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FFECT OF SOME POLLUTANTS AS STRESSORS ON SOME EHAVIOURAL PATTERNS AND PERFORMANCE OF BROILER HICKENS

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e performance of broiler chickens as well as me behavioural patterns (ingestive, comfort d agonistic) were investigated under the normal d stress conditions throughout the experimental riod of this work.

wo hundred Hubbard day old chicks of both xes were raised together up to two weeks of e, then were randomly divided into four equal oups (I,II,III, and IV) each of 50 birds. Each oup was housed in a separate room. The first oup (I) was optimally accommodated and nsidered as the control, while the second group I) birds were exposed to 3000-3200 ppm of rbon dioxide. The third group (III) was exposed 100-125 ppm of ammonia, last group (IV) was posed to sprinking with 10 gm fine dust for 15 inutes daily.

e obtained results showed that, the exposure of oiler chickens to some noxious stimuli tressors) throughout the rearing period has gnificantly reduced feed consumption, weight in, and consequently feed conversion compared to the control group. In addition, ingestive (feeding and drinking) and comfort (rest, sleep and preening) behaviours were influenced by stressors, in other side there was a significant increase in occurrence of agonistic behaviour (feather pecking and cannibalism) in the group exposed to stresses, this lead to increased mortality percentage among those birds.

So the environment inside the poultry house should be free from noxious stimuli (stressors) or with unavitable minimum level, to obtain good behavioural pattern, high performance and efficiency from the birds.

INTRODUCTION

Poultry building should be constructed to provide protection against the elements to avoid artificial stress conditions such as excess dust, insufficient ventilation that leads to ammonia build up and damp litter. However, litter is known about how meat chickens utilize their environment and how they budget their time, such as informations are of economic importance, because environmental stresses will influence activities, performance and feed utilization efficiency of broiler chickens.

Some researches have dealt with the effect of some environmental stress on performance of chickens. Anderson et al. (1976) could not demonstrate significant deleterious effects of short-term inhalation of dust by test chickens, it has been observed in practice that, colibacillosis outbreaks are frequently associated with inhalation of excessive dust. Charles and Payne (1966) found a concentration of 100 ppm of ammonia in the atmosphere was of deleterious effect on performance of broilers. The adverse effects of the high ammonia concentration appeared to be related to reduced feed intake. Moreover, exposure to as littler as 20 ppm of ammonia for 72 hours or 50 ppm for 48 hours increased the infection rate and histopathological changes of the respiratory epithelium of chicken when subsequently exposed to Newcastle disease virus (Anderson et al., 1964; and Hofstad et al., 1978). The effect of excess ammonia level inside the poultry house lead to reduced feed consumption, decrease in weight gain and reduction in feed utilization efficiency (Gaveny and Quarles, 1978; Reece et al., 1980; and MCFarlane et al., 1989).

In addition, Curtis and Drummond (1982) found that high concentration of carbon dioxide in poultry house resulting from respiration and decomposition of excreta causes damage of respiratory as well as depression of growth and feed consumption of broilers.

The purpose of the present work is to assess the effect of some pollutant stressors (high ammonia level, high concentration of carbon dioxide and dust) in poult houses on some behavioural patterns, performance and mor ality rate of broiler chickens under local conditions.

MATERIAL AND METHODS

Two hundred Hubbard day old chicks of both sexes obtained from El-Salam Poultry Company were reared under ideal standard of hygienic conditions in Faculty of Vet. Med., Cairo University at Poultry and Animal Research Center.

The chicks were housed in a clean well-ventilated house on a built up litter. The floor of the house was bedded by fresh clean wheat straw "Tibn" forming a deep litter of 10 cm depth. The house was provided with gas heatheer to adjust the environmental tremperature according to the age of birds. The maximum and minimum ambient temperrature recorded during the experimental period were 35°C and 23°C, respectively. Relative humidity inside the poultry house betwen 60% and 85%. The chicks were vaccinated according to the Company suggested programs. All birds were raised together up to 2 weeks of age, then were randomly divided into four equal groups (I,II,III, and IV) each of 50 birds. Each groups was completely separated from othe one in a separate room, at a stocking density of 10 birds/m². Each group was equally accommodated and managed except for the factors planned to be tested as follows:

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The first group (I) was optimally accommodated and considered as the control.

The second group (II), the birds were exposed to 3000-3200 ppm of carbon dioxide (CO_2), through the use of open-flame heaters in this poultry chamber to increase its level, while CO_2 level in the other three groups was established by the CO_2 respired by the birds and the normal atmosphere CO_2. Levels of CO_2 were measured with a Bendix/ Gaster gas detection system with a Piston-type volumetric pump and glass detection tubes according to Reece and Lott (1980).

