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Improving Broiler Chicks Immunological Efficiency and Performance Following Newcastle Vaccination

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Summary: Newly hatched flocks number 100 broiler chicks it was used to investigate the effect of some

feed additives on improving immunity of birds to Newcastle disease after vaccination, where it was divided the chicks into four groups of equal number :first group (negative))G1) was fed on the basic diet without any additives , G2 chicks received 250 mg Vitamin C in their drinking water,G3 chicks were treated 4% Nigella seeds, while G4 treated with cinnamon extract at doses of 4%, The birds received the first and second doses of the New Castle vaccination during the thirty-five-day experiment. After the initial and subsequent immunizations, the hem agglutination inhibitory antibody titers and antibody titers in an ELISA test were measured for these vaccines. The effect of these additions on productive traits, which included body weight, weight gain , and feed consumption, was studied . The results showed a positive effect on poultry health and productive performance and the results showed significant increase in the standard of antibodies to Newcastle antigen in the treatment groups G2,G3,G4 than the control

group at the level of probability ($P < 0.05$). Significant increase level ($P < 0.05$) inhibitory antibody titers of Newcastle in the treatment and control groups measured by ELISA test for the four groups at a probability level ($P < 0.05$) after the second vaccination compared to the first vaccination. Significant increase in the standard of volumetric inhibitory antibodies to Newcastle antigen in the group treated with vitamin C compared other two groups G3 ,G4 following first and second vaccinations .The results of the statistical analysis of body weight, weight gain , feed consumption, showed a significant superiority of treated groups comparison to the control group, as well as the significant superiority of vitamin C. treatment group over the two groups treated with Nigella Sativa and cinnamon, respectively.

Keywords: Newcastle disease, dietary supplements, antibodies, growth performance.

The study's objective

One of these disorders is Newcastle disease. worthy of attention due to the devastation and economic losses it causes. Therefore, it is necessary to pay attention to this issue through the use of immune stimuli to limit or reduce the losses caused by this disease.

Introduction

One of the most prevalent and serious viral infections, Newcastle disease significantly reduces the financial worth of flocks raised for eggs and broilers (1). Control vaccination programs also result in significant financial losses since it is challenging to create a global immunization program that is consistent across all countries. Even within the same nation, there is a lot of variance. This can be attributed to variations in the pathogenic potential of disease-causing strains or the sporadic emergence of genetic alterations in these bacteria. Therefore, in recent decades, there has been an upsurge in the use of immune stimulants to enhance immunological function and disease resistance (2). Gram-positive and gram-negative bacterial infections can be treated using the medicinal herb nigella sativa (3). In [4] Against Mycotoxicosis Nigella sativa has been linked to improved chicken immunity and health, according to numerous research (5). Additionally, it has been utilized to assist hens in adjusting to heat stress (6), (7), and (8). It was employed to remove parasites and worms from the internal organs of birds. VC reduces immunosuppression in birds

(9) due to its ability to enhance B and T cell response, which includes producing more antibodies, chemo taxis, and hypo chloric acid (HOCL) by auto-oxidation. A medicinal herb with anti-oxidant, anti-diabetic, and anti-septic properties, cinnamon may be a natural substitute for dietary antibiotics and enhance the growth performance of broiler chickens. Some research indicates that cinnamon can enhance the growth performance of broiler chickens and serve as a natural substitute for dietary antibiotics (10).

Materials and methods

Chicks experiment

In this experiment, one-day-old Bulgarian broiler chicks of the breed Ross (308) were utilized. 100 chicks were randomly separated into four equal groups and housed in specially designed wooden cages. For the course of the study over (thirty-five day).

Chicks groups experiment

24 chicks were placed in the first cage, fed a basic diet and inoculated with the Newcastle vaccine (control group C) (G1), in the second cage, 24 chicks were assigned to the first treatment group (Vit C) (250 mg) (G2). 24 chicks were placed in the third cage as part of the second treatment group (Nigella Sativa) (4%) according to (11) (G3) , 24 chicks were randomly assigned to the fourth cage, third treatment group (Cinnamon) (4%) (G4), to determine the vaccination standard, the Hem agglutination test was performed on (**four)** unvaccinated chicks.

