DATA ANALYSIS ON THE PERFORMANCE FOR THREE STRAINS OF DUCK IN EGYPT
2-FEED INTAKE AND FEED CONVERSION THROUGH REARING PERIOD AND THEIR ECONOMIC EFFICIENCY

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Abstract

Results were built upon the data of 436422 ducklings day-old representing three different strains (Pekin, Muscovy and Khaki-Campbell) located in Behaira, Kafr El-Sheikh, Demietta, Gharbeya, Giza and Dakahlia Governorates. The data were taken through the 4-23 weeks of age during the period from 1990 to 2000 belonging to ten farms from each of the governmental and private sectors. The traits studied were feed intake (g.feed/duckling/day), feed conversion (g feed/g gain), costs, returns, economic efficiency and production function at the end of rearing period (23 weeks of age).

The main results could be summarized as follows:

1-The averages feed intake (g feed/duckling/day) for combined sexes of Pekin, Muscovy and Khaki-Campbell ducklings during the period of 4-23 weeks of age were 138.68, 142.55 and 143.01 g, respectively. The seasonal averages of this trait were 137.27, 135.14, 143.02 and 133.91 g in the winter; spring, summer and fall seasons, respectively. The means were 148.83 and 126.46 g for the governmental and private sectors, respectively.

2-The averages feed conversion (g feed/g gain) for combined sexes of Pekin, Muscovy and Khaki-Campbell ducklings during the period of 4-23 weeks of age were 8.12, 9.93 and 8.79, respectively. The seasonal averages of this trait were 9.29, 8.46, 9.97 and 8.46 for the winter, spring, summer and fall seasons, respectively. The means were 9.24 and 8.34 for the governmental and private sectors, respectively.

3- The fixed costs were 7.96, 6.53 and 7.86% and the variable costs were 92.04, 93.47 and 92.14% from the total costs. The ducklings and feed costs are the two most important cost factors, the first item accounts for 15.95, 29.87 and 16.83% and the second item accounts for 59.35, 50.70 and 58.58% from the total costs of producing 100 ducklings.

INTRODUCTION

Egyptians have known waterfowl production thousands of years ago, as duck production ranked second after chickens production for the majority of human. Ducks meat is of high quality regarding the palatability, especially after force-feeding. Ducks

have higher production ability, modest house, easily management and higher resistance to diseases when compared with the production of the other animals as an example. There is a quite huge deficiency in the Egyptian citizen share regarding duck and geese meat, even if we discarded young children and infants who do not consume meat (1.12 kg duck and 0.57 kg geese/person/year) (El-Sayad, 1999.) The situation in Egypt regarding waterfowl production is really very bad. This needs great efforts to improve such production generally that Egyptian citizens suffer from a lack in his daily and annual share of it. The feed intake of ducklings increased significantly after 5 weeks of age and was more than 200 g feed/duck/day (Pan *et al.* 1985). The flock of the ducks had no disease infection and higher ability up to 12 weeks of age (Hamdy *et al.*1987).

The main objectives of the present study were:

1- To detect the effects of each of strain, sector and season on the different traits during the rearing period.

2- To analyze the functional relation between gross returns and total costs per each of 100 Pekin, Muscovy and Khaki-Campbell ducklings at the end of rearing period

3- To detect the effect of strain on the fixed and variable costs of production for the ducklings.

MATERIALS AND METHODS

The present study was carried out at the Poultry Department, Faculty of Agriculture, Alexandria University. Data for this investigation have been collected during the period from 1990 to 2000 from three parent duck flocks comprising the Pekin, Muscovy and Khaki-Campbell strains belonging to ten farms from each of the governmental and private sectors and produced in 116 cycles (436422 ducklings day-old). Random samples of duck farms in Behaira, Kafr El-Sheikh, Demietta, Gharbeya, Giza and Dakahlia Governorates were included in this study. Production and economic data were collected from the accounts of balance sheet of the farm .

Production aspects include

Feed intake (g feed/duckling/day) and feed conversion (g feed/g gain) through the rearing period (4-23 weeks of age).

