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# Effect Drenching Elderberry Flower Extract with Different Proportion to Reduce the Effect of Heat Stress in Hot Summer and Enhance Levels of Physiological and Productive Performance Parameter in Layining Hens

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**Abstract**

This experiment was conducted at the private field of laying hens In Babylon governorate in Iraq during summer from the period of 1/6 /2020 – 1/9/2020 to investigate the effect of dietary supplement with elderberry flower extract on some blood parameters , antioxidant enzymes and feed consumption ,egg weight and egg production .The aim of this study was investigate the effect of dietary supplementation by drenching elderberry flower extract with different levels on hens in summer season with high level of heat degree with heat stress on blood hematology , antioxidant enzymes and productive performance .sixty laying hens in age 32 week in weight 1800 gm divided randomly in to three group each group has (20)laying hens the first group (T)control group ,second group (T1) hens administered 5% of Elderberry flower extract orally .Third group (T2) hens administered 10% Elderberry flower extract orally . The results of the experiment showed that the groups of lying hens who gave elderberry flowers extract orally led to significant increase $p<0.05$in blood haematology ,Albumin ,Total protein ,HDL ,calesium .it was significant in antioxidant Enzymes GSH-PX ,CAT , S.O.D ,M.D.A and it was significant in production Traits such as egg productive rat ,egg weight compared with control group and there was decrease in significant in cholesterol ,LDL ,Triglycirid ,Glucose ,and feed consumption rate .it was **concluded that** oral administration of elderberry flowers extract 10%to heat stress lying hens in heat stress condition improved the blood hematology ,antioxidant Enzymes and production performance of these bird .

**Keyward :** drenching elderberry Flower extract, Laying hens , hot summer , heat stress condition , physiological parameter , antioxidant enzymes , productive performance.

## Introduction

The last few years reasrch have used plant extract as food additives in poultry to improve the efficiency of egg production establishment of difficult environmental conditions in countries with hot summer and improve the poultry health .in these aim used elderberry flower extract to reduce the effect of heat stress in the summer on egg production ,antioxidant enzymes and hematological characteristics .

Heat stress induced oxidative stress in poultry because the was effect in mitochondria dysfunction and increasing the percentage of free radical (ROS) reactive oxygen species which causes oxidative damage to cells (1).

Heat stress reduced hepatic SOD,GSH-PX and CAT activity in addition to reduction in Nrf2(2) .

The Elderberry genus( *sambucus nigra )* grow as tree long 2-5meter perennial tree with dense

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yellow or white flowers the fruits spherical in shape and have tree seed it original home is Europe the most widespread species in Europe and it is also widely found in the United States of America (3).Elderberry is good source of protein ,unsaturated fatty acid ,fiber ,vitamins , antioxidants and minerals it is also posses biological active compound know polyphenols like anthocyanins , flavonoid , phenolic acid and proanthocanidins (4).elderberry flowers used to reduced inflammation and treatment of colds and flu elderberry has high biological active components proanthocyanidine ,flavones ,phenolic acid (5).

**Materials and methods**

This study was conducted in the field of laying hens a private sector in Babylon governorate ,Iraq .for period of 12weeks during the summer (June ,July and August ) 60Wahman laying hens were used in age 34 weeks with an average weight of 1800g .it was randomly distributed to 3treatments with tow replicates for each treatments and 10 hens for each replicate (20 treated hen in one treatment ).

The first group (T) was control second group T1 (hens administered 5% of Elderberry flower extract orally) third group T2(hens administered 10% Elderberry flower extract orally) and the hens were given the ratio used in the experiment whose shown in table (1) .

| % | Feed material | |
|---|---|---|
| 37.5 | Corn | 1 |
| 28.5 | Wheat | 2 |
| 16 | soybean meal | 3 |
| 10 | Concentrated protein (40%) | 4 |
| 7.7 | Calcium carbonate | 5 |
| 0.3 | Salt (Nacl) | 6 |
| 100 | Total | |
| 17.75 | Raw protein | |
| 2759 | Calculated energy content | |
| 155 | Ratio of energy to protein | |
| 0.86 | Lysine | |
| 0.41 | Methionine | |
| 3.60 | Calcium | |
| 0.44 | Available phosphorous | |

The values of the chemical composition of the feed materials were calculated according to (6)
16 hour lighting program was applied and the room temperature was 36 experimental chicken were raised in cages with dimensions of (55cm width *60cm length *60 cm hight ) and pleased in three lines each line 10 cages each line represents one of the treatment the first line ( T ) ,the second line ( $T_1$) the third line ($T_2$ ). Blood samples were collected at the end of the experiment and then placed in blood collection tubes the plasma was separated by using a centrifuge (3000 rpm) to examine the haematological characteristics and antioxidants enzymes the number of eggs and their weights were recorded daily feed consumption by each replicate recorded weekly feed Conversion Ratio was calculated as the ratio of grams of total feed intake to grams of total egg weight.egg production percentage calculated based on the number of chickens per week .

