The effects of seasonal variations on 16-week body weight variability of W.Leghorn and Fayoumi Chickens

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Single Comb white Leghorn and Fayoumi chickes hatched during winter and summer were used.

The results showed that chicks hatched during winter were significantly heavier than those hatched in summer. The leghorn chicks were significantly heavier than Fayoumi chicks during almost the experimental period.Fayoumi chicks were heavier during summer especially in early age than leghorn chicks. This may be due to genetic adaptation of local breed to hot climate of subtropics. Determination coefficiients of multiple linear regresssion showed that early growth rate period of winter hatched chicks had maximum effect on the variability of 16- week body weight, while it was the second and the third periods during summer hatching season. This reveals the effect of high ambient temperature on body weight of chicks.

The demand for poultry production all the year around calls for special consideration of producing efficient products during all the year.

A lot of study had been carried out on the eff ect of season on body weight and growth rate. The effect of date of hatch on body weight gain was very great(Gafber and Godbey, 1952), and both sexes were effected(Amer et al,1964). Many workers reported that heavier birds with rapid rate of growth were produced from winter hatches(Ragab and Kotby,

1958. Amer et al, 1964;Abdou,1964 and Ghany et al, 1971.

El-Gamal(1969) reported that the chicks hatched in December were heavier that those hatched in March,On the other had Amer(1965)reported that March could be considered the Most favourable month for hatching as the Fayoumi chicks hatched during that moth were the heaviest all over the period of study. Abdou et al (1979) reported that Fayoumi chicks hatched during spring had significantly heavier body weight and heavier growth rates than winter hatched chicks up to 8 weeks of age.Later on,at 12 and 16 weeks of age, the winter hatched chicks were significantly heavier and showed higher growoth rate than the spring hatched chicks. They added that the variation coefficients were 20.0 percent for the growth rate during period of 12-16 weeks in males and females of winter season, while the corresponding coefficients in spring hatched chicks were 31.4 and 37.5 percent respectively. The results showed also that the first interval growth rate(0 - 4 weeks) and higher effect on 16- week body weight variations of winter hatched chicks than of those hatched in spring.

MATERIAL AND METHODS

These experiment was carried out at the poultry farm of the faculty of agriculture "NORFA Project" Minufiya University, Shebin El-Kom. One day old chicks from single comb white leghern and Fayoumi were used in the experiment, Two different hatches winter and summerm were used to study the effect of seasonal variations on body weight and growth rate. Winter hatch represnted chicks hatched in October, while summer hatch represented that chicks hatched in Aril. The chicks were brooded in batteries kept in brooder house with temperature controlled by a central heating system through warm water tubes.

The initial temperature was 95 °F in the first week with gradual decreasing of 5 °F per weak till it reached 70-75 °F. The local and exotic chicks were randomly distributed into cages of the brooding house. At hatch, all baby chicks were wing-banded and vaccinated againest Merck's disease, then weighed to the nearest gram. On the third day, the chicks were vaccinated againest Newcastle disease. At 7 weeks of age chicks were debeaked to prevent cannibalism. The chicks fed normal ration contained 20% crude protein and 2778 K,Cal/Kg.M.E on ad-libitum basis (Table a). The chicks were weighedat biweekly intervals to the nearest gram. Growth rates of each chick during the periods 0-4,4-8,8-12 and 12-16 of age were calculated using the formula given by Brody(1945).

The statistical analysis had been done at the Computer Center of Agriculture University of Norway at AAS.Determination coefficient and coefficient of variability were used to compare variations existed in body growth rates due to different factors.

RESULTS and DISCUSSION

Variability existing in body weight is considered as an important tool for poultry breeder to be utilized to improve body weight. Table(1)illustrates average body weights and coefficient of variability of W.Leghorn and Fayoumi chickens during winter and summer seasons. It was noticed that the winter hatched chicks were heavier than those hatched in summer in all periods of growth of the two breeds. In winter, the leghorn chicks were heavier than those of Fayoumi chickenswhile in summer the opposite was true; particularely in the early period.

This may reflect a well-adaptation of local Fayoumi chicks to hot climate. The coefficients of variability of body weight means of summer hatched chicks are greater than those of winter hatched chicks of both breeds(Table 1). This reveals the effect of hot climate on body weight variability.The Fayoumi chicks showed less variability to hot climate than leghorn chicks specially after 8 weeks of age when the ambient temperature was higher in summer. this indicates again the good adaptation of local hens to hot climate in subtropics. This adaptation should not be neglected in breeding programs specially when local chickens are crossed with exotic breeds.

