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MEAT PRODUCTION EFFICIENCY OF TWO LINES OF PEKIN DUCKS UNDER TWO DIFFERENT FEEDING SYSTEMS

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ABSTRACT : *The present work was carried out in the Farm of French group at Sadat City, El Menofiya Government, which cooperated with the French Gourmand (Duck breeders) selection group. The experiment was conducted in 2012 for two generations, in order to, study the effect of generations, lines, sexes, and feeding systems on meat efficiency and some carcass traits of two lines PKL (light line) and PKM (medium line) of Pekin ducks during the rearing periods. One thousand and sixty hundred (1600) ducklings were used. Each line (PKL) and PKM) was represented by 800 ducklings, 400 for each generation.*

The following results were obtained

1. *It was found that all factors (generation, line, feeding system and sex) had significant effect on meat production as Kg/m^2 but did not affect fattening index and house efficiency.*
2. *The second generation had higher meat production Kg / m^2 (7.48) than the first generation (7.25 Kg / m^2).*
3. *Overall means for line effects obtained that PKL line had higher meat production (7.41 Kg/m^2) than PKM line (7.33 Kg/m^2).*
4. *Ducklings fed two meals daily were produced higher meat production (9.26 Kg/m^2) than those fed ad libtium (5.47 Kg / m^2).*

5. House efficiency of the PKM line was higher (308.43 %) than the PKL line (283.19 %). Males, as expected, had higher house efficiency (348.47 %) than females (243.45 %).

6. Means of life body weight before slaughtering (50 days of age) were 3748.81 ± 43.30 and 3959.61 ± 43.30 for the first and second generation. PKL line had higher life body weight (4094.29 ± 43.38 g) than PKM line (3614.13 ± 43.30 g).

7. In general, ducklings of both lines fed two meals daily had higher live body weight, dressing weight, boneless weight and vicera weight than ducklings with ad libtum feeding system and PKL ducklings were more efficient under two meals feeding system than PKM line.

8. Also males were more efficient for meat production than females under all studied feeding systems. Breeders and producers must take it in consideration ion the interaction effects between lines, feeding system and sex when they applied and produced ducklings for meat production.

Key words: *Fattening index, house efficiency, Pekin ducks.*

INTRODUCTION

Like the meat production of all poultry species, the world duck meat demand and production is still increasing. In 2009, 3.8 million tones of duck meat was produced in world, this value is about one million more than the value in year 2000 and one million and 3000 tones than 2006 (Hans, 2008 and Ariane, 2012). The Egyptian duck production was 42000 tones in 2006 and it is equal to 1.7 % from the world production in this year (2 millions and 5000 tones). By this production capacity, Egypt take the second place after China (2 million and 383 thousand tones or 94.3 % from the world production (Hans, 2008). According to Ministry of Agriculture and land reclamation (Egyptian statisticstics of poultry, 2012), the number of Egyptian farms are 588 overall Egypt and the number of activated houses are 813. The total number of duck layers (activated) 1,650,956 and the

deactivated capacity were 686277.

In developing countries, such as Egypt, having shortage in animal protein supply which may consider all available protein resources for human nutrition (Singh *et al.*, 1981). It was reported that about 25 % from the total number of farms still deactivated and this means about 41 % of the total number of duck parents were deactivated capacity Egyptian statistic of Poultry (2012). Meat production ducks (Mule ducks hybrid) were produced from mating females of Pekin Ducks ((PKL or PKM lines) with males from Muscovy ducks. Therefore, reducing feed costs of parent stock female Pekin ducks specially during rearing periods which may be lead to decreasing the cost of producing meat production of ducks (Mule ducks) and by this way reducing the cost of meat production of ducks.

The present study was undertaken to determine the effect of some factors such as generations, lines, sexes and feeding system on the meat productivity of parent stock ducks (Pekin ducks) and their carcass traits under the conditions of commercial farmers in Egypt.

MATERIALS AND METHODS :

The present work was carried out in the Farm of French group at Sadat City, El Menofiya Government, which cooperated with the French Gourmand (Duck breeders) selection group. The experiment was conducted in 2012 for two generations, in order to, study the effect of generations, lines, sexes, and feeding systems on meat efficiency and some carcas traits of Pekin ducks.

1. Pekin duck lines :

Two lines of Pekin ducks (PKL, light line) and (PKM, medium line) were used during the rearing periods. One thousand and sixty hundreds (1600) ducklings were used. Each line (PKL) and PKM) was represented by 800 ducklings, 400 for each generation. Two feeding systems were applied, two meals each day and *ad libtum*. Table (1) illustrate the distribution of birds in each line and

each generation on the different feeding systems.

Table (1) : Distribution of birds on treatment factors.

Generation	Strain	Sex	Feeding system	No. birds
G1	PKM	Males	*Ad. Lib.*	100
	PKM	Males	Two meals	100
	PKM	Female	Two meals	100
	PKM	Female	*Ad. Lib.*	100
	PKM			400
G1	PKL	Males	*Ad. Lib.*	100
	PKL	Males	Two meals	100
	PKL	Female	Two meals	100
	PKL	Female	*Ad. Lib.*	100
	PKL			400
Total G1				800
G2	PKM	Males	*Ad. Lib.*	100
	PKM	Males	Two meals	100
	PKM	Female	Two meals	100
	PKM	Female	*Ad. Lib.*	100
	PKM			400
G2	PKL	Males	*Ad. Lib.*	100
	PKL	Males	Two meals	100
	PKL	Female	Two meals	100
	PKL	Female	*Ad. Lib.*	100
	PKL			400
Total G2				800
Total birds				1600

2. Stock management : A total number of 800 birds in each generation

were used. One day ducklings from both lines (PKL and PKM) were exported from French Gourmand selection group (Duck breeders) in Cooperation with the Egyptian French group at Sadat City. The Pekin ducks were housed in semi open house on a straw litter. They were grouped in Parcs 200 around a heater (not more than 20 ducklings / m^2) at 35˚C, and the house temperature was recorded daily. The house was divided to 8 separate departments. These departments were used as 4 departments for the PKL line and 4 for the PKM line. Each sex of each line with one type of feeding system was represented with 100 ducklings (Table 1).

The temperature falls 1˚C every days after 5 days and will be at 25 – 26˚C at 4 weeks. The light program was 24 hours at the first four days, then 22 hours till the end of rearing period. The light intensity was 40 lux for the first 4 days, then it is 10 lux till the end of rearing period. The water system was 1 circular drinker for 50 ducklings, at 1 – 5 days, then, 1 for 80 ducklings at 6 – 16 days, and 1 for 100 at 17 – 50 days.

