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EFFECT OF STOCKING DENSITY ON PERFORMANCE AND IMMUNE RESPONSE OF BROILERS

BY

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SUMMARY

This experiment was carried out on three hundred white Arbor Acres day-old chicks to study the effect of different stocking densities on bird performance as well as on their immune response against Newcastle disease (ND) and injected sheep red blood corpuscles (SRBCs). At the age of 4th week the chicks were classified into three main groups, group A (10 bird /m^2, group B (15 bird/ m^2) and group C (20 bird/ m^2). All the three groups were vaccinated against ND and injected with SRBCs (at 4th week of age), the average body weight, feed conversion and antibodies titres were estimated for all groups. The resutls revealed that body weight, feed conversion and estimated titers were significantly affected with higher stocking densities resulting in a significant reduction in body weight and immune response of groups B & C in comparable to those of group A.

INTRODUCTION

In recent years there has been wide spread concern about the successful and profitable poultry production, to achieve that production, it should be emphasized that poultry industry is based mainly on certain important aspects. Among these aspects, the genetic characteristics of the bird, which needs a careful and strict system of management to provide the birds with the most suitable and comfortable components of the environment during the rearing period to achieve a successful performance from the birds.

In Egypt, poultry industry has subjected to many stressors, among these stressors is overstocking, which may modulate the expression of genetic potentialities and homeostasis which consequently affect the performance of birds.

The relationship between performance and stocking rate has been the subject of many major reviews (Hartung, 1955), (Wyne et al., 1960), (Adams and Jackson, 1970), (Andrews, 1972), (Al- Rawi and Craig, 1975), (Proudfoot et al., 1979), (Ouart and Adams, 1982) and (Appleby et al., 1988).

Not only the performance of the bird found to be affected by higher stocking densities but also the immunity of the bird (Joseph and Graves, 1984).

The present study planned to study the effect of different stocking densities on body weight, feed conversion and immune response of the bird against ND and injected SRBCs.

MATERIAL AND METHODS

This experiment was conducted at Faculty of Veterinary Medicine, Cairo Unviersity at Animal and Poultry Research Centre in which three hundred white Arbor Acres day-old chicks were used, the chicks were obtained from El-Salam Polutry Company and reared under suitable hygienic conditions.

Description of rearing place and bird grouping:

The chicks were housed on deep litter system at three different stocking densities as they were divided equally into three groups at 4th week age, the first one (group A) had 10 bird/m^2 , while the second group (group B) had 15 bird/m^2 and the third group (group C) had 20 bird/m^2. All the groups were fed on broiler starter ration containing 21% protein till the end of the experiment, the brooding temperature was

(32-33C°) at 1st week, then decreased to 2 C° weekly till become 24 C°, each gorup was supplied with sufficient number of drinkers and feeders and completely separated from the others by a wire net partitions.

Vaccination programm

The three groups were vaccinated at the age of 7 days against Newcastle disease (ND) using Hitchner B_1 as double dose via drinking water, then revaccinated at the age of 21 and 35 days using Lasota strain (double dose), vaccination against Gumboro disease were carried out twice (double dose) in drinking water at the age of 12 and 28 days, respectively.

Bird performance:

A random sample of 10% of each group was collectively weighed weekly to obtain the average body weight (kg.).

The average feed taken was also recorded weekly (kg). The feed conversion ratio was calculated by dividing the weekly feed takedn by the weekly average body gain.

Serum and plasma samples:

Ten serum samples were collected weekly from each group to determine the efficacy of ND vaccines (haemagglutination inhibition test) according to (Giambrone, 1981). At the age of 2 weeks, all the three gorups were injected I/M with 1 ml of packed sheep red blood cells (about 26 X 10^9 cell/ml) according to Van der Zipp and Leenstra (1980).

To estimate the immune response of the bird against these injected cells, ten plasma samples were also collected also from each group at the age of 30, 35, 39 and 45 days old and titrated individually using microtitre system Dynatech. Packed SRBCs were resuspended into phosphate Buffer saline (PBS) to make 2% solution. Titres were expressed as the log 2 of the reciprocal of the highest dilution giving complete agglutination.

