UDK 636.59:546.15

ANTIOXIDANT PROPERTIES OF PLANT EXTRACTS AND ITS APPLICATION IN CHICKEN PRODUCTION

Bordunova Olga Georgievna
Doctor of Agricultural Sciences, Proffesor
Sumy National Agrarian University
ORCID: 0000-0002-7120-1040
E-mail: bordunova.olga59@gmail.com

Vechorka Victoria Viktorivna
Doctor of Agricultural Sciences, Professor
Sumy National Agrarian University
ORCID: 0000-0003-4956-2074
E-mail: vvvechorka@gmail.com

Liu Changzhong
Doctor of Agricultural Sciences, Professor
Henan Institute of Science and Technology of China
ORCID: 0000-0002-7014-4486
e-mail: 15103733474@163.com

Kyselov Oleksandr Borisovich
PhD, Associate Professor
Sumy National Agrarian University
ORCID: 0000-0003-0134-7893
email: oleksandr.kyselov@snau.edu.ua

Samokhina Evgeniya Anatoliyivna
PhD, Associate Professor
Sumy National Agrarian University
ORCID: 0000-0002-0983-3047
E-mail: evgeniya_samokhina@ukr.net

The authors theoretically substantiated and practically proved the effectiveness of use of phytogenic drugs in the production of *poultry products. In the context of the comprehensive of "ban on resistance" to feed, the use of feed additives with high antioxidant content has a positive effect on the anti-stress ability of broiler chickens, as well as reduce its negative impact at large-scale rearing. The use of antioxidant feed additives in poultry has become one of the most important factors, increasing the productivity of broiler chickens in general in the large-scale farms. The plant extracts have a high potential for use as feed additives in agriculture and are a potentially perspective object of research. This article reviews the antioxidant properties of plant extract feed additives and their application in chicken production, and provides a theoretical basis for the further development and application of plant extracts.*

Key words: *plant extracts, antioxidant, chicken production, technology, biologically active substances, egg-laying qualities, chickens eggs*

DOI: https://doi.org/10.32845/bsnau.lvst.2021.4.3

With the high degree of intensification of livestock and poultry breeding, factors such as high-density feeding, lack of exercise, and poor ventilation have reduced the immunity of livestock and poultry, and their production performance has been seriously affected (Liu Changxiao et al., 2017). Unfortunately the use of antibiotics has become the guarantee for the sustainable development of large-scale agricultural sector. The long-term or irregular use of antibiotics has led to increasingly serious problems such as bacterial resistance, normal flora imbalance in animal intestines, and drug residues in livestock and poultry products, posing a serious threat to human health and the ecological environment (Cheng Guyue et al., 2014). Therefore, seeking eco-green antibiotic substitutes is an urgent task in the post-antibiotic era. In recent years, plant extracts have attracted much attention in the research of antibiotic substitutes because of their safety, high efficiency, no residue, no drug resistance, natural antioxidant and other advantages. Studies have shown that feeding healthy animals with plant extracts as additives can stimulate animal feeding, improve the antioxidant function and immunity of livestock and poultry, and promote the healthy growth of poultry, thereby improving economic efficiency (Jin Lizhi et al., 2010).

1 Plant extracts

Plant extracts are active substances extracted from plants, using plants as raw materials, according to the different characteristics of the biologically active substances of different plants, according to the needs of the use of the extract, through physical and chemical extraction and separation methods, to obtain a certain part of the plant. A product formed by one or more active ingredients without changing the structure of the active ingredients. The extraction and separation can be done by supercritical CO2 extraction (Gu Renyong et al., 2006). The promoting effect of plant extracts in animal breeding may be manifested as activating feed intake, promoting secretion of

digestive juice, stimulating immunity, antibacterial, anticoccidial, deworming, antiviral, etc., especially anti-oxidant activity. A large number of studies have shown that astragalus, licorice, rosemary, rhubarb, olive oil, anti-dysentery, sage, sesame, garlic, ginger, honeysuckle, wolfberry, liangmianzi, schisandra, green bamboo, bitter bamboo, green bamboo, etc. A variety of plant extracts have antioxidant capacity (Economou et al. 1991, Liu Shide et al. 2003, Shi Donghui et al. 2010, Liu Shuxing et al. 2007). Plant extract additives have positive effects on poultry welfare, growth performance, nutrition and energy utilization, which is the reason for their widespread use.