3. Feeding composition :

Table (2) presented the composition of the experimental diet. Ducklings were fed *ad libitum* from one day till 4 weeks. Ducklings were fed with starter diet from one day till 4 weeks, then from 4 – 6 weeks with grower diet, then in the last week, duckling fed a finisher diet.

At 7 weeks of age, 5 birds from each sex with each feeding system were chosen at random and slaughtered. to estimate carcass traits.

Table (2) : Composition of the experimental diet (Kg / Ton).

Ingredients	Starter 1–4 wks	Growing 4-6 wks	Finishing 6-7 wk
Yellow corn	615	662.5	697
Soybean meal (44%)	325	273	220
Limestone	18	17	17.5
Premix	3	3	3
Mono\Mineral	18	18	18
Oil	4	3	3
Methionen	0	7	25
Fish meal (72%)	2	1.5	1.5
Total	15	15	15
	1000	1000	1000
Chemical analysis :			
Energy Kcal/Kg diet	2845.56	2952.57	3108.75
Crude protein %	20.2	18.10	16.03
Methionen %	0.55	0.47	0.44
Cysteen %	0.84	0.74	0.68
Lysin %	1.08	0.94	0.79
Cal. %	1.04	0.97	0.96
Avalibilable (P) %	0.50	0.47	0.43
Sodiam %	0.16	0.16	0.16

4. Studied traits :

The following traits were measured :

1. House efficiency (H.E.) was estimated using the following formula by (Meltzer, 1980 and Soltan and Kusainova, 2012).

$$H.E. = \frac{\text{meat produced (Kg) / m2 * 100}}{\text{Feed efficiency}}$$

2. Fatting index (F.I.) was estimated as the formula from (Soltan and Kusalnova, 2012)

$$F.I. = \frac{\text{Body weight (Kg)}}{\text{Feed efficiency}} \times 100$$

3. Caracas trait was estimated at 7 weeks of age as the following
   a. Weight of eviescerated caracas (g).
   b. Dressing % from live body weight.
   c. Weight of edible parts of whole caracas (g).
   d. Percentage of muscles (bonless meat from live body weight) %.

Statistical analysis :

Data were computerized and analyzed (SPSS 1997) according to the following Model. Also, significant difference among means were detected by Duncan (1955).

$$Y_{ijkm} = \mu + G_i + L_j + S_K + F_m + (GxL)_{ij} + (GxS)_{iK} + (GxF)_{im} + Y_{iokmn} (LxS)_{jK} + (LXF)_{jm} + (FxLxS)_{mjK} + (GxLxF)_{ijm} + (GxSxF)_{iKm} + (LxSxF)_{jKm} + (GxLxSxF)_{ijKm} + e_{ijkmn}.$$

Where :

Y_{ijkmm} = Observation from generation I, line j, Sex k and feeding system m.

G_i = Fixed effect of (i) generation.

L_j = Fixed effect of (j) line.

S_K = Fixed effect of (K) sex.

F_m = fixed effect of (m) feeding system

$(GxL)_{ij}$ = Interaction effect of G_i and L_j.

$(GxS)_{iK}$ = Interaction effect of G_i and S_K.

$(GxF)_{im}$ = Interaction effect of G_i and F_m.

$(LxS)_{jK}$ = Interaction effect of (L_j and S_K.

$(LxF)_{jm}$ = Interaction effect of L_j and F_m.

$(FxS)_{mK}$ = Interaction effect of S_K and F_m.

$(GxLxS)_{ijk}$ = Interaction effect of G_i, L_j and S_K.

$(GxLxF)_{ijm}$ = Interaction effect of gi, L_j and F_M.

$(GxSxF)_{ikm}$ = Interaction effect of G_i, S_K and F_m.

$(GxLxSxF)_{ijkm}$ = Interaction effect of G_i, L_j, S_K and F_m.

e_{ijkmn} = Residral effect.

RESULTS AND DISCUSSION :

1. Meat production and efficiency :

It was noticed that all factors (generations, lines,

feeding system and sex) had significant effects on meat production as Kg / m^2, but did not affect fattening index and house efficiency. This may be statistically due to higher residual effect, where it included other interaction effects which had significant effect on feed efficiency and not affected body weight (Tables 3). Similar effects were reported by Mazanowski and Ksiazkiewicz (2001).

The second generation had higher meat production Kg / m^2 (7.48) than the first generation (7.25 Kg / m^2). Overall means for line effects obtained that PKL line had higher meat production 7.41 Kg / m^2 than PKM line 7.33 Kg /m^2 (Table 3).

Ducklings fed two meals daily were produced higher meat production 9.26 Kg / m^2 than those feed Libtium 5.47 Kg / m^2. However, Solomon *et al.* at (2007), found higher meat production for birds fed *ad libtum* feeding system than birds with restricted feeding amount (65, 74 and 82 %). These results could be explained by interaction effect, where ducklings of PKM line had (5.34 Kg / m^2) for females and 5.85 Kg / m^2 for males under *ad libtum* feeding system, where the corresponding values under two meals feeding were 8.12 Kg / m^2 for females and 9.04 Kg / m^2 for males. In respect of PKL line, females produced 5.24 Kg / m^2 and males produced 5.46 Kg / m^2 under *ad libtum* system and it were 9.10 Kg/m^2 for females and 9.82 Kg / m2 for males under the system of two meals daily. Figures (1, 2, and 3) illustrate these interaction effects.

Table 3

Fig 1

Fig 2

Fig 3

House efficiency of the PKM line was higher (308.43 %) than the PKL line (283.19 %). This may be due to better feed efficiency of the PKM line (2.12) than PKL line (2.98) during the period of 28 – 50 days, however this difference was not significant. In addition fattening index for PKM was 123.49 % higher than that of PKL line 113.37 % and also the difference was not significant. Mazanowski and Ksiazkiewics (2001) reported that house efficiency was 404 % and Kokoszynski *et al.* (2010) found house efficiency of 225 – 421 %.

Males, as expected, had higher house efficiency (348.47 %) than females (243.45 %) similar trend was noticed by Soltan and Kusainova (2012) and Kusainova *et al.* (2012 a, b and c).

2. Carcass traits :

It was showed that highly significant differences were noticed among generations, lines, feeding system and sexes for body weight before slaughtering, dressing weight, boneless weight, feather weight,

blood weight and vicera weight. In addition, interaction (G*L), (G * F) and (L * F) had highly significant effect on most of carcass traits, also this effect was noticed for (G * L * F) interactions. Similar significant differences were reported and noticed by Valdive *et al.* (2000) and Abdallah *et al.* (2001).

