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Comparative Study on Effect of Garlic Extract and Probiotics on the Productivity and Immune Response of Broiler Chickens to Live Newcastle Disease Vaccine

Eman R. Hassan, Kh. M. ELbayoumi, Hoda M. Mekky, Dalia Sedeek, Nagwa S. Rabie and Zeinab M. S. Amin Girh

Poultry Diseases Department,
Veterinary Research Division, National Research Centre, Dokki, Giza, Egypt

Abstract: This study was conducted to compare the efficacy of garlic extract and probiotics (essential oil) in term of growth performance and immune response of broiler chickens to live Newcastle disease (ND) virus vaccine. A total of 200 one day old broiler chick were divided into 4 groups; 50 birds in each. All chicken groups were reared under same environmental condition and treated as: group (1) was considered control negative while groups (2), (3) and (4) were vaccinated with ND Hitchener B_1 vaccine via ocular instillation rout at the 5th days of age followed by booster ND vaccine in drinking water using la Sota live vaccine at the 14th days of age. Group (2) considered control positive, group (3) treated with garlic extract from 1st day of life and finally group (4) treated with essential oil from 1st day of life. Body weight gain was calculated weekly for each group (1-4 weeks) while blood samples were collected at days 14, 21 and 28 days of age/ for each group. HI test was used for detection of ND hemagglutination antibody titres. Results of this study revealed that group 4 (received Probiotics) has the highest body weight gain than group 3 (received garlic extract) followed by group 2 (received vaccine only) and finally the control group 1. On the other hand results of HI test of group receive probiotics (group 4) are nearly the same as those receive vaccine only (group 2) while the highest titre was found in the group receive garlic extract (group 3). This study concluded that the usage of essential oil (as probiotics) and garlic extract are of value in poultry production in aspect of weight gain and immune response to live ND vaccine.

Key words: Probiotics · Garlic · Newcastle Disease · Hemagglutination

INTRODUCTION

In modern poultry production persistence need for nontraditional ways to decrease cost of production while improving poultry productivity such as garlic extract and probiotics (as volatile oil) as it was found that garlic supplementation have a strong stimulating effect on the immune system and enhance digestion and productivity due to its aromatic oils component [1]. This due to the active ingredient of garlic extract is allicin which rapidly decomposed to several volatile organosulphur compounds poses their activities [2] on the other hand essential oil (as probiotics) may play a great role in poultry performance as it has some biological properties such as antimicrobial effect [3], antioxidant [4], enzymatic [5], digestion stimulating effect [6] and positive effect on broilers performance and weight gain [7]. Severe outbreaks in poultry farms despite of regular and intense vaccination programme against viral poultry disease, which may be concluded due to vaccination failure [8] this rise the need of using immune modulators or stimulants to improve response to vaccines. From the above mentioned data this research applied to compare the effect of garlic extract with essential oil in team of productivity and immune response to live Newcastle viral vaccine under field condition.

MATERIALS AND METHODS

Experimental Birds: Two hundred (200), 1- day old, cobb broiler chicken fed commercial ration and water ad libitum and reared under strict hygienic measures.

Corresponding Author: Kh. M. ELbayoumi, Poultry Diseases Department, Veterinary Research Division, National Research Centre, Postal Code: 12622, Dokki, Giza, Egypt.

ND Virus Vaccines:

- HB1 vaccine: Hebra, batch no.40M/2, 1000 dose.
- La Sota vaccine – Intervet - batch no. 12636KJ01, 1000 doses and titer of $10^{7.5}$ EID_{50} /dose.

Probiotics: Commercial probiotics "Symopro" – Poland - containing high concentration of essential oil. Batch No.: 011012 was used according manufacturer instruction.

Garlic extract: Commercial garlic extract "Allicin oil" – China – Batch No.: 2013614 was used according manufacturer instruction.

Haemagglutinating Antigen: It was prepared according to methods of Allan *et al.*[9].

Serum Samples for HI Test: Serum from blood samples was collected from wing vein, labeled and kept at -20°C till used.

Chicken Red Blood Cells: Red blood cells (RBCs) from susceptible adult birds were collected on 4% sodium citrate as anticoagulant. The RBCs were washed three times with phosphate buffered saline (PBS) at PH 7.0 -7.2.