The third group (III), the chicks were exposed to 100-125 ppm of ammonia, where anhydrous ammonia was metered into this bird chamber to maintain levels ranged between 100-125 ppm on a volume basis. Ammonia level was checked daily with a Bendix/ Gaster gas detector (Reece and Lott, 1980). No ammonia was added to other three groups (I,II, and III).

The last group (IV), in this work, the atmosphere was sprinkled with 10 gm fine dust for 15 minutes daily till end of experiment.

The birds were fed ad-libitum on a previously weighed ration and fresh clean drinking water was consistently available. The amount of food consumed in each group was recorded till the end of experimental period (49 days). The feed intake per bird in grams for each group was calculated. Regarding to the increase of body weight, ten chicks were randomly selected and identified from each group and were weighed weekly till the end of test period (7 weeks). The food conversion rate was measured by dividing the amount of food consumed, in a certain period, by the gain in body weight at the same perod, expressed in the same weight units (Abasiekony, 1988).

Behavioural observations:

In order to register the some behavioural patterns in each of the test groups, each group was watched for 30 minuted daily at a time ranged from 10.00 to 12.00 O'clock a.m-throughout the experimental period. The behavioural patterns that were observed including:

1- Ingestive behaviour: that was represented by length of feeding and drinking time elapsed, minute/bird per observation period according to Gvaryahu et al. (1989).

2- Comfort behaviour; that include resting, sleeping and preening measured as a time elapsed (minutes) for a bird throughout the observation period.

3- Agonistic behaviour; that represented by feather pecking and cannibalism recorded as a number of occurrence per observation period.

Mortality percentage among those birds in different groups was recorded in the two period of age (1-3 weeks) and (4-6 weeks).

Statistical analysis:

All obtained data were analyzed by analysis of variance (ANOVA) according to Snedecor and Cochran (1989).

Table (1): Food intake, body weight gain and feed conversion rate at *seven weeks* age for broiler chickens exposed to some pollutant stressors :

Groups / Parameters	I Control	II CO_2 exposed	III Ammonia exposed	IV Dust inhalation
Food intake (g/bird) *	3766.0 ±114.0	3479.0 ±129.0	3556.0 ±118.0	3353.0 ± 121.0
Body weight gain ** (grams)	1727.6 ±75.0	1339.7 ±63.0	1314.0 ±72.0	1307.5 ± 56.0
Feed conversion rate (g feed/g body weight)	2.179 ±0.27	2.597 ±0.31	2.706 ± 0.28	2.564 ± 0.22

* Food intake (g) / bird throughout the experimental period (7 weeks) .

** Body weight (g) at the end of the experiment .

Results are expressed as mean ± S.E. . Means within a horizontal raw with unlike superscripts indicates significant differences at $P< 0.05$.

Table (2): Mortality percentage of broiler chicken as affected by some pollutant stressors during two periods of age (1-3 and 4-6 weeks) .

Mortality % / Groups	At first period (1-3 weeks of age) (%)	At second period (4-6 weeks of age) (%)
Control (I)	5	3
CO_2 exposed (II)	5	15
Ammonia exposed (III)	6	13
Dust inhalation (IV)	7	11

Table (3): Some behavioural patterns of broiler chickens exposed to some pollutant. stressors throughout the experimental period .

Group / Parameters	I Control	II CO_2 exposed	III Ammonia exposed	IV Dust inhalation
Length of feeding time (min./bird)	12.1± 0.76 a	9.3 ±0.69 b	7.5± 0.62 c	8.2 ±0.52 b
Drinking time (minute/bird)	2.5 ±0.18 b	3.9 ±0.24 a	4.3± 0.21 a	3.6 ±0.19 a
Resting (minute/bird)	6.5± 0.77 a	4.1 ±0.54 b	3.1± 0.41 c	5.0± 0.55 b
Sleeping (minute/bird)	2.4± 0.32 b	3.8± 0.22 a	4.9± 0.27 a	1.0 ±0.12 c
Preening (minute/bird)	5.4±0.33 a	1.6±0.21 bc	2.3±0.19 b	1.3± 0.12 c
Feather pecking (occurrence/observ.)	0.45± 0.04 b	0.73± 0.02 a	0.75± 0.02a	0.68± 0.03a
Cannibalism (occurrence/observ.)	0.27±0.03 b	0.48± 0.03 a	0.58 ±0.03a	0.54± 0.02a

a,b,c Mean S.E. within each raw bearing different superscripts differ significantly at $P<0.05$

Observation period takes 30 minutes daily for each group. Occurrence recorded per group per observation period .

