HEMATOLOGICAL AND IMMUNOLOGICAL CHANGES ASSOCIATED WITH FEEDING OF ONION AND/OR GARLIC IN BROILER MUSCOVY DUCKS

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ABSTRACT

Thirteen thousands apparently healthy Muscovy ducklings were randomly divided into thirteen equal groups each of ten replicate. All groups fed on starter diet (19-19.5% CP, 2900-2950 kcal ME/kg diet, CIP ratio 150.9-151.8, Methionin 0.52-0.53%, Lysine 1.02%, Ca 1.02% AV.P. 0.49, total P. 0.72) for seven weeks, from 8 week reared on finisher diet till slaughtering (CP 17%, 3030 kcal ME/kg, Methionin 0.5-0.8% Ca 1.01%, total P. 0.65%, AV.P. 0.43%) according to breeding catalog. All rations were isonitrogenous, isocaloric, different only in inclusion rate of onion and/or garlic (0%; 1% onion; 1% garlic; 3% garlic; 4% garlic; 1% onion plus 2% garlic; 1% onion plus 3% garlic; 1% onion plus 4% garlic; 1% garlic plus 1% onion; 1.5% onion plus 1.5% garlic; 2% onion; 2% garlic; 2% onion plus 2% garlic). Addition of onion and/or garlic to broiler Muscovy ducks rations increased the primary immune response than the control free one. The highest primary immune response against SRBCs was in groups reared on rations supplemented with 3% garlic and 1% onion plus 3% garlic. Adding onion and garlic induced a fluctuating non significant changes in the red cell count, hemoglobin, and hematocrite values as well as red cell indices (P>0.05). Also activation of secondary lymphoid organs and serum globulins recorded in both similar groups at the same time. Incorporation of both onion and garlic induced more beneficial effect than onion alone. Increase in total leucocytic count, hetrophil and lymphocyte was mainly due to the immune stimulation and the enhancing effect of such natural herbal antioxidant especially in groups fed diets supplemented with 3% garlic, 1% onion plus 3% garlic, and 1% onion plus 4% garlic.

Abbreviation: CP= Crude protein; K cal= Kilocalorie; SRBCs= Sheep red blood cells; PBS= Phosphate buffer saline

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INTRODUCTION

Onion (*Allium cepa* L) and garlic (*Allium Sativum* L) are widely cultivated in Egypt and used as flavoring agents, a common feed and popular remedy. Because of the hypoglycemic effect of onion and its insulin like activity and the thyroxin like activity of garlic it is suggested that they have growth stimulating effect (9,16). Moreover onion and garlic have beneficial effect on lowering the level of cholesterol in blood plasma and serum in animals (1). Although raw garlic causes anemia, weight loss and growth failure in rats (20), garlic extract was reported to have anti stress effect (21). Also, they improve peripheral circulation (18) protect vascular endothelial cell from oxidant injury and reduce plasma lipids (25). The improved immune response and antibacterial effects were induced by its contents of pungent substances (17). Garlic increased antibody titer (8). The pungent substance in onion or garlic leads to higher production of saliva and gastric juices. The secretions of salivary glands and gastric juices is stimulated by vagal nerve feed back. And due to bitter substances in stomach, the gastric phase will be initiated gastrin which stimulate the secretion as well as on the motility of the stomach and small intestine also, increase the production of pancreatic juices (6).

Onion and garlic stimulated growth by increasing the inflow of glucose into tissues and thyroid like activity (9). Also, improvement of live body weight gain of broiler by feeding onion and/or garlic may be due to their contents of sulphar compounds that are considered as active antimicrobial agents and improve immunity (7). The present study was designed to study the effect of incorporation of onion and/or garlic in the ration of broiler Muscovy duckling on hematological parameters, immune response and internal lymphoid organs in comparison with final live body weight.

MATERIAL AND METHODS

Thirteen thousands, one-day-old broiler Muscovy ducklings were randomly divided into 13 groups were reared for 7 weeks on a starter ration and from 8 week till slaughtering on a finisher ration(Table 1) with different incorporation levels of onion and/or garlic. Liver weight, bursa, spleen weight were recorded in grams and as percentage of final live body weight. Counting both red cell and Leukocytes using hemocytometer according to Herrick (12), measurement of hematocrit (PCV%), hemoglobin, estimation of MCV, MCH and MCHC according to Coles (4) differential leucocytic count according to Jain (15). SRBC antibody were determined by microtiter procedure described by VanDerZijpp and Leensha (22) and monitored by hemoagglutination inhibition (HI) test (3). Each serum sample was titrated individually. The titer was expressed as the Log base 2 of the reciprocal of the highest dilution giving a visible agglutination. Control well contained phosphate buffered saline PBS at pH 7.2
and SRBC only according to VanDerZijpp and Frankena (22). Obtained data were analyzed according to Prtrie and Watson (19) in order to achieve the least significant difference LSD at P<0.05.