The results were tabulated in Tables (1-4) and Fig. (1 and 2).

RESULTS

Table (I): Effect of stocking density on the mean body weight of the broilers (Kg.).

Age in weeks	Mean Body weight (Kg)		
	Group A	Group B	Group C
1	←.	0.122	→.
2	←.	0.270	→.
3	←.	0.410	→.
4	0.875	0.860	0.820
5	1.100	1.070	1.000
6	1.510	1.430	1.360
L.S.D. at 5%		0.065	

Group A = Stocking density 10 bird/m^2.
Group B = Stocking density 15 bird /m^2.
Group C = Stocking density 20 bird/m^2.
L.S.D.= Least signifiant difference.

Table (2): Effect of stocking density on food conversion ratio of the broilers.

Age in weeks	Feed conversion ratio		
	Group A	Group B	Group C
1	←.	1.4	→
2	←	1.5	→
3	←.	2.1	→
4	1.8	2.1	2.3
5	2.1	2.5	2.6
6	2.3	2.7	2.9
L.S.D. at 5%		0.17	

Group A = Stocking density 10 bird/m^2.
Group B = Stocking density 15 bird /m^2.
Group C = Stocking density 20 bird/m^2.
L.S.D.= Least signifiant difference.

Table (3): Antibodies titres of haemagglutination inhibition test against NDV of different stocking densities.

Age in weeks	Antibodies titre		
	Group A	Group B	Group C
30	1.4±0.4	1.0±0.3	0.6±0.2
35	1.0±0.3	0.8±0.2	0.8±0.6
39	4.0±0.7	2.33±0.6	0.2±0.3
45	4.8±4.8	3.00±0.5	2.8±0.4
L.S.D. at 5% 0.18			

Table (4): Effect of different stocking densities on immune response of the bird against SRBCs.

Age in weeks	Antibodies titre		
	Group A	Group B	Group C
30	4.2±0.3	2.6 ±0.6	2.5±0.2
35	5.6±0.5	3.4 ±0.6	3.4±0.4
39	6.0±0.8	4.67±0.7	4.0±0.4
45	2.8±0.9	2.42±0.5	2.2±0.5
L.S.D. at 5% 0.21			

Group A = Stocking density 10 bird/m^2.
Group B = Stocking density 15 bird /m^2.
Group C = Stocking density 20 bird/m^2.
HI = Haemagglutination inhibition.
SRBCs= Sheep red blood corpuscles.