The difference between the two sexes differed from breed to other and from winter to summer. This may be considered as a result of the interactions among them(breeds, seasons and sexes). Body weight of male female leghorn chicks hatched during winter were 245 and 213 grams at 4 weeks of age, versus,217 and 210 grams in Fayoumi chicks, respectively .The corresponding values during the summer season were 129 and 123 grams in leghorn and 155 and 145 grams in Fayoumi. Table(2) shows that there was a signifcant difference between breeds and highly significant difference between seasons.

The same trend was also found at 8 weeks of age where the general means in leghorn chicks were 668 and 531 grams for males and females, while they were 52o and 466 in Fayoumi for chicks hatched in winter. The corresponding values were 328 and 305 grams for leghorn males and females, while they were 318 and 291 grams in Fayoumi chicks in summer. There were highly significant differences between breeds as well as between seasons and their interaction (Tabble 2,3 and 4) at both 12 and 16 weeks of age, winter hatched chicks were still heavier than those hatched in summer. The general means of leghorn

males in winter were 1097 and 1167 grams at 12 and 16 weeks of age, while they were 894 and 952 in the corresponding Fayoumi males respectively. The leghorn body weight means in summer were 596 and 1000 grams at 12 and 16 weeks of age, while they were 616 and 869 grams in Fayoumi males, respectively. The females winter hatched chicks scored also heavier body weight and the means of leghorn hatched in winter at 12 and 16 weeks of age were 836 and 1044 grams, while they were 766 and 953 grams in Fayoumi chicks, respectively. During summer season the leghorn females had means equal to 535 and 822 grams at 12 and 16 weeks of age, while the corresponding means of Fayoumi females were 543 and 692 grams in the same order. These results indicated that winter hatched chicks were heavier than chicks hatched in summer and hhis superiority lasted all over the experimental period. This was due mainly to high ambient temperature in summer which affected food intake High environmental temprature causes the depression of thyroxine secrction and then growth rate.

A decrease in thyroid secretion with high environmental temperatures have been reported by many workers(Mueller end Amezcua, 1959; and Huston et al, 1962)..

Reineke and Turner(1945) showed that in young chicks (2 weeks of age) the thyroxine secretion rate in summer was one-half that in winter.

Slight improvement in growth was obsereved in Rhode Island Red chickens receiving levels of 0.025 to 0.2 percent thyroprotein(Parker,1943). White Plymouth Rocks fed less than 0.1 percent thyroprotein (Irwin et al, 1943) showed an improvement in growth up to 6 weeks of age but not at 12 weeks.Receiving thyroprotein causes hyperthrodism(Scurkei 1965).

It is advisable to pay attention to chicks in rearing period in summer season by using well planted runts with trees which are watered and sprayed daily.

It was found that leghorn chicks hatched in winter were heavier than Fayoumi chicks.During summer the opposite finding was noticed and the Fayoumi chicks were, in generalm heavier than those of leghorn chicks except at 16 weeks of age. This reveals the high adaptation of local bread to high increasing temperature in summer.

Coefficients of variability of winter hatched chicks of exotic and local breeds were smaller than those of summer chickens.Moreover, the coeffcients of varability of body means in summer showed a wide variation comparing with those of winter means(Table 1). The means of winter hatched chicks and coefficients of variability ranged from 10.48 to 13 perecent in leghorn chicks and from 5.68 to 18.22 perecentin Fayoumi chicks. The corresponding percentages of coefficients of variablity achieved in summer ranged from 15.40 to 31.56 in leghorn chicks and from 7.84 to 28.27 in Fayoumi chicks.

It was noticed that specially at 8 weeks of age. There were almost highly significant interactions between each two variates of breed, sex and season(Table 4). The interaction between breed and sex can be the finding that the differences between sexess were not equal during winter and summer. For example, the difference between males and females, in leghorn in relation to summer weight was 25.8 percent while this difference in summer was 7.5 perecent. For Fayoumi chicks the differences were 11.9 and 9.0 Perecent in winter and summer seasons respectively.It should point to the finding that the higer growth rate of leghorn male chicks was more affected by hot weather. Moreover, Fayoumi chicks exhibited more resistance to heat change than leghorn chicks

and the differences between males and females were not obvious as found in leghorn case. The leghorn chicks of winter hatch had smaller coefficients of variability than Fayoumi chicks. This means that leghorn chicks had more uniformity in body size than Fayoumi and this was due to selection in leghorn chicks. Second trend is that the leghorn chicks during high ambient temparature in summer showed a wide variation than those of Fayoumi chicks which were well adapted to local environment . It may be concluded that the advantage of both breeds; uniformity in size of leghorn and good adaptation of local breeds plus other advantages, should be combined in one breed when selection program is set up to improve local breeds.

