# A TRIAL TO DETECT THE EFFECT OF STRAIN AND DIFFERENT SOURCES OF DRINKING WATER ON SOME PRODUCTIVE TRAITS IN BROILER CHICKS

[82]

**Shimaa M. Shaker[1*], El-Safty S.A[.2], Shoureap, U.A.[2] and Zienb, El-Awamry[1]**
1. The Regional Center for Food & Feed (RCFF), Agriculture Research Center, Giza, Egypt.
2. Poultry Production Dept., Fac. of Agric., Ain Shams Univ., P.O. Box 68, Hadyek Shoubra11241, Cairo, Egypt

*Corresponding author: shaimaashaker82@gmail .com

## ABSTRACT

The main goal of this experiment was to evaluate the effect of broiler strain and source of drinking water on some performance traits (body weight and carcass traits). Sample of water were taken from two different location sources, Giza governorate (as Nile water) and Qalubia governorate (as well water or ground water). Three different broiler strains were used in this study (Arbor acres, Hubbard and Cobb). Lead concentration (as a heavy metal element) and bacteriological analysis (total bacteria and fecal coliforms) in both water and carcass were carried out. The main results obtained can be summarized as follow: Arbor acres strain recorded the heaviest body at most ages compared to the other strains, the difference was highly significant at 5 and 6 weeks of ages. Total bacteria were significantly high in ground water compared to Nile water. Conversely, Coliforms bacteria count was significantly high in Nile water compared to ground water source. Regardless strain type, high positive correlation between lead concentration in drinking water and lead concentration in liver, kidney and carcass weight was observed

**Key words:** Productive traits, Broiler chicks

## INTRODUCTION

Water is a vital element for life. For many kinds of poultry, water helps in digestion, absorption, elimination the harmful substances and excess salts by the kidney and supports the endocrine gland's function **(Barney and Van Horn, 2003).** Birds consumed about 40% of the drinking water to regulate their body temperature and to remain it constant at 42°C **(Allam, 1986).** (Carter and Sneed, 1996) stated that the quality of water for poultry is very important, where, as an increase in the salt content of well water above the optimum level leads to adverse, devastating and some pathological expression on birds resulting in high mortality and elimination. However, consuming contaminated poultry with heavy metals is very dangerous due to be accumulated of its heavy metal residues in chicken tissues and organs **(El-Sarha and Hussein, 1994). (Vodela et al 1997)** reported that increasing levels of drinking water contaminants such as Arsenic, Cadmium and Lead in the existence of low levels of vitamins and minerals in the diet resulted in a deterioration of natural, humoral and cell - immune response in turn poultry health at all.

## MATERIALS AND METHODS

This study was carried out at Poultry Breeding Farm, Poultry Production Department, Faculty of Agriculture, Ain Shams University. The aim of this experiment was to evaluate the effect of different water sources on some productive performance in broilers strains.

Three genetic lines of broiler chicks (110 hubbard, 110 cobb and 110 arbor acres) were reared under similar managerial, environmental and hygienic conditions. They were brooded and raring in floor from hatching to 6 weeks of age. At one weeks of age, 120 chicks (30 each) were randomly

taken and transferred to individual cages. The feed and water were supplied add libitum. They were fed a commercial diets (starter, grower and finisher) according their ages. The high and low ambient temperatures recorded during experimental period were 32.8 and 28 ºC, respectively.

**Experimental water**

Water from different sources, Nile River (Giza location) and well (Qalubia location) were dealt with in this experiment.

**Analysis of water:**

Water first allowed running for several minutes to allow a representative fresh sample to reach the water outlet. Then a sterilized container was rinsed several times with the water to be sampled. Chemical and bacteriological analyses of water and carcass were carried out to determine lead concentration, total bacteria and fecal coliforms.

**Measurement**

Body weight was recorded from 0 day of age up to the marketing age (6 weeks of age) on weekly basis. At marketing age, 6 birds from each studied group were slaughtered for carcass evaluation. However, the carcass, liver, kidney were weighed.