Economic aspects

Fixed costs: Including depreciation of the buildings and equipment.

Variable costs: Including price of ducklings, feed, energy and water, medicine and vaccine, wages of labour, and other costs

Statistical analysis: The data were classified and tabulated on Microsoft(1997) Excel (6) in Windows 98 then, were analyzed by statistical program on *SPSS 8 (1997)* Windows. Means and standard errors for all studied traits were calculated.

Economic efficiency is computed according to Debertin (1986) and John and Orazem (1978) as follow:

1 - Net income = Total return – Total costs

2 - Sidelong net income = Total return – Total variable costs

3 - Net income / Total fixed costs

4 - Total return / Total variable costs

5 - Total return / Total costs

Production function: For 100 ducklings of the Pekin, Muscovy and Khaki-Campbell at the end of rearing period the regression gross returns on each of the variable costs (price of ducklings, $\mathbf{X_1}$; feed costs, $\mathbf{X_2}$; energy and water, $\mathbf{X_3}$; medicine and vaccine, $\mathbf{X_4}$; wages of labour, $\mathbf{X_5}$ and other costs, $\mathbf{X_6}$) were analyzed by using the following multiple regression equation (Snedecor and Cochran, 1981):

$$\mathbf{Y = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6}$$

RESULTS AND DISCUSSION

Production aspects

Effect of strains

The means and their standard errors of feed intake (g feed/duckling/day) and feed conversion (g feed/g gain) during 4-23 weeks of age are shown in Table 1.

The averages of feed intake were 138.68, 142.55 and 143.01 g feed/duckling/day, for the Pekin, Muscovy and Khaki-Campbell ducklings, respectively. The differences among these strains were highly significant. These results were higher than those reported by Bird (1986) who found that feed consumption during 0-20 weeks of age was 10.3 kg for Cherry Vally and 8.9 kg for Khaki-Campbell ducks. On the other hand, these results were lower than those reported by Olver (1995) who found that the average of feed consumption (kg feed/ducking) for the Pekin ducks during 8-20 weeks of age is 17.3 kg.

The averages of feed conversion (g feed/g gain) were 8.12, 9.93 and 8.79 for the Pekin, Muscovy and Khaki-Campbell ducklings, respectively. The Pekin ducklings had the best significant mean followed by the Khaki-Campbell and Muscovy ducklings. The feed conversion was the poorest for Muscovy ducklings than the other two strains, which may be due to that the birds of Muscovy ducklings used, were F2 or F3 not true F1 hybrid. The differences among these strains were highly significant. These results are in agreement with El-Sheikh (1999).

Effect of season

The seasonal averages of feed intake (g feed/ducklings/day) were 137.27, 135.14, 143.02and 133.91 g in the winter, spring, summer and fall seasons, respectively, as shown in Table 2. The summer season had the highest value followed by the winter, spring and fall seasons through 4-23 weeks of age. The differences among these seasons were significant. These results are in agreement with those reported by Osman *et al.* (1996) who found that, feed consumption, (kg feed/duckling/period) for Pekin ducklingss were lower in winter season than fall season.

The seasonal averages of feed conversion (g feed/g gain) were 9.29, 8.46, 9.97and 8.46 for the winter, spring, summer and fall seasons, respectively. The spring and fall seasons had the best values followed by the winter and summer seasons through 4-23 weeks of age .The feed conversion was the poorest in the summer season than the other seasons which may be due to the raise in feed consumed per bird and the reduction in body weight gain The differences among the four seasons were highly significant. These results are in agreement with those reported by Hamdy *et al.* (1987) who showed that the feed conversion values for the Pekin ducks were the highest in winter followed by spring, autumn and summer, respectively.

Effect of sector

Comparing feed intake among sectors, it is obvious that, the means of the governmental and private sectors, were 148.83 and 126.46 g feed/ducklings/day respectively, as shown in Table 3. The increase in feed intake per duckling in the governmental sector than in the private sector may be due to the increase in the amount of feed given per bird. The differences among these sectors were highly significant. These results are in agreement with those reported by Zatter (1998) who found that the averages of feed consumption (kg feed/bird) were higher in investment sector than in the cooperative and private sectors.