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**Statistics analysis**

Data were performed using spss program (7)

**Results and Discussion**

1-Blood biochemical parameters

Table (2)Effect of elderberry flower extract on blood , albumin ,total protein ,cholesterol, HDL ,LDL ,TG ,Glucose and calcium.

| Group | Albumin g/dl | total prot g/dl | Cholesterol mg /100ml | HDL mg/100ml | LDL mg/100 ml | TG mg/dl | Glucose mg/dl | Calcium mg/dl |
|---|---|---|---|---|---|---|---|---|
| **T** | 1.464± 0.022 | 2.9±0.007 | 200.5± 0.82 | 89.765 ±0.508 | 50.68±1. 611 | 94.3± 0.81 | 280± 2.008 | 7.99± 0.025 |
| **T1** | 1.874 ± 0.0719 | 3.307± * 0.06 | 158.8± * 7.30 | 93.1±0.49 | 45.2± * 1.76 | 77.5± * 0.65 | 215± * 0.24 | 8.75 ± * 0.045 |
| **T2** | 2.03 ± 0.079 | 3.607± * 0.05 | 139.9± * 3.49 | 95.29± * 1.088 | 41.5 ±* 1.05 | 65.9± * 0.69 | 199.9±* 0.69 | 9.32± * 0.013 |

The numbers represent the rates±standard error

The mark *means that there is significant difference at the level ($p<0.05$ )

Data in **Table 2** showed that increasing Albumin ,total protein ,HDL, and calcium significant ($p<0.0.05$ ) in treatment T2and T1compaird to T group and the results showed decreased the levels of cholesterol,LDL ,TG ,and glucose .

Elderberry flower have a protein content of 2.5%and it have sixteen amino acids and essential amino acid about 9%in flower this amino acid like Glutamic acid, aspergic acid and alanine acid (8,9)the result were agreement with (10)it has proven that elderberry flower extract effect in reduce cholesterol and improve (HDL) level .the result of TG ,Glucose recorded significant decrease in level ($p<0.05$ ). The result was also recorded significant increased in level ($p<0.05$ ) in calcium . Elderberry flower extract posses multiple phenolic compounds that act as antioxidant such as flavonoids ,phenolic acid , pectin Anthocyanin ,this product act as a tiny perglycemic effect ,antioxidant and anti inflamentory effect .(11)

2-antioxidant enzymes level

Table (3): effect of elderberry flower extract on serum antioxidant enzymes GSH-PX ,CAT ,SOD ,MDA

| Group | GSH-PX | CAT | SOD | MDA |
|---|---|---|---|---|
| **T** | 188.42± 0.125 | 140.5±1.05 | 4.5±0.012 | 8.03±0.0081 |
| **T1** | 201.2±0.56 * | 203.9±0.41 * | 6.03 ±0.0121* | 6.3±0.024 * |
| **T2** | 223.8±0.56** | 223±0.07 ** | 7.22±0.013** | 5.2±0.003** |

The numbers represent the rates ±standard error

The mark *means that there is significant difference at the level ($p<0.05$ )

The result show in the **table No.3** that there is significant difference at the level ($p<0.05$ ) between the treatment and control group the group T1significant from control group the result also indicated there

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is significant difference group T2 compared with T1 group and the control group .High levels of antioxidant enzymes in groups drench elderberry extract .Elderberry flower high in antioxidants activity it have phenolic acid like (chlorogenic , p-coumaric , caffeine ,Gallic ,ferulic , and syringing acid ) and has flavonoids like (Myricetin , quercettin , kaempferols , and rutin ) . (12)