**Statistical analysis**

Data were subjected to two-way analysis of variance with strain and the source of water as main effects using the General Linear Model (GLM) procedure of **SAS User's Guide, (1998)** according to the following model;

$$Y_{ij}= \mu + S_i + So_{ij} + e_{ijk}$$

Where;
μ = Overall mean,
$L_i$ =Strain effect (i =1, 2, 3),
So= Source of water (j= 1, 2)
$e_{ijk}$ = experimental error.

**Lead analysis in tissues**

Samples of liver and kidney were collected from 12 chickens in each strain at time of necropsy, pooled by tissue type for each treatment group, and stored (-20 C) in polyethylene bags for heavy metal analysis. 36 sample preparation involved ashing of bone samples, and digestion of liver and

kidney samples with tertiary acid in a Kjeldahl flash followed by dilution with water. Spectrophotometric analysis of arsenic was done at 540 nm absorbance using a series 634 UV-Visible spectrophotometer. A Varian Flame Atomic Absorption Spectrophotometer was used for analysis of cadmium (283.3 nm) and Perkin Elmer Graphite Furnace Atomic absorption spectrophotometer (228.8 nm) was used for lead analysis.

**Results and discussion**

Impact of strain on body weight character was presented in **Table (1).** It could be observed that Arbor Acres strain recorded the heaviest body in general compared to hubbard and cobb hybrids. The significant difference was obvious at later ages (4, 5 and 6 weeks of age). The body weight of arbor acres strain was significantly high compared to other strains. The range of body weight gain for arbor acres was about 60-80 gram more than Hubbard and Cobb counterparts at marketing age. Similar results are reported by **(Elisabeth et al 1999)** and **(Price et al 1999),** who reported significant differences in weight gain in different strains of broiler due to their genetic potential and environment. There results were comparable to the present study.

**Table 1.** Body weights, gram (Mean ± SE) of Arbor Acres, Hubbard and Cobb broiler chick strains at different ages. J. Agric. & Env. Sci. Alex.Univ., Egypt Vol.5 (3) 2006

| Age (wk) | STRAIN | | | Prob. |
|---|---|---|---|---|
| | Arbor Acres | Hubbard | Cobb | |
| 0 | 43.9[a] ±0.35 | 42.4[b] ±0.31 | 42.4[a] ±0.28 | ** |
| 1 | 143.0 ±1.95 | 141.9 ±1.91 | 146.0 ±1.70 | NS |
| 2 | 326.9 ±5.57 | 331.3 ±6.01 | 324.3 ±5.75 | NS |
| 3 | 658.4 ±9.18 | 635.2 ±8.93 | 653.9 ±9.29 | NS |
| 4 | 981.8[a] ±13.64 | 950.6[ab] ±12.07 | 929.2[b] ±12.39 | ** |
| 5 | 1291.4[a] ±18.21 | 1221.8[b] ±17.26 | 1207.1[b] ±16.51 | ** |
| 6 | 1539.8[a] ±20.26 | 1456.3[b] ±22.01 | 1478.9[b] ±21.26 | ** |

[a,b] values with different superscripts are statistically different within the same raw.
**P≤ 0.01          NS: not significant

Data listed in **Table (2)** revealed that the carcass weight of arbor acres strain was significantly heavier than those in hubbard and cobb chicks.

This is true, due to that the heavier body weight will in turn has heavier carcass weight. The previous result is a reflection to the results of body weight trait. Regarding the estimates of liver weight in the studied strains, there was a significant difference among strains in such trait. hubbard strain recorded the highest value, while cobb birds had the lowest values, but arbor acres chicks had intermediate figures. Concerning the kidney weight, there was no significant difference among hybrids in such trait.

