

## **EFFECT OF SEPARATE-SEX REARING ON BROILER PERFORMANCE, LITTER QUALITY AND IMMUNE RESPONSE.**

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### **SUMMARY**

One thousand and five hundreds feather sexed day-old chicks (Cobb 500) were divided into three equal groups; males, females and straight-run (as hatched). The 3 groups were reared identically. Body weight was significantly higher in male group compared with either female or straight-run groups. Also, the feed conversion ratio of the male group was significantly lower than the female group. The litter of the male group showed significantly lower moisture content as compared with the female group. No significant differences were observed in the maternal antibodies (for both ND and IBD viruses) between separately grown males and females. However, the non-specific immune response to SRBCs was significantly higher in females than males.

meet certain market demands and possible economic benefits. One of the major advantages of sex-separate rearing is product uniformity, since males are about 20% larger than females of the same age. Also, males will respond to higher plane of nutrition for a longer time than females.

The economic implications of raising separate sex flocks have been discussed by Leeson and Summers (1980) and Veerapen (1996).

In boilers, not only the final body weight but also the net carcass yield as well as the internal organs are affected by sex (Edwards et. al., 1973 and Susbilla et. al., 1994). Birds' activities e.g. feeding, drinking and resting are also affected by sex (Lei and van Beek, 1997 and Fayed et. al., 1996).

The genetic selection of poultry for growth rate and feed efficiency is thought to be accompanied by a reduction in immune response (Hayyari et. al., 1996). Moreover, in domestic fowl, stressful social environments result in less antibody activi-

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### **INTRODUCTION**

Broilers may be raised sex-separate in order to

ty against a variety of particulate antigens, including sheep red blood cells (SRBCs) (Gross and Siegel, 1973 and Siegel and Latimer, 1975).

The present study was carried out to evaluate the effect of separate-sex rearing on broiler performance, litter quality criteria and immune response to SRBCs (as anon-specific immune stimulant)

## MATERIAL AND METHODS

### I- Experimental birds and Management:

One thousand and five hundreds day old chicks (Cobb 500) were feather sexed according to Anon., 1988 and divided into three equal groups. The first group was assigned to male chicks, the second group to female chicks and the third group to both males and females. The birds were kept in an open sided house at Animal and Poultry Management Research Center, Faculty of Veterinary Medicine, Cairo University.

The birds were floor reared on a 10-cm thick layer of clean chopped wheat straw litter and received a commercial broiler ration, 23% crude protein and 3100 Kcal. ME until the 21st day of age then shifted to 22% crude protein and 3200 Kcal. ME ration until marketing age.

The following vaccination programme was adopted using eye drop method: Hitchner B1 at 7 days, La Sota at 14 days and IBD BLEN at 15 days. While inactivated ND vaccine was injected at 17

days. From the beginning of the third week, birds were sprayed weekly using Hitchner B1 vaccine.

### II- Performance:

Average body weight was determined weekly by weighing a sample of 50 birds from each group. The feed consumption was recorded weekly and feed conversion ratio was estimated.

### III- Examination of Litter:

Composite samples from surface and deep litter were collected weekly in clean polyethylene bags and examined for determination of:

**1- pH:** This was done electrochemically in a 1/10 dilution in distilled water.

**2- Moisture content:** The moisture percent was calculated after drying a 100 gm sample to a constant weight at 110 oC (Parsons and Baker, 1985).

**3- Total colony count:** By plating 1ml of the appropriate dilution of 1 gm sample using standard plate count agar.

### IV- Immunological studies:

Blood samples were collected from a random sample of 25 birds from each group on days 1, 7, and 14 of age. The collected serum was used for measuring maternal antibody levels against Newcastle disease (ND) virus using haemagglutination-inhibition (HI) test (Beard, 1980) and Infectious bursal disease (IBD) virus using agar gel precipitation

tation test (AGPT) (Cullen and Wyeth, 1975).

On the 15th day of age, 30 birds from each group were individually inoculated with 1 ml of 10% suspension of sheep red blood cells (SRBCs) as an antigenic stimulant (Gross, 1986). Blood samples were collected from the inoculated birds on days 3, 7, 14, and 21 post inoculation and the antibody response to SRBCs was measured using haemagglutination test (HA).

### RESULTS AND DISCUSSION:

The effects of separate sex rearing on the average body weight and feed conversion ratio is shown in Table (1) and Fig. (1 and 2). It has been observed that separately grown male chickens had significantly higher average body weight from the beginning of the fourth week until the end of the sixth week of age (995, 1,230, 1,601 g) as compared to either separately grown females (949, 1,190, 1,550 g) or the straight-run group (721, 1,209, 1,530) respectively.

Also, the feed conversion ratio of the male group was significantly lower than that of the female group during the fifth and sixth week of age (1.9 and 2.1 compared to 2.1 and 2.3 respectively). These findings are in agreement with the other reports of Leeson and Summers (1980), Veerapen (1996) and Fayed et. al., (1996).