Means of life body weight before slaughtering (50 days of age) were 3748.81 ± 43.30 and 3959.61 ± 43.30 for the first and second generation, respectively. (Table 4) Such difference may be due to the environmental changes specially due to the temperature degress of weather (inner house) during both generation.

Also, PKL line had higher life weight (4094.29 ± 43.38 g) than PKM line (3614.13 ± 43.30 g), this may be due to faster growing for PKL line under two meals feeding system (5089.16 g for females and 5352.77 g for males) than those for PKM line (3475.00 g for males and 3949.61 g for females). Vanli *et al.* (1994) reported carcass weight of 961.3 g for Pekin ducks at 8 weeks of age. Therefore, PKL line had higher values for dressing weight, boneless weight, feather weight, blood weight and viscera weight than those obtained for PKM line (Table 4).

In general, ducklings of both lines fed two meals daily had higher live body weight, dressing weight, boneless weight and vicera weight than ducklings with *ad libtum* feeding system. Also, PKL ducklings were more efficiend under two meals feeding system than PKM line (Table 4).

As expected male ducklings of both lines had heavier weight before slaughtering than females (3979.66 vs. 3728.77 g). In addition, males had higher dressing weight, bonleless weight and vicea weight than females (Table 4). Figures (4, 5 and 6), illustrate the performance of carcass traits (life weight, dressing weight, and vicera weight) of PKM and PKL lines in each generation according to feeding system and sex effects. The results were in agreement with those obtained by Valdine *et al.* (2000), Mazanowski and Ksiazkieniecz (2001).

In general, the present results indicated that PKM line was more efficient than PKL line under *ad libtum* feeding system, but PKL line was more efficient for meat production than PKM line under two meals feeding system. Also males were more efficient for meat production than females under all studied feeding systems. Breeders and producers must take it in consideration the interaction effects between lines, feeding system and sex when they applied and produced ducklings for

meat production.

Table 4

Fig 4

Fig 5

Fig 6

RERERENCES

Ariane, H. (2012). Amino acid nutrition knowledge lacking in duck meat production. World Poultry Vol. 28 : 17 – 19.

Duncan, D.B. (1955). Multiple ranges and multiple F test Biometrics, 11 : 1 - 42.

Egyptian Statistics of Poultry (2012). Arab Republic of Egypt ministry of Agriculture

and land Meclamation economic Affaims sector.

Hans, W.W. (2008). The time spatial dynamics of global poultry meat production between 1970 and 2006 and perspectives for 2016 Zoo technical international World's Poultry Journal 16 – 26.

Kokoszynski, D., H. Konytkowska and B. Korytdowski (2010). Companion of some meat traits of ducks from P 44 and P 55 flocks. Acta Scientiarum Pobnorum Zoo technica; 2010, 9 : 2, 21 – 28.

Mazanowski, A. and J. Ksiazkiewicz (2001). Effects of feeding on rearing performance of cross breds of Muscovy drakes and Pekin type ducks and on fatty liver weight after fattening with Maize. Annals of Animal Science; 2001, 1 : 1, 121 – 137.

Meltzar, A. (1980). Dense brooding and rearing of broilers. 6 European Poultry Conf., Hamburg, West Germany, Vol. IV, (8 – 16), 1980.

Singh, B.P., B. Panda, S.D. Ahaja, S.K. Agarwal, M. Prakash Babu, A.K. Shivastava and O.P. Butta (1981). Development of quails for meat and egg. Central avian Res. Inst. Izatnagar.

Solomon, J.K.Q., R. Auszin and R.N. Cumberbatch (2007). Restricted feeding of Pekin ducks a comparison of three levels of quantitative feed restriction and full feed on the growth. Carcass and economic in dices. Livestock research for Rural Development, 2007, 19 : 7, article (91).

Soltan, M.E. and Z. Kusainova (2012). Performance of broiler chickens in different farming with different feed conversions under Egyptian conditions. Minufiya Journal of

Agricultural Research Volume 37 No. 5 part (1).
SPSS (1997). P.C. Programe. By Spssinc., North Midhigan U.S.A.
Valdivie, M., M. Fernandez, B. Sanchez and J. Aveleira (2000). Pekin ducks grow well in rice fields. World Poultry, 2000, 16 : 12, 42 – 34.
Vanli, Y., O. Karaca, T. Altin, M. Demirel, E. Gozutok and H. Tokay (1994). Meat producing ability of Pekin ducks. Foga, Turk Veterinerlik Ve Hayvanclk Dergisi, 1994, 18 : 4, 229 – 235.

كفاءة إنتاج اللحم لخطين من البط البكين تحت نظامين مختلفين من التغذية

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الملخص العربي

أجريت هذه الدراسة بمزرعة المجموعة الفرنسية بمدينة السادات بمحافظة المنوفية والتي تتعاون مع مجموعة جورماند الفرنسية لتربية البط والانتخاب . وأجريت التجربة خلال عام ٢٠١٢ لمدة جيلين من أجل دراسة تأثير الأجيال والخطوط والجنسين ونظام التغذية علي كفاءة إنتاج اللحم وبعض صفات الذبيحة في (خطين) خط PKL (خفيف الوزن) وخط PKM (متوسط الوزن) من البط البكين خلال فترة الرعاية . استخدم في التجربة عدد ١٦٠٠ من كتاكيت البط وكان كل خط بعدد ٨٠٠ بطة صغيرة بمعدل ٤٠٠ بطة لكل جيل . وكانت أهم النتائج ما يلي :

١ – لقد وجد أن كل العوامل (الجيل ، الخط ، نظام التغذية والجنس) حققت تأثير معنوي علي إنتاج اللحم ، (كجم / م^{٢}) ، ولكن لم تؤثر معنويا علي دليل التسمين

وكفاءة المسكن .

٢ – كان معدل إنتاج اللحم كجم / م^{٢} في الجيل الثاني (٧.٤٨) أعلي منه في الجيل الأول (٧.٢٥ كجم / م^{٢}) .

٣ – أوضح المتوسط العام لتأثير الخطوط أن خط (PKL) حقق معدل إنتاج لحم عالي (٧.٤١ كجم / م^{٢}) عن الخط (PKM) (٧.٣٣ كجم / م^{٢}) .

٤ – حققت صغار البط المغذاة مرتين يوميا معدل عالي من اللحم بلغ (٩.٢٦ كجم / م^{٢}) أعلي من مثيلتها تحت نظام التغذية الحرة (٥.٠٧ كجم / م^{٢}) .