**Table 2.** Carcass, liver and kidney weights, gram (Mean±SE) of Arbor Acres, Hubbard and Cobb broiler strains.

| Trait | STRAIN | | | Prob. |
|---|---|---|---|---|
| | Arbor Acres | Hub-bard | Cobb | |
| Carcass weight, g | $1363.5^a$ | $1325.5^b$ | $1306.0^b$ | * |
| | ± 95.4 | ±82.5 | ± 88.4 | |
| Liver weight, g | $51.63^b$ | $57.5^a$ | $44.63^c$ | ** |
| | ± 3.9 | ±4.2 | ± 2.8 | |
| Kidney weight, g | 6.73 | 6.88 | 6.15 | NS |
| | ±0.49 | ±0.50 | ±0.40 | |

[a,b] values with different superscripts are statistically different within the same raw.

* $P \leq 0.05$    ** $P \leq 0.01$    NS: not significant

With regard to chemical and bacteriological analysis of underground water gained from various sources (Nile and well water), **Table (3)** showed that there was no significant difference between the two sources of water for lead concentration. Generally, noxious chemicals like heavy metals include cadmium, lead, chromium, copper, nickel, etc., that pollute the soils, ground water, sediments and surface waters    represent in soluble form. **(Faiza Salem et al 2015).** The two sources are somewhat the same in total bacterial. Whereas, the significant difference was observed in total bacterial count. Where, the ground water recorded more bacterial count compared to the Nile water. That means the ground water may be subjected to more contamination from environment surrounding (especially soil) rather than Nile water. Heavy metal contaminated soils and waterways is increasingly becoming an environmental, health, economic, and planning issue. **(Ansari and Malik, 2001).** The isolation of bacteria from soil samples was a reference that the estimated microorganisms were susceptive of growing in the existence of toxic heavy

metals as lead **(Singh et al 2010).** The capability of microbial strains to grow in the presence of heavy metals could be helpful and facilitator in the soil treatment where microorganisms are immediately implicated in the decomposition of organic matter in biological operations for the treatment of soil and water, because often the adverse effect of heavy metals is a prevalent phenomenon that pass in the biological trial on water and soils **(Verma et al 2001).**

**Table 3.** Chemical and bacteriological analysis of water obtained from different sources.

| Parameters | Nile (Giza location) | Well (Qalu-bia location) | Prob. |
|---|---|---|---|
| Lead concentra-tion, mg\L | 0.91 ±0.17 | 0.92±0.19 | NS |
| Total bacteria, CFU**/ml | $6.75^b$ ±0.23 | $7.14^a$±0.16 | * |
| Fecal coliforms, CFU/ml | $2.98^a$ ±0.65 | $1.27^b$±0.40 | * |

[a,b] values with different superscripts are statistically different within the same raw.

* $P \leq 0.05$    NS: not significant

** Colony forming unit

Conversely, was observed regarding fecal coliforms, the water from Nile recorded the highest figures compared to ground water counterpart. The previous result may be due to that this water may be contaminated with animal or human feces.

**Table (4)** revealed the chemical and bacteriological analysis of carcass, liver and kidney obtained from strains using different sources of water. Lead concentration in liver was slightly high in birds consumed ground water (well), especially in cobb birds. The difference between water locations or among strains was not significant in such trait. The same trend was realized in lead concentration in kidney. Regarding total bacterial count in carcasses, it could be noted that the carcasses from the birds consumed ground water have more bacterial count compared with the carcasses from those consumed Nile water. The hubbard birds recorded the highest values for such trait. Concerning the fecal coliforms bacteria, the previous trend was realized. That means the residues from bacteria or lead was slightly obvious when using well water compared to Nile water. Generally, it could be concluded that no significant difference was observed whether using Nile or Well water on the studied traits.

**Table 4.** Chemical and bacteriological analysis of carcass obtained from strains.

| Parameters | Organ | Nile (Giza location) | | | Well (Qalubia location) | | |
|---|---|---|---|---|---|---|---|
| | | Strain | | | Strain | | |
| | | Arbor | Cobb | Hubbard | Arbor | Cobb | Hubbard |
| Lead concen-tration, mg\L | Liver | 0.61±0.14 | 0.67±011 | 0.66±0.13 | 0.65±0.11 | 0.70±0.13 | 0.68±0.11 |
| | | | NS | | | NS | |
| | Kidney | 0.31±0.12 | 0.30±0.10 | 0.29±0.11 | 0.33±0.11 | 0.32±0.13 | 0.30±0.11 |
| Total bacte-ria, CFU/ml | Carcass | 4.11±0.20 | 4.20±0.22 | 4.23±0.23 | 4.78±0.24 | 4.69±0.26 | 4.90±0.25 |
| | | | NS | | | NS | |
| Fecal coli-forms, FU/ml | Carcass | 1.36±0.10 | 1.36±0.09 | 1.50±0.13 | 1.51±0.12 | 1.55±0.11 | 1.52±0.17 |
| | | | NS | | | NS | |