Concerning litter quality criteria, the obtained results (Table 2 and Fig. 3) revealed no significant differences in either litter pH or total colony counts between separately grown sexes and straight-run group. However, the litter pH showed a characteristic shift to the alkaline side by the end of the 3rd week of age in the 3 experimental groups. Also, the total colony counts exhibited a gradual and steady rise as the birds advanced in age.

As for the litter moisture %, it is noticed that, from the beginning of the third week of age, the female group showed a significantly higher moisture content (16.65, 12.65, 23.9 and 33.45%) as compared with either male group (12.5, 10, 17.15 and 28.4%) or straight-run group (8.3, 9.8, 14, 28) respectively. Dry litter in the male group could be possibly attributed to the differences in physical activities between males, females and straight-run birds (Fayed et. al., 1996). Males, being more active, provided better chances for maintaining dry litter.

Results in tables (3 and 4) show that screening of the maternal antibodies for both ND and IBV viruses on 1st, 7th and 14th days of age, revealed no significant differences between separately grown males and females. On the other hand, the non-specific immune response to SRBCs (Table 5 and Fig. 4) revealed significantly higher HA antibody

Table (1): Effect of separate-sex rearing on broiler performance.

Age (Weeks)	Males		Females		Straight run	
	Body Weight/g	FCR*	Body Weight/g	FCR	Body Weight/g	FCR
1	115.2	1.12	106	1.2	101	1.16
2	246	1.35	237	1.45	259	1.4
3	458	1.6	435	1.7	469	1.65
4	995	1.8	949	1.9	721	1.85
5	1.230*	1.9**	1.190	2.1	1.209	2
6	1.601*	2.1**	1.550	2.3	1.530	2.2

\* Feed Conversion Ratio.

\* Significant differences P( 0.05 in body weight between male and both female and straight-run groups

\*\* Significant differences P( 0.05 in FCR between male and female groups.

Table (2): Effect of separate sex rearing on litter quality.

Age (Weeks)	Males			Females			Straight run		
	Moisture %	pH	T.C.C.*	Moisture %	pH	T.C.C.*	Moisture %	pH	T.C.C.*
1	10	6.6	4.7	10	6.6	4.7	11	6.6	4.7
2	7.85	9	7.49	8.05	8.6	6.75	6.6	9.6	6.9
3	12.5	8.4	7.65	16.65*	8.4	7.88	8.3	8.5	6.9
4	10	7.9	8.79	12.65*	8.3	8.18	9.8	8.4	8.15
5	17.15	7	8.4	23.9*	7	8.72	14	7	8.9
6	28.4	7	9.65	33.45*	7	9.39	28	7	7.96

\*Log total colony count/ g dry weight.

\* Significant differences P≤ 0.05 in moisture % between female and both male and straight run groups

Table (3): Maternal antibodies against Newcastle disease in sera of chickens grown separately.

Time of testing	Arithmetic mean of HI* test.	
	Males	Females
Day old	3.6	3.6
7 days	2.9	2.9
14 days	3.2	3.2

\* Haemagglutination inhibition.

Table (4): Maternal antibodies against infectious bursal disease in sera of chickens grown separately.

Time of testing	% of positives AGPT*	
	Males	Females
Day old	90%	90%
7 days	60%	60%
14 days	40%	60%

\* Agar gel precipitation test.

Table (5): Haemagglutinin antibody response (GMT)<sup>o</sup> of separately reared chickens inoculated with sheep red blood cells (SRBCs) at 15 days of age.

Days pos inoculation with SRBCs.	Males	Females	Control
3 days	0	0	0
7 days	1.9	2.5*	0
14 days	3.2	2.95	0
21 days	3.5	4*	0

<sup>o</sup> Geometric mean titer.

\* Significant differences P( 0.05 between female and male groups

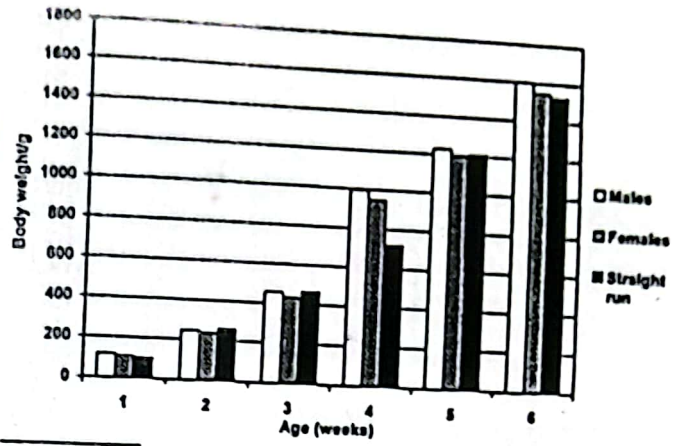


Fig.(1) : Effect of separate sex rearing on body weight



Fig.(2) : Effect of separate sex rearing on feed conversion ratio (FCR)

