4). In broiler chickens of the third and fourth experimental groups showed an increase the mass of internal organs where we used vermiculite and fishmeal.

Table 4 - Weight of internal organs of broiler chickens

Indicators	Groups				
	A	B	C	D	E
Liver	39,9 ± 0,3	40,2 ± 0,3	42,6± 0,5	42,6 ± 0,56	42,9 ± 0,45
Heart	9,8 ± 0,1	9,9 ± 0,1	10,9 ± 0,1	10,8 ± 0,31	10,9 ± 0,41
Lungs	9,7± 0,2	9,7 ± 0,2	11,7± 0,1	11,7 ± 0,16	11,8 ± 0,21
Spleen	2,3 ± 0,1	2,4 ± 0,1	2,7 ± 0,1	2,7 ± 0,06	2,7 ± 0,13
Muscular stomach	30,3 ± 0,3	30,3 ± 0,2	33,3 ± 0,3	33,3 ± 0,20	33,4 ± 0,21
Kidneys	4,9± 0,1	4,9 ± 0,2	5,5 ± 0,1	5,5 ± 0,03	5,6 ± 0,32

The poultry of the control group by weight of the liver was inferior to the chickens of the third and fourth test groups by 6,3-6,9%, by mass of the heart - by 9,2-10,0%, lungs - by 17,0-17,8%, the spleen - by 14,8-14,9%, the muscular stomach - on 9,0-9,2%, kidneys - on 10,9-12,0%.

Thus, feed additives based on vermiculite in the studied doses contribute to improving the growth and development of broiler chickens, increasing their meat production.

Conclusion

In conclusion these results suggested, that expanded vermiculite of the Kazakhstan deposits and fish meal may be able to use as substitute for feed additives because the growth performance in chicks fed diet with vermiculite and fish meal was very productive with regard to increasing the total weight of broilers relative to the control group.

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ВЕРМИКУЛИТ НЕГІЗІНДЕГІ АЗЫҚТЫҚ ҚОСПАЛАРДЫҢ БРОЙЛЕР БАЛАПАНДАРЫНЫҢ ӨНІМДІЛІГІНЕ ӘСЕРІН ЗЕРТТЕУ

Аңдатпа

Мақалада Қазақстанда өндірілген вермикулит негізіндегі азықтық қоспаларды қолданған кездегі бройлер балапандары өнімділігінің нәтижелері көрсетілген. Тәжірибеде жасы бір тәуліктен 42 тәулікке дейінгі (союға жарамды) әр топта 20 бастан бөлінген бес топ балапандар қолданылды. Тәжірибелік топтағы балапандар негізгі ас үлесіне қосымша азықтық қоспалармен азықтандырылды: сәйкесінше, 3%, 5% вермикулит және 3% (1% В + 2% БҰ), 5% (1,5% В + 3,5% БҰ) вермикулит балық ұнымен. Зерттеу нәтижелері бройлер балапандарының физиологиялық жағдайына жаңа азықтық қоспалардың қандай да теріс әсерінің жоқтығын көрсетті.

Кілт сөздер: вермикулит, бройлер балапандары, азықтық қоспа, еттің сапасы.

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ИССЛЕДОВАНИЕ ВЛИЯНИЯ КОРМОВЫХ ДОБАВОК НА ОСНОВЕ ВЕРМИКУЛИТА НА ПРОДУКТИВНОСТЬ ЦЫПЛЯТ-БРОЙЛЕРОВ

Аннотация

В статье приведены результаты продуктивности цыплят-бройлеров при применениий кормовых добавок на основе вермикулита Казахстанкого производства. В опыте использовались цыплята с суточного до 42-дневного (убойного) возраста, которые были сформированы в пять группы по 20 голов в каждой. Цыплята опытных групп дополнительно к основному рациону получали кормовые добавки: 3%, 5% вермикулита и 3% (1% В + 2% РМ), 5% (1,5% В + 3,5% РМ) вермикулит с рыбной мукой соответственно.

Результаты исследований свидетельствовали об отсутствии какого-либо негативного воздействия новых кормовых добавок на физиологическое состояние бройлеров.

Ключевые слова: вермикулит, цыплята-бройлеры, кормовая добавка, качество мяса.

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ОПРЕДЕЛЕНИЕ ИММУНИЗИРУЮЩЕЙ ДОЗЫ И СРОКА НАСТУПЛЕНИЯ ИММУНИТЕТА У СВИНЕЙ, ПРИВИТЫХ БИВАЛЕНТНОЙ ИНАКТИВИРОВАННОЙ ВАКЦИНОЙ ПРОТИВ РЕПРОДУКТИВНОГО РЕСПИРАТОРНОГО СИНДРОМА СВИНЕЙ

Аннотация

В данной статье представлены результаты проведенных исследований по определению иммунизирующей дозы и срока наступления иммунитета у свиней, привитых бивалентной инактивированной вакциной против РРСС американского и европейского генотипов на основе адъюванта Montanide Gel 01. Было установлено, что наиболее оптимальной дозой бивалентной вакцины для свиней является 4,0 мл, которая обусловливает формированию специфических антител у всех привитых свиней на 14 сут.

Ключевые слова: иммунизирующая доза, срок наступления, бивалентная вакцина, РРСС.

Введение

Вирус репродуктивно-респираторного синдрома свиней вызывает одноименное заболевание свиней, так же известное как «синее ухо». Только в США экономические потери вызванные РРСС, ежегодно составляют более чем 560 миллионов долларов США [1]. Вирус принадлежит к семейству Arteriviridae, роду Arterivirus, отряду Nidovirales [2]. Вирус РРСС размножается в культуре клеток альвеолярных макрофагов и клеточных линиях почки обезьяны [3]. Вирус РРСС имеет одноцепочную положительно заряженную РНК. Геномная РНК имеет размер 15 килооснований (1000 гетероциклических оснований) нуклеотидов [4].

Сравнение нуклеотидных последовательностей различных штаммов показало, что европейский (Lelystad штамм) и североамериканский (штамм VR-2332) представляют два различных генотипа. Европейские и североамериканские штаммы вируса РРСС вызывают заболевание с похожими клиническими признаками, но они представляют два разных генотипа, чьи геномы разнятся примерно на уровне 40 %, таким образом, создавая «тайну» в происхождении вируса [5]. Генетические вариации вируса выделенного в разных местах увеличивают трудность в разработке вакцин.

Впервые РРСС был обнаружен в свиноводческих хозяйствах США и Канады в 1986-1987 гг. [6]. В Европе вирус распространился всего лишь в течение 2-х лет 1990-1992 гг. В настоящее время заболевание распространено по всему миру, исключая Австралию, Новую Зеландию, Финляндию, Норвегию, Швецию и Швейцарию [7]. Оба генотипа вируса РРСС зарегистрировано и в Казахстане [8, 9].

В настоящее время в ряде стран основным средством борьбы с РРСС является специфическая профилактика, для которой применяются как живые, так и инактивированные вакцины. Следовательно, в связи с циркуляцией двух генотипов (европейский и североамериканский) вируса РРСС на территории Казахстана в НИИПББ разработана технология изготовления инактивированной бивалентной вакцины против РРСС обоих генотипов. При разработке технологии изготовления данной вакцины, как