For feed conversion (g feed/g gain), the means were 9.24 and 8.34 for the governmental and private sectors, respectively. The private sector had the best mean compared with the governmental sector, which may be due to utilizing proper management by private sector to prevent losses from colds and diseases and providing birds with good nutrition. The differences between the two sectors were significant. These results are in agreement with those reported by Abd El-Ghany (1985) who found that the feed conversion (kg feed/kg live weight) for broiler chicks was higher in the private sector (2.29) compared with governmental sector (3.31).

Economic aspects

Costs, returns, economic efficiency and production function per 100 ducklings for the Pekin, Muscovy and Khaki-Campbell ducklings at the end of rearing period (23 weeks of age) for the private sector based on the price of 1997/1999 seasons were as follows:

The fixed costs at the end of rearing period were 174.66, 182.66 and 163.49 L.E. per 100 ducks for the Pekin, Muscovy and Khaki-Campbell ducklings, respectively, as shown in Table 4. The relative means of these fixed costs were 7.96, 6.53 and 7.86 % from the total costs as shown in Table 5. The analysis of variance showed that the differences among the three strains were significant. Duncan's test showed that the Muscovy and Pekin ducklings had the highest significant mean, while, the Khaki-Campbell ducklings had the lowest significant mean.

The means of the total variable costs were 2019.21, 2612.28 and 1915.44 L.E. per 100 ducks for the Pekin, Muscovy and Khaki-Campbell ducklingss, respectively, as shown in Table 4.The relative means of these variable costs were 92.03, 93.46 and 92.13 % from the total costs as shown in Table 5. The differences among the three strains were highly significant. The Muscovy ducklings had the highest significant mean and the Khaki-Campbell ducklings had the lowest significant mean, however, the difference with the mean of the Pekin ducklings was not significant. These results were in agreement with those reported by Fouad (1985) who reported that the relative total variable costs from the total costs ranged from 91.43 % to 95.9% .

The ducklings and feed costs have the greatest portion in total cost. The first item accounts for 15.95, 29.87 and 16.83% and the second item accounts for 59.35, 50.70 and 58.58% of the total costs of producing 100 rearing ducks for the Pekin, Muscovy and Khaki-Campbell ducklings, respectively, as shown in Table 5. The differences among the three strains for the two items were highly significant.

The total costs were 21293.87, 2794.95 and 2078.94 L.E. per 100 ducks for the Pekin, Muscovy and Khaki-Campbell ducklings, respectively, as shown in Table 4, and the differences among them were highly significant. The amounts of total returns at the end of rearing period were 2467.04, 2929.63 and 2461.11 L.E. per 100 ducks for the Pekin, Muscovy and Khaki-Campbell ducklings, respectively, as shown in Table 4, and the differences among them were highly significant.

The averages of the total returns/total costs per 100 ducklings at the end of rearing period were 1.12, 1.04 and 1.18 % for the Pekin, Muscovy and Khaki-Campbell ducklings, respectively (Table 6), and the differences among them were highly significant. Duncan's test showed that the Khaki-Campbell ducklings had the highest significant mean, while, the Muscovy ducklings had the lowest mean. The net income obtained by the Khaki-Campbell ducklings was higher than that of the other two strains as well as the economic efficiency was better which may be due to the income of the amount of total returns for the Khaki-Campbell ducks which was better than the other two strains.The production function

The multiple regression analysis for estimation the function relationship between the gross returns and variable costs per 100 ducklings for the Pekin (P), Muscovy (M) and Khaki-Campbell (K.C) ducklings at the end of rearing period were:

A-For Pekin ducklings

$Y_P = 464.69 + 1.34 X_1 + 3.10 X_2 - 17.76 X_3 - 19.11 X_4 + 0.75 X_5 - 2.86 X_6$

$^*R^2 = 0.826$

B-For Muscovy ducklings

$Y_M = 393.58 + 1.04 X_1 + 3.09 X_2 - 21.81 X_3 - 18.41 X_4 - 0.81 X_5 - 4.31 X_6$

$^*R^2 = 0.889$

C-For Khaki-Campbell ducklings

$Y_{K.C} = 451.66 + 1.96 X_1 + 4.11 X_2 + 0.38 X_3 - 14.96 X_4 - 10.75 X_5 - 12.51 X_6$

$^*R^2 = 0.907$

D-For all ducklings

$Y_{All} = 428.31 + 1.79X1 + 3.81 X2 + 0.47 X3 - 12.81 X4 - 14.77 X5 - 9.39 X6$

*R2 = 0.874

$^*R^2$ = Restricted coefficient.

Table 1. Means and standard errors ($\bar{X}\pm SE$) of feed intake (g feed/duckling/day) and feed conversion (g feed/g gain) for Pekin, Muscovy and Khaki-Campbell ducklings through 4-23 weeks of age as affected by strains and sectors.

Strain	Sector	Circle count.	Feed intake (g.feed/duck/day)	Feed conversion (g.feed/ g.gain)
Pekin	Governmental	11	153.51±3.62	8.54±0.36
	Private	10	122.37±4.04	7.76±0.34
Overall mean		21	138.68±2.83	8.12±0.27
Muscovy	Governmental	8	144.93±5.05	9.64±0.29
	Private	3	136.20±8.77	10.72±0.33
Overall mean		11	142.55±4.37	9.93±0.27
Khaki-Campbell	Governmental	9	148.79±5.24	9.43±0.49
	Private	11	127.53±4.14	8.34±0.16
Overall mean		20	143.01±3.14	8.79±0.25

Table 2. Means and standard errors ($\bar{X}$±SE) of feed intake (g feed/duckling/day) and feed conversion (g feed/g gain) through 4-23 weeks of age as affected by strains and seasons

Strains	N	Winter	N	Spring	N	Summer	N	Fall	N	Overall mean
	Feed intake (g feed/duckling/day)									
Pekin	2	125.98	8	134.43 ±7.18	-	-	7	147.90±6.63	17	138.68 ±2.83^{b}
Muscovy	4	144.27 ±6.06	2	138.31	1	134.47	4	142.63±4.51	11	142.55 ±4.37^{a}
Khaki-Campbell	7	137.27 ±6.87	5	135.36 ±7.46	4	135.18 ±9.86	4	130.64±2.49	20	143.01 ±3.14^{a}
Overall mean	13	137.27 ±5.96^{B}	15	135.14 ±6.40^{B}	5	143.02 ±5.73^{A}	15	133.91±4.32^{B}	48	141.16 ±3.28
	Feed conversion (g feed/g gain)									
Pekin	2	8.82	8	8.15 ± 0.42	-	-	7	7.96 ± 0.39	17	8.12 ± 0.27 ^{b}
Muscovy	4	10.48 ± 0.11	2	9.19	1	11.31	4	9.41 ± 0.26	11	9.93 ± 0.27 ^{a}
Khaki-Campbell	7	8.75± 0.47	5	8.66 ± 0.52	4	9.64 ± 0.63	4	8.30± 0.34	20	8.79 ± 0.25 ^{b}
Overall mean	13	9.29 ± 0.36 ^{A}	15	8.46 ± 0.30 ^{B}	5	9.97 ± 0.59 ^{A}	15	8.46 ± 0.25 ^{B}	48	8.84 ± 0.18

Means having the different small or capital letters in each column or row differ significantly ($P \leq 0.05$)

Table 3. Means and standard errors ($\bar{X}$±SE) of feed intake (g feed/duckling/day) and feed conversion (g feed/g gain) for governmental and private sector through 4-23 weeks of age.