2 Antioxidant research of plant extracts

2.1 In vitro antioxidant research of plant extracts

There are many methods for evaluating the in vitro antioxidant activity of plant extracts. Zhao Yanhong et al. (2009) used the Prussian blue method, the phenanthroline-Fe2+ oxidation method, the light riboflavin-nitrogen blue tetrazolium method and the DPPH-method to compare . The antioxidant capacity of several common plant materials was evaluated in vitro, and the results showed that the antioxidant capacity of different plants is quite different. Wu Yinghua et al. (2014) used aluminum chloride colorimetric method and Folin-Ciocalteu method to determine 7 plant extracts of ginger root, guava leaf, guava seed, orange peel, sesame seed coat, rice bran and wheat germ in different solvents. The amount of total polyphenols and total flavonoids in the plant extracts, and the in vitro antioxidant activities of these 7 plant extracts were compared. The results of the study showed that the same plant was extracted with different solvents, and the antioxidant activities of the plant extracts were quite different. The total flavonoids in plant extracts are the highest in ginger root and the lowest in guava seed. Common methods include rancidity test and particulate peroxidation. The rancidity test is mainly used to select fat-soluble antioxidants. The antioxidant factor (AF) value is used to indicate the antioxidant capacity. The higher the AF value, the stronger the antioxidant capacity, while the particulate peroxidation is to choose water-soluble antioxidants. Zheng Wei (2001) and others measured the total phenol content and antioxidant activity of various plant extracts, and found that the total phenol content and the strongest antioxidant activity in the long-flowered mint, followed by oregano, the lowest is Aloe. They also measured the content of phenolic compounds in these plant extracts, and found that sage, oregano, long-flowered gray mint, and thyme contained the highest rosmarinic acid content, while rosemary had the highest carnosic acid content. The highest, the vanillic acid content in these plant extracts is low. These in vitro studies have proved that plant extracts have antioxidant capacity, laying a foundation for plant extracts to replace antibiotics as safe antioxidants in the future.

2.2 In vivo antioxidant research of plant extracts

Some scholars have discovered in the study of the effect of plant extracts on chickens that it may be due to the antioxidant components in plant extracts entering the circulatory system of chickens, transported through the blood to the tissues, and then stored in the tissues, thereby exhibiting anti-oxidant properties. Oxidation capacity (Slavomir et al., 2008, Botsoglou et al. 2002) studied how oregano grass extract can exert antioxidant effects in muscle and abdominal fat. The main reason is that the antioxidant components in oregano grass extract enter the cell membrane, indicating that the plant extract is protective Antioxidant ingredients of glutathione bind to the cell membrane and then play a role. Zhang Guizhi et al. (2007) compared the antioxidant components of plant extracts and found that the antioxidant activity of plant extracts is closely related to the structure of the active ingredients. The increase in hydroxyl groups at positions 5, 7, and 8 on the «A» ring can increase antioxidant activity to varying degrees ability. It is generally believed that the hydroxyl groups on the benzene ring of the thymol structure provide hydrogen ions for the free radicals generated in the first step of fat oxidation to delay the peroxidation process. This may be the reason for the high antioxidant activity of thymol.

3 Antioxidant mechanism of plant extracts

In the process of animal growth and evolution, it has formed a set of antioxidant mechanisms in the body. Under normal physiological conditions, the body's oxidative system and antioxidant system are in a dynamic balance. An appropriate amount of free radicals can catalyze the catabolic reactions in the body. However, under abnormal physiological conditions in animals, the body will produce a large number of excess free radicals, and the existence of a large number of free radicals will break this dynamic balance. Free radicals have a very strong oxidizing ability, which will cause the body's macromolecular substances to produce peroxidation through oxidation, which will cause oxidative damage to the body and cause various diseases in the animal body. Therefore, excess free radicals must be removed in time, O2- is the first free radical in active oxygen, OH- is the free radical that causes lipid peroxidation, DPPH- is a relatively stable free radical, belonging to the aromatic free radical. Therefore, the ability to scavenge these free radicals can be used to evaluate the antioxidant activity of plant extracts (Aruoma et al. 1993, Mark et al. 1999, Brand et al. 1995).

