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Effects of Adding Different Levels of Selenium-Enriched *Saccharomyces cerevisiae* on Productive Performance, Antioxidative Capacity, and Cecal Microbiota of Heat-Stress Broilers

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Abstract

THIS STUDY was conducted to investigate the effects of selenium-enriched *Saccharomyces cerevisiae* (Se-enriched *S. cerevisiae*) supplementation on growth performance, blood serum lipids, cecal microbiota, and antioxidative capacity of heat-stressed broilers. One-day-old 300 chicks (Ross 308) were randomly assigned into four groups, each consisted of five replicates (15 chicks/ replicate). Chicks in the control group were received a basal diet without feed additives, while the other groups received the basal diets supplemented with three levels of Se-enriched *S. cerevisiae* (0.5, 1, and 1.5 g/kg diet, respectively). The results showed that adding Se-enriched *S. cerevisiae* significantly increased body weight gain and decreased feed conversion ratio ($P < 0.05$). Additionally, supplementing Se-enriched *S. cerevisiae* showed higher ($P < 0.05$) activities of serum superoxide dismutase (SOD) and glutathione peroxidase (GPx), but lower malondialdehyde (MDA) content compared to the control group. Se-enriched *S. cerevisiae* supplements enhance the metabolism of blood lipids by lowering cholesterol and LDL levels and increasing HDL levels, likewise raising blood triiodothyronine (T3) concentration. Se-enriched *S. cerevisiae* modified the cecal microbial content by increasing *Lactobacillus* count and decreasing *Escherichia coli* count compared to those of the control group. It could be concluded that adding Se-enriched *S. cerevisiae* to the diet of heat-stressed broilers had an effective impact on enhancing growth performance, dressing percentage, lipid metabolism, oxidative status, and modifying cecal beneficial microbiota.

Keywords: Broiler performance, Selenium, Saccharomyces cerevisiae, lipid metabolism, gut integrity.

Introduction

Heat stress is one of the major threats to the poultry industry especially in light of ongoing climate changes [1]. Modern broiler chickens (Ross, IR, Hubbard, and Arbor Acres) are characterized by their high metabolic rate compared to old breeds, which leads to increased heat production in the body [2], and makes them more sensitive to heat stress. In addition to the limited ability of poultry to regulate heat loss due to the presence of feathers and the lack of sweat glands [3]. Several scientific evidence have documented the detrimental effects of heat stress on broiler performance, physiology, and metabolism, which include impairment of intestinal integrity, and induction of oxidative stress leading to epithelial damage and inflammatory response [4]. In this context, some studies have shown that adding nutritional supplements had a positive role in mitigating the harmful effects of heat stress [5, 6].

Yeast (*Saccharomyces cerevisiae*) is widely used in the pharmaceutical and biotechnology industries as well as in the production of animal feed, which supports animal health and performance [7, 8]. *Saccharomyces cerevisiae* is characterized by its rapid metabolism, which makes it more reactive to the environment, in addition to its high propagation rate, which provides a large cell biomass [9]. Yeast has also been shown to absorb and convert many

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minerals and elements with high efficiency in the yeast cell structure, such as selenium.

Selenium (Se) is an essential trace element for animal performance and health, as it has antioxidant properties and protects the animal from the effects of free radicals [10], which cause damage to cell membranes. It is also involved in many biological processes such as thyroid hormone production, reduction of inflammation, and formation of enzymes, including glutathione peroxidase, which has a significant role in minimizing lipid peroxides and hydrogen peroxide that are produced during normal metabolic activities [11]. In addition, it plays an important role in the activity of most arms of the immune system and in maintaining normal muscle function [12, 13]. Therefore, it has become necessary to supplement Se to meet the basic nutritional requirements and for many potential health benefits, especially when the bird is exposed to stress. In poultry nutrition, there are two main sources of selenium, namely organic selenium (Se-Met) and inorganic selenium (sodium selenite). Many studies confirmed that organic Se is absorbed in greater amounts in the body than inorganic Se [14]. Organic Se (including Se-enriched yeast) has higher bioavailability and accumulation rates, in addition to lower toxicity compared to the inorganic form [15]. Therefore, organic Se supplements have been recommended for use in the poultry industry, such as selenium-enriched yeast, and approved for use as a Se additive to maintain poultry health and increase Se concentration in poultry products including carcass meat and eggs [16].