Sector	Circle count.	Feed intake (g feed/duckling/day)	Feed conversion (g feed/ g gain)
Governmental	28	148.83±0.72	9.24±0.22
Private	24	126.46±0.53	8.34±0.34
Overall mean	52	138.50±0.63	8.82±0.27

Table 4. Means and standard errors ($\bar{X}\pm SE$) of costs and returns in Egyptian pounds (L.E) per 100 Pekin, Muscovy and Khaki-Campbell ducklings at 23 weeks of age for the private sector based on the price of 1997/1999 seasons.

Description		Pekin	Muscovy	Khaki-Campbell
Circle count		3	3	3
Fixed costs	Depreciation of the buildings	118.85±0.95 ^{ab}	124.29±2.12 ^{a}	113.18±1.94 ^{b}
	Depreciation of the equipments	55.80±0.64 ^{a}	58.37±1.82 ^{a}	50.31±1.90 ^{b}
	Total fixed costs	174.66±1.57 ^{a}	182.66±3.71 ^{a}	163.49±3.83 ^{b}
Variable costs	Duckling costs	350.00±0.00 ^{b}	835.00±0.00 ^{a}	350.00±0.00 ^{b}
	Feed costs	1302.25±7.35 ^{b} *	1417.16±8.00 ^{a} **	1217.99±6.88 ^{c} ***
	Energy and water costs	48.49±1.02	47.34±1.92	48.92±2.78
	Medicine and vaccine costs	70.29±1.61	66.65±2.92	63.99±1.88
	Labor costs	113.73±1.64 ^{ab}	117.85±0.85 ^{a}	108.06±2.78 ^{b}
	Other costs	134.44±1.25 ^{a}	128.27±2.29 ^{b}	126.47±1.02 ^{b}
	Total variable costs	2019.21±5.61 ^{b}	2612.28±7.33 ^{a}	1915.44±6.91 ^{c}
Total costs		21293.87±4.27 ^{b}	2794.95±9.18 ^{a}	2078.94±9.8 ^{c}
Return	Ducks (End period) price	2402.00±12.87 ^{b}	2864.00±13.13 ^{a}	2400.66±11.58 ^{b}
	Dropping price	60.13±1.27	60.33±1.74	55.86±1.16
	Empty bags price	4.90±0.03 ^{b}	5.30±0.03 ^{a}	4.58±0.02 ^{c}
	Total return	2467.04±13.93 ^{b}	2929.63±14.72 ^{a}	2461.11±12.28 ^{b}

Means having the same small letter in each raw are not significantly different ($p\leq 0.05$)

*17.00 kg/Pekin duck/period **18.50 kg/Muscovy duck/period

***15.90 kg/Khaki-Campbell/period

Table 5. Relative means and standard errors ($\bar{X}\pm SE$) of fixed and variable costs from the total costs per 100 Pekin, Muscovy and Khaki-Campbell ducklings at 23 weeks of age for the private sector based on the price of 1997/1999 seasons.

Description		Pekin	Muscovy	Khaki-Campbell
Circle count		3	3	3
Fixed costs	Depreciation of the buildings	5.41±0.05	4.45±0.08	5.44±0.08
	Depreciation of the equipments	2.54±0.03	2.08±0.06	2.42±0.08
	Total fixed costs	7.96±0.08	6.53±0.12	7.86±0.16
Variable costs	Duckling costs	15.95±0.03	29.87±0.16	16.83±0.08
	Feed costs	59.35±0.23	50.70±0.14	58.58±0.15
	Energy and water costs	2.21±0.05	1.69±0.07	2.35±0.14
	Medicine and vaccine costs	3.20±0.08	2.38±0.10	3.07±0.08
	Labor costs	5.1±0.07	4.21±0.04	5.19±0.13
	Other costs	6.13±0.07	4.59±0.09	6.08±0.08
	Total variable costs	92.03±0.08	93.46±0.12	92.13±0.16

Table 6. Means and standard errors ($\bar{X}\pm SE$) of economic efficiency per 100 Pekin, Muscovy and Khaki-Campbell ducklings at 23 weeks of age for the private sector based on the price of 1997/1999 seasons.