٥ – كانت كفاءة المسكن في خط (PKM) أعلي (٣٠٨.٤٣ %) منه في خط (PKL) (٢٨٣.١٩%) . حققت الذكور كما هو متوقع معدل كفاءة للمسكن لإنتاج اللحم أعلي (٤٨.٤٧ %) من الإناث (٢٤٣.٤٥ %) .

٦ – بلغت متوسطات الوزن الحي قبل الذبح (٥٠ يوم من العمر ٣٧٤٨.٨١ ± ٤٣.٣٠) ، ٣٩٥٩.٦١ ± ٤٣.٣٠ لكل من الجيل الأول والثاني علي التوالي . وحقق خط (PKL) أعلي وزن حي قبل الذبح (٤٠٩٤.٢٩ ± ٤٣.٣٨ كجم) عن الخط (PKM) (٣٦١٤.١٤ ± ٤٣.٣٠) .

٧ – وبصفة عامة حققت صغار البط من كلا الخطين التي غذيت مرتين يوميا كانت أعلي في صفات الذبيحة والوزن الحي ووزن التصافي ووزن التشافي والأحشاء المأكولة عن مثيلتها عند نظام التغذية الحرة وكان الخط (PJK) أكثر كفاءة تحت نظام التغذية مرتين يوميا عن الخط (PKM) .

٨ – كانت الذكور أكثر كفاءة لإنتاج اللحم عن الإناث تحت كل نظم التغذية المدروسة . يجب أن يأخذ المربي أو المنتج في الاعتبار تأثير التداخل بين الخطوط ونظام التغذية والجنس عند إنتاج اللحم من صغار البط .

Table (3): Mean and standard errors of meat production (M), fattening index (FI) and house efficiency (HE) as affected by generations, lines, feeding system and sex.

				$(\bar{X} \pm SE)$		
Generation	Lines	Feeding system	Sex	M	HE	FI
Generation1				7.25±0.005[b]	295.53±12.73	118.21±5.09
Generation2				7.48±0.005[a]	296.39±12.73	118.55±5.09
	PKM			7.33±0.005[b]	308.73±12.73	123.49±5.09
	PKL			7.41±0.005[a]	283.19±12.73	113.27±5.09
		Ad. lib.		5.47±0.005[b]	278.70±12.73	111.48±5.09
		Two meals		9.26±0.005[a]	313.22±12.73	125.29±5.09
			Female	7.09±0.005[b]	243.45±12.73[b]	97.38±5.09[a]
			Male	7.64±0.005[a]	348.47±12.73[a]	139.39±5.09[b]
Generation1	PKM	*Ad. lib.*	Female	5.34±0.014[b]	185.53±36.00	74.21±14.40
			Male	5.85±0.014[a]	203.17±36.00	81.27±14.40
		Two meals	Female	8.12±0.014[b]	341.80±36.00[b]	136.72±14.40[b]
			Male	9.04±0.014[a]	458.83±36.00[a]	183.53±14.40[a]
	PKL	*Ad. lib.*	Female	5.24±0.014[b]	182.05±36.00	72.82±14.40
			Male	5.46±0.014[a]	196.27±36.00	78.51±14.40
		Two meals	Female	9.10±0.014[b]	383.19±36.00[b]	153.28±14.40
			Male	9.82±0.014[a]	413.43±36.00[a]	165.37±14.40
Generation2	PKM	*Ad. lib.*	Female	5.44±0.014[b]	326.70±36.00[b]	130.68±14.40[b]
			Male	5.78±0.014[a]	553.43±36.00[a]	221.37±14.40[a]
		Two meals	Female	9.18±0.014[b]	214.11±36.00[a]	85.65±14.40
			Male	9.85±0.014[a]	186.28±36.00[b]	74.51±14.40
	PKL	*Ad. lib.*	Female	5.18±0.014[b]	58.94±36.00[b]	23.58±14.40[b]
			Male	5.47±0.014[a]	523.51±36.00[a]	209.40±14.40[a]
		Two meals	Female	9.15±0.014[b]	255.28±36.00	102.11±14.40
			Male	9.82±0.014[a]	252.84±36.00	101.13±14.40

Means within the same column at the same factor carry different small superscripts are significant at level $P \leq 0.05$,