As a result of the many advantages confirmed by many previous reports, it was assumed that adding Se-Enriched *Saccharomyces cerevisiae* may reduce the harmful effects of heat stress on broilers. Therefore, this study was designed to investigate the effects of Se-enriched *S. cerevisiae* supplementation on growth performance, antioxidant capacity, and cecal microbiota of heat-stressed broilers.

Material and Methods

Diets, Experimental Design, and Management

The experimental procedures were performed according to the Experimental Animal Care Committee, Desert Research Center. The experiment was conducted on the farm of the Desert Research Center in June 2023 (summer season). Three hundred unsexed broiler chicks (Ross 308) were purchased from a commercial hatchery and distributed randomly into four experimental groups (5 replicates, each containing 15 chicks). The control group (CON) was fed a corn-soybean meal basal diet, and the other three groups fed the same basal diet supplemented with 0.5, 1, and 1.5 g/kg Se-enriched *S. cerevisiae* (Se-ES1, Se-ES2, and Se-ES3, respectively). A corn-soybean meal basal diet was formulated to meet the recommendations for broiler chickens of the National Research Council [17], as shown in Table 1. Feed and water were provided ad libitum during the 35-days experiment. The chicks were exposed to 24 h of lighting for the first 1 week and then 4 h of darkness and 20 h of lighting until the end of the experiment, with an average light intensity of 40 lx for the first 1 week and then an average light intensity of 15 lx until the end of the experiment. The temperature was set at 33.5 °C and the relative humidity was 60-65% during the first day, and then the temperature gradually decreased at a rate of half a degree per day until the 7th day, then the chicks were exposed to a temperature of 35 °C for 3 hours five days a week during the experimental period. The temperature and humidity were recorded using EasyLog USB data loggers (Lascar Electronics, Whiteparish, Wiltshire, UK), with a temperature accuracy of ±0.5 and humidity accuracy of ±3%.

Preparation of Selenium-Enriched S. cerevisiae

Colonies from pure culture of *Saccharomyces cerevisiae* were transferred to 50 ml of Sabouraud dextrose broth and incubated at 30°C for 18 to 24 h in an orbital shaking incubator at 200 g. Five liters (5 L) of the culture medium was prepared in a fermenter and autoclaved at 121°C at 1.2 bar for 15 min. Inorganic selenium (sodium selenite, Na2SeO3) was added at a concentration of 50 ppm to a concentrated glucose solution (150 g L-1) and used as the feeding solution. Fermentation was performed in a 10 L laboratory fermenter (Scigenics India). Fermentation and incubation were carried out as described by Rajashree, and Muthukumar [18]. The selenium-enriched yeast was freeze-dried and stored at 4°C until the experiment was performed.

Growth Performance Index

Live body weight (LBW), and feed intake (FI), of broiler chickens at 35 days of age were recorded. Average daily weight gain (ADG) and feed conversion ratio (FCR) were calculated. After the slaughtering process, internal organs such as the liver, spleen, bursa of Fabricius, and thymus were separated and weighed, in addition to dressing percentage and abdominal fat content were calculated. The relative weight of each organ was calculated as follows: relative weight = (organ weight/live body weight) x 100.

Blood Parameters

Wing vein blood samples of 2.0 ml were randomly collected on day 35 from 20 broilers (5 chicks per group) for chemical analysis. Serum total cholesterol, triglycerides, glucose, high-density lipoprotein (LDL), and low-density lipoprotein (HDL) were measured in blood after being centrifuged at 3500 for 10 min at 4◦C using a spectrophotometer (Shimadzu UV 1601) by commercial kits produced by Stanbio Laboratory (Boerne, Texas, USA). According to the

manufacturer's instructions, malondialdehyde (MDA), superoxide dismutase (SOD), and glutathione peroxidase (GPx) levels were assayed using commercial kits (Spinreact Co. Girona, Spain). Serum triiodothyronine (T3) hormone concentration was measured by radioimmunoassay with a kit produced by the Institute of Isotopes Co., Ltd. (Budapest, Hungary).