RESULTS AND DISCUSSION

Results of erythrogram (Hb, hematocrite % and erythrocytes count) described in table 2. According the estimated data of (LSD at P $\leq$ 0.05) revealed inconstant changes among different groups received different levels of onion and garlic. Adding one or both of them to broiler duck rations produce pronounced significant increase in Hb, hematocrite and red cell count especially in groups received 2%, 3% and 4% garlic levels (P<0.05). In case of onion groups significant increase in hematocrite values and erythrocyte count in group received 1% and 2% but regarding to hemoglobin there was non significant decrease in group received 1% and 2% onion (P>0.05). Elevation in hematocrite values may be due to presences of excess immature cell that induce such increase hematocrite values. In groups received both of them there was a mild non significant increase to significant increase in hemoglobin values while hematocrite percent and red cell count showing significant increase in all supplemented groups. A slight decrease in onion supplement group may be due to oxidant effect of onion achieve by n-propyle di sulphide that induce hemolytic anemia resulting in lowering the hemoglobin level in these groups. Also, groups received garlic only showed significant increase in their red cell count that may be due to the antioxidant activity of garlic and its content of vitamin and minerals that enhance the process of erythropoiesis similar results were described by Abdo(2) and Hassan (11). In groups received combination of garlic and onion Hb, PCV and RBCs count showing significant increase in their levels. Combination of both garlic and onion induce more beneficial effect than onion only while the increase in garlic only or with onion is associated with better results.

Onion and/or garlic supplementation revealed insignificant increase or decrease in MCHC and MCV that means the absolute value of red cell and hemoglobin content not changed significantly by adding such nutrient to duck ration. Finally the adding of onion and garlic is not harmful to the physiological performance of erythropoietin specially when fresh garlic is added up to a level of 3% and when mixed with fresh onion to ratio of 3:1% which reflects on final live body weight.

Regarding to total leukocytic count that were mentioned in table (2) According to the estimated data of (LSD at P $\leq$ 0.05) all groups showing increase in heterophils, lymphocytes, Monocytes and eosinophil. But the most effective increase that induce the direct changes mentioned in total leukocytic count, heterophil and lymphocytes was highly significant.
specially in groups which fed diets containing 4 % garlic, 1 % onion plus 2 % garlic, 1% onion plus 3 % garlic and 1 % onion plus 4 % garlic respectively. A varied responses in Monocytes and eosinophil that varied from non significant to significant increase in all groups showing significant increase in their level but the most prominent increase were recorded in groups which fed diets containing 1% onion plus 4 % garlic, 1 % onion plus 3 % garlic, 2% onion plus 2 % garlic and 4 % garlic respectively. Changes in mean total leukocytic count of different groups were mainly due to the immune - stimulation and potentiation effect of such natural herbal antioxidant (sulphur containing compound) that stimulate the processes of granulopoeisis as well as enhance the division of lymphocytes. Our result coincided with results obtained by Abdo (2) EL-Shabrawy (10) and Hassan (11), on other hand Horton et al. (13) who described those hematological changes was associated with reduction in all parameters. The variation in results may be due to variation in the experimental host, percentage of added material to the ration, due to the proper preparation of onion and/or garlic and isonitrogenous, isocaloric ration used in our experiments and also, due to the adaptation of the digestive tract for the different levels of fresh onion and/or garlic.

Studying the effect of feeding fresh onion and/or garlic on internal lymphoid organs. Revealed absolute increase in spleen weight values in grams of males and females broiler Muscovy ducks that were presented in table 3. From tabulated data it was observed that spleen weight was increased in all fresh onion and/or garlic supplemented diet groups than control one especially in (3% garlic) (1 % onion plus 3% garlic). In males Muscovy duck the increase in spleen weight were ranged between 4% in group fed ration supplemented with 1% and 30% in group supplemented with 3% garlic while in female Muscovy duck spleen weight increased and ranged between 50% in group fed ration with supplemented 1% onion plus 4% garlic and 72% in group fed supplemented with 1% onion plus 3% garlic, and other supplemented groups were increased double of time than control group.