Plant extracts can reduce oxidative damage caused by free radicals. Their main active ingredients are polyphenols, flavonoids, vitamins, alkaloids, peptides, etc. Many studies have proved the antioxidant effects of these active substances on animals, and the antioxidant components of plant extracts cooperate with each other to exert their antioxidant effects (Milos et al., 2004). Tan Yuxin et al. (2010) gave a brief description of these active ingredients in plant extracts, showing that these active ingredients have good antioxidant effects. Their antioxidant mechanisms mainly include: reaction with excess free radicals; promotion of antioxidant enzyme activity and inhibition of oxidase activity; reduction of metal catalytic factors; mutual synergy between active ingredients, etc. Astragalus polysaccharide is a plant polysaccharide extracted from astragalus. Wei Bingdong et al. (2011) proved that many plant polysaccharides, including astragalus polysaccharide, have strong antioxidant effects. The mechanism is: 1) Polysaccharide molecules increase antioxidant enzymes in the body. Activity, to play an antioxidant effect; 2) Polysaccharide molecules can directly act on the free radicals themselves to capture the active oxygen generated during the lipid peroxidation reaction, thereby achieving the purpose of anti-oxidation.

4 Application of plant extracts in chicken production

4.1 Application of plant extracts in broiler production

As a high-protein and low-fat food, chicken has become a popular product for consumers. Therefore, it must have the characteristics of safety, health, good taste, and good meat

quality. Only in this way can it meet the needs of consumers. A large number of polyunsaturated fatty acids in poultry meat are the most sensitive part in the oxidation process. With the occurrence of a large number of oxidation reactions, a large number of free radicals will be generated during this process, and then aldehydes will be produced, which will make normal poultry meat. The taste and color of the meat have undergone major changes, so oxidation is one of the important reasons for the deterioration of product quality during poultry storage. Scholars have studied the effects of plant extracts in the breast and thigh meat, blood, and gastrointestinal tract of broiler chickens. Studies have shown that plant extracts can enhance the antioxidant capacity of broiler chickens. Liu Xiaohua et al. (2004) studied the effects of tea polyphenols on the slaughter performance and meat quality of broiler chickens. The experimental results showed that adding tea polyphenols to the broiler's diet can improve the slaughter performance and muscle quality. Total superoxide dismutase (T-SOD) and glutathione peroxidase (GSH-Px) are important enzymes in the antioxidant system in the body, and malondialdehyde (MDA) is the product of lipid peroxidation of cell membranes. Its content can indirectly reflect the degree of cell damage, Shi Donghui et al. (2013) measured the effects of Zhili Cao on the levels of superoxide dismutase (SOD), GSH-Px and catalase (CAT) in the serum of broilers on 21 day and 42 days. The results show that the activity of these enzymes is higher than that of the control group and the antibiotic group. It also proves that the plant extracts have a good antioxidant effect. Plant extracts also have many beneficial effects on the gastrointestinal tract. For example, after adding some plant essential oils to the feed of broilers, the activities of trypsin and amylase are significantly enhanced (Jing et al., 2004). Researcher Wei Bingdong et al. (2011) showed that Astragalus polysaccharides can increase the antioxidant enzyme activity in the serum and liver of broilers from 1 to 7 and 1 to 14 days old, reduce MDA content, and enhance the body's antioxidant capacity. Meng Xianrong et al. (2002) found that astragalus polysaccharides can enhance the function of the antioxidant enzyme system in chickens, reduce the content of lipid peroxides, and reduce the damage of active oxygen free radicals to the body, thereby reducing the morbidity and mortality of Marek's disease. Astragalus polysaccharides can increase the activity of T-SOD and GSH-Px in the serum and liver of broiler chickens, reduce the content of MDA, and relieve the oxidative stress induced by hydrocortisone, thereby increasing the organ index of broilers and ensuring animal growth (Wei Bingdong et al., 2012). Wu Hua et al. (2010) studied the effect of adding liquoric herb residue to the feed on the performance of broiler chickens, and found that compared with the control group, the 3% liquoric herb residue group can significantly increase the daily gain of broilers and reduce the feed. Meat ratio ($P < 0.05$), and can significantly increase the apparent metabolic rate of crude protein in the diet ($P < 0.05$), and the addition of different levels of licorice residue group can reduce the apparent metabolic rate of crude fat in the diet ($P < 0.05$). The study by Shao Qi et al. (2016) showed that adding a proper amount of licorice cream can significantly increase the antioxidant capacity in broiler serum. The antioxidant capacity of the 50 mg/L group was significantly higher than that of the 0 mg/L and 100 mg/L groups ($P<0.05$). Researcher Li Guosheng (2001) found in the research on the effect of plant extract feed additives on the production performance of Chinese yellow feather broilers that the daily gain of yellow feather broilers with plant extracts added to the feed increased by 11.4%, and the feed return improved by 10.1%. Some scholars have also studied the relationship between plant extracts and broiler mortality, and the results show that the mortality of broiler chickens fed with plant extracts has significantly decreased. The results of a large number of studies on the antioxidant effect of plant extracts are almost similar, all have good antioxidant effects, indicating that plant extracts can improve the economic benefits of the poultry industry by improving the production performance of broilers.