Microbial enumeration

For cecum microbial content estimation, the cecum contents were squeezed into sterilized stomacher bags at 35 days of age. Five fresh samples (2 g/sample) from each group were diluted and placed on the specific agar for each microbe and incubated at the required temperature and time. The target microbes were *Lactobacillus*, *coliforms*, and *Escherichia coli*, and the specific agar for each microbe was as follows: MacConkey agar, Rogosa, deMan, and Sharpe agar, respectively.

Statistical Analysis

All data were analyzed using SPSS statistical software (SPSS for Windows, version 16.0; SPSS Inc., Chicago, IL). One-way analysis of variance followed by Duncan's multiple comparison test was used to identify differences in means among treatments. Data were assumed to be statistically significant at $P<0.05$.

Results and Discussion

The effect of different levels of Se-enriched *Saccharomyces cerevisiae* on the growth performance of heat-stressed broiler chickens is shown in Table 2. Se-enriched *S. cerevisiae* supplementation had a positive effect ($P < 0.05$) on measured growth parameters of broiler chickens, including increased LBW and ADG and decreased FCR ($P < 0.05$). However, Se-enriched *Saccharomyces cerevisiae* supplementation did not affect the feed intake of broiler chickens. There was a significant improvement in the FCR with increasing levels of Se-enriched *Saccharomyces cerevisiae* ($P < 0.05$), while the best FCR was for chickens that received 1.5 g/kg Se-enriched *S. cerevisiae*. In addition, chickens receiving 1.0 and 1.5 g/kg Se-enriched *S. cerevisiae* had higher weight gain ($P < 0.05$) than in other groups. In agreement with our results, increased body weight gain and feed efficiency were reported in broiler chickens fed a diet supplemented with Se-enriched yeast [19]. Similar results have been reported, wherein Se supplementation revealed enhanced effects on body weight gain and feed efficiency [20] in broilers under heat stress. Similar to our findings, He et al. [21] and Elbaz et al. [7] reported that the dietary addition of *Saccharomyces cerevisiae* enhanced growth performance in broilers during summer. The improved growth performance of chickens fed Se-enriched *S. cerevisiae* may be attributed to the combined roles of selenium and *Saccharomyces cerevisiae* via enhanced oxidative stability and gut integrity, allowing greater digestion and absorption of nutrients, enhancing enzymatic activities, and immune response as well [5, 7, 9, 12].

Despite the significant improvement in growth performance in our results, Se-enriched *S. cerevisiae* supplementation did not affect carcass dressing percentage (Table 3), while abdominal fat content was reduced ($P < 0.05$). However, there was an insignificant numerical improvement ($P = 0.064$) in carcass yield with increasing Se-enriched *S. cerevisiae* levels. In line with our findings, Chen et al. [9] and Elbaz et al. [7] reported that carcass traits and lower abdominal fat were noticed in chickens fed *Saccharomyces cerevisiae*-supplemented diets. In contrast, Ayyat et al. [22] and Bhatt et al. [23] reported that including probiotics or Se in chicken and rabbit feed did not affect carcass weight. These discrepancies in the impact of probiotics on carcass traits might be attributed to many factors, including probiotic dosage and strain, diet composition, and animal species and age [24]. Some reports have also confirmed the positive role of Se supplements in enhancing the weight of the carcass through its role in the synthesis of many proteins and modifying the gene expression of these proteins, which contributes to the development of the skeletal muscles of the carcass [25-26]. Furthermore, our results are consistent with those of Abdel-Moneim et al. [27], who reported a decrease ($P < 0.05$) in abdominal fat content in broilers receiving probiotics compared to the control group. The decrease in the relative weight of abdominal fat may be explained by the role of *Saccharomyces cerevisiae* in reducing fatty acid synthesis by reducing the activity of acetyl-CoA carboxylase (the enzyme responsible for reducing fatty acid synthesis) or by diverting excess energy from metabolism (better fat metabolism) [28]. This illustrates the positive role of Se-enriched *S. cerevisiae* supplements in enhancing carcass weight and fat distribution into the carcass by reducing abdominal fat.