Physiological Saline: Prepared and autoclaved according to Cruickshank *et al.* [10] then stored at 4°C till used.

Haemagglutination Inhibition (HI) Test: The test was carried out according to the standard procedure described by Majiyagbe and Hitchner [11] the end point was estimated according to scheme described by Kaleta and Siegmann [12].

Determination of Body Weight: The body weight of each broiler chick was determined using digital balance weekly for four weeks until the end of the experiment, the mean body weight of each group was measured.

Experimental Design: From day (1) old the used chicks were divided into four groups. group (1) considered control negative while groups (2), (3) and (4) vaccinated with Hitchener B_1 by ocular rout at 5 days of age following by booster dose using la Sota live vaccine at 14 days of age in drinking water, group (2) considered control positive, group (3) treated with garlic extract from 1st day of life, finally group (4) treated with essential oil from 1st day of life. Body weight gain were calculated weekly for each group (1-4 weeks) while blood sampling were collected at days 14, 21 and 28 days of age using HI test for ND antibody titres.

RESULTS AND DISCUSSION

Result of studies of effect of Probiotics and garlic extract on growth performance showed in Table (1) revealed that both Probiotics and garlic extract has growth promoting effect group received Probiotics has the highest body weight followed by those received garlic extract and finally those received ND vaccine and control negative groups consecutively.

This result was matched with Alçiçek *et al.* [6], Alçiçek *et al.* [13] who stated that probiotics supplementation in broiler ration results in growth promotion, nutrient digestibility, enhancement and improvement of feed efficacy, this improvement in growth performance by essential oil maybe due to it has some biological properties [5]. Garlic extract found to be growth promoter which is assisted by result of Ali and Zahran [14] this may due to its antimicrobial and antioxidant effect [15] due to bioactive components present in garlic [16] such as sulphur containing organic compound "diakyl polysufides" which possess antimicrobial activity [17] that could be responsible for the growth promoting effect of garlic [18]. Also Gobenga *et al.* [19] studied the use of garlic extract in different levels in poultry rations and concluded that supplementation of chicken rations with garlic extract marginally improved weight gain and it was better at high level (5.000mg/kg diet) also author stated that garlic supplementation improved meat quality by increasing meat palatability score and reducing the extent of oxidation of meat during refrigerated storage.

The result of HI titer to ND vaccine was higher in all vaccinated groups (groups 2, 3 and 4) than negative control group on the other hand probiotics vaccinated group are nearly similar to group receive vaccine alone while group receive garlic extract show higher titer than vaccinated group who receive vaccine alone as shown in Table (2).

This result was matched with Kong *et al.* [20] who stated that supplementation of probiotics in poultry diets had no statistically significant advantageous effect on antibody titers against Newcastle disease virus vaccine but on the other hand it is higher than control group, the same conclusion was found by Özek *et al.* [21] on the other hand Mosleh *et al.* [22] concluded that use of probiotics essential oil stimulates humoral immune

Table 1: Average body gain (gms) of treated and control negative broiler chicken groups

		Average body weight in grams at days of age			
Group No	Treatment	7	14	21	28
1	Control negative	160	400.2	726	1016
2	Control Vaccinated	163	401.4	727	1018
3	Garlic extract	164	422.4	741.7	1160.04
4	Probiotics	165	430	795.2	1269.68

Table 2: Mean HI titer of treated and control negative broiler chicken groups

		Mean HI titer		
		Days post booster dose		
Group No	Treatment	15	21	28
1	Control negative	2.6	2.2	1.9
2	Control vaccinated	3.5	5.8	6.9
2	Garlic extract	3.7	6.4	7.7
4	Probiotics	3.6	5.8	7

responses and shortens faecal virus shedding period in chickens vaccinated with live Newcastle vaccines. In contrarily result of group receive live Newcastle vaccine together with garlic extract show better immune response than group receive vaccine alone, this result was found by Garbaa *et al.* [23] in broiler chicken and the same result was found in laying hens by Rahman Jahanian and Elham Rasouli [24].

It could be concluded that garlic extract and Probiotics improve poultry productivity as garlic extract improve immune response and weight gain compared to control group, on the other hand Probiotics did not improve humoral immune response to live Newcastle vaccine but improve weight gain compared with all groups in this study, anyhow this need further investigation.

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