INFLUENCE OF LITTER TYPE ON EMISSED AMMONIA AND PERFORMANCE IN DOMYATI DUCKLINGS

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Abstract

A total of 450 day – old Domyati ducklings were randomly divided in to three equal groups according to litter type treatment.

Each group was reared on different kind of litter by wheat straw (Tr1), fine sawdust (Tr2) and wood shaving (Tr3).

A study was carried out to determine the effect of different litter on ammonia emission in duckling houses.

The results obtained were as fallows:

The ducklings reared on fine sawdust were significantly heavier in body weight than other treatments at 4, 8, 20 weeks of age and not significance at 16 weeks.

The interaction between treatment and sex was not significant at all ages studied except at 12 weeks of age.

For growth rate (GR) the results showed that ducklings grew faster at early ages (0-12 weeds of age) than those in the late period.

The litter type effect on (GR) was noticed since ducklings reared on fine sawdust were significantly higher than the other litters at all ages except at 12 and 16 weeks.

Shank length and body depth increased with the advance in age. Shank length was influenced significantly by litter type and sex at all ages.

Carcass traits for ducklings reared on wheat straw scored high value in percentages of feather, carcass, heart, fore-& hind- quarter as compared with those reared on the other two types of litters.

It was found that wheat straw kept the highest quantity of ammonia followed by wood shaving, while, fine sawdust reserved the lowest quantity of ammonia.

INTRODUCTION

Ducks took an increased attention in the last years in Egypt for meat production.

Domyati Ducks are considered the local breed which is favourable to both of breeders and consumer.

The effect of genetic and environmental components solely or interacted is of utmost significance for the producer to decide most suitable changes in environmental components that are available to him without any broiler performance due to different litter materials (Dick *et al.* 1976). Veltmann *et al.* (1984) reported that the rice hulls product produced an adverse effect upon pullets performance (body weight). Lien *et al.* (1991) showed that body weight was not influenced by litter treatments. Strawe *et al.* (1992) observed that there were no interactions (P= 0.15) for body weight of the pullets reared on different litter types.

Most studies concluded that the sex had a significant effect on body weight. Studies of Farghaly and Asar (1988) and Tag El-Din *et al.* (1989) observed that the differences in live body weight between sexes were gradually increased with advance in age. Lien *et al.* (1991) reported that the litter material had no significance on chick mortality.

Ammonia gas which can be produced in high quantities in poultry rearing facilities adversely affects poultry performance (Moore *et al.* 1996)

The aim of this research was to study the effect of three types of litter on the performance of Domyati ducks.

MATERIALS AND METHODS

This work was conducted in the Research Station for Waterfowls at El-Serw, which belongs to the Animals Production Research Institute, Ministry of Agriculture, Dokki. It lasted for 5 months from March to July 1999.

Birds and Management

Four hundred and fifty day-old Domyati duckling were legs banded, weighed and brooded in well-ventilated pens, and randomly divided into three equal groups; the duckling in each group were reared on the pervious three kinds of deep litter (10 cm): wheat straw (Tr1), Fine sawdust (Tr2) and Wood shaving (Tr3). Continuous light was used for the first week of age, and then, left to natural light. The brooding temperature was regulated to be kept at 32°C for the first week, then, reduced weekly by 4°C till it reached 24°C by using kerosene heaters. After two weeks of age.

Feed and fresh water were available ad-libitum throughout the experimental period., using starter diet (19 % protein and 2868 kcal./kg ME) during the first six weeks of age, followed by growing diet (15 % protein and 2690 Kcal/Kg ME)from 6 until the experiment was terminated.

Measurments

During the experimental period from hatching, live body weight of birds was individually recorded to the nearest gram at 4, 8, 16, 20, weeks of age. All dickling were sexed at the eight weeks.

The growth rate (GR) was calculated by using the equation:

$GR = [\{ (w_x - w_0)/ w_0 \} X 100]$ where: GR is the rate of growth, (w_x) is the weight at any age and (w_0) is the weight at hatch. The cumulative mortality rate was recorded for each treatment. Shank length and body depth were measured by caliper to the nearest millimeter at 8, 12 and 16 weeks of age.