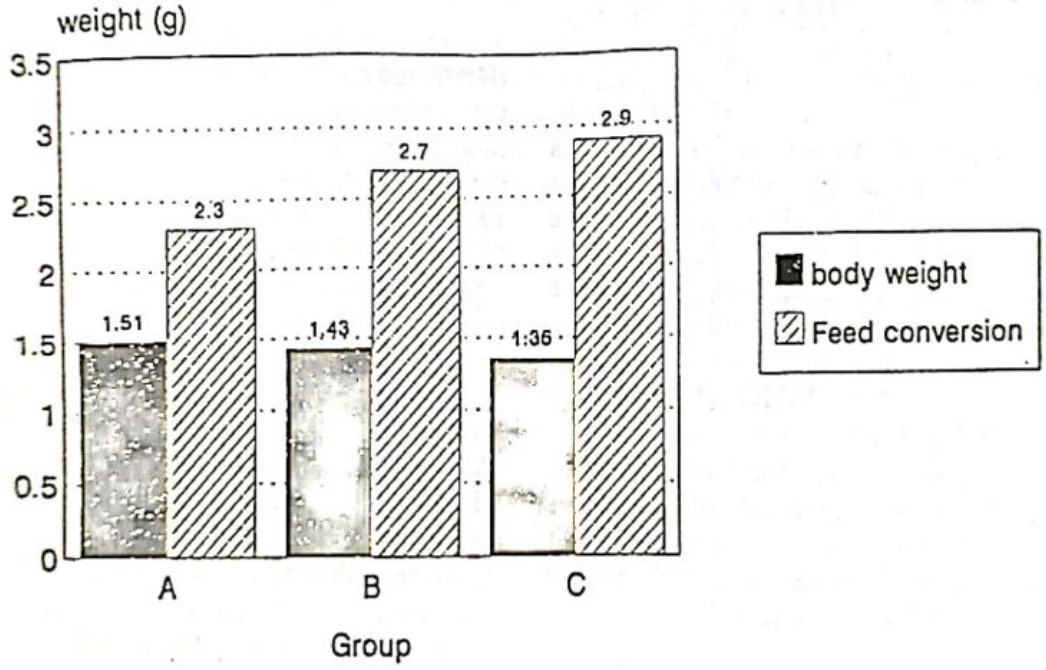

Fig. (1): Effect of Stocking density on final body weight and feed conversion in broiler

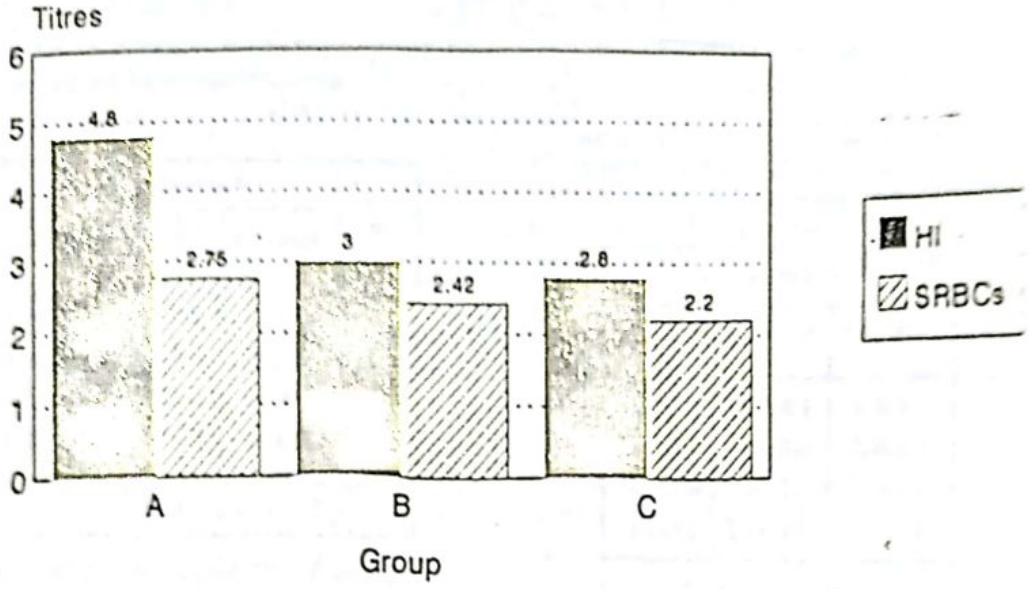

Fig. (2): Effect of Stocking density on immune response against ND and SRBCs.
HI= Haemagglutination inhibition.
SRBCs Sheep red blood corpuscles.

DISCUSSION

The crowding of chicks as a stress factor was studied to illustrate its influence on the performance of broiler chickens as well as the antibodies titre against ND and SRBCs allover the experimental rearing period, bird performance was expressed as body gain and feed conversion.

The data presented in Tables (1 & 2) and illustrated in Fig. (1) demonstrate that the final body weight gain (1.51 kg) and feed conversion (2.3) in group A (stocking density of 10 bird/m^2) proved to be significantly better than those obtained for group B (which were (1.43 kg and 2.7) and (1.36 kg & 2.9), respectively.

As the body weight and feed conversion were significantly decrease with higher stocking densities, this resulting in a significant reduction in the final body weight of gorup B and C. These results are agree with those reported by Proudfoot et al. (1979). Ouart and Adams, (1982) and Appleby et al. (1988) who mentioned that increasing stocking density of floor area per bird caused a slower growth rate and efficient food utilization, but disagree with the result obtained by (Yule, 1972), (Parkhurst et al., 1977) and (Reece and Drott, 1981) who reported that broiler performance was unaffected by stocking density. In addition, noticing the results for the gorup (A) coincide with the results reported by (Maha, 1987) who mentioned that the proper physiological and ethological needs were provided to the chicks when each square meter contained 10 birds.