4.2 Application of plant extracts in egg-laying production

Researcher Yu Wei et al. (2011) added 300 mg/kg glycopeptide ketone terpene, the 60-day test period test results showed that glycopeptide ketone terpene can significantly regulate the follicular maturation of laying hens. The effects of luteinizing hormone, triiodothyronine, tetraiodothyronine and progesterone promote ovulation and improve laying performance of laying hens. Wu Jiajing et al. (2012) added okra leaf powder to the diet of Hailan layer hens during the peak period of egg production. During the 12-week test period, the test results showed that adding different amounts of okra leaf powder to the layer diet can be used to a certain extent. It can reduce the number of Escherichia coli in the cecum, increase the number of bifidobacteria and lactobacilli, at the same time, it can increase the height of small intestine villi, reduce the depth of crypts, increase the ratio of the height of small intestine villi to the depth of crypts, and improve the morphology and structure of the intestinal mucosa, thereby increasing. It improves the body's defense against diseases and the improvement of digestive organ function. Radwan et al. (2008) evaluated the effects of thyme, rosemary, oregano and turmeric on the performance of laying hens and the oxidative stability of eggs, and found that adding 1% of thyme and rosemary to the diet of laying hens can be significant. To reduce the lipid content in plasma, adding 1% turmeric can significantly reduce the total lipid content in egg yolk; adding 1% oregano grass during laying period can significantly reduce the oxidation of eggs during storage. The results show that these natural antioxidants can improve the antioxidant capacity of plasma, thereby reducing free radicals transported to eggs. Wu Xingjin et al. (2005) studied the effect of irus on egg quality, and the difference in egg shape index was not significant, but the rate of breaking soft eggshells was significantly lower than that of the control group. Adding plant extracts during the laying period can improve the production performance and egg quality of laying hens, increase egg production and egg weight, and increase the feed-to-egg ratio. Zhang Lin et al. (2013) reported that quercetin can increase the laying rate of laying hens and reduce the feed-to-egg ratio. 0.02% quercetin can increase the serum insulin (INS) level, 0.04% quercetin can significantly increase the serum estradiol (E2) and INS levels, and can increase the total egg yolk phospholipid and lecithin content. The most suitable addition amount is 0.04%. It is reported that adding 0.6% rosemary vanilla powder to the diet of laying hens can significantly increase the expression of lysozyme (LYZ) gene in the spleen, heart, liver, lung, small intestine, proventriculus, ovary, and isthmus, and reduce heat stress protein 70 (HSP70) gene expression in the lungs, kidneys, heart, ovary, and uterus, thereby reducing the adverse effects of heat stress on laying

performance of laying hens and prolonging the storage time of eggs (Wang Xiaohui et al., 2019). Garlic essential oil can significantly increase the laying rate of laying hens in the later stage of laying, reduce the average daily feed intake and feed-to-egg ratio, increase the egg protein height and the Huff unit, and thereby increase the market value of the laying hens (Xu Jing et al., 2020).

Conclusions

As a new type of green, safe, residue-free, and strong antioxidant feed additives, plant extracts have broad application prospects in poultry production, but there are still some problems waiting to be resolved, such as the source of the plant area, cutting time, use part, extraction craftsmanship and so on. In the future, the effective ingredients in plant extracts need to be refined and developed to achieve the principle of micro-level and high-efficiency applications. At the same time, the mechanism of action of various effective ingredients should be systematically studied in terms of metabolic utilization pathways, immune regulation, and hormone regulation. Maximize the effectiveness of plant extracts in replacing antibiotics.

References:

1.Liu Changxiao. 2017. Challenges and reflections on the development of contemporary antibiotics [J]. Chinese Journal of Antibiotics, 42(1):1-12.

2.Cheng Guyue,Hao Haihong,Xie Shuyu, 2014. Research progress of antibiotic substitutes[J].Chinese Agricultural Science Bulletin, 30(35):97-106.

3.Jin Lizhi. 2010.The application of plant extract additives in animal nutrition and the research progress of its mechanism[J]. Chinese Journal of Nutrition, 22(5): 1154-1157.