At 12 weeks of age, 5 males and 5 females from each treatment were slaughtered after 12 hours fasting. The blood loss, feather, heads, carcass (fore and hind quarter), heart, liver and empty gizzards were individually weighed and calculated as percentages to the live body weight.

At 2, 4, 6 and 8 weeks of age ammonia emitted from litter was measured using the kits known as pH ydrion supplied from BK\ym, NY in which measurements ranged from 0-100 ppm. Ammonia in sample of litter was randomly taken from each treatment and was measured using kjeldahle method at the same ages.

Statistical analysis

The parameters were statistically analyzed using the GLM procedure of SAS (1988), live body weight, growth rate, body measurements and carcass traits according to the following model:

$$Y_{ij1} = u + T_i + S_j + (T^*S)_{ij} = e_{ij1}$$

Where y_{ij1} indicates a given phenotype, S and T are sex and litter type effects that are assumed to influence the parameters and e_{ij1} is an random error.

Ammonia measurements was statistically analyzed according to the following model:

$$y_{ik1} = u + T_i + Ag_k + (T^*Ag)_{ik} + e_{ik1}$$

where y_{ik1} indicates a given phenotype, Ag and T are age and litter type effects and eik1 is a random error.

Means of different treatments were significantly differentiated by Ducan (1995).

RESULTS AND DISCUSSION

Body weight and Growth rate

Means of live body weight (Table1) in general increased from the old-day (BWt 0) up to 20th weeks of age. The increases in live body weight from 0 up to 12 weeks were higher than those in the late period of age (i.e from 12 to 20 weeks of age) in which the increases were not magnitude.

Differences in lice body weight from 4 up to 20 weeks age due to the effect of treatment were noticed. The ducklings reared on fine sawdust were significantly heavier in live body weight than those reared on wood shavings and wheat straw at 4, 8, 20 weeks of age, and not significant at 16 weeks of age.

Table 1 showed that males were superior in their body weight than females at all the period of study, except at 4 weeks of age; this, differences were highly significant at 12 and 16 weeks of age.

The interaction between treatment and sex was not significant at all ages studied, except at 12 weeks of age. These were in agreement with results found by Fattouh (1994) and Ghonim (1998).

Means of growth rate in Table 2 showed that treatment 2 grew faster at all ages studied, followed in general, by treatment 3 and 1 in descending order. Also, it could be noticed that duckling grew faster at early ages (0-12 weeks of age).

Regarding growth rate and with respect to the effect of treatment, highly significant differences of birds reared on fine sawdust were the heaviest, except at 12 and 16 weeks of age. This may be due to that the birds perhaps had consumed some of the litter, and this may have improved the digestion and absorption. Also, significant differences between the two sexes appeared at 12 and 16 weeks of age.

Mortality rate was 5.96%, 7.43% and 4.69% for ducklings reared on wheat straw, fine sawdust and wood shavings, respectively, during period from hatching up to 6 weeks of age. These results are in agreement with those found by lien *et al.*(1991), Martinez and gernat (1995) who showed that the litter material had no significant influence on mortality rate.

Body Measurements

Table 3 shows that the length of shanks of the ducklings reared on wood shavings at 8, 12, and 16 weeks of age had the longest shanks, followed by those reared on wheat straw, however, the shortest shanks recorded by those reared on fine sawdust. These results were confirmed with El-Soudany (2000) who found that, type of litter significantly ($P<0.05$) influenced the shank length at 12 weeks of age for chicks.

With respect to sex, males had significantl longer shanks than females at various ages. But, the interactions between treatments and sex were not significant at all the ages studied.

The result for body depth in Table 3 indicated that the effect of treatment was not significant at all ages except at 16 weeks of age. Wood shavings treatment was significantly higher for body depth than the others.

The sex effect for body depth and interactions were not significant at all ages studied.

Carcass Trait

The carcass traits are presented in Table 4 from which it was noticed that males were significantly ($P<0.05$) heavier than females in pre-slaughter weight at 12 weeks of age. Also, in response to different bedding materials, the ducks reared on wheat straw were highly significantly ($P<0.01$) heavier than those reared on fine sawdust and wood shavings.

