Effect of in-ovo injection of amino acids mixture in fertili breeder's eggs of Muscovy ducks on the performance of new hatched ducklings

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Abstract

Two experiments were conducted on 150 fertilized eggs and their hatc ducklings. In the first experiment, eggs were assigned to three groups after candlin 12th day of incubation. At this time, the first group was kept without treatment a control group and the second was injected with 0.5 ml of distilled water onto the yolk. The third group of fertilized eggs was injected with 0.5 ml of amino acids mix onto the yolk, which of identical pattern to egg's amino acids. Eggs incubation continued till hatching. All ducklings in each group were sexed producing two replic for males and females. The newly hatched ducklings fed on standard rations, w formulated according the breedś requirements till 9th week of age. Injection of ferti eggs by amino acids increased (P<0.05) hatchability%, hatching body weight, intake, and cumulative feed conversion. Relative growth rate was enhanced (P<(during the growing period in males while during the growing and finishing perioc female ducks. There were no significant effects on the dressing% of carcass relative weights of heart and abdominal fat in males and only abdominal fat in fem in which heart's weight reduced. Relative weight of Gizzard reduced significant both sexes while that of liver reduced only in male. Serum globulin reduced in sexes while total protein, albumen, calcium, and phosphorous weren't affecte injection of eggs by amino acids mixture. In the second experiment, ducklings o third group were divided into two subgroups at hatching. One subgroup of them fe the standard rations after their supplementation with 25% of duckś requirement methionine and lysine by their synthetic form during the experimental periods. Re of the second experiment showed that the amino acid supplementation of the ra didn't affect the duck's performance, blood parameters, and carcass characteri except higher weights for the edible parts. It was concluded that amino acids con of the fertile eggs of Muscovy ducks were enough for growth of embryos but insufficient for their maximum growth and the injected amino acids mixture enha the consequent growth for hatched ducklings.

Keywords: *Muscovy ducks; In ovo, Amino acids; Methionine and Lysine*

Introduction

The growth performance and meat yield of commercial poultry has impr linearly each year with greater input efficiency (Havenstein et al., 2003). Nutr utilization in the egg's embryo is very important. Their transfer from the mother t embryo is completed before the egg is laid, so the egg contains all of the nutr needed for the growth and development of the embryo. In mammals, the nutriti nursing or post nursing animals affects the subsequent growth and ca

composition of progeny (Knittle and Hirsch, 1968; Winick and Noble, 1967) chicks are affected by the nutrients in yolk remaining in the peritoneal c hatching (Romanoff, 1960).

In ovo feeding, may "jump-start" or stimulate development to begin would otherwise occur after the birds hatch. Improving the nutritional st neonate by in ovo feeding may yield several advantages: greater efficie nutrient utilization (Bhanja et al., 2004); reduced post-hatch mortality (At and morbidity; improved immune response to enteric antigens (Johri, 2004) skeletal growth (Hargis et al., 1989); and increased muscle development meat yield (Uni et al., 2005). These benefits will ultimately reduce the proc of poultry meat by alleviating the growth constraints of "altricial" broilers s rapid growth rate. The poultry industry's acceptance of in ovo-administered programs is increasing (Johnston et al., 1997). However, research concer nutrients administration such as amino acid (AA) in broiler-breeder's eggs and no reports available for in ovo research in meat type ducks. Because eg moisture, but not protein, are in excess percentages (Al-Murrani, 1978 protein is the origin of the required free amino acids during early emb (Gerhartz et al., 1999), embryonic and postembryonic growth may be impr injection into the egg yolk (Al-Murrani, 1982) with consequent improvemer performances and health. Due to the importance of Methionine and Lysine post hatching growth periods, addition of methionine and/or lysine recommended requirement of meat type birds improves their performance body weight gain and food conversion efficiency (Rezaei et al., 2004). The study was to study the effect of in ovo injection of fertile Muscovy duck's amino acids mixture and the subsequent feeding of the hatched duckling protein, DL-methionine and L-lysine-supplemented diets on the ducks pe carcass characteristics, and blood parameters.