DISCUSSION

From Table (1), it can noticed that, the food intake in the control group (3766.0 gm) was higher than others, at the same time the group exposed to dust showed the lowest food intake (3353.0gm) in comparison with other groups exposed to carbon dioxide (3479.0 gm) and to ammonia (3556.0 gm). Meanwhile, the body weight gain in the control group was significantly higher than that of other groups. The feed conversion ratio in group exposed to ammonia was 2.706 when compared with control group (2.179), while in both groups either dust or CO2 this value reached to 2.564 and 2.597, respectively. From the above mentioned results, it is clear that, the birds exposed to high level of ammonia showed a marked reduction in feed intake, decrease body weight gain and feed conversion, these results agree with those reported by Gaveny and Quarles (1978); Reece et al., (1980); Sainsbury (1988) and McFarlane et al. (1989).

The bad effect of ammonia in poultry house, may be attributed to inability of broiler chickens to consume the available food due to ocular lesions caused by severe irritation of mucous membrane of eye as a result of exposure to this noxious stimuli (Anderson et al., 1964).

Regarding to effect of carbon dioxide and dust on broiler performance, this results agree with Curtis and Drummond (1982); Harry (1988) and Madelin and Wathes (1989) mentioned that, high concentration of carbon dioxide and dust in poultry house cause affection of respiratory tract, as well as depression of growth, reduce feed consumption and consequently low conversion. The decreased values for parameters of performance are attribute distress and grasping of birds to ammo carbon dioxide and dust.

The mortality rate for the tested groups is sh in Table (2) as it was recorded throughout periods of age (1-3 weeks and 4-6 weeks), it noticed that there is no difference in morta percentage (1-3 weeks), while at the seco period (4-6 weeks) at which the birds we exposed to different noxious stimuli. Th mortality percentage was higher in CO2 gro (15%) at the same time it was 13% and 11% both ammonia and dust groups, respectively comparison with the control one (3%). Thes results agree with those reported by Anderson e al. (1976) and Rreece et al. (1980). The hig mortalities recorded for groups exposed to noxious stressors may be due to the devitalizatio of the immune response of the birds that permi different pathogens to invade different organs of the bird and induce outbreak (Maxwell et al., 1989 and Maxwell, 1990).

From the previously mentioned results, it is clear that, adverse hygienic conditions as; increase level of CO2, ammonia and dust inside poultry house lead to lowered resistance against many infectious diseases, and broilers become more susceptible to respiratory affection (Collins and Algers, 1984). The measured behavioural parameters are recorded in Table (3). It is clearly that ingestive berhaviour (feeding and drinking) was characterized by frequent changes amongst the different groups, where there was a low significant in length of feeding time in third group III (7.5 min.) when compared with other groups, I (12.1 min.); II (9.3 min) and IV ((8.2 min.), while time elapsed in drinking per bird was highly significant in the groups exposed to noxious stressors (II,III and IV), when compared with control group (I). Murphy and Preston (1988) mentioned that, altered feeding or drinking behaviour may be important for performance if they affect competition between birds or overall energy expenditure.

Meanwhile comfort behaviour (rest, sleep and preening) was clearly variable among tested groups, it is clear that, birds exposed to ammonia (group III) showed a lower value in resting (3.1 min.) than other groups II and IV (4.1 and 5.1 min., respectively) while in the control group (I) reached up to 6.5 minutes. Sleeping in both groups (II and III) showed a marked increase when compared with either control I (2.4 min.) or group IV (1.0 min.). It can be noticed that a high significance in preening was recorded in control I (5.4 min) and lower values in other groups IV (1.3 min); II (1.6 min) and III (2.3 min). The agonistic behaviour (feather pecking and cannibalism) showed a marked incidenc in the birds exposed to the stressors, where it was significant for feather pecking and cannibalism in the group (II,III and IV) in comparison with the control group (I).

In conclusion, the exposure of broiler chickens to some pollutant stressors (increase levels of ammonia, carbon dioxide and dust) adversely effect their performance and maintenance behaviours, in addition to increase in the agonistic behaviour leading to a high mortality rate. Therefore, a good and comfortable environmental condition is recommened for broiler chickens to establish and improve the internal homeostasis that will be reflected on high performance of those birds.

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