Chicks vaccine experiment

The chicks received the first live Newcastle disease vaccine (**Lasota strain Vaxxon lasota)** when they were one day old via spray method and the second vaccine with same strain were given at 15 days old via drinking water.

Blood collection and serological testing

Blood was extracted in tubes containing and lacking anticoagulants ten days following the first vaccination and seven days following the second.Serum is isolated for immunological serological testing and kept at -18°C.

0.5 and 2% preparation and collection of chicken red blood cells Using a sterile syringe and needle loaded with an anticoagulant (Alsever's solution) at a rate of 5 ml per 5 ml blood, chicken blood was extracted from the wing vein. After being drawn, the blood sample was centrifuged for five minutes at 500 rpm after being cleaned with PBS. After removing the supernatant, cRBCs were found. For the HI test as well as slide and micro HA testing, 2% and 0.5% cRBC were generated in PBS. Until it was required, the unused cRBC suspension was stored. Immunological assays were conducted in accordance with (12), including the agglutination inhibition test and the ELISA test.

Body weight and weight gain. The chicks were weighed collectively at one day of age and again on the 10^{th}, 20^{th} ,30^{th} days, using a floor scale. They were divided into groups and the live weight rates for each treatment were recorded as well as the weight gain.

Feed Consumption FC. The amount of feed consumed per week was calculated for each group.

Statistical analysis. The findings were statistically analyzed using analytical tests, which included the following techniques: To ascertain whether there were significant differences between treatments, a one-way ANOVA was used, then a test that is less significant (P 0.05) (13).

Results

The statistical analysis of the volumetric criterion of anti-agglutinating Newcastle antibody titer revealed significant variations following the initial immunization. The treatment groups (G2, G3, and G4) significantly outperformed the control group (G1) (P 0.05). After the second vaccination, the three treated groups (G2, G3, and G4) performed better than the control group (P 0.05), and

the four groups performed better than the first vaccination in terms of inhibitory Newcastle antibodies.

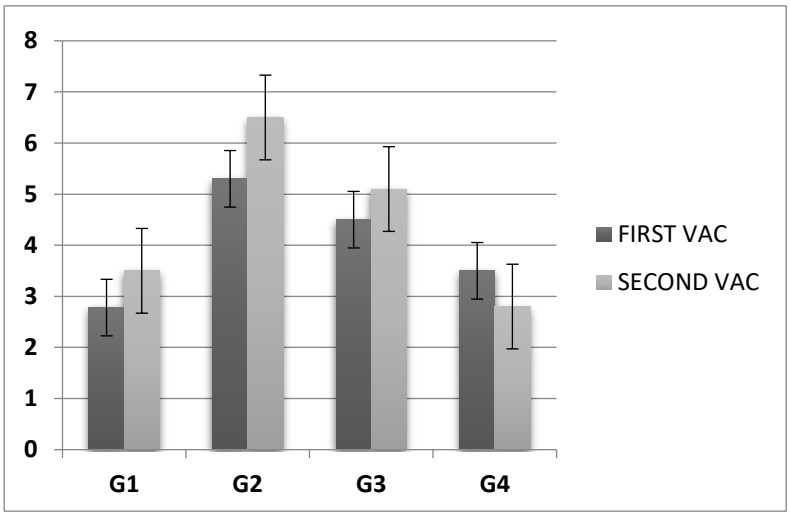

Fig (1) Newcastle agglutinin antibodies that limit volumetric agglutination after the first and second vaccinations