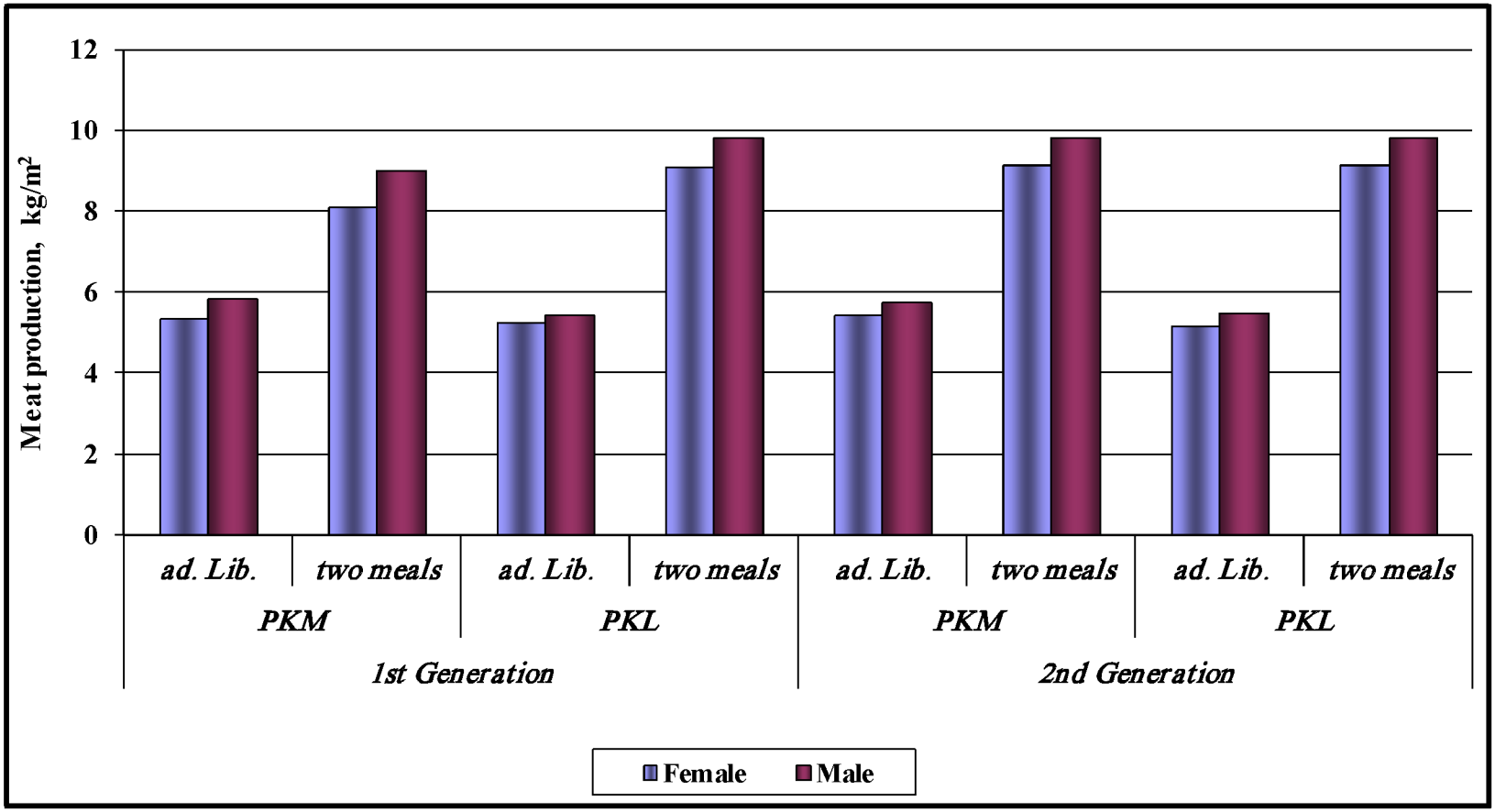

Fig (1): Meat production kg/m^2 of two lines of ducks in each generation according to sex and feeding system effects.

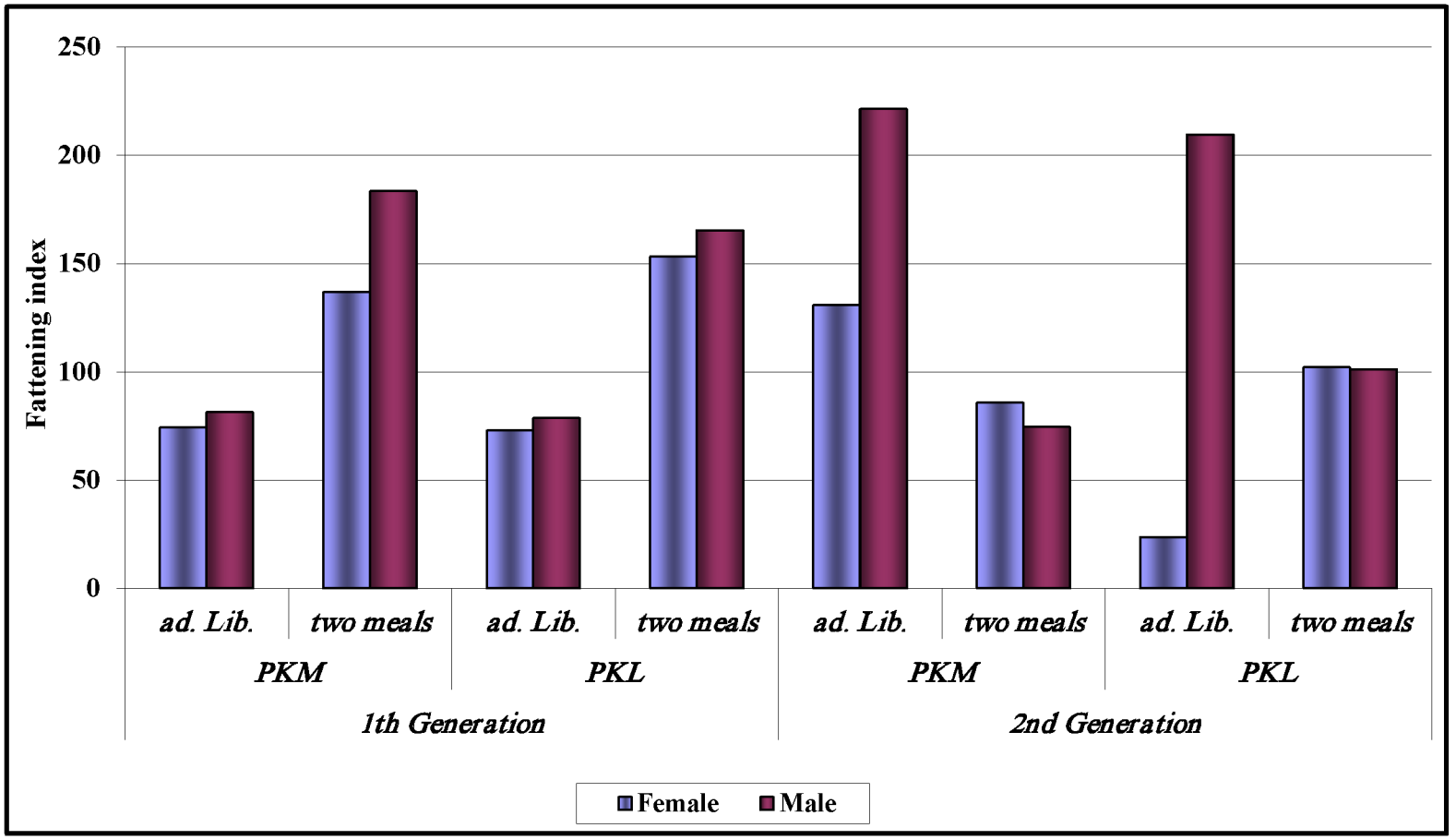

Fig (2) : Fattening index of two lines of ducks in each generation according to sex and feeding system effects.