The obtained results may be attributed to the decrease of mobile activities of the birds in group (A) rather than gorup (B & C), as the decrease in this mobile activities were decreased with the absence of agonistic behaviour, in tutn led to deviation of the energy produced from food to the direction of building up the body which led to an increase in the final body weight gain.

Moreover, the results tabulated in Tables (3 and 4) and illustrated in Fig. (2) indicated that the antibodies titres against ND and injected SRBCs were significantly higher in group A (4.8 & 2.75) rather than gorup B (3.0 & 2.42) and group C (2.8 & 2.2) at the end of the experimental period (45 days). These results agree with those reported by (Joseph and Graves, 1984) which found differences in antibody titres under different stocking densities.

This obtained result may be attributed to hypersenstivity of the birds in gorup (C) to stress (higher stocking density), accordingly the immunological system of the stressed birds was affected and the ability of stimulation of the immunological organs to produce more antibodies decreased and consequently the titre was decreased.

Finally from the previously mentioned findings it could be concluded that high stocking density affect body weight, feed conversion as well as the immuntiy of the bird against ND and injected SRBCs, and we can tolerate overstocking which help the producers to make economic use of floor area, facilities and supplies without any bad effect on the final body weight gain, feed conversion and mmunity of the bird.

REFERENCES

Adams, A.W. And M.E. Jackson (1970): Effect of cage size and bird density on performance of six commercial strains of layers. Poult. Sci.; 49: 1712-1719.

Al-Rawi, B. and Craig, J.V. (1975): Agonistic behaviour of caged chickens related to group size and area per bird. Appl. Anim. Ethol., 2: 69-80.

Andrews, L.D. (1972): Cage rearing of broiler. Poult. Sci., 51: 1194-1197.

Appleby, M.C.; Becon, J.A. and Hughes, B.O. (1988): Performance of a deep litter system for egg production. Br. Poult. Sci., 29: 735-751.

Giambrone, J.J. (1981): Laboratory evaluation of the immune response of young broiler chickens vaccinated against Newcastle disease under field conditions. Poult. Sci., 60: 1204-1208.

Hartung, T.E. (1955): Floor space for broilers. Poult. Sci., 34: 1200.

Joseph, M.M. and H.B. Graves (1984): Some observation on the role of behaviour in poultry production future research needs. Appl. Anim. Ethol., 21:391.

Maha, T. (1987): Influence of different coloured light environment on some behaviour and performance. M.V.Sc. Vet. med., Cairo Unviersity.

Ouart, M.D. and A.W. Adams (1982): Effects of cage design and bird density on layers. I. Productivity, feathering and nervousness. Poult. Sci., 61: 1606-1613.

Parkhurst, C.R., G.R. Boughman, J.P. Thaxton, J.D. Garlick, and F.W. Edens, (1977): A comparison of broilers grown in environmentally modified and conventional housing at different population densities. 1- Production performance and economic analysis. Poult. Sci, 56: 883-885.

Proudfoot, F.G., Hulan, H.W. and Ramey, D.R. (1979): The effect of 4 stocking densities on broiler carcass grade. The incidence of breast blisters and other performance traits. Poult. Sci., 58 (4): 791-793.

Reece, F.N. and Drott, J.H. (1981): The effect of limited area brooding on broiler chickens performance. Poult. Sci., 60 (19): 2240-2245.

Van der Zipp, A.J. and Leenstra, F.R. (1980): Genetic analysis of the humoral immune response of white leghorn chicks. Poult. Sci., 59:1363-1369.

Weaver, W.R., Beane, W.L. and Cherry, J.A. (1982): Effect of light feeding space, stocking density and dietary energy on broiler performance. Poult. Sci., 61 (1): 33-37.

Wyne, J.W., M.G. Maccartney and R.D. Carter (1960): The effect of feeder and floor spaces upon growing turkeys. Ohio Agric. Exp. Sta. Res., 87.

Yule, W.J. (1972): Stocking density for broiler in controlled environmental houses. Poult Sci., 17-19.