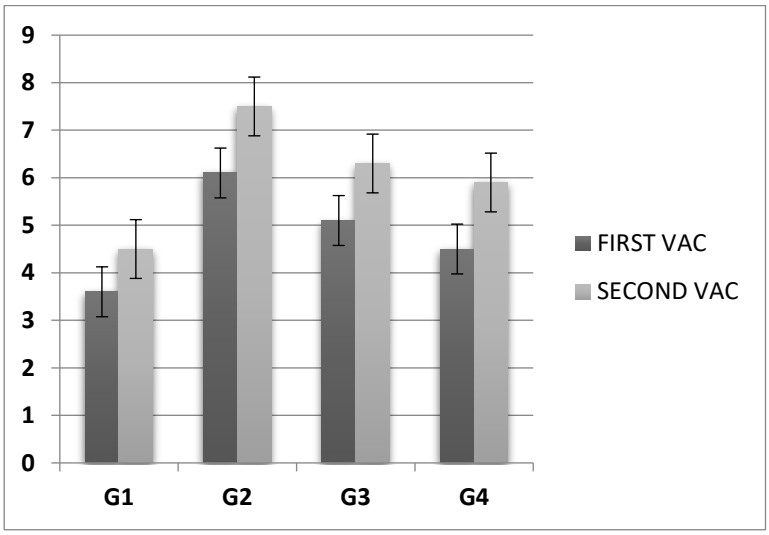

Fig. (2)The volumetric Newcastle antibody titer rate measurement using ELISA revealed After the first and second vaccinations

The treated groups (G2, G3, and G4) considerably outperformed the control group (G1) in terms of the volumetric standard rate of Newcastle antibodies as determined by ELISA following the initial vaccination, and the treated groups (G2) outperformed the treatment groups (G3, G4). The P value for it is 0.05. After the second vaccination, the treatment groups (G2, G3, and G4) performed better than the control group (G1), according to the statistical analysis (P 0.05). Additionally, following the second immunization, all four groups performed noticeably better than following the first.

Table No. 1 shows the effect of dietary supplements on body weight after Newcastle vaccine inoculation on days 10, 20, and 30. The results revealed that adding vitamin C to G2 was significantly superior to the other three groups by a value of (281 4.27, 591 3.42, and 5.13971, respectively), whereas the three treatment groups exhibited significant superiority over the control group in all times.

Table 1: The effect of dietary supplements on chicks weight (gm)

Group	10 day	20 day	30 day
G1	230.8 ± 1.81 Dc	446.8 ± 5.31 Db	757.8 ± 1.65 Da
G2	281 ± 4.27 Ac	591± 3.42 Ab	971± 5.13 Aa
G3	259 ± 4.3 BCc	581 ± 5.94 Bb	963 ± 3.16 Ba
G4	262 ± 0.99 Cc	579 ±11.7 CBb	959 ± 1.69 CBa

The numbers reflect rates and standard deviation.

* While capital letters indicate the vertical statistical reading (between groups), small letters indicate the horizontal statistical reading (between periods). While distinct letters signify significant differences at the probability threshold P 0.05, similar letters suggest no statistically significant differences between treatments.

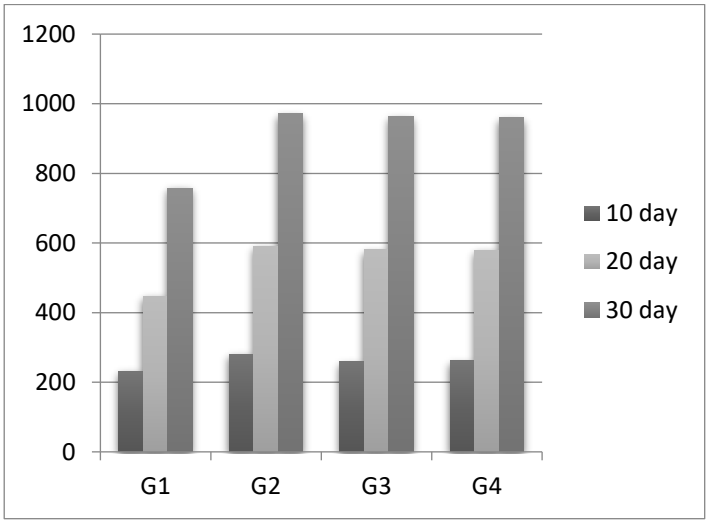

Fig 1: The effect of dietary supplements on chicks weight (gm).

