

**Effect of gelatin feeding on the growth performance
of Muscovy ducks
BY**

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Abstract

Two hundred and forty Muscovy ducklings were used to study the effect of feeding diets containing gelatin as animal protein source on the growth performance of ducks as conventional feed to substitute the other animal protein source and on the current costs of the used rations. Ducklings were randomly allocated to four treatments for both male and female birds separately. The first treatment was the control diet based on corn-soybean meal without addition of gelatin and from the second to fourth treatments based on the control diet with addition of 7, 10, and 12% gelatin replacing the animal protein source, respectively. These diets were used for feeding of birds through the starting (0-3 weeks) and growing-finishing (3-10 weeks) periods. There were no significant differences in the averages of feed intake, body weight, relative growth rate, food conversion rate, and protein efficiency ratio between the ducks of control group and those fed on diet containing 7% gelatin for both male and female groups. These different performances were reduced by increasing the level of gelatin over 7% in the diets for both sexes, with more pronounced influence in female groups.

Key words: Gelatin, Muscovy ducks, performances.

Abbreviations: RGR: Relative Growth Rate; PER: Protein Efficiency Ratio.

Introduction

Ducks are more resistant birds to many conditions and more feed consumer. In resemblance to other birds, ducks may need a minimal content of animal protein source in their diets that may raise the cost of the formulated diets. Reduction of the cost of formulated diets is the main object of most nutritionists through formulating diets using the conventional and unconventional feedstuffs. The animal source gelatin is one of the unconventional feedstuffs, which is heterogeneous mixture of high molecular weight, water soluble protein (Budavari, 1996). It is considered as food rather than feed additive (FDA, 1990). The protein content of gelatin is higher than that of soybean, meat meal, and fish meal. It has similar metabolizable energy to soybean meal and particularly high levels of glycine; glutamine, proline, lysine, serine and threonine which are the major amino acids found in mucins and the intestinal glycocalyx (Tse and Chadee, 1992; Lang et al., 2004) but has no tryptophane, little or no tyrosine and is deficient in Isoleucin and methionine (NRC, 1994, OMRI, 2002). There are many lots of tons are produced by using many industrial techniques. These industrial prepared gelatins vary in the quality and cost. The available gelatin may substitute the animal protein source in the poultry diet. The aim of this work was to achieve the maximum level of growth

performance with an optimum levels of gelatin in the ration of ducks substituting the other high-cost protein sources to reduce the cost of formulated diets without any growth depression and signs of deficiency.

Materials and methods

Ducklings and diets: Two hundred and forty one day-old Muscovy ducklings (50 g average body weight) were used in this study. They were sexed and allocated to four groups for both male and female, three replicates in each group and ten identified ducklings in each replicate. The experiment was designed to have starting (0 to 3 weeks) and growing-finishing (3 to 10 weeks) periods. Four diets were formulated during each period (Table 1). The first diet of both periods was typical control corn-soybean meal based starter and growing-finisher diet without addition of gelatin. The other three diets of both periods were formulated on the basis of corn-soy bean meal with addition of 7, 10, and 12% of gelatin, respectively, to substitute the other animal source of protein (meat and fish meal).

Feeding and measurements: The ducklings were fed *ad libitum* on the starter diets for the first three weeks of age, then on the grower-finisher diets till the end of the experiment at ten weeks old. During the experiment, the averages of body weights and feed intakes were determined at weekly intervals on individual and groups basis, respectively. Food conversion (Lambert et al., 1936), relative growth rate (Crampton and lloyd, 1959), and protein efficiency ratio (McDonald et al., 2002) were calculated. A representative samples from gelatin, and different diets were analysed for assurance of their protein contents (A O A C, 1990).

Statistics: Data was statistically analysed by paired sample T. test using SPSS programe, version 9.

Results and Discussion

Feed intake: The inclusion of gelatin in the diets of ducks reduced the feed intake for both sexes except when gelatin was added at 7% of the diet. In comparison to the control group, the weekly and cumulative feed intake of male and female ducks fed on diets contained 12% gelatin decreased excessively during starting and growing-finishing periods (Table 2 & 4). The presence of high levels of gelatin in the diet aggravated the amino acids imbalance of that diet, which might be intended as a cause for the reduced feed intake as cited by Byung-Chul Park (2006) who concluded that feed intake of chicken was reduced by feeding on diets contained high levels of imbalanced amino acids-protein.