The results of the current study showed significant ($P<,0.05$) relative weight of the bursa of Fabricius in chickens fed 1 and 1.5g of Se-enriched *S. cerevisiae* (Table 3). Such a result indicates that feeding Se-enriched *S. cerevisiae* enhanced chicken resistance to heat stress, however, the relative weight of other lymphoid organs (spleen and thymus) was not affected by the experimental supplements. In agreement with the current study's results, Khan et al. [12] found that adding Se led to an increase in bursa of Fabricius in chickens. Previous studies reported that dietary Se supplementation had positive effects on lymphocyte concentration and follicle size in the bursa of Fabricius [29, 30] associated with an increase in the subsequent proliferation of B cells [11], which explains the increased relative weight of

the bursa of Fabricius in the current study. Similarly, Sun et al., [31] observed a significant increase in the relative weight of the bursa when broilers were fed diets containing yeast. Some reports have also shown that the cell walls of live yeast (*Saccharomyces cerevisiae)* can produce some nutrients that act as immune support, in addition to its specific interaction with various immune-competent cells [22, 32], thus stimulating the immune function of the host.

Triiodothyronine (T3) is the most functional active form of the thyroid gland; it plays a major role in the body's metabolism and energy production and is associated with protein synthesis [30]. Our results showed a significant decrease ($P < 0.05$) in the T3 level in the serum of chickens fed the control diet under heat stress compared to other treatments (Table 4), while the glucose level was not affected ($P < 0.05$) among the experimental treatments. In agreement with the current study results, Aluwong et al. [8] found an increase in T3 levels ($P < 0.05$) in chickens fed a diet containing probiotics, which is due to the direct effect of microbes in stimulating the production of T3 in chickens exposed to stress. Similarly, Wang et al. [33] found that selenium supplementation significantly increased plasma T3 concentrations. Several reports have confirmed the positive correlation between serum T3 and selenium concentrations, as selenium is essential for the metabolism of thyroid hormones [34]. Se-enriched *S. cerevisiae* supplements decreased cholesterol and LDL ($P < 0.05$) while increasing HDL levels. These results are in agreement with those obtained by Elbaz [35], who found that serum cholesterol levels of growing rabbits fed diets containing probiotics were lower compared to the control group. The lower cholesterol levels in Se-enriched *S. cerevisiae*-fed chickens may be due to the ability of *Saccharomyces cerevisiae* to incorporate cholesterol into the cell membrane and convert it to coprostanol, which is excreted in the feces, consequently reducing cholesterol in the blood [8]. Previous reports have indicated that Se supplementation reduces cholesterol and LDL cholesterol levels in chickens [36]. Selenium supplements have also shown a positive effect on fat metabolism by binding to bile acids and reducing fat absorption in the intestine, thus reducing cholesterol synthesis and blood levels [37]. Our results show the positive effect of Se-enriched *S. cerevisiae* supplements on fat metabolism in chickens during heat stress.