With respect to the amount of blood, it could be noticed that females bled more than males and these differences were significant. Ducks reared on fine sawdust significantly bled higher percentage than wood shavings (6.39% vs 5.51%) and not significantly than wheat straw (6.39% vs. 5.96%).

On the other hand, the results in Table 4 showed that males were heavier and not significant than females only in feather %, head%, viscera % and gizzard %. Hetzel

(1983) found that gizzard in general was 2.2% heavier in males than in females, while, females were superior in other traits.

In response to different litters, ducklings reared on wood shavings and fine sawdust showed the highest percentages of feather and liver than wheat straw group. These differences were apparently due to the ducklings growth rate (0-8 weeks) reared on both litters. These results are in agreement with El-Gendy *et al.* (1999).

The carcass percentage of ducklings reared on wheat straw were 1.55% and 0.35% higher than reared on wood shavings and on fine sawdust, respectively.

Also, the results showed that the ducklings groups reared on wheat straw were superior in heart weight %, fore quarters and hind quarters.

Generally, there were no significant effects due to sex, treatments and their interactions in some carcass traits.

Ammonia emission

To reduce ammonia emission from poultry houses, it is of great importance to choose the bedding material in poultry quarters (Moore *et al.* 1996).

In Table 5 the ammonia level of air and litter had higher significant value due to age of ducklings.

With respect to the effect of bedding material according to their keeping quality to ammonia, wheat straw kept the highest amount than other treatments.

Also, differences among treatments were highly significant in litter and not significant in air. This may be due to that the wheat straw had the least density due to its coarse particles, and for this reason, it kept the highest quantity of feces, compared with the other two kinds of litter. These are in agreement with those reported by El-Sudany (2000) on chicken. The interactions between age and treatment in levels of ammonia were not significant.

Table 1. Least-squares means ±S. E. and its probability (Prob.) for live body weight (BWt) for females (F) and males (M) of Domyati ducklings as affected by treatment (Tr.) at different ages.

Trait	Sex	Treatments			Average		Prob.
		Tr.1	Tr.2	Tr.3			
BWt 0	F	40.4±0.48	40.2±0.50	39.0±0.47	**39.9**	Tr.	Ns
	M	40.2±0.47	39.5±0.45	40.3±0.46	**40.0**	Sex	Ns
	Av.	**40.3**	**39.9**	**39.6**		Tr. X Age	Ns
BWt 4	F	474.9±14.08	537.7±14.74	506.0±13.97	**506.2**	Tr.	0.0001
	M	455.5±13.78	531.2±13.23	486.1±13.49	**490.9**	Sex	Ns
	Av.	**465.2^{c}**	**534.5^{a}**	**496.1^{b}**		Tr. X Age	Ns
BWt 8	F	961.3±20.56	1012.9±21.53	975.9±20.41	**983.4**	Tr.	0.0048
	M	950.4±20.12	1031.4±19.32	1019.1±19.71	**1000.3**	Sex	Ns
	Av.	**955.8^{b}**	**1022.1^{a}**	**997.5^{a}**		Tr. X Age	Ns
BWt 12	F	1472.2±19.08	1493.8±18.21	1433.5±18.05	**1466.5**	Tr.	Ns
	M	1698.2±29.05	1611.0±30.47	1648.5±30.47	**1652.6**	Sex	0.0001
	Av.	**1585.2**	**1552.4**	**1541.0**		Tr. X Age	0.0586
BWt 16	F	1445.0±20.16	1548.8±19.37	1483.3±19.01	**1492.4**	Tr.	Ns
	M	1668.7±32.05	1660.0±34.92	1682.4±33.88	**1670.4**	Sex	0.0001
	Av.	**1556.8**	**1604.4**	**1582.8**		Tr. X Age	Ns
BWt 20	F	1489.3±21.17	1639.6±20.08	1518.2±19.88	**1549.1**	Tr.	0.0028
	M	1566.7±41.00	1641.0±44.91	1582.0±44.91	**1596.6**	Sex	Ns
	Av.	**1528.0^{b}**	**1640.3^{a}**	**1550.1^{b}**		Tr. X Age	Ns

a, b, c Means with no common superscript differ significantly for row.

