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IMPROVING THE PROPERTİES OF EGG SHELLS THROUGH THE USE OF Vitamin D

Fariz A. Amirli[1], Guliyeva A. Narmina[2], Mammadova F. Aynur[3], Nasibova A. Fidan[4], Abdullayev Q. Raul[5], Cafarov O. Tural[6], Bahmanov I. Vasif[7], Gadashov Nihad[8], T.N. Akylbekova[9]

[1] Azerbaijan State Oil and Industry University, Baku, Azerbaijan
[9] Abai Kazakh National Pedagogical University, Kazakhstan
[1] fariz.emirov@asoiu.edu.az, http://orcid.org/0000-0002-9095-2982
[3] http://orcid.org/0000-0002-1938-1320
[4] http://orcid.org/0009-0007-9318-5751
[5] http://orcid.org/0009-0000-7223-3442
[6] http://orcid.org/0009-0001-3068-3872
[7] http://orcid.org/0009-0003-0841-5163
[8] http://orcid.org/0009-0001-5780-0266
[9] http://orcid.org/0000-0002-6028-6229

ABSTRACT
In the work presented by us, we conducted a comparative study of the dried egg shells of chickens grown from broiler eggs with the shells of other chicken eggs (Siyazan Broiler JSC, Shafa Mılls Broiler, MERCAN). It was determined how feeding chickens with Vitamin D supplements affects the shell. The importance of Vitamin nutrition is fully explained and standard solutions are defined. One of the main tasks of the Republic of Azerbaijan is to achieve a leading position in the global food market, and we have developed and provided a scheme for feeding chickens to achieve the best result. Thus, we have proved that when Vitamin D is used as an additive to compound feed of parent flock hens and broiler-laying eggs, changes occur in the teat layer of the egg shell, indicating an improvement in their qualities. In parent flocks, these positive structural changes occur at the end of the production period, which allows the high hatchability of the eggs to be maintained. In our work, we experimentally studied the effect of Vitamin D, i.e. Tenat, on the structure of the shell. Thus, the use of Vitamin D contributes to the accumulation of nutrients, in particular calcium stores in the body, which helps the bird survive periods of stress without losing productivity and egg quality.
Keywords: polystyrene waste, polyvinyl chloride, capillary viscometry, static and dynamic exchange capacity, mechanical strength.

Introduction

Nowadays, the increasing population of the country, prevailing environmental scenarios, the amount of food consumed, advancements within the food industry, and the manufacturing of a wider range of higher-quality products hold special importance. [1].

Almost 90% of calcium carbonate is in the shell of chicken eggs that we lay every day. In addition to calcium, egg shells contain many other useful elements: copper, iron, silicon, phosphorus, manganese, zinc, and selenium. Those eggshells can be used after some simple processing operations.

Eggshell serves as an excellent calcium source, a naturally balanced product easily assimilated by the body. Calcium plays a pivotal role in various bodily functions, including excretion, digestion, and the nervous, immune, and reproductive systems. Calcium deficiency stands as one of the prevalent metabolic disorders in the contemporary world.

A disturbance in the calcium exchange within bones, specifically, results in childhood rickets, spinal curvature, premature tooth damage, bone fragility at a certain age, and diminished reproductive activity in women. Insufficient calcium in the body results in compromised immunity, increased susceptibility to colds, and the onset of allergic diseases.

From natural minerals, for example, ordinary eggshell is well absorbed as a natural food. Medical synthetic preparations of gypsum, chalk, and calcium chloride are slowly absorbed by the body [2,3].

It should be noted that the daily use of eggshells in the form of powder should be 1.5-3 grams with food (mixed with porridge

or cottage cheese) during breakfast [4,5]. When consuming the powder in its unadulterated state, it's advised to mix it with a few drops of fresh lemon juice. The utilization of eggshell powder is particularly crucial for pregnant women, seniors, and infants younger than six months. [6].

Frequently, specialists consider factors influencing the economic productivity of bird rearing. They primarily aim to enhance the yield of both marketable and breeding eggs, boost the egg-laying capacity of hens, and advance bone mineralization alongside the consistent development of contemporary broiler strains.