Table No. 2 shows the influence of feed additives on weight increase following Newcastle vaccine immunization. The results demonstrate that there are considerable differences between the groups, G2 outperforming others by values of **183**, 298 and 410 on 10, 20, and 30 days, respectively . The G3 was next, whereas the G1 had the lowest values in all eras.

Table 2 Indicates the influence of dietary supplements on weight increase (gm)

Group	10 day	20 day	30 day
G1	161.8± 1.03 Dc	176±2.23 Db	301±4.4 Da
G2	183± 3.9 Ac	298±3.16 Ab	410±3.42 Aa
G3	169± 2.54 Bc	293±2.71 Bb	400±4.27 Ba
G4	167± 2.19 CBc	290±4.95 Cb	397±5.19 CBa

* The numbers show the standard deviation of rates.

* Capital letters reflect the vertical statistical reading (between groups), whereas small letters represent the horizontal statistical reading (between periods).

* Similar letters suggest that there are no statistically significant differences between the treatments, but different letters indicate that there are significant differences at the probability level. ($P < 0.05$)

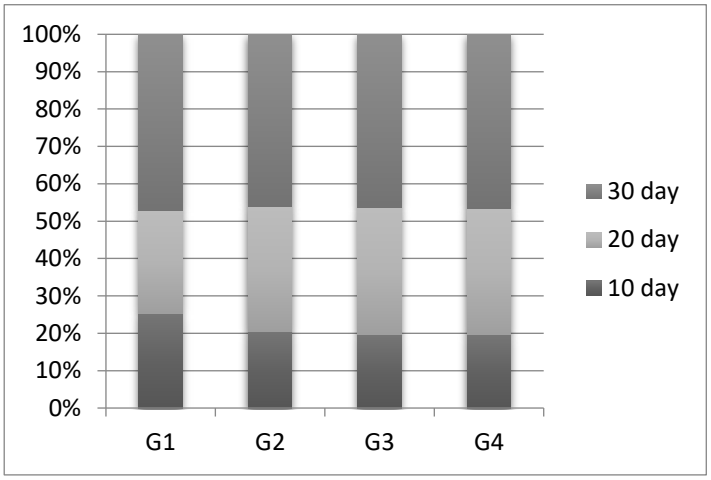

Fig 2 Indicates the influence of dietary supplements on weight increase (gm)

Table No. 3 shows the effect of dietary supplements on food consumption on days 10, 20, and 30 of the birds' age , where the treated groups showed a significant superiority over the control group in the rate of food consumption, while the second group showed a significant superiority over the other groups, with values 286, 870.2, 1513.33 on 10, 20, and 30 of the birds' lives, respectively. It significantly outperformed the fourth group at all time , the three treated groups outperformed the control group by a large margin.

Table 3 Effect of dietary supplements on feed consumption (g) (FC).

Group	10 day	20 day	30 day
G1	260.66 Dc	697.45 Db	1150.51 Da
G2	286 Ac	870.2 Ab	1513.33 Aa
G3	267.93 Bc	750.13 Bb	1490.34 Ba
G4	265.8 CBc	710 Cb	1488.25 CBa

* The figures represent rates.

* The horizontal statistical reading between (times) is indicated by tiny letters, whereas the vertical statistical reading between (totals) is indicated by capital letters.
* While different letters signify significant differences at the probability level (P 0.05), similar letters suggest no statistically significant differences between treatments.