No significant difference (NS) was observed between locations or strains in the studied traits

**Table (5)** explained that regardless strain type, high positive correlation between lead concentration in drinking water and lead concentration in liver, kidney and carcass weight was observed. Also, the high and positive relationship was very clear among lead in both liver and kidney in one side and carcass weight in another side. The poisoning of these metal elements has two main forms, they have no known metabolic function but when current in the body damage normal cellular procedure leading to toxicity and the potency of these heavy metals to accumulate in biological organs, a process known as bio accumulated **(Mariam et al 2004).**

**Table 5.** Correlation coefficients among lead concentration in water and its concentrations in liver and kidney and different relations with carcass weight.

| Trait | Y | Y1 | Y2 | Y3 | Stain |
|---|---|---|---|---|---|
| lead in water (Y) | - | 0.75[**] | 0.75[**] | 0.84[**] | Arbor acre |
| | - | 0.83[**] | 0.87[**] | 0.84[**] | Cobb |
| | - | 0.84[**] | 0.87[**] | 0.44[*] | Hubbard |
| lead in liver (Y1) | _ | _ | 0.81[**] | 0.77[**] | Arbor acre |
| | | | 0.89[**] | 0.88[**] | Cobb |
| | - | - | 0.89[**] | 0.52[*] | Hubbard |
| Lead in kidney (Y2) | - | - | - | 0.81[**] | Arbor acre |
| | | | - | 0.97[**] | Cobb |
| | | | | 0.59[**] | Hubbard |
| Carcass weight (Y3) | | | | - | Arbor acre |
| | | | | - | Cobb |
| | | | | | Hubbard |

They inferred that the oxidative stress prompt by cadmium and lead plays a function in decreasing the execution of chickens. This come because the metals, once taken up into the body is stored in particular organs, for example the liver and the kidney **(Demerezen et al 2006).**

## REFERENCES

**Allam, S., 1986. Chicken Rearing and Caring. 7th Ed.** Egyptian Anglo Publication. Cairo, Egypt. **Cited by El-Ghazaly N., Bin Dohaish E. and Alsolamy S. (2008). J. Biology Sc., 11, 559-564.**

**Ansari. M.I. and Malik. A., 2010.** Seasonal Variation of Different Microorganisms with Nickel and Cadmium in the Industrial Wastewater and Agricultural Soils. **J. Bacteriolog, 167, 151-163.**

**Barney, H. Jr. and Van Horn, H.H., 2003.** Water and its importance to animals. **Florida Coop. Ext. Serv. Univ. of Florida, Gainesville, pp. 1-8.**

**Carter, T.A. and Sneed, R.E. 1996,** Drinking water quality for poultry. North Carolina coop. Ext. Serv., No. PS and T=42. Cited by El-Ghazaly, et al., 2008.

**Demirezen, O. and Uruc, K., 2006.** Comparative study of trace elements in certain fish, meat and meat products. **Food Chemistry, 32, 215-222.**

**Elisabeth, G., Buyse, J., Sartori, J.R., Loddi, M.M. and Decuypere, E. 2012.** Metabolic disturbance in Male broiler of different strains. **Poultry Science, 91(11), 2942-2948.**

**El-Sarha, A.I. and Hussein H.K. 1994.** Pollution of ground water by mercury and its residues in

chicken tissue. **Bull. Fac. Sci. Alex. Univ., 34 (2), 187-197.**

**Faiza Saleem, Fareeha Aftab, Rooma Adalat and Neelma Munir 2015.** Isolation of Lead Resistant Bacteria from Lead Contaminated Soil Samples Collected from Sundar Industrial Estate and their Potential Use in Bioremediation. **J. Chem. Soc. Pak., 37(3), 495-501**