Nutritional and energy values per 100 grams:
Protein: 19.7 gr
Fat: 12.2 gr
Energy: 188kcal

Fig.1. brands we use to compare broiler chickens, to which Vitamin D has also been added to the feed mixture

The process of metabolizing vitamin D, calcium, and phosphorus is intricate, involving the

liver and kidneys. This is because these organs are responsible for converting the primary form of vitamin D into its active variant, 1,25-dihydroxyvitamin D3 in these organs. However, this conversion is often restricted at critical stages of production (e.g., laying hens over 50 weeks of age). Factors such as fatty liver or mycotoxin contamination of feed adversely affect liver function and cause liver damage. A compromised liver struggles to process Vitamin D effectively, leading to a decrease in the availability of calcium and phosphorus needed for plaque formation. Specifically, Vitamin D's crucial function in any animal's body, ranging from chickens to humans, is to regulate metabolism. When there isn't sufficient calcium consumed through the diet, a scenario of "calcium starvation" can occur, despite the presence of adequate calcium in the food intake. Specifically, in chickens, this manifests itself primarily in the fact that they begin to lay fewer eggs and almost burst from the side. There is no question of hatching a chicken from a baby chicken and eating eggs for food.

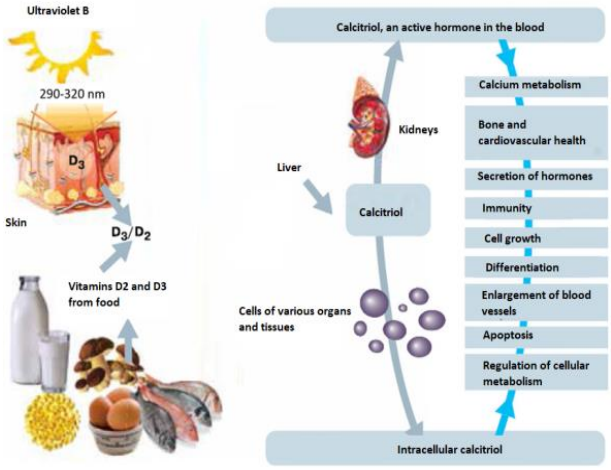


Fig.2. Cycling of Vitamin D in the body

Specifically, in chickens, the first indicator of to is in the fact that they begin to lay fewer eggs. But it is not limited to eggs. If Vitamin D deficiency (starvation) started at an early age, the lack of absorption of calcium and phosphorus by the bird's body can lead to the following consequences:

We must not forget that the Vitamin we use as a food supplement is not soluble in water, only soluble in fat. This mixture can also be added to porridge - Vitamin D is the most resistant to heat, so it will not completely dissipate during heat exchange (e.g. steaming of grain).

Materials:

Tenat (vitamin D) drops, oats, barley, wheat and corn crushed grain, meat and bone meal, and chalk.

Methods :

IR spectroscopy (Perkin-Elmer IR spectrum) and comparison method.

Practical part

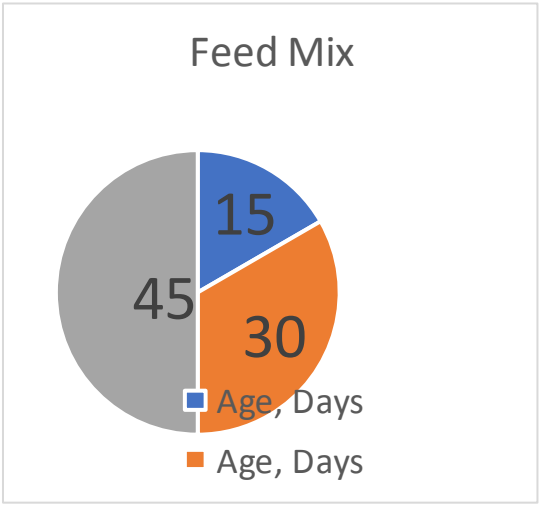
Composition of feed: We use the following feed recipe for chicken eggs under 3 months old, crushed grain from oats, barley, wheat and corn, meat and bone meal, and chalk.

We pour a tablespoon of Vitamin D into this whole mixture of about 5 liters, after that, we

mix well until the composition is smooth and put the food aside. This is a daily allowance for about 15 young chickens or 10 adult chickens. It is used once in 2-3 days.

Tab 1. Feed mixture with the addition of Vitamin D by day

Feed mix: crushed grain from oats, barley,
wheat and corn, meat and bone meal, chalk.



Vitamin D is “5” for all mix

Fig.3 Crushed egg shells

Results and discussions.

After we used Vitamin D in the feed mixture, we waited for periods to obtain eggs from broiler chickens of the above brands and manufacturers, and also the feed mixture was given to a village real chicken that grew from a village chicken egg, unlike other chickens that were grown from broiler eggs. According to the results of IR spectroscopy (Perkin-Elmer IR spectrum), we can state that the use of Vitamin D in the feed mixture gives a positive result in all cases since when analyzing the powder obtained from the shells of eggs fed with our Vitamin D fortified mixture, we can speak of a harder shell and better mechanical and physical indicators for these eggs, since even the shape of the eggs is more elongated, more similar to real eggs, in contrast to broiler eggs, which are known to be more rounded, since their shell is thinner and more inflatable.

