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THE INTENSITY OF LIPIDS' PEROXIDE OXIDATION IN HENS' ORGANISMS UNDER DIFFERENT AMOUNTS OF CAROTENOIDS IN THE RATIO

It was found that there is a strong correlative relation between the level of carotenoids in the ration of breeding hens during the reproductive period and the content of lipid peroxidation products in their liver and liver of embryos. In particular, increasing of the level of carotenoids in the mixed fodder for chickens from 8 g to 32 g per tonne during the intense oviposition reduces MDA level and diene conjugates as well as in the liver of adult hens, as in the liver of embryos before the hatching, which is an important biochemical mechanism during the oxidative stress prevention of one-day chickens.

Key words: carotenoids, diene conjugates, malondialdehyde, hens, embryos, liver

It was established that carotenoids play an important role in the regulation of lipid peroxidation processes in tissues and organs of animals and fowl [3; 12]

As natural antioxidants, carotenoids, due to the presence of conjugated double relations, intercept the singlet oxygen in cells and inhibit the formation of free radicals [1; 2]. However, under the conditions of interaction with oxygen intermediate radicals carotene can form peroxide radicals, thus initiating chain reactions of lipid peroxidation [7].

Antioxidant properties of carotenoids in tissues are determined by many factors, including oxygen tension, concentration of carotenoids and their interaction with other antioxidants [8; 10]

According to this, the research interest is in studying the influence of the carotenoids level in the ration of fowl during the reproductive period on the processes of lipid peroxidation in the tissues of embryos and bred chickens.

It is known [4; 6] that the intensification of processes of lipid peroxidation in tissues, especially in the liver of fowl embryos before hatching from the eggs is the determining factor of appearing of the oxidative stress in one-day chickens.

That's why the purpose of our work was studying the influence of the level of carotenoids in the ration of hens during the period of intensive eggs laying capacity on the content of lipid peroxidation products in the hens' liver of parent herd and embryos at 19 days of growth.

Materials and Methods

Researches were conducted on 4 groups of 220 days Shaver-579 chickens on the base of LLC «Chortkiv breeding poultry». Chickens were kept in cages with free access to fodder and water. Main parameters of indoor climate were as following: 17 ° C air temperature, 65% relative humidity, 17 hours per day lighting with the intensity of 17 lux. In each group there were 10 hens and 1 cock. Hens of the first (control) group received standard mixed fodder, balanced according to the nutrition norms [10] without supplements of carotenoids in the ration. Hens of the second group received 8 g of carotenoids additionally, of the third one - 16 g, and of the fourth one - 32 g of carotenoids per 1 tonne of mixed fodder, that stands accordingly for 0.92 mg, 1.84 mg, 3.68 mg for one unit of fowl.

In our studies we used carotenoids preparation «ORO GLO 20 DRY» of «Kemin Europa NV» (Belgium) as a fodder additive. The content of the xanthophylls (lutein and zeaxanthin) in the «ORO GLO» was 20 g / kg.

The duration of experiment was 90 days. At the end of the experiment the specimens from each group were killed and the samples of the liver were taken. Received eggs from each group of chickens were incubated in the «Universal-55» incubator. The liver of embryos of the 19-day incubation was taken from each group. Then the level of malondialdehyde [11] and diene conjugates [5] was determined in the liver of chickens and 19-day-embryos. Obtained figures were processed statistically.

Results and Discussion

As it is evident from Fig. 1, the level of malondialdehyde decreased in the liver of chickens of the 2nd experimental group by 26.8% (P <0.05), the 3rd one – by 35.5% (P <0.01), and the 4 th one – by 57.9% (P <0.001) in comparison with the 1st control group.

Together with the decrease in the level of malondialdehyde in the liver of chickens of the research groups, reduction of diene conjugates is observed.

In particular, the content of diene conjugates in the liver of chickens of the 2nd experimental group decreased by 35.3% (P <0.01) in the 3rd one – by 47.2% (P <0.001), and in the 4th – by 58.4% (P <0.001) compared with the control group.

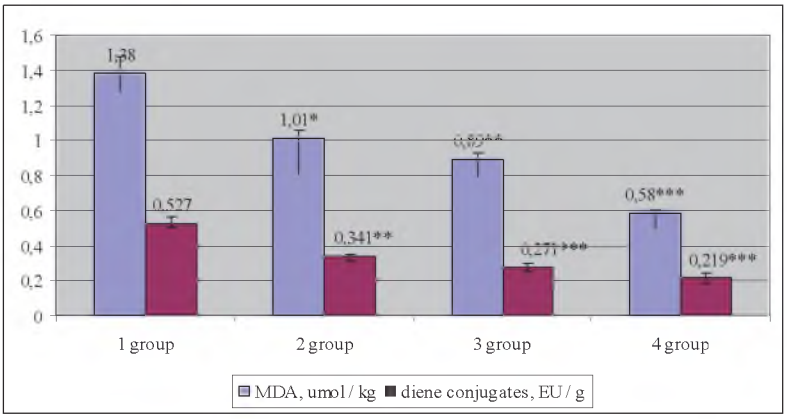

Fig.1. Concentration of lipid peroxidation products in the liver of chicken parent stock for various levels of carotenoids in the feed (M ± m, n = 7)

It should be noticed that the addition of carotenoids to the fodder for the chickens is in inverse correlation with the content of malondialdehyde and diene conjugates in their liver with correlation coefficient -0.97; -0.90, respectively.