4.Gu Renyong, Liu Yingying. 2006. Study on the antibacterial and antioxidant properties of oregano essential oil[J]. Food and Fermentation Industries, 32(10): 51-52.

5.Economou K D, Oreopoulou V, Thomopolous C. 1991. An-tioxidant properties of some plant extracts of the Labiatae family[J]. Journal of the American Chemical Society, 68:109-113.

6.Liu Shide, Yu Yuwen, Zhang Jianhua, 2003. Application research of rosemary antioxidant extract[J]. Food Science, 24(2): 95-99.

7.Shi Donghui, Li Tiexin, Ma Xuehui. 2010. Antioxidant effect of Zhili grass extract on weaned piglets and its influence on growth performance. Chinese Journal of Animal Husbandry, 46(4): 53-57.

8.Liu Shuxing, Zhao Fang. 2007. Research progress in developing antioxidants from natural plants[J]. Food Research and Development, 28(7): 179-182.

9.Zhao Yanhong, Li Jianke, Zhao Wei, 2009. Evaluation of in vitro antioxidant activity of common medicinal and edible plants[J]. Food Science, 30(3): 104-106.

10.Wu Yinghua, Ren Fenglian. 2014. Comparative study on the in vitro antioxidant activity of seven plant extracts[J]. Chinese Patent Medicine, 36(6): 1298-1230.

11.Wei Zheng, Shiow Y Wang. 2001. Antioxidant Activi-ty and Phenolic Compounds in Selected Herbs [J]. Agric. Food Chem, 49: 5166-5168.

12.Slavomir M, Rudolf C, Peter P, 2008. Antiox-idative effect of oregano supplemented to broilers on oxidative stability of poultryment. Original Research Paper, 45(2):61-66.

13.Botsoglou N A, Florou-paneri P, Christaki E, 2002. Effect of dietary oregano essential

oil on performance of chickens and on ironinduced lipid oxidation of breast, thigh and abdominal fat tissues[J].British Poultry Science, 43: 223-230.

14.Zhang Guizhi, Geng Sha, Yang Haiyan, 2007. Research progress in plant antioxidant components[J]. Food Science, 28(12): 551-553.

15.Aruoma O I, Murcia A, Butler J, 1993. Evaluation of the antioxidant and prooxidant actions of garlic acid and its derivatives. Journal of Agricultural and Food Chemistry, 41(11): 1880-1885

16.Mark Hodges D, Delong John M, Forney Charles F, 1999. Improving the thiobarbituric acid-Reactive-substances assay for estimating lipid peroxidation in plant tissues containing anthocyanin and other interfering compounds. Planta, 207(4): 604-611.

17.Brand- Williams W, Cuvelier M E, Berset C. 1995.Use of a free radical method to evaluate antioxidant activity. Lebensmittel- Wissen-schaft and Technologies, 41: 1738-1744.

18.Milos T, Kulisic A, Radonic V. 2004. Use of different methods for testing antioxidative

activity of oregano essential oil[J]. Food Chemistry, 85: 633-640.

19.Tan Yuxin, Ye Tao, Liu Xiangxin, 2010. Research progress on antioxidant components and mechanism of plant extracts[J]. Food Science, 31(15): 288-291

20.Liu Xiaohua, Gao Weihua, Xia Yu, 2004. Effects of tea polyphenols on broiler performance, slaughter performance and meat quality. Modern Animal Husbandry and Veterinary Medicine, 12: 9-11.

21.Shi Donghui, Chen Junfeng, Zhao Liansheng, 2013. Study on the effect of Lamiaceae plant extracts on the antioxidant function of broiler serum and the oxidation of chicken lipids[J]. Animal Health, 49(7): 64-66.

22.Jang I S, Y H. Ko, H Y Yang, 2004. Influence of essential oil components on growth

performance and the functional activity of the pancreas and small intestine in broiler chickens. Asian-australas. J. Anim. Sci.,7(3): 394-400.

23.Li Guosheng. 2001.Efficacy test on breeding yellow-feather broilers with Haoligao additives[J]. Poultry and Poultry Disease Control, 12: 20-21.

24.Yu Wei, Liu Haiyan, Qi Hongwei. 2011.The effects of glycopeptide ketone terpenes on the production performance and

blood hormone levels of laying hens. China National Poultry,33(20):21 -23.