According to the data we received, it can be seen that Vitamin D is found in the eggshell powders we tested.

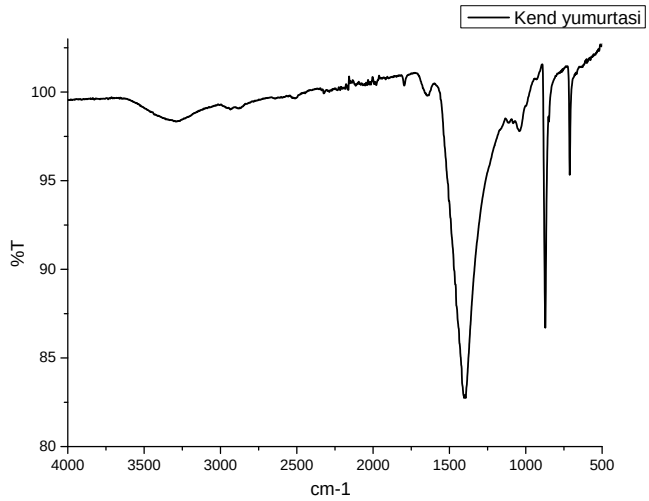


Fig.4. IR spectrum (Perkin-Elmer IR spectrum) of egg powder after Vitamin D supplementation in the feed mixture.

References

7. Bar, A., E. Vax, and S. Striem. 1999. Relationship among age,eggshell thickness and Vitamin D metabolism and its expres-sion in the laying hen. Comp. Biochem. Physiol. 123A:147–154. (16) (PDF) Effect of Vitamin D2- and D3-Enriched Diets on Egg Vitamin D Content, Production, and Bird Condition During an Entire Production Period.
8. Barker, D. H., R. R. Biehl, and J. L. Emmet. 1998. Vitamin D3 requirement of young chicks receiving diets varying in calcium and available phosphorus. Br. Poult. Sci. 39:413–417.
9. Shen, H., J. D. Summers, and S. Leeson. 2009. Egg productionand shell quality of layers fed various levels of Vitamin D3.Poult. Sci. 60:1485–1490. (16) (PDF) Effect of Vitamin D2- and D3-Enriched Diets on Egg Vitamin D Content, Production, and Bird Condition During an Entire Production Period.
10. Eastell, R., and B. L. Riggs. 1999. Vitamin D and Osteoporosis.Pages 695–71 in Vitamin D. D. Feldman, F. H. Glorieux, andJ. W. Pike, ed. Academic Press, London.Food and Nutrition Board. 2005. Dietary reference intakes forcalcium, phosphorus, magnesium, Vitamin D, and fluoride.Standing Committee on the Scientific Evaluation of DietaryReference Intakes, Institute of Medicine. National AcademyPress, Washington, DC (16) (PDF) Effect of Vitamin D2- and D3-Enriched Diets on Egg Vitamin D Content, Production, and Bird Condition During an Entire Production
11. Lamberg-Allardt, C., T. Outila, M. Ka¨rkka¨inen, H. Rita, and L.Valsta. 2001. Vitamin D deficiency and bone health in healthyadults in Finland: Could this be a concern in other parts ofEurope? J. Bone Miner. Res. 16:2066–2073. (16) (PDF) Effect of Vitamin D2- and D3-Enriched Diets on Egg Vitamin D Content, Production, and Bird Condition During an Entire Production
12. https://www.researchgate.net/publication/8650453_Effect_of_Vitamin_D2-_and_D3-Enriched_Diets_on_Egg_Vitamin_D_Content_Production_and_Bird_Condition_During_an_Entire_Production_Period

D VİTAMİNİNİN İSTİFADƏSİ İLƏ YUMURTA QABIĞININ XÜSUSİYYƏTLƏRİNİN YAXŞILAMASI

Fariz A. Əmirli[1], Quliyeva A. Nərminə[2], Məmmədova F. Aynur[3], Nəsibova A. Fidan[4], Abdullayev Q. Raul[5], Cəfərov O. Tural[6], Bəhmənov İ. Vasif[7], Qədaşov Nihad[8], T.N. Akılbekova[9]

[1] Azərbaycan Dövlət Neft və Sənaye Universiteti, Bakı, Azərbaycan
[9] Abay adına Qazax Milli Pedaqoji Universiteti, Qazaxıstan
[1] fariz.emirov@asoiu.edu.az, http://orcid.org/0000-0002-9095-2982
[3] http://orcid.org/0000-0002-1938-1320
[4] http://orcid.org/0009-0007-9318-5751
[5] http://orcid.org/0009-0000-7223-3442
[6] http://orcid.org/0009-0001-3068-3872
[7] http://orcid.org/0009-0003-0841-5163
[8] http://orcid.org/0009-0001-5780-0266
[9] http://orcid.org/0000-0002-6028-6229