Description	Pekin	Muscovy	Khaki-Campbell
Circle count.	3	3	3
Net income (L.E.)	273.16+11.16 ^{b}	134.68+8.09 ^{c}	382.17+13.53 ^{a}
Sidelong net income	447.82+9.79 ^{b}	317.35+11.73 ^{c}	545.66+10.31 ^{a}
Net income / Fixed costs	1.56+0.13 ^{b}	0.73+0.03 ^{c}	2.34+0.23 ^{a}
Total return / Total variable costs	1.22+0.003 ^{b}	1.12+0.003 ^{c}	1.28+0.006 ^{a}
Total return / Total costs	1.12+0.003 ^{b}	1.04+0.003 ^{c}	1.18+0.006 ^{a}

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تحليل بيانات صفات ثلاث سلالات من البط فى مصر
٢- الغذاء المستهلك والكفاءة التحويليه خلال مرحلة الرعاية وكفاءتها الاقتصادية

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تم تجميع بيانات ميدانيه على عدد ٤٣٦٤٢٢ بطه عمر يوم تمثل ثلاث سلالات مختلفه من البط هى : البكينى والمسكوفى والخاكى كامبل فى محافظات البحيره وكفر الشيخ ودمياط والغربيه والجيزه والدقهليه. جمعت البيانات خلال الفتره من ٤-٢٣ أسبوعا من العمر وذلك خلال السنوات من ١٩٩٠-٢٠٠٠م وكانت تمثل عشره مزارع لكل من القطاعين الحكومى والخاص حيث تم دراسه كميه الغذاء المستهلك (جم علف/البطه/اليوم) ، الكفاءه التحويليه (جم علف/جم زياده فى وزن الجسم) ، التكاليف ، الايرادات ، الكفاءه الاقتصاديه ، دوال الانتاج فى نهايه مرحله الرعايه(٢٣ أسبوعاً من العمر)

وكانت أهم النتائج المتحصل عليها كالأتى:

١- كـــان متوسط الغذاء المستهلك (جم علف/بطه/اليوم) هو ١٣٨,٦٨ ، ١٤٢,٥٥ ، ١٤٣,٠١ جـــم لكلا الجنسين من للبط البكينى والمسكوفى والخاكى كامبل على التوالى وكان متوسط هـــذه الصفه هو ١٣٧,٢٧ ، ١٣٥,١٤ ، ١٤٣,٠٢ ، ١٣٣,٩١ جم لفصول الشتاء والربيع والصيف والخريف على التوالى وأيضا كان المتوسط هو ١٤٨,٨٣ ، ١٢٦,٤٦جم لكل من القطاعين الحكومى والخاص على التوالى.

٢- بلغ متوسط الكفاءه التحويليه للغذاء (جم علف/ جم زياده فى وزن الجسم) ٨,١٢ ، ٩,٩٣ ، ٨,٧٩ لكـــلا الجنسين من البط البكينى والمسكوفى والخاكى كامبل على التوالى. بينما كان متوســـط تلك الصفه هو ٩,٢٩ ، ٨,٤٦ ، ٩,٩٧ ، ٨,٤٦ لفصول الشتاء والربيع والصيف والخـــريف على التوالى وأيضا كان المتوسط ٩,٢٤ ، ٨,٣٤ لكل من القطاعين الحكومى والخاص على التوالى.

٣- بلغـــت التكاليف الثابته ٧,٩٦%، ٦,٥٣%، ٧,٨٦% بينما كانت التكاليف المتغيره ٩٢,٠٤ %، ٩٣,٤٧%، ٩٢,١٤% مـــن اجمـــالى التكالـــيف الكلـــيه. كان ثمن البط والعلف أهم عنصـــرين مؤثريـــن فى التكاليف حيث كان العنصر الأول يمثل ١٥,٩٥%، ٢٩,٨٧%، ١٦,٨٣% والعنصـــر الثانى يمثل ٥٩,٣٥%، ٥٠,٧٠%، ٥٨,٥٨% من اجمالى التكاليف الكليه لانتاج ١٠٠ بطه خلال تلك الفتره .