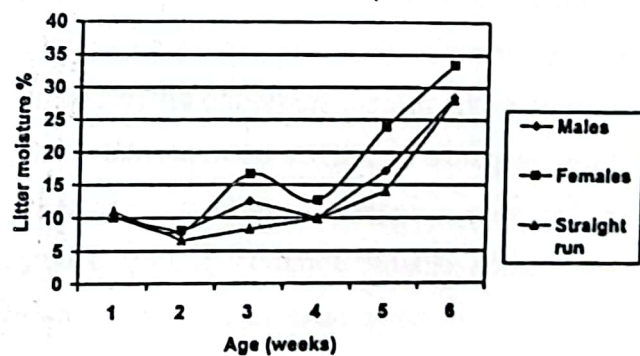


Fig.(3) : Effect of separate sex rearing on litter moisture

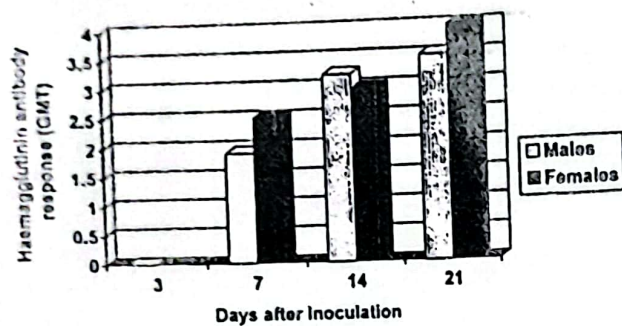


Fig.(4) : Haemagglutinin antibody response of separately reared chickens inoculated with SRBCs at 15 days

ies in separately grown females on the 7th and 21st days post inoculation (2.5 and 4) as compared to separately grown males (1.9 and 3.5) respectively. The observed reduction in HA antibodies to SRBCs in separately grown males is certainly attributed to higher growth rate in males (Hayyari et al., 1996).

Conclusively, the economic implications of raising separate sex flocks should be considered in relation to the cost of sexing day old chicks, and changes in processing or marketing strategies. According to the present study, the difference in immune response to SRBCs between males and females may suggest a different schedule of vaccination against common poultry pathogens. However, this point needs further investigation.

## REFERENCES

- Anon., (1988): Cobb 500. Broiler Management Guide. The Cobb Breeding Company LTD, East Hanningfield, Chelmsford, Essex CM3 8BY, United Kingdom.
- Bayyari, G. R., Huff, W. E., Rath, N. C., Balog, G. M., Newberry, L. A., Villines, J. D., Skecles, J. K., Anthony N. B. and Nestor, K. E. (1996): Lymphocytes evaluation of male turkeys from six genetic lines. Abst. No. 8, Abstracts of papers, 17 th Annual meeting of the Southern Poultry Science Society. Jan., 22-23, 1996. Atlanta Georgia.
- Edwards, H. M., Jr., Denman, F., Abu Ashour, A, and Nigara, D. (1973): Carcass composition studies. I- Influence of age, sex and type of dietary fat supplementation on total carcass and fatty acid composition. *Poult. Sci.* 52: 934 - 948.
- Fayed, R. H., Ali, M. M. and Zamzam H. Abdel Wahab (1996): Effect of sex on performance, carcass yield and activities of broiler chicks under Egyptian conditions. *Zagazig Vet. J.* 24 (3): 116 -121.
- Gross, W. B. (1986): Effect of dose of antigen and social environment on antibody response of high and low antibody response chickens. *Poult. Sci.*, 65: 687 - 692.
- Gross, W. B. and Siegel, P. B. (1973): Effects of social stress and steroids on antibody production. *Avian Diseases* 17: 807.
- Jean Faure, M. and Bryan Jones, R. (1982): Effects of strain and type of perch on perching behaviour in the domestic fowl. *App. Anim. Ethol.*, 8: 281 - 293.

Leceson, S. and Summers, J. D. (1980): Production and carcass characteristics of the broiler chicken. *Poult. Sci.*, 59: 786 - 798.

Lei, S. and van Beek, G. (1997): Influence of activity and dietary energy on broiler performance, carcass yield and sensory quality. *Br. Poult. Sci.*, 38(2): 183 - 189.

Parsons, A. H. and Baker, S. L. (1985): Softwood chipping fines: efficacy as poultry litter. *Poult. Sci.*, 64: 2292 - 2295.

Siegel, H. S. and Latimer, J. W. (1975): Social interactions and antibody titers in young male chickens. *Animal Behaviour*, 23: 323.

Susbilla, J. P., Frankel, T. L., Parkinson, G. and Gow, C. B. (1994): Weight of internal organs and carcass yield of early food restricted broilers. *Br. Poult. Sci.*, 35: 677 - 685.

Veerapen, S. D. (1996): Separate sex growing of Ross 208 broilers. Faculty of Agriculture - Extended abstracts. University of Mauritius, Reduit, Mauritius.