Bursa weights in grams of males and females broiler Muscovy duck were presented in table (3). Bursa weight was increased in all fresh onion and/or garlic supplemented diet groups than the control one. In males Muscovy duck the increase in bursa weights were ranged between 48% in group fed supplemented with 1% garlic and 150% in group supplemented ratio with 3% garlic while in female Muscovy duck bursa weight increased and ranged between 12% in group fed ration supplemented with 2% onion, and 138% in group fed ration supplemented with 1% onion plus 3% garlic. And other supplemented groups were increased couple of time than control free one. These results were in agreement with that obtained by El-Afify (7) who reported that bursa and spleen weights were magnified by feeding garlic and/or its fractions to broiler chicks. As percentage to control this magnitude in bursa weights were 74%,31%,42% and 74% while spleen weight were 53%,10%,18% and 63% by feeding minced
garlic, garlic juice, garlic residue and garlic oil respectively (2) also, he reported an increase in spleen weight when supplementing broiler chicks rations with 3% garlic. Jaffe (14) found that birds with bigger bursa had better disease resistance and higher efficiency for immune globulin synthesis. Yamamoto and Glick (24) reported that immunoglobulin synthesis by large bursa chicks was significantly higher than those of small bursa, So birds of bigger bursa had better disease resistance and high level of antibody titers, consequently improve chick immunity and improve growth rate and resistance. Dafwang et al. (5) stated that onion and/or garlic have a mode of action similar to antibiotics. So, the increase in bursa weight resulting in increasing of blood protein; also slight increase in blood globulins to albumins ratio when feeding onion and/or garlic to broiler chicks. This increase in blood globulins is probably related to high activity of large bursa which is primary site for synthesis of immunoglobulin gamma.

Primary response patterns for total haemagglutination (HA) titers against sheep RBCS were presented in table (4). On day 4th post immunization, group supplemented with 4% garlic and 1% onion plus 3% garlic or 1.5% onion plus 1.5% garlic achieved high immune response. On day 7th, day 14th and 28th these effect manifested a high immune response for birds received diet supplemented with 3% garlic and 1% onion plus 3% garlic. The highest mean total antibody titer value was 2.4 and 2.7. On day 28 for diet containing 1% onion plus 3% garlic and 3% garlic respectively. It can be concluded that feeding onion and/or garlic to broiler Muscovy ducks increase primary response by 1.5 – 3.5 times than control free group. The highest primary response against SRBC’s was in diet supplemented with 1% onion plus 3% garlic and 3% garlic. These results agreed with those obtained by Hasaan (11) who stated that the highest primary response against SRBC’s is due to an effective substance in garlic and onion (Allicin, sulphide group) respectively, Which activated secondary lymphoid organs and serum globulin.

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التغيرات الدموية والمناعية المصاحبة لمصاحبة تغذية البط المسكوفى

على علاقات تحتوي على البصل والثوم

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اجريت التجربة على عدد ثلاثة عشر الف بطة تم قسمتهم إلى مجموعات مختلفة اضافة إلى مجموعة ضابطة غذبت
على علبة بدون أي اضافات. غذبت المجموعات بعلاقة بادية استمرت لمدة ثمانية أسابيع وكذلك علبه ناية. وفقا لما ورد في
كتالوج التربة.

قد تم مراعاة أن تكون جميع العلامات متواصلة في المحتوى الحراري والبيروجيني على أن يكون الفارق فقط في
محتوى كل علبة من الثوم أو البصل أو كلهما معا وتراعمت نسبة البصل من 1% إلى 2% والثوم من 1% إلى 4% عند فحص
التغيرات في عدد خلايا الدم الحمراء والهيموجلوبين والهيماتوكريت ومعاملات الدم وجدت زيادة في المجموعات التي غذبت على
2%, 3%, 4% و 6% ثم وكذلك في المجموعات التي غذيت على 1% و2% بصل. وقد لوحظ أن اضافة الاثنين معا قد أحدث
تحسين في معاملات خلايا الدم الحمراء أفضل من اضافة أي منهم على حدة. وقد وجد أن اضافة البصل والثوم للبط المسكوفى قد زاد
من رد الفعل المناعي للبط ضد الخلايا الحمراء لاغذاء أكثر منه في المجموعة الضابطة كما جمعت زيادة معنوية في وزن الأعضاء
الليمفاوية وقد لوحظ أن اضافة الاثنين معا قد أحدثت إثرا أفضل من اضافة أي منهم على حدة. أيضا و وجود زيادة في العد الكلي
خلايا الدم البيضاء وكذلك العد النوعي لكل من البوليفيلو والخلايا الليمفاوية وكذلك كرد فعل للإثارة المناعية في المجموعات
التي غذيت على 3% و 4% بصل مع 3% و 4% بصل مع 4% بصل.

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