These antioxidant potential assessed by 2,2-diphenhydramine – 1-picrylhydrazyl (DPPH) radical and ferric reducing antioxidant power (FRAP) therefore elderberry important sources for antioxidants prevention the effects of oxidative stress (13) . The antioxidant compound in elderflower which caus modulation of complement activity and inhibition of nitric oxide (NO) production macrophage and dendrite cells .extract of elderberry flowers scavenged hydroxyl radicals (HO) and 2,2.diphenhydramine-1-picryl thydrazyl radical (DPPH)and inhibited lipid peroxidation in linolic acid emulsion .(15) in this Table we noted that giving elderberry flower extract reduced the significant in level( $p<0.05$) of (MDA).which is produced from lipid peroxidative and break down of phospholipids that lead to increased of MDA . it working to modify the (LDL) low density lipoprotein .(16)free radicals attack on polyunsaturated membrane lipid and cans lipid peroxidatione and production of MDA and it concern the measured the measured of free radical injury on me brain lipid (17) superoxide dismutase is protective enzyme for free radicals ( $O_2^{\cdot-}$)in various tissue and organs by transform reactive( $O_2^{\cdot-}$)to low reactive $H_2O_2$ and keep( $O_2^{\cdot-}$)at certain level in body (18). Catalase (CAT) is an iron containing enzymes found in various tissue and in blood cells it works to dissolve analyse and exclude the toxic effect of $H_2O_2$(19) Glutathione peroxidase GSH-PX it works to conversion harmful substance produced in lipid peroxidation to corresponding alcohols and effect on cycle reaction chain and convert $H_2O_2$to $H_2O$ (20)

3- Productive traits

Table (4): effect of elderberry flower extract on feed consumption egg productive rat ,egg weight.

| group | feed consumption | egg productive rat | egg weight |
|---|---|---|---|
| **T** | 12.5±0.7 | 60.53±0.057 | 75.8±0.58 |
| **T1** | 128±0.8 * | 67.26±0.026 * | 79.1±0.41* |
| **T2** | 129±1.9 * | 68.46±1.027 ** | 81.9±2.566 ** |

The numbers represent the rates ±standard error

The mark *means that there is significant difference at the level ($p<0.05$ )

The result show in the **table No.4**that there is significant difference at the level ($p<0.05$ ) between the groups in feed consumption .it also showed that there are significant difference at the level($p<0.05$ ) between T1 and T group and T2,T groups where we note superiority of the groups that were dosed the aqueous extract of elderberry flowers .the result also show superiority of the group T3compaired with T2 . Heat stress effect on poultry production and feed consumption because the heat stress effect on body temperature ,blood circulation ,peripheral blood flow increases where there visceral blood flow decreases this change lead to limited nutrition utilization and reduce poultry production and feed conversation (21).heat stress effect on the laying performance and egg quality which causes decline in production rates ,egg weight.(22) we can explain this results that the extract of elderberry flower lead to significant increase in egg weight ,feed consumption and egg production rat because it is rich with phenolic acid and flavonoid (14). The studies have shown that

increased heat stress reduce feed intake (23).the protective effect of polyphenoles and flavonoid against heat stress response proteins (heat shock proteins) HSP70 and antioxidant enzymes which can reduce and disable reactive oxygen species (ROS) (24) .

## Reference

[1]. Mujahid ,A.; Pumford ,N.R.; Battje ,W.; Nakagawa ,K.; Miyazawa ,T .; Akiba ,Y .and Toyomizy ,M.(2007).Mitochonderial oxidative damage in chicken skeletal muscle induced by acute heat stress .Jpn.pout. Sci. , 44:439-445

[2]. Sahin,K.; Orhan,C.; Tuzcu,M; Ali,S.; Sahin,N.; and Hoyirli,A. (2010). Epigallocatechin-3-gallate prevent lipid peroxidation and enhances antioxidant defense system via modulating hepatic nuclear transcription factors in heat stress quails .Poult Sci.89:2251.

[3]. Vlachojannis , J.E.; Cameron ,M.and chrubasik ,S.(2010)Asystemic review onhte sambuci frutus effect and efficacyprofiles.phytother .Res.,24:1-8 .

[4]. Andrzej , S.; Anna.G.M.(2015).Advanced research on the antioxidant and health benefit of elderberry (sambucus nigra ) in food – a review . Functional food J.Vol:18:941-958 .

[5]. Heim ,K .E. ; Tagliaferro , A.R.; Bobilya ,D.J.(2002).Flavonoid antioxidant :chemistry ,metabolism and structure activity relationships .J.Nutr.Biochem.13:572-584.

[6]. National Research council(N.A.R.)1994 . Nutrient requirement of poultry 9$^{th}$revisited National academy press .Wshington D.C.,U.S.A.

