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Effect of Inner Environmental Conditions of Poultry House on Harmful Gases and Dust

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Abstract: Like the other animal husbandry fields, the aim of poultry is also to gain higher production with lower cost. Since, chickens live in poultry house for all their life, to gain higher production; it is necessary that get them live in suitable environmental conditions with good caring and feeding as addition to their genetical abilities. So, it is obligatory for benefical poultry that to build more cleaner and healty poultry houses; providing the optimum enviromental conditions that animals need and is suitable for good caring and feeding. This research was carried on in Eastern Turkey for invastigeting effect of inner environmental conditions on harmful gases and dust and these effects were determined and effective fan ventilation systems and spraying oil-water mixture were recommended for more healtier and cleaner air conditions in poultry house for chickens.

Key words: Poultry, temperature, relative humidity, harmful gases, carbon dioxide, ammonia, hydrogen sulphide, dust

INTRODUCTION

Like the other animal husbandry fields, the aim of poultry is also to gain higher production with lower cost. Since, chickens live in poultry house for all their life, to gain higher production; it is necessary that get them live in suitable environmental conditions with good caring and feeding as addition to their genetical abilities. So, it is obligatory for benefical poultry that to build more cleaner and haealty poultry houses; providing the optimum enviromental conditions that animals need and is suitable for good caring and feeding (Kocaman *et al*., 2005).

Production (yield) level of chickens mostly effected by environmental conditions. At the same time chickens are more sensitive than the other animals against to environmental conditions and especially to the climatic environmental conditions.

As inner poultry house environmental conditions; temperature, relative humidity, air flow, lighting, living area for per animal, animal manners (attidutes), sound, atmospheric pressure, husbandry equipments, existence of harmful organisms, harmful gases, unexpected odor and dust can be accepted (Esmay, 1973; Esmay and Dixon, 1986).

In planning poultry buildings, mostly inner environmental conditions including temperature, relative humidity, ventilation and lighting are considered but effects of harmful gases, odor and dust neglected. By the way that amount of harmful gases, odor and dust which known also as inner husbandry house polluting materials are over the given values then effected animal healt and their yield at important levels. Most effected polluting materials are ammonia (NH_3), Carbon dioxide (CO_2), Hydrogen Sulphide (H_2S) and dust. Their negative effects on animal healt and people working in barns must be considered for barns planning (Phillips *et al*., 1998).

While in poultry houses which have caged layer systems, dust concentarion is <2 mg m^{-3} is more than that value in other kind poultry houses systems (Ellen *et al*., 2000). Polluted air is harmful for animals and people and causes serious respiration diseases especially for people (Pratt and May,1984).

Being less or more than optimum values of inner barn temperature has a negative effect on production. Optimum temperature values range between 10-20°C for chickens. At the same time temperature values ranging between 5-10 and 20-25°C are also acceptable values. When poultry house inner temperature reach 21°C, eggs became small and their peels became thin (Mutaf, 1988; Sterling *et al*., 2003).

In poultry houses for egg production, relative humidity values must range between 60-70%. If relative humidity is much low, amount of dust in barn air will increase and it causes some respiration diseases for chickens bye the way that irritating their tracheas.

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Recommended maximum concentration of Carbon dioxide (CO_2), ammonia (NH_3), Hydrogen Sulphide (H_2S) gases in poultry buildings have been reported as 3000, 15 and 3 ppm, respectively by Chastain (2004).

For providing optimum enviromental conditions in poultry buildings; barns fitting with provincess must be built, on the other hand enviromental controlling measures like ventilation, heating, cooling and lighting must be taken (Yildiz *et al*., 2010).

This research aimed to investigation of effect of poultry buildings inner environmental conditions which are inner temperature and inner relative humidity on harmful gases and dust collecting in barns.

MATERIALS AND METHODS

This research carried on in the poultry house having 6000 chickens capacity, automatic feding, watering and mechanical ventilation system for 2 years in Eastern Turkey.

In poultry house, inner temperature inner relative humidity, air flow velocity, harmful gases and dust values were measured. Air flow velocities were measured with digital anemometers. Harmful gases (carbon dioxide, ammonia and hydrogen sulphide) measured with a multiple gas measurement apparatus which give values as ppm (Instrument manufacturated in Drager, Germany). For measuring amount of dust (HD-1002 by SKC Ltd. UK) apparatus which give the dust amount as m^3/mg directly was used. Values were measured per week and their monthly mean were calculated.

To determine whether any difference exist or not between variables in aspect of years independent t-test was applied to datas. To determine the effect of independent variables like inner temperature and relative humidity on dependent variables like ammonia, carbon dioxide, hydrogen sulphide and dust, simple linear regression analysis was applied. As addition, correlation analysis was also applied to datas. For all statistical analysis, SPSS 16.0 Packet program was used.