Body weight and gain: The live body weights and cumulative gains were reduced significantly in ducks fed on diets contained 12% gelatin for both male and female and in ducks fed on diet contained 10% gelatin in most experimental weeks for only male, but those fed on diets contained 7% gelatin from both sexes were not affected compared with the control group (Table 3 & 4). Lyman and Elvehjem (1951) recorded previously this inhibition in chicken fed on purified diets contained gelatin, and Guzik (2002) recorded a reduction in body weight and gain of pigs fed on diet contained 5% gelatin.

However, Fasina et al., (2007) found an increased body weight gain of chicks fed on diet contained 2% gelatin during the first week of age. which was not significantly recorded in this work. The reductions in the body weights of ducks fed 12% gelatin were more pronounced in the female than male compared to those of control groups (Table 3). The birds of this group suffered from Niacin/tryptophan symptoms; sever reduction in body weight, enlargement of hock joint, crusts on the mouth and poor feathering. Male ducks were less affected by these symptoms than female. These reductions in weight and gain might be due to the reduction in feed intake in addition to limitation of tryptophan where it is the first limiting amino acid in these diets. Increasing the content of the diets by gelatin aggravated these symptoms and the presence of soybean meal with low level of gelatin reduced the adverse effect of amino acids imbalance of gelatin, Richert and Westerfeld (1965) stated that the presence of soybean protein with amino acid imbalanced protein counteract its adverse effect.

Relative growth rate: The RGR were enhanced for all groups of ducklings during the first two weeks of age and till the fourth week of age except ducklings fed on diet contained 12% gelatin. This enhanced growth was significant during the first two weeks of age for ducklings fed diet contained 7% gelatin (Fig. 1) compared to the control group. Fasina et al. (2007) found an enhanced body growth and early intestinal development of chicks during the first weeks of life, where The growth of birds during the first 7 days of life represents approximately 10% of the final market weight (Lilbum 1998). Stucki and Harper (1961) demonstrate also that the presence of gelatin in the diet of poultry stimulated their growth due to its high content of dispensable amino acids.

As seen in figure (1) there were no significant differences in RGR between the control group and the ducks fed on diets contained 7% and 10% gelatin but it was reduced excessively in those fed on diets contained 12% gelatin for either male or female from the fourth to sixth weeks of age, which was compensated during the tenth week of age.

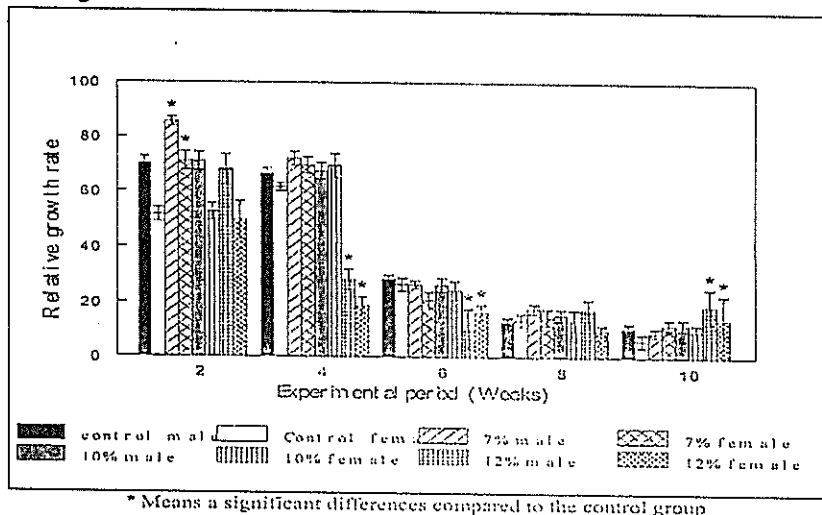
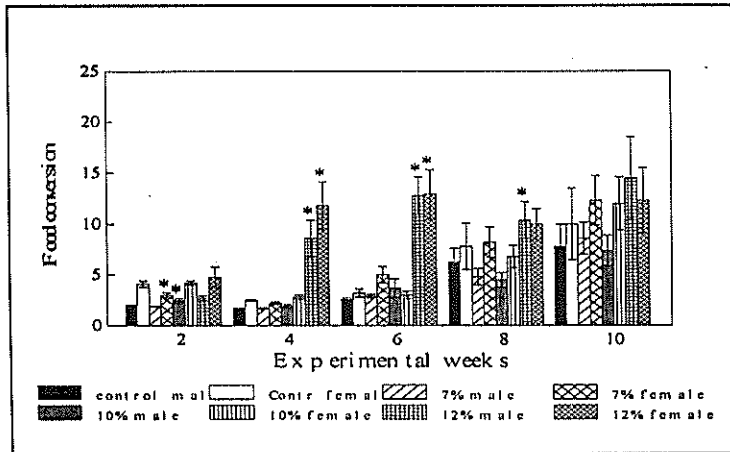