[7]. SPSS for widows 11.5 (2002)

[8]. Akbulut,M.; Ericisli,S.and Tosum,M.(2009).Phsico-chemical characteristic of some wild grown European elderberry (sambucus nigra L.) genotypes .pharmacology Magazine 5:20,320-323.

[9]. Kislichenko,V.S.and Vel˙ma ,V.V.(2006).Amino-acid composition of flowers leaves and extract of sambucus nigra fiowers .Chemistry of Natural compound ,42(1),125-126 .

[10]. Nicholas,F.; G Regory,N.; Sang,G.; Ockk,C.and Christopher ,N.B. (2015).Anthocyanin rich black elderberry extract improves markers of HDL function and reduces aortic cholesterol in hyper lipidemic mice .Food &Function Ju.issue ,4.

[11]. Ciocoiu,M.; Miron,A.; Mares,L.; Tutuna,d.; pohaci,C.; Groza,M. and Badescu ,M.(2009).The effects of sambucus nigra polyphenols on oxidative stress and metabolic disorders in experimental diabetes mellitus .J.Physiol.Biochem. 65:297-304.

[12]. Maja,M.P.; Justyna ,S.; Klemen,E.; Franci,S and Robert ,V. (2015). Traditional Elderflower Beverages: A Rich Source of Phenolic Compounds with High Antioxidant Activity . Agric. Food Chem . 63, 5, 1477–1487 .

[13]. Agnieszka,V.and Marek ,W.(2017).The phenolic contents and antioxidant activity of infusions of sambucus nigra-L .Plant food Hum.Nutr.72(1):82-87.

[14]. Giang , T.T.; Helle, W.and Hilde, B.(2017).Elderberry and Elderrflower extract ,phenolic compounds and metabolites and their effect on complement RAW264.7 Macrophages and dendritic cells .Int.J.Mol.Sci.18:584.

[15]. Stoilova ,L.; Wiker,M.; Stoyanova,A.; Krastanov,A.and Stanchev,V. (2007).Antioxident activity of extract from elderflower (sambucus nigra-L.). Herba polonica ,53,45-54.

[16]. Peerapatdit,T.; Patchanans ,N.; likidlilid,A.; Poldee,S.and Sriratana,s.c. (2006).lipid per oxidation and antioxidant nutrition in type 2 diabitic patients .J.Med.Assoc.Thai.89:S 145-155.

[17]. Niedernhofer,L.J.; Danials ,J.S.and Rouzer,C.A.(2003).Malondialdihyede ,product of lipid per oxidation ,is mutagenic in human cell. J.Biochem. 278 : (33) .

[18]. Nagami,H.; Yoshimoto,N.; Umakoshi,H.; Shimanou,T.and kuboi,R.(2005). Liposome-assisted activity of superoxide dismutase under oxidative stress .Biosci.J.Bioeng .J .99,423-428 .

[19]. Kumerova ,A.; Lece ,A.; Skester ,A.; Silova ,A.and Petuhovs ,V.(1998). Anemia and antioxidant defence of the red blood cells .Mater, Med. Pol.J.Med pharm .30,12-15.

[20]. Yang, L.; Tan, G.Y.; Fu, Y.Q.; Feng, J.H.; Zhang, M.H.( 2010)Effects of acute heat stress and subsequent stress removal on function of hepatic mitochondrial respiration, ROS production and lipid peroxidation in broiler chickens. Comp. Biochem. Physiol. Toxicol. Pharmacol. 151, 204–208.

[21]. Dai,S.F.; Wang ,L.K.; Wen,A.Y.; Wana ,L.X.and Jin,G.M.(2009).Dietary glutamine supplementation improves growth performance ,meat quality and colour stability of broilers under heat stress .Br.Poult.Sci.50,333-340 .

[22]. Torki ,M.; Zangeneh ,S.; Habibian ,M.(2014).Performance ,egg quality traits and serum metabolite concentrations of layining hens affected by dietary supplemental chromium picolinate and vitamin Cunder heat stress condition . Biol .Trace Elm.Res . 157,120-129 .

[23]. He,S.J.; Zhao,S.J.; Dai,S.F.; Liu,D.Y.and Bokhari ,S.G.(2015).Effect of dietary betaine on growth performance , fat deposition and serum lipis in broilersa subjected to chronic heat stress . Anim .Sci. J . 86,897-903.

[24]. Ruizhi ,H.; Yujia,H.; Muhammed,A.A.; Shusong,W.and Jianhua,H. (2019).Review poly phenols as potential attenuators of heat stress in poultry production .Antioxidant Journal 8,67.