One of the most dangerous effects of heat stress is oxidative stress (ROS accumulation), which can be life-threatening to the bird. The extent of the animal's exposure to stress is shown by estimating the activity of oxidative enzymes, which are affected by nutritional supplements and reduce the risk of oxidative stress on the bird. Whereas, the superoxide dismutase (SOD) and glutathione peroxidase (GPx) protect the biological cells from the adversities of ROS [38]. SOD and GPx are known to catalyze the reduction of lipid peroxide and hydrogen peroxide, thus protecting cells from oxidative damage [39]. Malondialdehyde (MDA) decreased ($P < 0.05$) with an increment of Se-enriched *Saccharomyces cerevisiae* in the diet (Table 4). On the contrary, the activities of SOD and GPx increased ($P < 0.05$) with an increase in Se-enriched *S. cerevisiae* concentration in the diet. In agreement with our study, increased antioxidant enzyme activities when chickens were fed Se supplements reduced oxidative stress [14, 20]. Similar findings are also reported in broilers fed diets with *Saccharomyces cerevisiae* supplementation [26]. El-Deep et al. [40] and He et al. [21] reported that feeding rabbits a diet containing probiotics improved antioxidant status by regulating antioxidant-related genes, via reducing MDA levels, and increasing SOD and CAT activity. We hypothesized that Se-enriched *S. cerevisiae* could affect the antioxidant enzyme activities, which supports the protection of cells from oxidative stress in broiler chickens.

Results showed that including Se-enriched *S. cerevisiae* in broiler feed improved the microbial count in the cecum, as shown in Table 5. *Lactobacillus* count increased ($P < 0.05$) with increasing Se-enriched *S. cerevisiae* supplementation content in the diet, while the *Escherichia coli* count decreased ($P < 0.05$) compared to the control groups. However, the Se-enriched *Saccharomyces cerevisiae* supplements did not affect the count of *Coliforms*. Consistent with our results, several reports have found that Se or probiotics tend to have a positive effect on the gut microbial composition by reducing the burden of pathogenic bacteria (*Escherichia coli*) and increasing *Lactobacillus* in several animals [5, 35]. The positive effect of probiotics in modifying the gut microbiota content may be due to their antimicrobial effect through several mechanisms, including the competitive exclusion of gut microbes from food [24]. It can be concluded that Se-enriched *S. cerevisiae* improves the host's intestinal microbial balance and creates an intestinal environment that is inhibitive of pathogenic microbes and favourable for supporting beneficial microbes.

Conclusion

Supplementing broiler diets with Se-enriched *S. cerevisiae* has improved growth performance and carcass percentage. Additionally, these supplements enhance thyroid function, relative weight of immune organs, antioxidant levels, and cecum microbiota composition in heat-stressed broilers. These findings suggest that Se-enriched *S. cerevisiae* can be included in broiler diets at levels of up to 1.5 g/kg, and it provides an effective provides an effective role of anti-heat stress to achieve optimal chicken growth performance.

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Authors contributions:

Conceptualization: Ahmed M. Elbaz and M.G. Sallam; Methodology: Ahmed M. Elbaz, Eman S. Ashmawy, and Safaa A. M. Ali; Formal analysis and investigation: Ghada G. Gad and M.G. Sallam; Data curation and investigation: Ahmed M. Elbaz and M.G. Sallam; Writing - original draft preparation: Ahmed M. Elbaz; Writing - review and editing: Ahmed M. Elbaz and M.G. Sallam.; Resources: Ahmed M. Elbaz, Ghada G. Gad, and M.G. Sallam; Supervision: Ahmed M. Elbaz, Eman S. Ashmawy, Safaa A. M. Ali, and M.G. Sallam. All authors read and approved the final manuscript.

Conflicts of interest

The authors declared no competing interests.

Ethical of approval

This study follows the ethics guidelines of the Desert Research Center, Cairo, Egypt (ethics approval number; 41/2023).

TABLE 1. Feed ingredients and calculated nutritional contents per kg of broiler diets.

Ingredients (g/kg)	Starter	Growth
Corn	52.5	56.1
Soybean Meal (44%)	37.9	32.7
Corn Gluten Meal	3.00	3.00
Soybean Oil	2.80	4.50
Calcium Carbonate	1.20	1.15
Dicalcium Phosphate	1.90	1.85
Premix	0.25	0.25
Salt	0.25	0.25
DL-Methionine (99%)	0.20	
Nutritional contents		
AME (Kcal/kg)	3000	3150
Crude protein (g/kg)	230	210
Crude fiber (g/kg)	33.1	31.5
Ash (g/kg)	49.6	48.3
Calcium (g/kg)	1.004	0.956
Available phosphorus (g/kg)	0.478	0.461

AME = apparent metabolizable energy.