Tr1 = Wheat straw, Tr2 = Fine sawdust and Tr3 = Wood shaving.

Table 2. Least-squares means±S.E. and its probability (Prob.) for growth rate (GR) for females (F) and males (M) of Domyati ducklings as affected by treatments (Tr.) from hatching up to different ages.

Trait	Sex	Treatments			Average		Prob.
		Tr.1	Tr.2	Tr.3			
GR 0-4	F	1082±34.76	1245±36.40	1197±34.51	**1175**	Tr.	0.0001
	M	1034±34.01	1252±32.67	1110±33.32	**1132**	Sex	Ns
	Av.	**1058^{c}**	**1248^{a}**	**1154^{b}**		Tr. X Age	Ns
GR 0-8	F	2295±50.90	2428±53.30	2406±50.53	**2376**	Tr.	0.0003
	M	2267±49.81	2528±47.83	2446±48.79	**2414**	Sex	Ns
	Av.	**2281^{b}**	**2478^{a}**	**2426^{a}**		Tr. X Age	Ns
GR 0-12	F	3361±64.13	3640±61.20	3583±60.66	**3594**	Tr.	Ns
	M	3998±97.64	3949±102.41	3960±102.41	**3969**	Sex	0.0001
	Av.	**3779**	**3795**	**3772**		Tr. X Age	Ns
GR 0-16	F	3514±72.85	3799±69.99	3724±68.68	**3679**	Tr.	Ns
	M	3978±115.78	4073±126.17	4028±122.40	**4026**	Sex	0.0001
	Av.	**3746**	**3936**	**3876**		Tr. X Age	Ns
GR 0-20	F	3638±76.96	4044±73.01	3819±72.30	**3834**	Tr.	0.0037
	M	3723±149.04	4119±163.26	3717±163.26	**3853**	Sex	Ns
	Av.	**3680^{b}**	**40.81^{a}**	**3768^{b}**		Tr. X Age	Ns

a, b, c Means with no common superscript differ significantly for row.

Table 3. Least-squares means ±S. E. and its probability (Prob.) for Shank length (ShL) and Body Depth (BD) in females (F) and males (M) of Domyati ducklings as affected by treatment (Tr.) at different ages.

Trait	Sex	Treatments			Average		Prob.
		Tr.1	Tr.2	Tr.3			
ShL at 8 weeks	F	6.93±0.063	6.68±0.063	7.19±0.063	**6.93**	Tr.	0.0001
	M	7.16±0.089	6.84±0.089	7.38±0.089	**7.12**	Sex	0.0038
	Av.	**7.05^{b}**	**6.76^{c}**	**7.29^{a}**		Tr. X Age	Ns
ShL at 8 weeks	F	7.05±0.065	6.83±0.065	7.28±0.065	**7.05**	Tr.	0.0001
	M	7.32±0.092	6.98±0.092	7.50±0.092	**7.26**	Sex	0.0021
	Av.	**7.19^{b}**	**6.91^{c}**	**7.39^{a}**		Tr. X Age	Ns
ShL at 8 weeks	F	7.08±0.078	6.86±0.078	7.39±0.078	**7.11**	Tr.	0.0001
	M	7.34±0.111	7.06±0.111	7.62±0.111	**7.34**	Sex	0.0056
	Av.	**7.21^{b}**	**6.96^{c}**	**7.51^{a}**		Tr. X Age	Ns
ShL at 8 weeks	F	7.39±0.125	7071±0.129	7.73±0.125	**7.79**	Tr.	Ns
	M	7.74±0.177	7.40±0.177	7.68±0.177	**7.60**	Sex	Ns
	Av.	**7.84**	**7.56**	**7.71**		Tr. X Age	Ns
ShL at 8 weeks	F	8.15±0.094	8.03±0.094	8.29±0.094	**8.16**	Tr.	Ns
	M	8.24±0.132	8.02±0.132	8.30±0.132	**8.19**	Sex	Ns
	Av.	**8.19**	**8.03**	**8.30**		Tr. X Age	Ns
ShL at 8 weeks	F	8.36±0.122	8.39±0.122	8.82±0.122	**8.52**	Tr.	0.0154
	M	8.62±0.173	8.40±0.173	8.84±0.173	**8.62**	Sex	Ns
	Av.	**8.49^{b}**	**8.39^{b}**	**8.83^{a}**		Tr. X Age	Ns

a, b, c Means with no common superscript differ significantly for row.