Materials and Methods

Two experiments were conducted using a total number of 150 ferti obtained from Muscovy duck (Cairina Muschata domestica breed) as sh diagram of the experiment's design (Figure 1). All eggs were obtained from flock and laid within a 24-h period. Egg weight ranged from 87.5 to 90 g.

First experiment: Eggs were assigned to three groups (each consists of 5 eggs) after candling using a hand candling ultraviolet lamp at 12th day of i On day 12th of incubation, the first group was kept without treatment as a co and the second was injected with 0.50 ml distilled water onto the yolk. The of fertilized eggs was injected with 0.50 ml of amino acids mixture (Am Egypt Otsuka Pharmaceutical Company) solution (Table 1) as was documen of researches (Bhanja and Mandal, 2004; Hajihosseini and Mottaghitalam, 2 et al., 1999 and 2001). This mixture of amino acids is of low cost and wit pattern to the egg's amino acids, which calculated as percentage of lysine the egg. Where, the ideal ratio of amino acids to lysine remains largely una dietary, environmental and genetic factors (Schutte and Jong, 2004). hatched ducklings fed on standard starter, grower, and finisher ratio formulated according the breed's requirements (Breed's Manual) till 9th wee (Table 2).

Table (1) Composition of amino acids solution injected onto fertile eggs*

Amino acids	Content and pattern	
	mg/0.5ml	% of L-Lysine
Arginine HCL	3.65	96.05
Histidine HCL	1.60	42.10
Methionine	0.50	13.20
Phenylalanine	0.50	13.20
Therionine	2.25	59.20
Valine	4.20	110.5
Amino acetic acid	4.50	118.4
Lysine HCl	3.80	100.0
Tryptophane	0.35	09.20
Leucine	5.50	144.7
Isoleucine	4.50	118.4
Proline	4.00	105.3
Cysteine HCl	0.20	05.30
Serine	2.50	65.80
Alanine	3.75	98.70

*Identical to the egg's amino acids content

Procedure of eggs injection: Prior to injection, eggs were cleane fumigated. The blunt ends of the eggs were sterilized with 70% ethanol accor Kocamis et al. (1999). Then a very slight indentation was made in the sterilize using a sharp sterile pin, which was inserted onto a rubber stopper. The needl carefully inserted through the indentation site till reach the yolk, and then the s was injected. The puncture was sealed with a small drop of warm paraffi temperature of the incubator and hatchery is ranged from 55°C to 55.6°C an 54.4°C to 55°C, respectively. The relative humidity was about 55-60% during t 32 day of incubation and then elevated to be 70% at the rest of hatching period were turned automatically every one hour until the 32 th day of incubation. Egg transferred to hatchery at the end of 32 th of incubation. All eggs were indiv candled using a hand candling ultraviolet lamp at 12th day of incubation to det the infertile and early embryonic mortality and at 35th of incubation to determi late embryonic mortality (Harun et al., 2001). After hatching, hatchability (Ba Bakst, 1993), embryonic mortality (Suarez, et al., 1996), and hatching weigh calculated.

Second experiment: On one day old age, the hatchlings were sexed and ide with numbers to separate the two sexes in each group into male and female repl Ducklings of the third group (injected with amino acids) were divided int subgroups, each with two replicates for males and females. Ducklings of one sub were fed on the standard starter, grower, and finisher rations after supplementation with 25% over duck's requirements for methionine and lysine b synthetic form till the 9th week of age (Table 2).