As to the products of lipid peroxidation (Fig. 2.), it was found, that their level in the liver of embryos derived from eggs of hens research groups, decreased. Thus, MDA levels decreased by 19.5% (P <0.001) 3rd one – by 32.4% (P <0.001), 4 th – by 35.8% (P <0.001) in the liver of the 2nd experimental group embryos, and the content of diene conjugates of the 2nd one decreased by 21.4% (P <0.01) in the 3rd one – by 29.4% (P <0.001), and by 36.9% (P <0.001) in the 4th one as compared with the control group embryos.

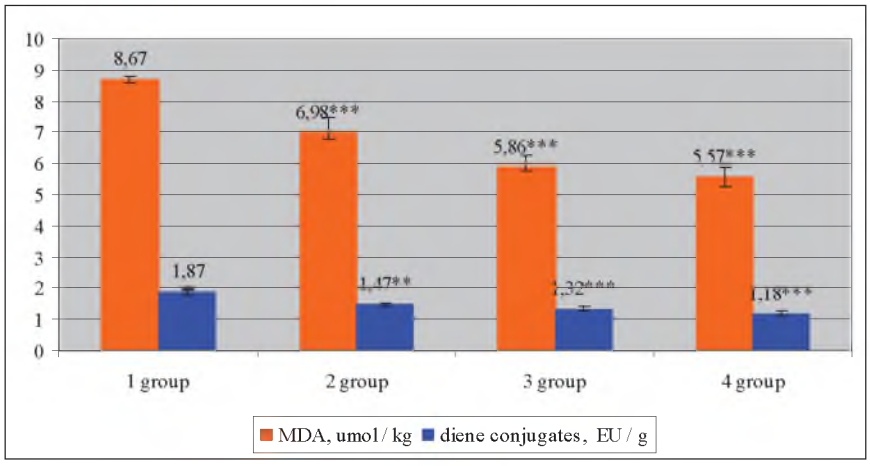

Fig.2. Concentration of lipid peroxidation products and vitamin E in the liver of 19-day-embryo chickens on terms of various carotenoids levels in the ration of chicken parent herd (M ± m, n = 7)

The received results show that the decrease of lipid peroxidation products such as MDA and diene conjugates takes place in the liver of 19-day-embryo research groups. On the basis of this we can assume that the increase in the level of carotenoids in the ration of parent herd will reduce oxidative stress at hatching and give more stable generation.

In general, the following conclusion comes out from the received results: there is a strong correlative connection between the level of carotenoids in the ration of breeding chickens during the reproductive period and the content of lipid peroxidation products in their liver and liver of the embryos. In particular, increased level of carotenoids in the chickens fodder from 8 g to 32 g per tonne during the intense oviposition reduces MDA and diene conjugates level in the liver of adult fowl as well as in the liver of embryos before hatching, which is an important biochemical mechanism in terms of prevention of oxidative stress in one-day chickens.

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ІНТЕНСИВНІСТЬ ПРОЦЕСІВ ПЕРЕКИСНОГО ОКИСЛЕННЯ ЛІПІДІВ В ОРГАНІЗМІ КУРЕЙ ЗА РІЗНОГО РІВНЯ КАРОТИНОЇДІВ У РАЦІОНІ

Встановлено, що між рівнем каротиноїдів в раціоні племінних курей у репродуктивний період і вмістом продуктів перекисного окиснення ліпідів як у їх печінці, так і печінці ембріонів, існує тісний корелятивний зв'язок. Зокрема, підвищення рівня каротиноїдів в комбікормі курей із 8 г до 32 г на тону в період інтенсивної яйцекладки знижує рівень дієнових кон'югатів і малонового діальдегіду як у печінці дорослої птиці, так і в печінці ембріонів перед їх вилупленням, що є важливим біохімічним механізмом у плані профілактики виникнення оксидативного стресу в добових курчат.

Ключові слова: каротиноїди, дієнові кон'югати, малоновий діальдегід, кури, ембріони, печінка

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ИНТЕНСИВНОСТЬ ПРОЦЕССОВ ПЕРЕКИСНОГО ОКИСЛЕНИЯ ЛИПИДОВ В ОРГАНИЗМЕ КУР ЗА РАЗНОГО УРОВНЯ КАРОТИНОИДОВ В РАЦИОНЕ

Установлено, что между уровнем каротиноидов в рационе племенных кур в репродуктивный период и содержанием продуктов перекисного окисления липидов как в их печени, так и печени эмбрионов, существует тесная коррелятивная связь. В частности повышение уровня каротиноидов у комбикорме кур с 8 г до 32 г на тонну в период интенсивной яйцекладки снижает уровень диеновых конъюгатов и малонового диальдегида как в печени взрослой птицы, так и в печени эмбрионов перед их вылупливанием, что является важным биохимическим механизмом в плане профилактики возникновения оксидативного стресса в суточных цыплят.

Ключевые слова: каротиноиды, диеновые конъюгаты, малоновый диальдегид, куры, эмбрион, печень

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