TABLE 2. Effect of Se-enriched *Saccharomyces cerevisiae* supplementation on growth performance of heat-stressed broiler chickens at 35 days of age.

Item	CON	Se-ES1	Se-ES2	Se-ES3	SEM	p-value
LBW, g	1768^{b}	1795^{ab}	1843^{a}	1855^{a}	6.035	0.001
ADG, g	49.34^{c}	50.09^{b}	51.48^{a}	51.80^{a}	1.241	0.001
FI, g/d	84.96	84.91	84.92	84.91	0.391	0.425
FCR, g/g	1.721^{a}	1.695^{b}	1.650^{c}	1.639^{c}	0.007	0.001

CON = Experimental basal diet without feed additive; Se-ES1 = Experimental basal diet with 0.5 g/kg Se-enriched *S. cerevisiae*; Se-ES2 = Experimental basal diet with 1.0 g/kg Se-enriched *S. cerevisiae*; Se-ES3 = Experimental basal diet with 1.5 g/kg Se-enriched *S. cerevisiae*; LBW= live body weight; ADG = average daily gain; FI = feed intake; FCR = feed conversion ratio, SEM = standard error of means. This means that the same row with different superscripts is significantly different.

TABLE 3. Effect of Se-enriched *Saccharomyces cerevisiae* supplementation on carcass traits of heat-stressed broiler chickens at 35 days of age

Item	CON	Se-ES1	Se-ES2	Se-ES3	SEM	p-value
Dressing	70.82	70.79	71.24	71.56	2.361	0.064
Liver	1.67	1.61	1.63	1.62	0.032	0.112
Abdominal fat	4.25^{a}	4.31^{a}	4.06^{ab}	3.74^{b}	0.009	0.004
Spleen	0.169	0.165	0.167	0.168	0.014	0.083
Thymus	0.182	0.179	0.191	0.194	0.006	0.081
Bursa of Fabricius	0.166^{b}	0.172^{b}	0.236^{a}	0.229^{a}	0.002	0.001

CON = Experimental basal diet without feed additive; Se-ES1 = Experimental basal diet with 0.5 g/kg Se-enriched *S. cerevisiae*; Se-ES2 = Experimental basal diet with 1.0 g/kg Se-enriched *S. cerevisiae*; Se-ES3 = Experimental basal diet with 1.5 g/kg Se-enriched *S. cerevisiae*; SEM = standard error of means. This means that the same row with different superscripts is significantly different.

TABLE 4. Effect of Se-enriched *Saccharomyces cerevisiae* supplementation on lipid profile and antioxidative capacity of heat-stressed broiler chickens at 35 days of age.

Item	CON	Se-ES1	Se-ES2	Se-ES3	SEM	p-value
Glucose (mg/dl)	68.4	67.9	68.2	68.3	1.067	0.121
T3 (ng/ml)	0.426^{b}	0.431^{b}	0.486^{ab}	0.507^{a}	0.004	0.030
Cholesterol (mg/dl)	213^{a}	208^{a}	186^{b}	188^{b}	0.845	0.010
Triglycerides (mg/dl)	224	226	221	217	2.341	0.094
LDL (mg/dl)	116^{a}	103^{ab}	87^{b}	83^{b}	0.663	0.001
HDL (mg/dl)	59.5^{b}	67.1^{ab}	73.8^{a}	79.4^{a}	0.125	0.020
MDA (nmol/ml)	1.51^{a}	1.26^{b}	1.16^{c}	1.09^{c}	0.092	0.001
SOD (U/ml)	103^{c}	126^{b}	134^{ab}	146^{a}	0.631	0.001
GPx (U/ml)	12.6^{b}	12.9^{b}	14.5^{a}	14.8^{a}	0.298	0.001

CON = Experimental basal diet without feed additive; Se-ES1 = Experimental basal diet with 0.5 g/kg Se-enriched *S. cerevisiae*; Se-ES2 = Experimental basal diet with 1.0 g/kg Se-enriched *S. cerevisiae*; Se-ES3 = Experimental basal diet with 1.5 g/kg Se-enriched *S. cerevisiae*; LDL = high-density lipoprotein cholesterol ; HDL = low-density lipoprotein cholesterol; MDA = malondialdehyde; SOD = superoxide dismutase; GPx = glutathione peroxidase; T3 = triiodothyronine; SEM = standard error of means. This means that the same row with different superscripts is significantly different.