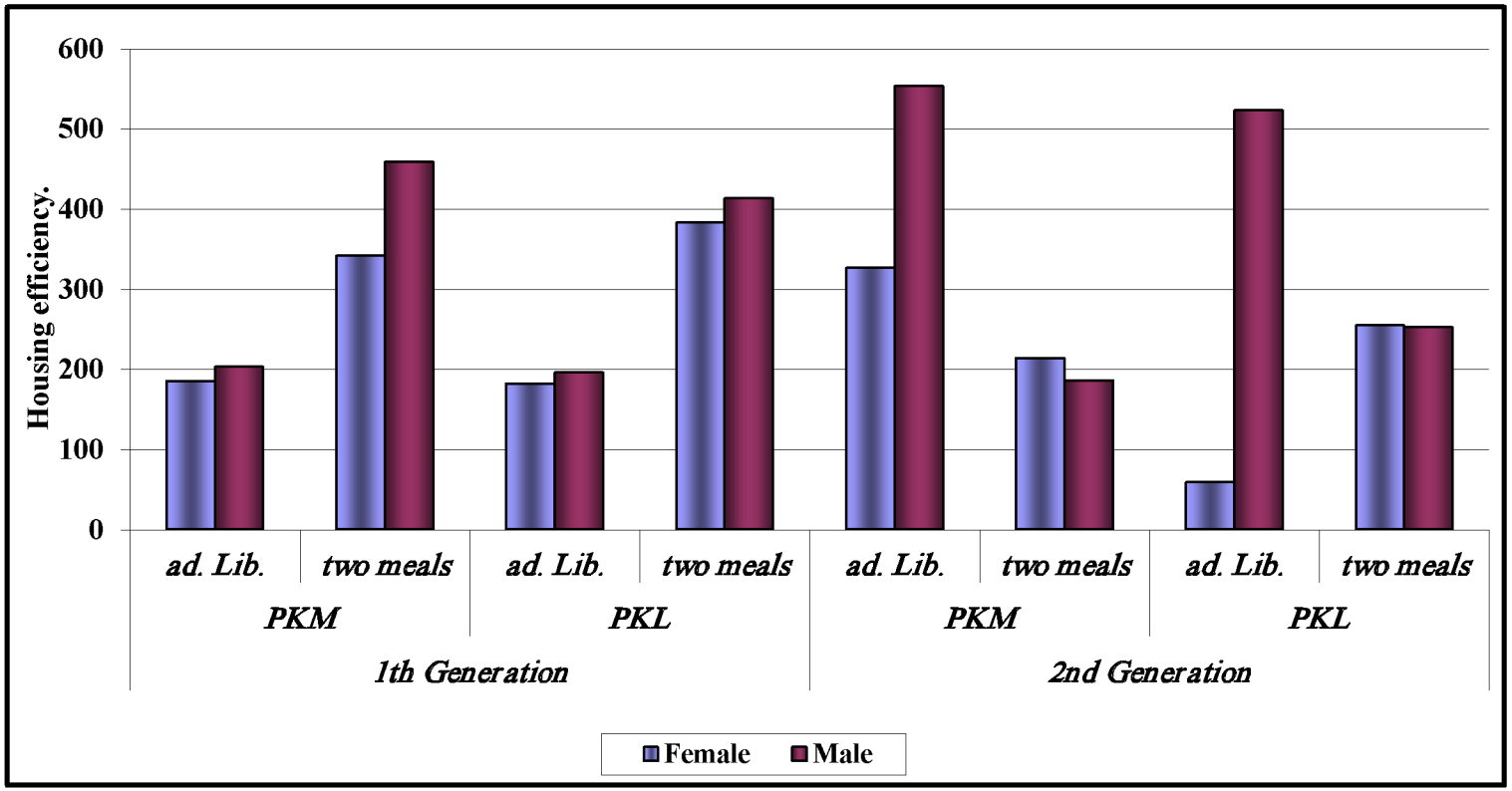

Fig (3) : Housing efficiency of two lines of ducks in each generation according to sex and feeding system effects.

Table (4) : Mean and standard error of some carcass traits as affected by generations, lines, feeding and sex.

Factors									
Generation	Lines	Feeding system	sex	Life weight	Dressing weight	Boneless weight	Feathers weight	Blood weight	Vicera Weight
Generation1				3748.81±43.30^{b}	2391.48±37.52^{b}	2167.15±17.93^{b}	195.58±2.36^{a}	133.67±2.10^{a}	539.11±3.78^{a}
Generation2				3959.61±43.30^{a}	2721.75±37.52^{a}	2576.80±17.93^{a}	105.46±2.36^{b}	109.39±2.10^{b}	506.55±3.78^{b}
	PKM			3614.13±43.30^{b}	2387.23±37.52^{b}	2190.80±17.93^{b}	132.94±2.36^{b}	111.88±2.10^{b}	510.68±3.78^{b}
	PKL			4094.29±43.30^{a}	2726.00±37.52^{a}	2553.15±17.93^{a}	168.10±2.36^{a}	131.18±2.10^{a}	534.98±3.78^{a}
		Ad. lib.		2982.99±43.30^{b}	1853.75±37.52^{b}	1745.98±17.93^{b}	127.09±2.36^{b}	112.05±2.10^{b}	501.01±3.78^{b}
		Two meals		4725.44±43.30^{a}	3259.48±37.52^{a}	2997.98±17.93^{a}	173.95±2.36^{a}	131.01±2.10^{a}	544.65±3.78^{a}
			Female	3728.77±43.30^{b}	2479.05±37.52^{b}	2273.05±17.93^{b}	140.74±2.36^{b}	119.89±2.10^{b}	502.73±3.78^{b}
			Male	3979.66±43.30^{a}	2634.18±37.52^{a}	2470.90±17.93^{a}	160.30±2.36^{a}	123.17±2.10^{a}	542.93±3.78^{a}
Generation1	PKM	*Ad. lib.*	Female	2730.51±122.47^{b}	1774.60±106.11	1643.60±50.70	92.72±6.69	83.38±5.93	423.66±10.70
			male	2994.28±122.47^{a}	1881.80±106.11	1740.60±50.70	105.40±6.69	88.32±5.93	528.20±10.70
		Two meals	Female	3475.00±122.47^{b}	2165.00±106.11	1928.80±50.70	203.86±6.69	149.70±5.93	503.18±10.70
			male	3949.61±122.47^{a}	2407.80±106.11	2127.20±50.70	265.16±6.69	161.16±5.93	600.32±10.70
	PKL	*Ad. lib.*	Female	3130.46±122.47^{b}	1870.60±106.11	1666.80±50.70	197.72±6.69	143.52±5.93	510.30±10.70
			male	3268.67±122.47^{a}	1956.40±106.11	1782.20±50.70	203.68±6.69	143.84±5.93	538.40±10.70
		Two meals	Female	5089.16±122.47^{b}	3430.60±106.11	3121.80±50.70	244.46±6.69	148.20±5.93	602.10±10.70
			male	5352.77±122.47^{a}	3645.00±106.11	3326.20±50.70	251.64±6.69	151.20±5.93	606.74±10.70
Generation2	PKM	*Ad. lib.*	Female	2867.02±122.47^{b}	1812.80±106.11	1640.40±50.70	93.22±6.69	102.64±5.93	484.40±10.70
			male	3063.42±122.47^{a}	1936.00±106.11	1813.80±50.70	104.14±6.69	108.26±5.93	515.44±10.70
		Two meals	Female	4672.84±122.47^{b}	3369.80±106.11	3122.60±50.70	86.74±6.69	105.52±5.93	501.28±10.70
			male	5160.37±122.47^{a}	3750.00±106.11	3509.40±50.70	112.28±6.69	96.06±5.93	528.94±10.70
	PKL	*Ad. lib.*	Female	3013.09±122.47^{a}	1916.80±106.11	1761.00±50.70	99.02±6.69	106.42±5.93	497.84±10.70
			male	2796.43±122.47^{b}	1681.00±106.11	1919.40±50.70	120.84±6.69	120.00±5.93	509.84±10.70
		Two meals	Female	4852.03±122.47^{b}	3492.20±106.11	3299.40±50.70	108.16±6.69	119.72±5.93	499.08±10.70
			male	5251.71±122.47^{a}	3815.40±106.11	3548.40±50.70	119.26±6.69	116.50±5.93	515.54±10.70