RESULTS AND DISCUSSION

According to Table 1 as a result of regression analysis; it was determined that inner temperature and relative humidity have improtant effect on carbon dioxide and ammonia and have no effect on hydrogen sulphide and dust for 2002 year. For 2003 year, inner temperature has an important effect on carbon dioxide, ammonia and hydrogen sulphide but has no effect on dust, on the other hand relative humidity has an important effect on carbon dioxide and ammonia and has no effect on hydrogen sulphide and dust.

Table 1: R^2 values for 2002 and 2003 years

Years	Environmental condition	CO_2	NH_3	H_2S	Dust
2002	Temperature	0.573*	0.513*	0.065	0.007
	Relative humidity	0.155*	0.132*	0.071	0.028
2003	Temperature	0.201*	0.232*	0.125*	0.018
	Relative humidity	0.110*	0.106*	0.008	0.006

*$p<0.05$

Table 2: Correlation efficients (r)

Parameters	Carbon dioxide	Ammonia	Dust
Inner temperature	-0.537*	-0.500*	0.108
Relative humidity	0.411*	0.330	0.241

*Significant

Table 3: Means and standard errors of measured values for 2002 and 2003 year

Parameters	Years	N	Mean+SE	Significant
Inner temperature	2002	50	19.76±0.499	NS
	2003	47	19.68±0.448	
Relative humidity	2002	50	73.16±1.051	*
	2003	47	66.02±1.249	
Carbon dioxide	2002	50	2028.00±114.108	*
	2003	47	1519.15±168.375	
Ammonia	2002	50	19.16±1.117	NS
	2003	47	16.47±1.625	
Hydrogen sulphide	2002	50	9.16±0.331	*
	2003	47	4.85±0.483	
Dust	2002	50	2.7469±0.12577	*
	2003	47	2.2106±0.06287	

*$p<0.05$; SE: Standard Error; NS: Not Significant

Correlation analysis was applied all datas together. According to the results of correlation analysis (Table 2), there are middle level negative relations between inner temperature and carbon dioxide and between inner temperature and ammonia but a positive poor level relation between inner temperature and dust. On the other hand a middle level positive relation between relative humidity and carbon dioxide, a poor level positive relation between relative humidity and ammonia and a middle level positive relation between relative humidity and dust were determined (Table 3).

Mean temperature, relative humidity and carbon dioxide values appropriate to recommended values but ammonia, hydrogen sulphide and dust values exceeds the recommended values.

CONCLUSION

This study shows that application of the spraying oil-water mixture and effective fan ventilation systems together could be suggested to improve air of caged layer houses as offered in Kocaman *et al*. (2005).

REFERENCES

Chastain, J.P., 2004. Odor control from poultry facilities. http://www.clemson.edu/extension/livestock/livestock/camm/camm_files/poultry/pch9_03.pdf.

Ellen, H.H., R.W. Bottcher, E. von Wachenfelt and H. Takai, 2000. Dust levels and control methods in poultry houses. J. Agric. Saf. Health, 6: 275-282.

Esmay, M.L. and J.E. Dixon, 1986. Environmental Control for Agricultural Buildings. AVI Pub. Co., USA., ISBN: 9780870554698, Pages: 287.

Esmay, M.L., 1973. Controlled Environmental Housing. In: Farm Builder's Handbook: With Added Material for Pole Type Industrial Buildings. Lytle, R.J. (Ed.). Structures Pub. Com., Farmington, Michigan, USA., Pages: 264.

Kocaman, B., A.V. Yaganoglu and M. Yanar, 2005. Combination of fan ventilation system and spraying of oil-water mixture on the levels of dust and gases in caged layer facilities in Eastern Turkey. J. Appl. Anim. Res., 27: 109-111.

Mutaf, S., 1988. Hayvan barinaklarinda dogal havalandirma ve hesaplama yontemi. Akdeniz Univ. Ziraat Fakultesi Dergisi, 1: 75-85.

Phillips, V.R., M.R. Holden, R.W. Sneath, J.L. Short and R.P. White *et al*., 1998. The development of robust methods for measuring concentrastions and emission rates of gaseous and particulare air pollutants in livestock buildings. J. Agricul. Engine. Res., 70: 11-24.

Pratt, D.S. and J.J. May, 1984. Feed-associated respiratory illness in farmer. Arch. Environ. Health, 39: 43-48.

Sterling, K.G., D.D. Bell, G.M. Pesti and S.E. Aggrey, 2003. Relationsships among strain, performance and environmental temperature in commercial laying hens. J. Appl. Poult. Res., 12: 85-91.

Yildiz, Y., C. Karaca and M. Dagtekin, 2010. Hayvan barinaklarinda cevre denetimi. Hasat Yayincilik Ltd., STI. Umraniye, Istanbul.