Figure (1) Relative growth rate of different groups of ducks during experiment

Feed conversion: There were no differences regarding the cumulative food conversion between the ducks of control group and those fed on the diets containing 7%

and 10% gelatin (Table 4 and Figure 2). As shown in the figure (2), the food conversion was reduced significantly in the birds fed diet contained 12% gelatin from the 4th to the 6th week old for both male and female and at the 8th week old for the male, that were compensated till marketing.

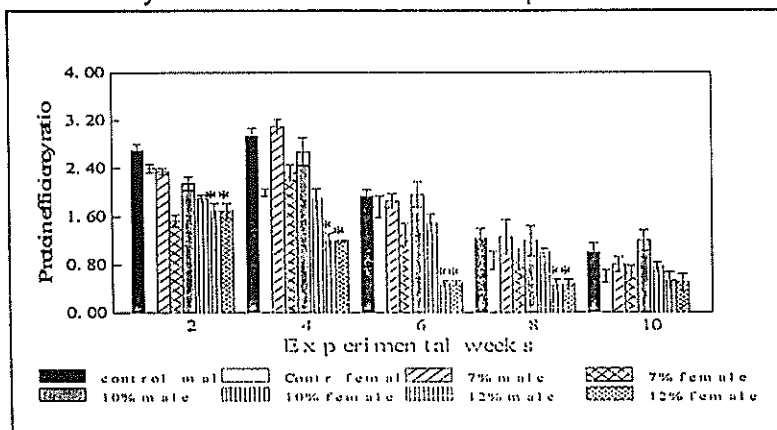


*Means significant differences compared to the control group

Figure (2) Food conversion of different groups of ducks during the experiment

Protein efficiency ratio: There were no significant differences in the PER between the first two treatments for both sexes and the control group during the starting and growing-finishing period (Fig. 3). There was significant decreased PER for both sexes of the groups fed on the highest gelatin diet till the 8th week of age compared to the control group. The figure is showing an increased PER for the male ducks groups except those fed on the highest gelatin treatment (12%) during the fourth week of age.

Economic profits: The prices of different feedstuffs used in the diets of the current experiment were used to calculate the actual cost of each diet to show the economic benefits from the inclusion of gelatin in the diets of ducks. Table (1) showing that the diets of control groups was the more expensive compared to the other treatments. Diet contained low level of gelatin that improved the different growth performances reduced its relative cost by more than 200 LE/ton compared to the cost of control diet.



*Means a significant a differences compared to the control group

Figure 3. Protein efficiency ratio of different groups of ducks during the experiment

Summary

Gelatin can be used as unconventional feed for feeding ducks in different ages but with maximum level up to 7% in the presence of an optimum level of good quality protein in the diet. This level achieved an optimum body weight, relative growth rate, and food conversion with improved protein efficiency ratio and normal feed intake. Ducks fed on diet contained 12% gelatin cause reduced growth performances and Niacin-tryptophan deficiency symptoms, where the females were more affected. On the other hand, the relative cost of the diet contained 7% of gelatin was low compared to the control diet.