Means within the same column at the same factor carry different small superscripts are significant at level $P \leq 0.05$,

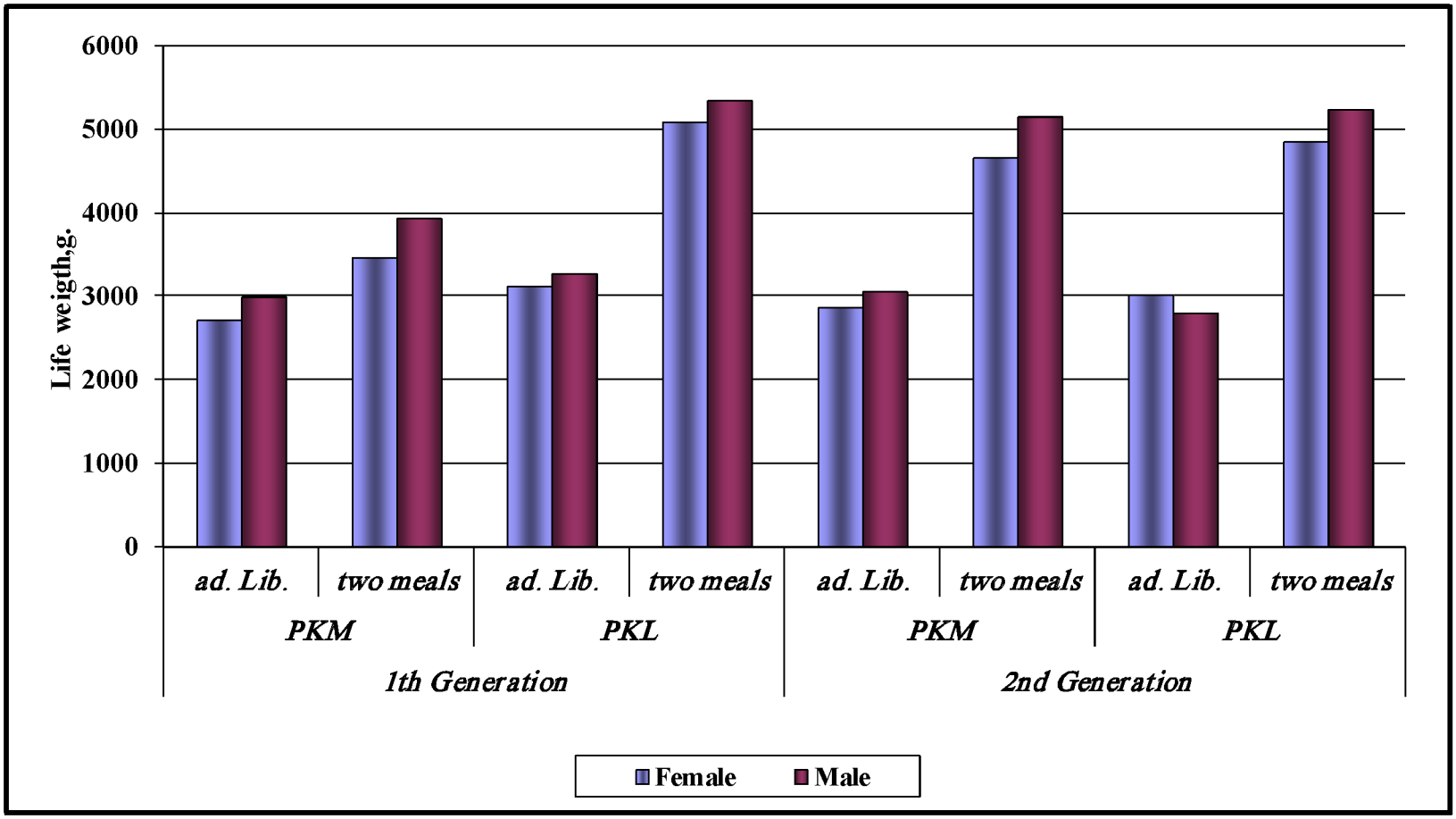

Fig (4) : Life weight of two lines before slaughtering of ducks in each generation according to sex and feeding system effects.