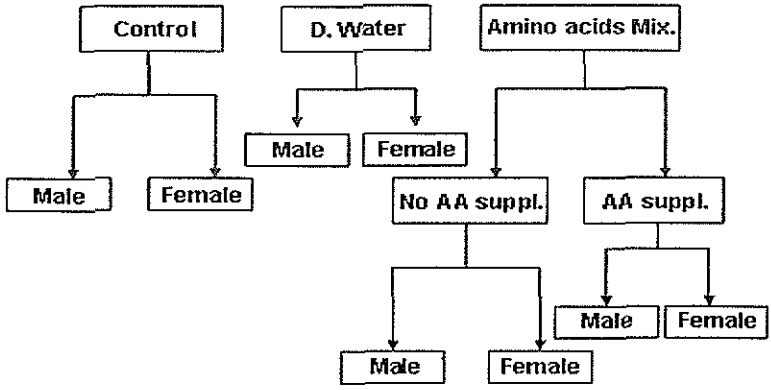

Figure (1) Diagram for the experiment's design

Table (2) Composition of the used rations during the experimental periods

Experimental periods	Starter		Grower		Fini
Groups	No AA suppl.	AA suppl.	No AA suppl.	AA suppl.	No AA suppl.
Ingredients %					
Yellow corn	61.3	61.3	67.0	67.0	68.0
Soybean meal 48	30.0	29.84	23.4	23.21	20.30
Corn gluten	4.30	4.30	5.00	5.00	5.00
Soybean oil	0.40	0.40	0.70	0.70	3.00
Mono Ca. Phosphat.	1.37	1.30	1.40	1.30	1.370
Lime stone	1.73	1.70	1.70	1.70	1.54
NaCl	0.40	0.30	0.30	0.30	0.30
Permix*	0.30	0.30	0.30	0.26	0.30
L-lysine	0.10	0.37	0.10	0.34	0.10
DL-methionine	0.10	0.19	0.10	019	0.10
Calculated composition					
ME Kcal/Kg	2916	2010	3005	3000	3145
Crude protein %	22.0	22.0	20.0	20.0	18.0
Lysine%	1.0	1.25	0.95	1.19	0.88
Methionine %	0.37	0.46	0.37	0.46	0.35
Methionine + Cystine %	0.81	0.90	0.80	0.90	0.75
Ether extract %	3.12	3.12	4.26	4.26	6.0
Calcium %	0.96	0.96	0.95	0.95	0.86
Av. Phosphorous %	0.45	0.45	0.46	0.46	0.43

*Vitamins and Minerals mixture: Each Kg provided 8800 IU Retinyl acetate Cholecalceferol; 11 IU DL-α-tocopheryl acetate; 2.2 mg Menadion sodium bisul Riboflavine; 8.8 mg D-calcium pantothenate; 44 mg Nicotinic acid; 2.2 mg hydrochloride; 0.55 mg Folic acid; 0.11 mg D-biotin; 25 mg Thiamine hydrochlo Vitamin B12; 220 mg Choline; 125 mg Ethoxyquine; 60 mg Mn; 50 mg Zn; 30 mg F 1.06 mg I; 1.1 mg Se.

Samples from different rations were taken for chemical analysis according t O. A. C., (1980). Body weights and feed intakes were recorded weekly to deterr the body weight gains, relative growth rates, and feed conversions (Goudriaan Laar, 1994). Four random blood samples were drawn from the brachial veins of male and female adult ducks for serum separation and determination of serum le for total protein (Layne, 1957), albumin (Ziyatdinova et al., 2004), calcium (Gin 1972) and phosphorous (Goldenberg, 1966). At the end of the experiment, 8 duck males and 4 females) from each group and subgroups were randomly t representing the average body weights of males and females. Prior to killing the b feed and water were withdrawn for 10 and 14 hr, respectively. The ducks v weighed, slaughtered and allowed to bleed freely for 5 minutes, and then the dres abdominal fat, and edible parts (Gizzard, Liver, Heart) were recorded as a percen of carcass weight.

Statistical analysis

Data were collected and analyzed statistically by one way ANOVA using SPS program, version 10 (SPSS®, 1999).

Results and Discussion:

First experiment:

Hatchability and Mortality: As shown in table (3), the injection of fertilized eg Muscovy ducks with amino acids mixture at 12th day of incubation didn't a mortality but increased the hatchability by 12% compared with the control group the eggs those injected with distilled water. Hatching body weights of ducklings higher with amino acids injection relative to the initial eggs weights compared t other groups where the embryo builds itself from the amino acids present in the with limited amino acids synthesis (Rupe and Farmer 1955). These incre hatchability and hatching weight relative to the initial egg were recorded in r studies (Abeer, 2005; Johri, 2004; Ohta and Kidd, 2001), while hatchability w affected in the studies of Ohta et al., (1999 and 2001). Our results demonstrated the more available amino acids in the eggs help the embryo to complete its g increasing hatchability and growth rate, where the amino acids utilization incre between 12th and 19th weeks of age (Muramatsu et al., 1987). Post-hatching mo of ducklings increased in the water-injected group is unexplained.