Conclusion:

Gelatin can be used as unconventional animal source of protein at level up to 7% of the total diet of Muscovy ducks without any signs of deficiency and adverse effects on the different growth performances. It reduced the actual cost of diet when added to them compared to the diets contained the conventional animal protein source.

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Table (1) Different diets of the starting and growing-finishing periods of the experiment

Items	Control		7% Gelatin		10% Gelatin		12% Gelatin	
	Starter	Finisher	Starter	Finisher	Starter	Finisher	Starter	Finisher
Ingradients								
Corn	57.7	64.0	59.5	65.4	62.0	69.7	63.2	69.5
SBM	30.0	23.4	27.0	19.8	21.0	13.3	16	10
Gelatine	-	-	7	7	10	10	12	12
Meat meal	5	5	-	-	-	-	-	-
Fish meal	3	3	-	-	-	-	-	-
Sunflower oil	2.0	2.5	3.0	4.5	3.5	4.0	5.0	5.0
Di-Ca-ph.	1.5	1.3	2.2	2.5	2.2	1.9	2.4	2.4
Lime stone	-	-	0.5	-	0.5	0.3	0.6	0.3
Salt	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Permixon	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Methionine	0.12	0.04	0.15	0.06	0.16	0.18	0.18	0.09
Composition								
CP%	23	20.4	22.8	20.10	22.8	20.1	22.4	20.1
ME kcal/kg	2950	3050	2870	2990	2860	2950	2910	2950
Ca%	1.0	0.9	0.1	0.9	1.0	0.9	1.0	0.9
P%	0.8	0.7	0.8	0.7	0.8	0.7	0.8	0.7
Methionine %	0.50	0.38	0.50	0.38	0.50	0.38	0.50	0.38
Lysine %	1.23	1.06	1.18	0.99	1.12	0.91	1.05	0.90
Actual cost								
Cost (LE)/100 kg	262	252	239	231	237	230	237	227

* Gelatin: 80% crude protein.

Table (2) Feed intakes of different groups of Muscovy ducks

Weeks	Control		7% Gelatin		10% Gelatin		12% Gelatin	
	Male	Female	Male	Female	Male	Female	Male	Female
1	190	170	170	150	175	150	150	135
2	400	380	400	380	390	370	305	275
3	810	780	800	790	750	700	540	480
4	1090	1030	1080	1040	1000	1020	650	530
5	1380	1200	1390	1190	1210	1140	680	570
6	1500	1300	1510	1290	1310	1180	680	690
7	1750	1550	1740	1560	1500	1320	860	730
8	1950	1770	1930	1790	1560	1380	710	590
9	1900	1800	1910	1790	1710	1530	750	630
10	1940	1780	1950	1770	1780	1590	730	600
Total	12910	11760	12880	11750	11385	10380	6205	5230

Table (3) Body weights of different groups of ducks during the experiment.