25.Wu Jiajing, Zhou Hanlin, Rong Guang, 2012. Effects of okra leaf powder on cecal microbes and intestinal tissue structure of Hailan brown layers. Journal of Livestock Ecology, 33(3):42-47.

26.Radwan Nadia L, Hassan R A, Qota E M. 2008. Effect of Natural Antioxidant on Oxidative Stabili-ty of Eggs and Productive and Reproductive Performance of Laying Hens[J]. International Journal of Poultry Science, 7(2): 134-135.

27.Wu Xingjin. 2005. The effect of feeding Yilusu on laying performance of laying hens. Guizhou Animal Husbandry and Veterinary Medicine, 29(3): 1-2

28.Wei Bingdong, Yu Wei, Tao Hao, 2011. Effects of Astragalus Polysaccharides on Growth Performance, Organ Index and Antioxidant Capacity of Broilers from 1 to 14 Days of Age. Journal of Animal Nutrition, (3):486-491.

29.Meng Xianrong, Li Qingzhang, Qu Qihuan, 2002. Effects of astragalus polysaccharide and lentinan on macrophage activity and interleukin-1 in vitro viability in virulent Marek's disease infected chickens[J]. Chinese Journal of Veterinary Medicine, 38 (007): 33-34.

30.Wei Bingdong, Tao Hao, Yu Wei, 2012. Effects of Astragalus Polysaccharides on Growth Performance, Organ Index and Antioxidant Capacity of Broiler Chickens under Hydrocortisone Oxidative Stress. Acta Zoo Nutrition, 24(010) : 1939-1945.

31.Wu Hua, Zhang Hui, Duan Qihui. 2010. The effect of licorice residue on the quality of grazing broiler chicken[J].Journal of Qinghai University (Natural Science Edition),28(03):58-61.

32.Shao Qi, Zhang Cai, Niu Yale, Zhang Xiong, Wang Hongwei, Wang Jicang, Yang Zijun. 2016. The effect of licorice cream on the growth performance and antioxidant capacity of broilers. Feed Industry,37(08):41-44.

33.Zhang Lin. 2013. The effect of quercetin on layer performance and lipid metabolism[D]. Harbin: Northeast Agricultural University.

34.Wang Xiaohui, Xin Shijie, Zou Wenbin, 2019. Effects of dietary supplementation of rosemary, vitamin E, vitamin C and soybean oil on the expression of HSP70 and LYZ genes in different tissues of laying hens during high temperature period. Chinese Journal of Veterinary Medicine, 39 (4): 767-773.

35.Xu Jing, Yang Shuzhan, Hu Bianwen, 2020. The effect of garlic essential oil on the production performance of laying hens and chicken flavors in late laying period. Chinese Journal of Animal Nutrition, 32 (1): 199-205.

Бордунова Ольга Георгіївна, *доктор сільськогосподарських наук, професор*
Вечорка Вікторія Вікторівна, *доктор сільськогосподарських наук, професор*
Лю Чанчжун, *доктор сільськогосподарських наук, професор, Хенаньський науково-технічний інститут Китаю*
Кисельов Олександр Борисович, *кандидат сільськогосподарських наук, доцент*
Самохіна Євгенія Анатоліївна, *кандидат сільськогосподарських наук, доцент*
Сумський національний аграрний університет (Суми, Україна)

Антиоксидантні властивості рослинних екстрактів та їх застосування у виробництві продукції птахівництва

Авторами теоретично обґрунтована та практично доведена ефективність застосування фітогенних препаратів при виробництві продукції птахівництва. В контексті світової тенденції «заборони на резистентність» кормів, використання саме кормових добавок з підвищеним вмістом антиоксидантів позитивно впливають на антистресову здатність курчат-бройлерів, а також знижують його негативний вплив при масштабному вирощуванні. Використання антиоксидантних кормових добавок у птахівництві стало одним з найважливіших факторів, що підвищує продуктивність курчат-бройлерів в цілому на великих птахо-комплексах. Рослинні екстракти мають високий потенціал для використання як кормові добавки у сільському господарстві та є потенційно перспективним об'єктом наукових досліджень. У статті розглядаються антиоксидантні властивості кормових добавок на основі екстрактів рослин і їх застосування у птахівництві, а також забезпечується теоретична основа для подальшої розробки та застосування рослинних екстрактів при виробництві продуктів птахівництва.

Ключові слова: *рослинні екстракти, антиоксиданти, виробництво курки, технологія, біологічно активні речовини, несучі якості, курячі яйця*

Дата надходження до редакції: 03.10.2021 р.