Table (3) Hatchability% and hatching weights of ducklings relative to the initial eggs weigh

Items	Control	In ovo D. water	In ovo AA mix
Hatchability (%)	70	70	82
Mortality (%)	0.00	2.8	0.00
Weight at hatching (g)	50.1 ± 4.2^{b}	45.6 ± 3.8^{c}	56.3 ± 4.1^{a}
Hatching relative weights (%)**	61 ± 6.7^{a}	51.4 ± 5.6^{b}	63.4 ± 6.8^{a}

[a-b] Means within the same raw having different superscript are significantly different (P < 0.05)

(Means ± SE)

** Hatching body weight ÷ Average egg's weight x 100

Second experiment:

Body weight and Feed conversion: Body weight, feed intake and cumulative conversion increased significantly (P<0.05) in male and female ducks hatched

eggs those previously injected with amino acids mixture compared with those injected with distilled water (Table 4, 5, 8, and 9). However, the fe enhanced only during the starting periods in males and females. These agreed with those of Bhanja and Mandal (2004) and Hajihosseini and I (2004) in chickens. As shown in table (6 & 7), amino acids injection of eg the relative growth rates during the starting periods in both sexes and red the growing periods in males and females and during the finishing period compared to the control group. On the other hand, there was significant relative growth rates for the distilled water injected group during the finishing periods in males and females as a result of compens Collectively, an increased body weight gain and feed conversion were amino acids injection of fertile eggs, which might be due to the increased utilization and protein synthesis. These results were in agreement with n (Al- Murrani, 1982; Bhanja and Mandal, 2005; Muramatsu et al., 1987).

Ducks of amino acids' injected eggs didn't show any significant e supplementation of their diets by DL-methionine and L-lysine except conversions during the starting period in males and females and during period of male but not in female ducks (Table 8 & 9), in which reduced l and feed intakes were recognized (Table 5 & 9, respectively) as compa other groups those weren't supplemented by DL-methionine and L-ly (2007) and Bones et al., (2002) reported an increased growth and feed e methionine and lysine supplementation of rations for Pekin ducks. Absel improvements in the performance of ducks in our experiment might be presence of normal requirement's levels for protein in the amino acids-s diets, where the extra supplementation of DL-methionine and L-lysine growth rate and feed conversion when the diets are low in protein con 1983; Gaafar et al., 2009)

Table (4) Body weights of male Muscovy ducks during the experimental pe

Periods	Treatments			
	Control (n=13)	In ovo D. water (n= 15)	In ovo amino acids mix	
			No AA suppl.(n= 8)	AA su
Starter	570 ± 19[d]	404 ± 8.9[c]	840 ± 31[b]	76
Grower	2207 ± 72[b]	1872 ± 2[c]	2478 ± 80[a]	246
Finisher	4129 ± 87[b]	3533 ± 13[c]	4576 ± 14[a]	440

[a-b] Means within the same raw having different superscript are significantly different (P < 0.05)
(Means ± SE)

Table (5) Body weights of female Muscovy ducks during the experimental p

Periods	Treatments			
	Control	In ovo D. water	In ovo amino acids mi	
			No AA suppl.	A
Starter	560.5 ± 13[c]	374.4 ± 6[b]	658.8 ± 12[a]	65
Grower	1771.6 ± 44[a]	1879 ± 14[a]	1816 ± 21.6[a]	18
Finisher	2622 ± 48[b]	2416 ± 20[c]	2843 ± 20[a]	26

[a-b] Means within the same raw having different superscript are significantly different (P < 0.05)
(Means ± SE)

Table (6) Relative growth rates of male Muscovy ducks during the experime periods

Periods	Treatments			
	Control	In ovo D. water	In ovo amino acids mixture	
			No AA suppl.	AA suppl.
Starter	87 ± 1.4^{a}	83.8 ± 0.82^{b}	90 ± 0.3^{a}	89.0 ± 0.3^{a}
Grower	65.6 ± 1.0^{d}	70.8 ± 0.6^{c}	56.5 ± 0.9^{b}	61.5 ± 0.8^{a}
Finisher	35.2 ± 1.2^{a}	37.2 ± 0.2^{c}	34.3 ± 1.4^{a}	33.9 ± 3.0^{a}