TABLE 5. Effect of Se-enriched *Saccharomyces cerevisiae* supplementation on microbial enumeration (Log^{10}CFU) of heat-stressed broiler chickens at 35 days of age.

Item	CON	Se-ES1	Se-ES2	Se-ES3	SEM	p-value
Lactobacillus	3.87b	4.11b	4.65a	4.74a	0.322	0.003
Coliforms	2.63	2.57	2.61	2.53	0.175	0.104
Escherichia coli	6.04a	5.88a	5.53ab	4.96b	0.098	0.001

CON = Experimental basal diet without feed additive; Se-ES1 = Experimental basal diet with 0.5 g/kg Se-enriched *S. cerevisiae*; Se-ES2 = Experimental basal diet with 1.0 g/kg Se-enriched *S. cerevisiae*; Se-ES3 = Experimental basal diet with 1.5 g/kg Se-enriched *S. cerevisiae*; This means that the same row with different superscripts is significantly different.

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تأثير إضافة مستويات مختلفة من الخميرة المخصبة بالسيلينيوم على الأداء الإنتاجي والقدرة المضادة للأكسدة والميكروبات الأعورية في دجاج التسمين المعرض للإجهاد الحراري

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الملخص

بحثت هذه الدراسة في تأثير إضافة خميرة (Saccharomyces cerevisiae) المخصبة بالسيلينيوم على أداء النمو وسمات الذبيحة وملامح الدهون وميكروبات الأمعاء والقدرة المضادة للأكسدة لدجاج التسمين المعرض للإجهاد الحراري. تم توزيع 300 كتكوت تسمين بعمر يوم واحد (Ross 308) عشوائيًا في أربع مجموعات، تتكون كل منها من خمس مكررات (15 كتكوتًا / مكرر). تلقت الكتاكيت في المجموعة الضابطة وجبات أساسية بدون إضافات علفية، بينما تلقت المجموعات الأخرى وجبات أساسية تحتوي على ثلاثة مستويات من خميرة المخصبة بالسيلينيوم (0.5 و1 و1.5 جم / كجم على التوالي). أظهرت النتائج أن إضافة خميرة المخصبة بالسيلينيوم أدت إلى زيادة كبيرة في وزن الجسم وخفضت معامل التحويل الغذائي ($P < 0.05$). بالإضافة إلى ذلك، أظهرت مكملات المخصبة بالسلينيوم نشاطًا أعلى لإنزيم SOD و GPx في المصل مقارنة بمجموعة التحكم ($P < 0.05$)، في حين كان محتوى MDA أقل. تعمل مكملات المخصبة بالسلينيوم على تعزيز عملية التمثيل الغذائي للدهون في الدم عن طريق خفض مستويات الكوليسترول LDL وزيادة مستويات ثلاثي يودوثيرونين (3T) وHDL. كما عدلت الخميرة المخصبة بالسلينيوم محتوى الميكروبات المعوية، مما أدى إلى زيادة عدد العصيات اللبنية وتقليل عدد الإشريكية القولونية مقارنة بمجموعة التحكم. الاستنتاج: كان لإضافة Saccharomyces cerevisiae المخصبة بالسلينيوم إلى النظام الغذائي للدجاج المجهد حراريًا تأثيرًا فعالًا على تحسين أداء النمو وخصائص الذبيحة والمناعة والحالة التأكسدية وميكروبات الأمعاء المعدلة.

الكلمات الدالة: أداء الدجاج اللاحم، السيلينيوم، الخميرة ، المناعة، سلامة الأمعاء.