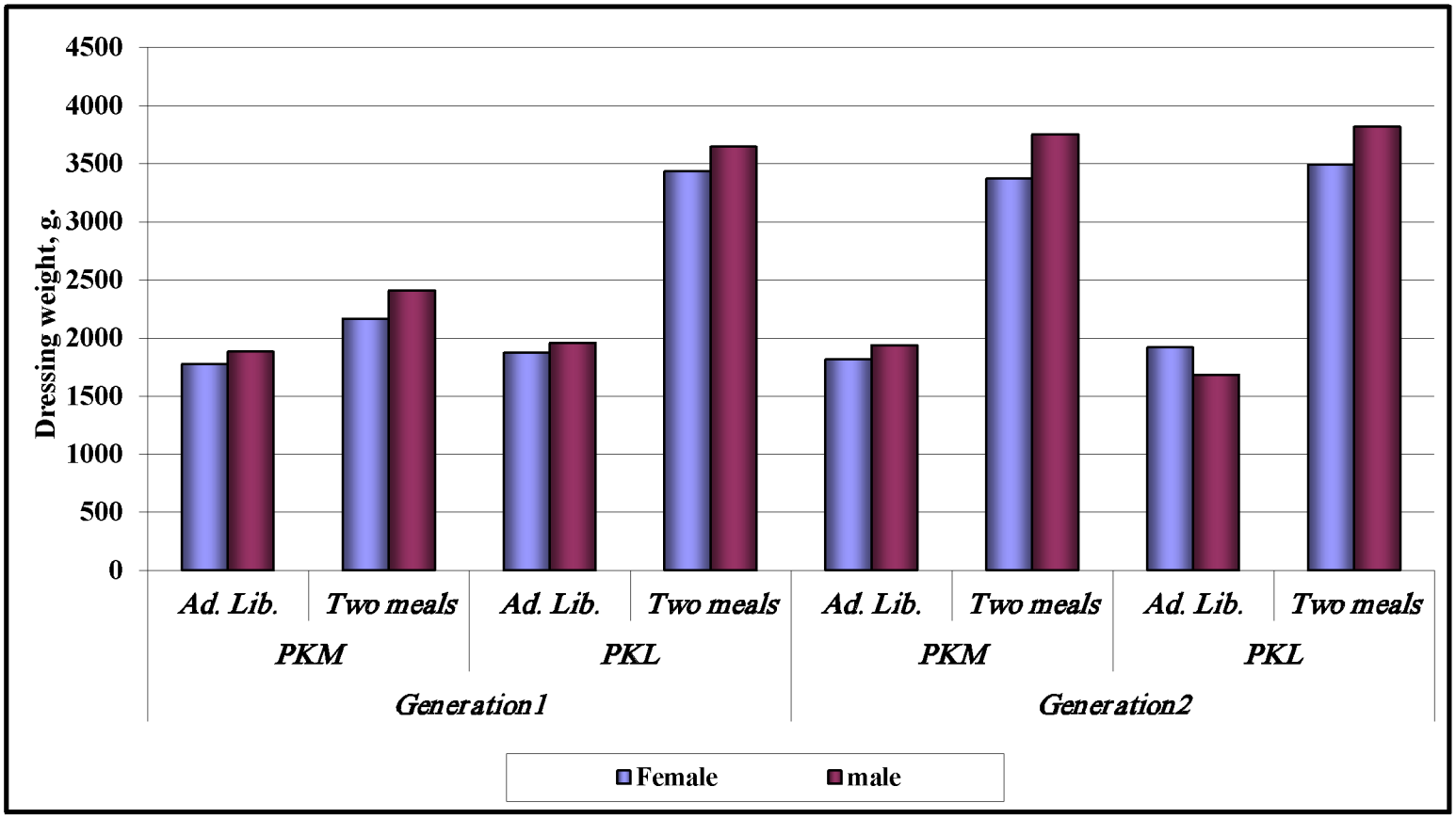

Fig (5) : Dressing weight of two lines of ducks in each generation according to sex, feeding system effects.

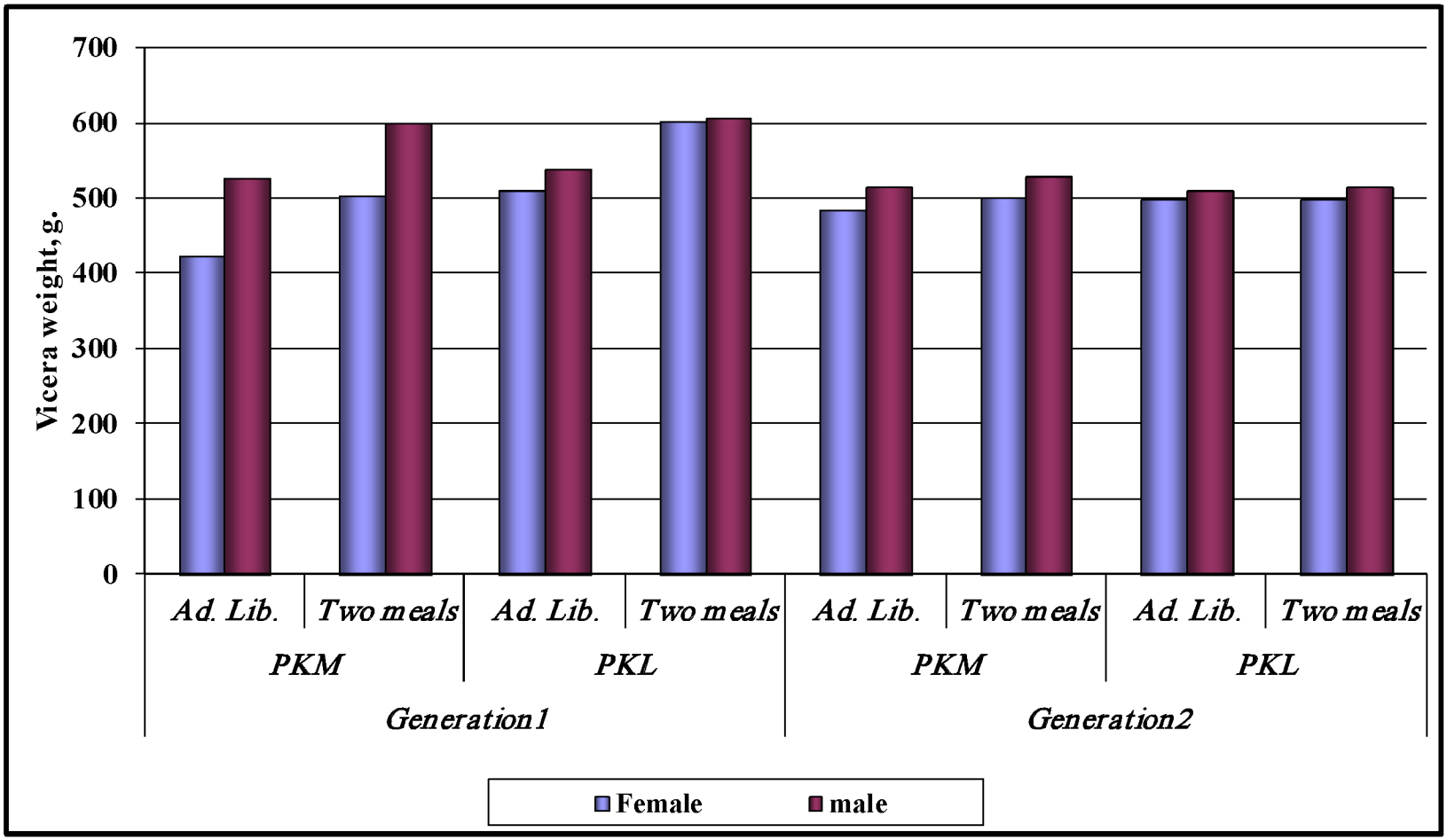

Fig (6): Vecira weight of two lines of ducks in each generation according to sex and feeding system effects.