[a-b] Means within the same raw having different superscript are significantly different ($P < 0.05$)
(Means ± SE)

Table (7) Relative growth rates of female Muscovy ducks during experimental perio

Periods	Treatments			
	Control	In ovo D. water	In ovo amino acids mixture	
			No AA suppl.	AA suppl.
Starter	88 ± 0.23^{a}	81.4 ± 0.54^{b}	88.6 ± 0.21^{a}	88.1 ± 0.11^{a}
Grower	58.9 ± 0.7^{b}	72.8 ± 0.4^{a}	54 ± 0.31^{c}	54.5 ± 0.9^{c}
Finisher	28.5 ± 0.9^{b}	36.7 ± 0.1^{a}	23.3 ± 0.6^{c}	21.7 ± 0.5^{c}

[a-b] Means within the same raw having different superscript are significantly different ($P < 0.05$)
(Means ± SE)

Table (8) Feed conversions of male Muscovy ducks during the experimental period

Periods	Treatments			
	Control	In ovo D. water	In ovo amino acids mixture	
			No AA suppl.	AA suppl
Starter	2.37 ± 0.01^{a}	2.4 ± 0.07^{a}	1.6 ± 0.06^{b}	1.3 ± 0.06
Grower	2.90 ± 0.09^{a}	2.15 ± 0.02^{a}	2.3 ± 0.06^{a}	1.6 ± 0.09
Finisher	2.70 ± 0.08^{a}	2.7 ± 0.02^{a}	2.7 ± 0.13^{a}	3.0 ± 0.2
Cumulative	2.26 ± 0.05^{a}	2.24 ± 0.01^{a}	2.11 ± 0.07^{b}	2.05 ± 0.0
Feed intake	9220	7850	9550	9258

[a-b] Means within the same raw having different superscript are significantly different ($P < 0.05$)
(Means ± SE)

Table (9) Feed conversions of female Muscovy ducks during the experimental peri

Periods	Treatments			
	Control	In ovo D. water	In ovo amino acids mixture	
			No AA suppl.	AA supp
Starter	2.26 ± 0.06^{b}	2.64 ± 0.05^{a}	2.05 ± 0.04^{c}	1.54 ± 0.0
Grower	3.20 ± 0.06^{a}	2.1 ± 0.09^{c}	2.3 ± 0.1^{c}	2.52 ± 0.0
Finisher	2.70 ± 0.08^{a}	2.7 ± 0.02^{a}	2.7 ± 0.13^{a}	3.0 ± 0.2
Cumulative	2.55 ± 0.06^{a}	2.65 ± 0.05^{a}	2.33 ± 0.03^{b}	2.30 ± 0.0
Feed intake	6320	6050	6540	6250

[a-b] Means within the same raw having different superscript are significantly different ($P < 0.05$)
(Means ± SE)

Carcass quality: As shown in tables (10 & 11), there were no effects on t percentages of carcasses and relative weights of hearts and abdominal fa and only abdominal fats in females, in which hearts reduced by amino aci as was found by Bhanja et al. (2004) and Johri (2004) but these results wer with the finding of Hajihosseini and Mottaghitalam (2004). The relative gizzards were reduced significantly (P<0.05) in both male and female duc acids-injected eggs but that of liver were reduced only in the males of the s which weren't agreed with the result of Johri (2004). Regarding to the redu weight of gizzard in both sexes or the liver only in males, it might be cont the injection of the eggs by amino acids might be denied access to feed than 72 h post-hatch compared to the other groups (Moran and Reinhart, 1 may hinder digestive system maturation and function.