Weeks	Control		7% Gelatin		10% Gelatin		12% Gelatin	
	Male	Female	Male	Female	Male	Female	Male	Female
1	0.15 ± 0.01 ^b	0.14 ± 0.02	0.15 ± 0.01	0.12 ± 0.02	0.15 ± 0.02	0.13 ± 0.02	0.12 ± 0.02	0.11 ± 0.01
2	0.35 ± 0.02	0.24 ± 0.03	0.36 ± 0.01	0.25 ± 0.04	0.31 ± 0.04	0.22 ± 0.02	0.23 ± 0.02	0.19 ± 0.03 ^a
3	0.65 ± 0.02	0.47 ± 0.02	0.60 ± 0.06*	0.46 ± 0.04*	0.51 ± 0.06*	0.36 ± 0.03*	0.45 ± 0.05	0.32 ± 0.03*
4	1.3 ± 0.09	0.89 ± 0.04	1.25 ± 0.06	0.95 ± 0.02	1.05 ± 0.02*	0.75 ± 0.09*	0.60 ± 0.07*	0.37 ± 0.03*
5	1.8 ± 0.06	1.4 ± 0.05	1.85 ± 0.01	1.46 ± 0.01	1.7 ± 0.10	1.40 ± 0.08	0.62 ± 0.09	0.44 ± 0.04*
6	1.4 ± 0.09	1.9 ± 0.02	2.40 ± 0.01	1.80 ± 0.01	2.20 ± 0.02*	1.80 ± 0.17	0.69 ± 0.10	0.48 ± 0.06*
7	2.9 ± 0.02	2.1 ± 0.02	2.80 ± 0.02	2.00 ± 0.02	2.6 ± 0.02*	2.10 ± 0.15	0.75 ± 0.06*	0.57 ± 0.07*
8	3.32 ± 0.02	2.4 ± 0.01	3.25 ± 0.03	2.34 ± 0.02	3.0 ± 0.02	2.40 ± 0.20	0.90 ± 0.13	0.63 ± 0.07
9	3.7 ± 0.02	2.57 ± 0.06	3.60 ± 0.02	2.50 ± 0.01	3.45 ± 0.02	2.60 ± 0.17	0.94 ± 0.13	0.70 ± 0.08
10	4.1 ± 0.02	2.7 ± 0.02	4.00 ± 0.02	2.80 ± 0.02	3.80 ± 0.02	2.65 ± 0.12	1.01 ± 0.20*	0.82 ± 0.12*

Means a significant difference compared to the control groups.

Table (4) Cumulative body weight gain, feed intake, and food conversion (Mean ± SD)

Performances	Control		7% Gelatin		10% Gelatin		12% Gelatin	
	Male	Female	Male	Female	Male	Female	Male	Female
Body weight gain Kg	4.06 ± 0.20	2.64 ± 0.23	3.95 ± 0.16	2.75 ± 0.18	3.75 ± 0.18*	2.63 ± 0.10	1.01 ± 0.17*	0.76 ± 0.11*
Feed intake Kg	12.92	11.76	12.88	11.75	11.39	10.38	6.21	5.23
Food conversion	3.18 ± 0.15	4.27 ± 0.15	3.26 ± 0.13	4.28 ± 0.30	2.96 ± 0.30*	3.95 ± 0.14*	6.22 ± 1.0*	6.60 ± 0.70*

Means significant difference compared to the control groups.

الملخص العربي

تأثير تغذية علائق تحتوى على جيلاتين حيوانى على معدلات النمو

والأداء المختلفة للبط المسكوفى

د/ خالد جعفر

كلية الطب البيطرى - مدينة السادات - جامعة المنوفية

تم اجراء هذه التجربة على عدد ٢٤٠ كتكوت مسكوفى عمر يوم وذلك لدراسة تأثير تغذيتهم على علائق تحتوى على نسب مختلفة من الجيلاتين الحيوانى على معدلات أداء النمو المختلفة وكذلك دراسة تأثير هذا الاستخدام على التكلفة الفعلية للعلائق حيث تم تقسيم هذه الطيور إلى أربعة مجموعات من الذكور وأخرى من الاناث وتم تغذيتهم على أربعة علائق بادية فى الفترة الأولى من التجربة (٠-٣ أسابيع) وعلى أربعة أخرى (نامى - ناهى) فى الفترة الثانية من التجربة (٣- ١٠ أسابيع) وكانت العليقة الأولى فى الفترة البادية وكذلك فى فترة النامى-الناهى هى العلائق الضابطة التى لاتحتوى على جيلاتين أما العلائق الثلاث الأخرى فى كلتا الفترتين كانت تحتوى على ٧% ، ١٠% ، ١٢% جيلاتين من الثانية إلى الرابعة على الترتيب .

ولقد وجد أنه لاتوجد فروق معنوية فى متوسطات كمية العلف المأكول وأوزان الأجسام ومعدلات النمو النسبية والتحويل الغذائى ومعدل كفاءة استهلاك البروتين بين المجموعة التى تم تغذيتها على علائق تحتوى على نسبة ٧% جيلاتين والمجموعة الضابطة ووجد أن جميع هذه القياسات قد ساءت مع زيادة كمية الجيلاتين فى العليقة وزاد وضوحاً فى مجموعات الإناث فى هذه الطيور .