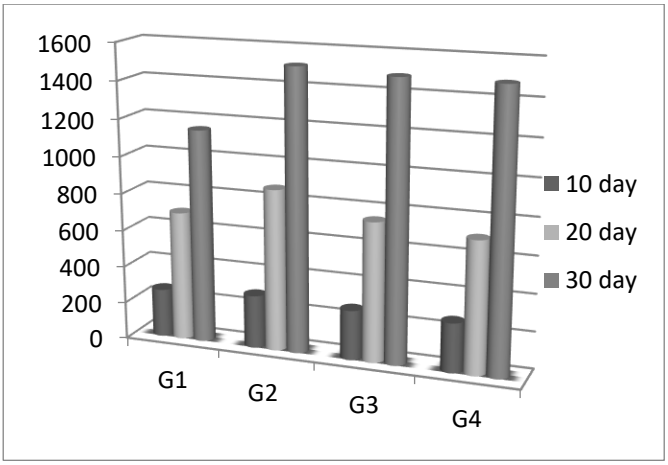

Fig 3 Effect of dietary supplements on feed consumption (g) (FC).

Discussion

This subject has been the subject of numerous studies and research projects, most of which focused on the potential use of immune stimuli to lower a significant disease like Newcastle from medicinal herbs and vitamins, on the one hand, and the potential use of them to improve production, particularly in terms of giving the required weight and in a record period to enhance production and fill consumer need, on the other hand. The study's findings were in line with those of other researchers in the field. The presence of Newcastle antibodies in the serum can be determined for the greatest number of samples using HI and the highly sensitive ELISA test. The ELISA test and the HI test are correlated, however the HI test is used to evaluate immunity, and it is believed that re-immunization following the first vaccination produces a secondary immune response when the antibody standard drops . Following the initial immunization, a secondary immune reaction develops when the antibody standard falls. This study's outcomes align with those of (14), which reported that after receiving the Newcastle vaccine, groups treated with VC had higher levels of antibodies as determined by the ELISA test than the control group and the two groups treated with Nigella sativa and cinnamon, respectively. VC promotes the immune response's synthesis of interferon (15). On the other hand, aims to build a high number of T-cell receptors and CD4 immune cell receptors, where the humeral immune response occurs through the employment of antibodies generated by plasma cells and circulated in the blood when antigen inter to the body and the immune cell surfaces are modeled as receptors that particular antigens bind and activate Th2 T helper-2 cells to become functional. It might be explained by the significance of VC in promoting the synthesis of cytokine rounds (IL-1), which is necessary for the generation of IgM and IgG antibodies (16). The study's outcomes align with the experts' conclusions (17). It's likely that immunological memory, which occurs when memory T cells proliferate and produce antibodies, is responsible for the notable rise in antibodies seen in the second vaccination as compared to the first. This is true, but it's also true that the birds' improved immunological status naturally has a beneficial impact on their increased feed intake and, hence, their increased weight gain in comparison to the negative group. These therapeutic herbs and vitamin C have a positive biological impact by stimulating the animal's entire digestive tract, improving the liver's capacity to process food, and increasing the release of digestive enzymes. These effects have significantly improved the broiler chickens' productivity and carcass features (22). The amino acids phenylene and tyrosine, which are crucial for the synthesis of thyroid hormones—hormones necessary for healthy growth—are represented by it in a significant way. Their absence lowers the concentration of this growth hormone. Their absence lowers the concentration of this growth hormone .It also concurs with current research findings (23). The cause is also attributed to vitamin C's beneficial effects on digestive enzyme activity (chymotrypsin, trypsin, lipase, and amylase), which increases nutrient digestibility and maximizes nutrient absorption. This leads to an increase in the feed conversion efficiency of chickens. (9), elucidated in (24). Nigella Sativa and cinnamon also provided good protection and a significant increase in weight and food consumption, and this agrees with other researchers in this field but less than VC, such as (11, 25).

Conclusions and recommendation

Newcastle disease is one of the most dangerous for poultry because of its detrimental effects on their health and high death rate.Vitamin C, Nigella Sativa and cinnamon give good result In improving and raising the immune response to Newcastle disease, especially after vaccination with vaccines against this disease, with the superiority of vitamin C. We need to carry out additional research and studies using vitamins or medicinal herbs and compare them in order to get the greatest positive findings in this sector in order to lessen and attempt to control this disease.

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