Table (10) Carcass traits of male Muscovy ducks during the experimental pe

%	Treatments			
	Control	In ovo D. water	In ovo amino acids r	
			No AA suppl.	AA
Dressing	82.6 ± 1.6[a]	77.0 ± 1.5[b]	78.0 ± 1.5[ab]	83.
Liver	2.30 ± 0.17[b]	2.3 ± 0.07[b]	1.7 ± 0.2[c]	3.4
Gizzard	2.53 ± 0.12[b]	3.0 ± 0.12[a]	2.23 ± 0.02[c]	2.6
Heart	0.68 ± 0.02[b]	0.69 ± 0.06[ab]	0.72 ± 0.04[ab]	0.7
Abdominal fat	2.5 ± 0.03[ab]	2.3 ± 0.14[b]	2.3 ± 0.07[b]	2.6

[a-b] Means within the same raw having different superscript are significantly different (P < 0.05)
(Means ± SE)

The supplementation of diets by DL-methionine and L-lysine significantly (P<0.05) the edible parts of male and female ducks except t which wasn't affected in male and female ducks. Higher weights for livers mi to the increased glycogen synthesis. Uni and Ferket (2003) demonstrate increased intake of Methionine might be increased the liver glycogen. It concluded that the injection of fertilized eggs by amino acids reduced the digestive system while the supplementation of the hatchling's diets by DL-r and L-lysine increased the weights of total edible parts.

Table (11) Carcass traits of female Muscovy ducks during the experimental p

%	Treatments			
	Control	In ovo D. water	In ovo amino acids mix	
			No AA suppl.	AA su
Dressing	75.7 ± 0.2[d]	72.6 ± 0.53[c]	74.0 ± 0.01[b]	77.4 ±
Liver	1.92 ± 0.1[b]	1.83 ± 0.07[b]	1.66 ± 0.02[b]	2.9 ±
Gizzard	2.73 ± 0.04[a]	2.4 ± 0.04[a]	2.2 ± 0.04[b]	3.0 ±
Heart	0.78 ± 0.08[b]	0.72 ± 0.05[b]	0.63 ± 0.09[c]	0.99 ±
Abdominal fat	2.7 ± 0.03[a]	2.47 ± 0.2[a]	2.4 ± 0.04[a]	2.6 ± 0

[a-b] Means within the same raw having different superscript are significantly different (P < 0.05)
(Means ± SE)

Blood parameters: As shown in table (12 & 13), serum globulin levels redu significantly (P<0.05) by injection of fertile eggs with amino acids mixture in both m and female, which needs further investigations to know the reasons for the redu serum globulin in relation to duck's immune response to amino acids injection. other blood parameters (Serum total protein, Albumin, Calcium and Phosphorc neither affected by injection of amino acids mixture onto fertile eggs supplementation of the duckling's diets by DL-methionine and L-lysine during experimental periods as compared with the control groups in both male and fem Most the previously published data didn't recognize the effect of in ovo injectior amino acids on these blood parameters..

Table (12) Blood parameters of male Muscovy ducks during the experimental period

%	Treatments			
	Control	In ovo D. water	In ovo amino acids mixture	
			No AA suppl.	AA suppl.
Total protein g/l	65.4 ± 7.6[a]	57.7 ± 7.8[a]	49.4 ± 5[a]	59.8 ± 6.2[a]
Albumen g/l	32.9 ± 3.8[a]	30.2 ± 1.6[a]	30.8 ± 1.5[a]	28.5 ± 3.1[a]
Globulin g/l	33.5 ± 3.3[a]	27.5 ± 1.9[a]	18.6 ± 2.4[b]	31.3 ± 0.7[a]
Calcium mg/dl	6.4 ± 1.2[a]	5.4 ± 0.38[a]	6.0 ± 0.44[a]	6.25 ± 0.52[a]
Phosphorous mg/dl	4.0 ± 0.2[a]	3.6 ± 0.20[a]	5.2 ± 0.4[a]	4.8 ± 0.3[a]

[a-b] Means within the same raw having different superscript are significantly different (P < 0.05)
*(Means ± SE)