Table 4. Least-squares means±S.E. and probability (Prob.) of carcass traits for Domyati ducklings at 12 weeks of age as affected by treatment (Tr.) and sex.

Trait	Tr.	Sex		Overall		Prob.
		Male	Female			
pre-slaughter weight (g.)	Tr.1	1830+61.69	1620+61.69	1725[a]	Sex	0.0204
	Tr.2	1703+61.69	1537+61.69	1620[b]	Tr.	0.0031
	Tr.3	1690+61.69	1643+61.69	1667[b]	Tr. X Sex	Ns
	Av.	1788	1653			
Blood %	Tr.1	5.92+0.31	5.99+0.31	5.96[ab]	Sex	0.0271
	Tr.2	5.85+0.31	6.93+0.31	6.39[a]	Tr.	0.0438
	Tr.3	5.13+0.31	5.88+0.31	5.51[b]	Tr. X Sex	Ns
	Av.	5.63	6.27			
Feather %	Tr.1	7.03+0.65	7.25+0.65	7.14	Sex	Ns
	Tr.2	8.19+0.65	8.25+0.65	8.22	Tr.	Ns
	Tr.3	9.45+0.65	7.11+0.65	8.28	Tr. X Sex	Ns
	Av.	8.22	7.54			
Head %	Tr.1	3.56+0.19	3.69+0.19	3.62	Sex	Ns
	Tr.2	3.59+0.19	3.57+0.19	3.58	Tr.	Ns
	Tr.3	3.72+0.19	3.59+0.19	3.65	Tr. X Sex	Ns
	Av.	3.62	3.61			
Viscera %	Tr.1	7.90+0.59	7.20+0.59	7.55	Sex	Ns
	Tr.2	7.77+0.59	6.66+0.59	7.21	Tr.	Ns
	Tr.3	7.75+0.59	8.17+0.59	7.96	Tr. X Sex	Ns
	Av.	7.81	7.35			

a, b, c Means with no common superscript differ significantly for column.

Table 4. Cont.

Trait	Tr.	Sex		Overall		Prob.
		Male	Female			
Carcass %	Tr.1	58.02±0.70	59.38±0.70	**58.70**	Sex	Ns
	Tr.2	57.41±0.70	56.88±0.70	**57.15**	Tr.	Ns
	Tr.3	56.97±0.70	58.03±0.70	**57.50**	Tr. x Sex	Ns
	Av.	**57.47**	**58.10**			
Liver %	Tr.1	2.00±0.12	1.96±0.12	**1.98**	Sex	Ns
	Tr.2	1.93±0.12	2.13±0.12	**2.04**	Tr.	Ns
	Tr.3	1.82±0.12	2.03±0.12	**1.93**	Tr. x Sex	Ns
	Av.	**1.92**	**2.04**			
Heart %	Tr.1	0.66±0.06	0.68±0.06	**0.67**	Sex	Ns
	Tr.2	0.65±0.06	0.66±0.06	**0.65**	Tr.	Ns
	Tr.3	0.62±0.06	0.65±0.06	**0.63**	Tr. x Sex	Ns
	Av.	**0.64**	**0.66**			
Gizzard %	Tr.1	3.16±0.22	2.89±00.22	**3.03**	Sex	Ns
	Tr.2	2.90±0.22	2.91±0.22	**2.91**	Tr.	Ns
	Tr.3	3.28±0.22	3.25±0.22	**3.27**	Tr. x Sex	Ns
	Av.	**3.12**	**3.02**			
Forequarters %	Tr.1	35.76±0.88	36.49±0.88	**36.13**	Sex	Ns
	Tr.2	35.46±0.88	34.80±0.88	**35.14**	Tr.	Ns
	Tr.3	35.06±0.88	36.09±0.88	**35.58**	Tr. x Sex	Ns
	Av.	**35.42**	**35.80**			
Hindquarters %	Tr.1	22.27±0.53	22.88±0.53	**22.58**	Sex	Ns
	Tr.2	21.95±0.53	22.08±0.53	**22.02**	Tr.	Ns
	Tr.3	21.91±0.53	21.93±0.53	**21.93**	Tr. x Sex	Ns
	Av.	**22.04**	**22.30**			

a, b, c Means with no common superscript differ significantly for column.