XÜLASƏ

Təqdim etdiyimiz işdə broyler yumurtasından yetişdirilən toyuqların qurudulmuş yumurta qabıqlarının digər toyuq yumurtalarının qabıqları ilə (Siyəzən Broyler ASC, Şəfa Mills Broyler, MERCAN) müqayisəli tədqiqi apardıq. Toyuqların D vitamini əlavələri ilə qidalanmasının qabığa necə təsir etdiyi müəyyən edilmişdir. Vitaminlə qidalanmanın əhəmiyyəti tam izah edilir və standart həllər müəyyən edilir. Azərbaycan Respublikasının əsas vəzifələrindən biri qlobal ərzaq bazarında lider mövqeyə nail olmaqdır və biz ən yaxşı nəticə əldə etmək üçün toyuqların yemlənməsi sxemini işləyib hazırlamışıq və təmin etmişik. Beləliklə, biz sübut etdik ki, D vitamini ana sürü toyuqlarının və broyler yumurtalarının qarışıq yeminə əlavə kimi istifadə edildikdə, yumurta qabığının döş qatında dəyişikliklər baş verir ki, bu da onların keyfiyyətinin yaxşılaşdığını göstərir. Ana sürülərdə bu müsbət struktur dəyişiklikləri istehsal dövrünün sonunda baş verir ki, bu da yumurtaların yüksək yumurtalıq qabiliyyətini saxlamağa imkan verir. İşimizdə D vitamininin, yəni Tenatın qabığın quruluşuna təsirini eksperimental olaraq öyrəndik. Beləliklə, D vitamininin istifadəsi qida maddələrinin, xüsusən də bədəndə kalsium ehtiyatlarının yığılmasına kömək edir ki, bu da quşun məhsuldarlığını və yumurta keyfiyyətini itirmədən stress dövrlərində sağ qalmasına kömək edir.

Açar sözlər: polistirol tullantıları, polivinilxlorid, kapilyar viskozimetriya, statik və dinamik mübadilə qabiliyyəti, mexaniki möhkəmlik.

УЛУЧШЕНИЕ СВОЙСТВ ЯИЧНОЙ СКОРЛУПЫ ЗА СЧЕТ ИСПОЛЬЗОВАНИЯ ВИТАМИНА D

Фариз А. Амирли[1], Гулиева А. Нармина[2], Мамедова Ф. Айнур[3], Насибова А. Фидан[4], Абдуллаев Г. Рауль[5], Джафаров О. Турал[6], Бахманов И. Васиф[7], Гадашов Нихад[8], Т.Н. Акылбекова[9]

[1] Азербайджанский Государственный Университет Нефти и Промышленности, Баку, Азербайджан
[9] Казахский Национальный Педагогический Университет имени Абая, Казахстан
[1] Fariz.emirov@asoiu.edu.az, http://orcid.org/0000-0002-9095-2982
[3] http://orcid.org/0000-0002-1938-1320
[4] http://orcid.org/0009-0007-9318-5751
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[8] http://orcid.org/0009-0001-5780-0266
[9] http://orcid.org/0000-0002-6028-6229

АБСТРАКТ

В представленной нами работе мы провели сравнительное исследование сушеной яичной скорлупы кур, выращенных из яиц бройлеров, со скорлупой других куриных яиц (ОАО «Сиязанский бройлер», Shafa Mılls Broiler, MERCAN). Установлено, как скармливание цыплятам добавок витамина Д влияет на скорлупу. Подробно объяснена важность витаминного питания и определены стандартные решения. Одной из основных задач Азербайджанской Республики является достижение лидирующих позиций на мировом продовольственном рынке, и мы разработали и предоставили схему кормления кур для достижения наилучшего результата. Таким образом, нами доказано, что при применении витамина Д в качестве добавки к комбикормам кур родительского стада и яиц бройлеров-несушек происходят изменения в сосковом слое скорлупы яиц, что свидетельствует об улучшении их качеств. В родительских стадах эти положительные структурные изменения происходят в конце производственного периода, что позволяет поддерживать высокую выводимость яиц. В нашей работе мы экспериментально изучали влияние витамина Д, то есть Тената, на структуру скорлупы. Таким образом, применение витамина Д способствует накоплению в организме питательных веществ, в частности запасов кальция, что помогает птице пережить периоды стресса без потери продуктивности и качества яиц.

Ключевые слова: отходы полистирола, поливинилхлорид, капиллярная вискозиметрия, статическая и динамическая обменная емкость, механическая прочность.