Table (13) Blood parameters of female Muscovy ducks during experimental period*

%	Treatments			
	Control	In ovo D. water	In ovo amino acids mixtur	
			No AA suppl.	AA suppl
Total protein g/l	66.6 ± 7.0[a]	58.0 ± 7.6[a]	55.4 ± 6.5[a]	62.5 ± 5.2
Albumen g/l	34.4 ± 3.6[a]	32.0 ± 1.8[a]	34.7 ± 3.5[a]	29.5 ± 3.1
Globulin g/l	32.2 ± 3.3[a]	26.0 ± 1.9[b]	20.7 ± 2.4[b]	33.0 ± 0.7
Calcium mg/dl	5.6 ± 0.87[a]	5.7 ± 0.33[a]	5.8 ± 0.54[a]	6.3 ± 0.5
Phosphorous mg/dl	5.6 ± 0.5[a]	4.6 ± 0.20[a]	5.2 ± 0.3[a]	5.8 ± 0.3

[a-b] Means within the same raw having different superscript are significantly different (P < 0.05)
*(Means ± SE)

Conclusion: *From our results, we could be concluded that, the amino acids cont of the egg yolk of Muscovy ducks' fertilized eggs were enough for embryo's growth insufficient for their maximum growth. This maximum growth might be achieve injection of the fertilized eggs by a mixture of amino acids, which is identical to amino acids pattern of the egg yolk. On the other hand, feeding of these duckling supplemented diets by DL-methionine and L-lysine didn't improve the d performance. Further studies were needed for feeding of these hatched duckling low-protein, DL-methionine and L-lysine-supplemented diets as a trial for improver of ducks performance using low cost ration.*

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ربى:

ض أمهات البط المسكوفى المخصب بخليط من الأحماض الأمينية على

س سوء التغذيه، كلية الطب البيطري، جامعة المنوفية-فرع السادات

راسة على تجربتين، التجربة الأولى أجريت على عدد ١٥٠ بيضة مخصبة منتجة فى
ات ٩قطيع بط مسكوفى حيث تم تحضين البيض لمدة ٣٥يوم وتم أختبار البيض لأستبعاد
خصب عند اليوم الثانى عشر بعد تقسيمهم الى ثلاث مجموعات الأولى لم يتم معاملتها
ن المجموعه الضابطه والثانية تم حقن البيض بها بـ ٠,٥ مللى من الماء المقطر والثالثة
فيها بـ ٠,٥ مللى من خليط سائل من أحماض أمينية مماثلة للموجودة داخل البيضة عند
شر للتحضين. وبعد الفقس تم تجنيس الطيور وتقسيمهم الى ذكور وأناث فى جميع
م تغذية الطيور على علائق مكونة على حسب أحتياجات السلالة حتى عمر تسعة أسابيع
حل (بادى و نامى و ناهى) فقد لوحظ من النتائج أن حقن البيض بالأحماض الأمينية أدى
الفقس بمعدل ١٢٪ وزيادة الوزن النسبى للطيور عند الفقس بالنسبة لوزن البيض ومعدل
، والتحويل الغذائى التراكمى كما لوحظ زيادة معنوية فى أوزان الطيورومعدلات الزيادة
، الرغم من وجود انخفاض فى معدل النمو النسبى أثناء فترة النامى فى الذكور وفى فترة
ى فى الأناث كما لوحظ انخفاض معنوى للوزن النسبى للجهاز الهضمى فى الجنسين
ة الجلوبيولين فى الدم للجنسين وعدم تأثر البروتين الكلى والألبيومين والكالسيوم و
م. وفى التجربة الثانية وعندما تم تجنيس الطيور عند الفقس وتقسيمهم الى ذكور وأناث
موعات قد تم تقسيم طيور المجموعة الثالثة الى مجموعتين مصنف كل منها الى أناث
ية أحداهما على نفس العلائق السابق ذكرها بعد اضافة ٢٥ ٪ من الميثيونين و الليثين
تياج السلالة منهما خلال الفترات الثلاثة (بادى و نامى و ناهى) حتى عمر تسعة أسابيع
زيادة نسبة الميثيونين و الليسين فى العلائق لم تؤثر على معدلات أداء الطيور وقياسات
ات الذبيحة فى الجنسين عدا زيادة وزن الكبد فى الجنسين. ونخلص من الدراسة أن
البط المخصب من الأحماض الأمينية كافى لنمو الأجنة وليس كافيا لأحداث أقصى معدل
الى أن حقن البيض بالأحماض الأمينية يحفز نمو الطيور بعد الفقس.