Table 5. Least-squares means+S.E. and its probability (Prob.) for the effect of ammonia in litter and in air each treatment (Tr.) at different ages.

Trait	Ages by week	Treatments			Average		Prob.
		Tr.1	Tr.2	Tr.3			
Ammonia in litter %	2	0.59±0.11	0.26±0.11	0.39±0.11	**0.41^{b}**	Tr.	0.0001
	4	0.86±0.11	0.33±0.11	0.48±0.11	**0.55^{b}**	Age	0.0012
	6	0.77±0.11	0.43±0.11	0.72±0.11	**0.61^{b}**	Tr. X	Ns
	8	1.11±0.11	0.58±0.11	0.84±0.11	**0.84^{a}**	Age	
	Av.	**0.83^{a}**	**0.37^{c}**	**0.61^{b}**			
Ammonia in air % p.p.m.	2	10.00±1.87	10.00±1.87	10.67±1.87	**10.22^{b}**	Tr.	Ns
	4	10.00±1.87	10.00±1.87	10.33±1.87	**10.11^{b}**	Age	0.003
	6	14.67±1.87	16.0±1.87	15.00±1.87	**15.22^{a}**	Tr. X	Ns
	8	15.33±1.87	12.67±1.87	15.33±1.87	**14.44^{a}**	Age	
	Av.	**12.50**	**12.16**	**12.83**			

a, b, c Means with no common superscript differ significantly for column.

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تأثير نوع الفرشة على إنبعاث الأمونيا والأداء الأنتاجى فى البط الدمياطى

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استخدم فى هذه التجربة ٤٥٠ بطة دمياطى عمر يوم تم توزيعها عشوائياً على ثلاث مجاميع متساوية تبعاً لنوع الفرشة .

استخدم ثلاثة أنواع من الفرشة وهى تبن القمح ونشارة الخشب الناعمة ونشارة الخشب الخشنة .

وكان الهدف من هذه الدراسة تحديد تأثير إختلاف نوع الفرشة والامونيا المنبعثة منها على الأداء الإنتاجى للبط الدمياطى ويمكن تلخيص أهم النتائج كما يلى :

* لوحظ أن مجموعة البط المرباه على فرشة من نشارة الخشب الناعمة كانت معنوياً أثقل فى الوزن من المجموعتين الآخريين عند عمر ٤ ، ٨ ، ٢٠ أسبوع وغير معنوية عند عمر ١٦ أسبوع وقد وجد أن التداخل بين نوع الفرشة والجنس كان غير معنوى فى جميع الأعمار بالنسبة لوزن الجسم فيما عدا ١٦ أسبوع .

* كان معدل النمو أسرع خلال الأعمار المبكرة (من الفقس حتى ١٢ أسبوع) عن الأعمار المتأخرة (بعد عمر ١٢ أسبوع) .

* ظهر أن البط المربى على فرشة نشارة الخشب الناعمة كان معنوياً أسرع نمواً في جميع الأعمار المدروسة فيما عدا عند عمر ١٢ ، ١٦ زسبوع إذا كان غير معنوى .

* يزيد كل من طول الساق وعمق الجسم بتقديم العمر وكان لتأثير الجنس وإختلاف نوع الفرشة تأثير معنوى على طول الساق وغير معنوى علي عمق الجسم .

* بالنسبة لصفات الذبيحة البط المربى على فرشة نشارة الخشب الناعمة أعطى فيما أعلى بالنسب المئوية للريش والقلب والأجزاء الخلفية والأمامية وكذلك وزن الذبيحة بالمقارنة بالأنواع الأخرى من الفرشة .

* وجد أن فرشة تبن القمح تحتفظ بكمية أعلى من الامونيا يليها فرشة نشارة الخشب الخشنة ثم أقلها إحتفاظاً بالامونيا نشارة الخشب الناعمة .