**Mariam, I.S. and Nagre, S., 2004.** Distribution of some trace and macro minerals in beef, mutton and poultry. **International Journal of Agric. and Biology, 6, 816-820.**

**Price, C.J., Lott, B.D. and Morgan, G.W. 1999.** Performance of four commercial broiler strain crosses fed graded levels of amino acids. **Poult. Sci 88**[th] **Annual Meeting Abstract August, pp. 8-11.**

**Singh, V., P. K. Chauhan, R. Kanta, T. Dhewa and V. Kumar, 2010,** Isolation and Characterization of Pseudomonas Resistant to Heavy Metals Contamination, **Int. J. Pharm. Sci. Rev. Res., 3, 164-167.**

**Verma, T., Srinath, T., Gadpayle R.U., Ramtake P. W., Hans R.K. and Garg S.K. 2001.** Chromate Tolerant Bacteria Isolated from Tannery **Effluent. Biores. Technol., 78, 31-35.**

**Vodela, J.K., Renden J.A., Lenz S.D., Mcelhenney W.H. and Kemppainen B.W., 1997**. Drinking water contaminants (arsenic, cadmium, lead, benzene and trichloroethylene). 1. Interaction of contaminants with nutritional status on general performance and immune function in broiler chickens. **Poult. Sci., 76, 1474-1492.**

# تجربة تكشف عن تأثير السلالة ومصادر مختلفة من مياه الشرب على بعض الصفات الإنتاجية في دجاج اللحم

# [82]

شيماء محمد شاكر[1]– صلاح الدين الصفتى[2]– أسامة على شوريب[2]– زينب العوامري[1]

1–المركز الإقليمي للأغذية والاعلاف – مركز البحوث الزراعية– الجيزة– مصر

2–قسم إنتاج الدواجن– كلية الزراعة– جامعة عين شمس– ص.ب 68– حدائق شبرا 11241 – القاهرة– مصر

*Corresponding author: shaimaashaker82@gmail .com

## الموجـــــــز

تهدف التجربة  للكشف عن تأثير السلالة ومصادر مختلفة لمياه الشرب على بعض الصفات الإنتاجية في دجاج اللحم، وكان الهدف الرئيسي لهذه التجربة تقييم تأثير سلالات التسمين ومصدر مياه الشرب على بعض الصفات الانتاجية مثل (وزن الجسم وصفات الذبيحة). وقد تم أخذ عينة مياه من مصدرين من مواقع مختلفة، وهما محافظة الجيزة (كمياه النيل) ومحافظة القليوبية (كمياه الآبار أو المياه الجوفية), واستخدمت ثلاث سلالات مختلفة من التسمين في هذه الدراسة (Arbor Acres, Hubbard and Cobb). وأجريت مجموعة تحاليل بكتريولوجية (عن مجموع البكتيريا الكلى وبكتيريا القولون)  وذلك  في كل  من

المياه والذبيحة، وقد تم قياس تركيز الرصاص (كعنصر من المعادن الثقيلة). وتخلص أهم النتائج التي تم الحصول عليها فيما يلى: أن سلالة "Arbor Acres " تسجل أقل وزن جسم في معظم الإعمار مقارنة بالسلالات الأخرى، والفرق كان معنوى  في الأعمار 5، 6 أسابيع.  وأيضا وجد ان مجموع البكتيريا مرتفعة إلى حد كبير في المياه الجوفية مقارنة بمياه النيل.

على العكس من ذلك ،كان عدد بكتيريا القولون أعلى في مياه النيل بالمقارنة بالمياه الجوفية. وبغض النظر عن نوع السلالة ، لوحظ وجود ارتباط معنوى بين تركيز الرصاص في مياه الشرب وتركيز الرصاص في وزن الكبد والكلى والذبيحة.

**الكلمات الدالة:** سلالات الإنتاج، دجاج التسمين