Table(5) and (6) illustrate determination coefficients for the multiple linear regressions of different growth rate periods on 16-week body weight of winter and summer hatched chicks. It was noticed that over all the subgroups used in both seasons,94 to 99 percent of the total variations existed in 16-week body weight were significantly accounted for the components traits 0-4, 4-8, 8-12 and 12-16 weeks growth rates.These results point to the fact that all of these interval growth rate together are able to explain essentially all the variations existed in 16-week weights.These determination coofficients pointed to the finding that the first growth rate period, in general, had maximum effect on body weight variations at 16-weeks of age of winter hatched chicks, while it was the second and third periods in summer hatched chicks. Similar results obtained by Abdou et al (1979).

On the average 35 and 43 percent of 16-week body weight variations, in leghorn males and females chicks hatched in winter season could be explained by omitting the first interval period. These corresponding percentage in Fayoumi chicks were 33 and 18

in the same order. The second or third period had maximum effect on final variations of body weight of chicks hatched in summer and sbout 42 percent of total variations in leghorn males could be affected by the third period. On the average 25,47 and 35 percent of final variations were accounted for by the second period in leghorn females,Fayoumi males and females, respectively. These results indicated that the first period had meximum effect in winter , while second and third had maximum effect in summer. This may be due to the nature of subtropical climate where heating during brooding period is often discontinued after 4 weeks of age in summer, while heating is continued till 8 weeks of age in winter. It should be pointed out that the brooding temperature in winter, using electric heaters with thermostates, is more stable than in summer in which the climate often becomes hot. These results indicate that when chicks are brooded under a single environmental regime such as a suitable and stable temperature, the early growth period has a major effect on the subsequent performance of the chicks. This is in agreement with findings of Roborts (1965), Paulson et al (1973), and Abdou et at (1979).

These findings are true if we take into consideration two periods. On winter hatched chicks the first period with the second or the third had the maximum effect, while in summer the fourth period with second or third period had maximum effect.

These results point to the importance of taking these seasonal variations into consideration in subtropical countries. Special constructipm of growing hen building with surrounded trees may decrease the effect of high temperature in summer. Moreover, selection indexes designed to improve

local chickens should comprise adaptation in addition of the production and reproductive traits.

REFERENCES

Abdou, F,H,,1964: The effects of crossbreeding on meat yield of Fayoumi chickens. M/Sc. Thesis, Univ.of Alexandria.

Abdou,F.H.,M.A.El-Sayed and N.Kolstad,1979:The effects of hatohing season and brooding system on 16-week body weight variability of Fayoumi chickens. Meldinger Fra Norges Landbruksho Gskole Vol.58 No. 7: 1-10.

Amer, M.F.,1965: A contribution to the introduction of standard breeds of poultry to Egypt. M.Sc.Thesis, Univ. of Ein-Shams, Cairo.

Amer, M.F., H.M. El-Ibiary, S.S. Khishin, and H.P. Issawi 1964; A comperative study of Egyptian strain of chickens and three standard breeds imported from Holand. Alex.J. of Aric.Res. 5; 103-121.

Brody, S. 1945. Bionergetics and growth. Rein hold Pub. Corp., New York.

El-Gammal, A.M.1969.Developmental changes and meat quality in some breeds and strains of chickens reared in upper Egypt. Ph. D. Thesis Univ. of Assuit 1969.

Garber, M.J. and C.B. Godbey, 1952. The influence of sire, dam and hatching date on specific rate of growth of single comb White leghorn pullets from hatching to twelve weeks of age. Poult. Sci : 31 : 945 - 955.

Ghany, M.A., A.F. El-Diffrawi, M.A. Kheireldin and G.A.R. Kamar, 1971. The effect of various types of brodding on growth of chickens and related characters.
4 th conference of Animal Production,Alexandria Univ.1971.

Huston,, T.M., H.M. Edwards and J.J.Williams.1962. The effects of high enviroument al temperature on thyroid secretion rate of domestivc fowl. Poultry Sc.. 41: 640.

Irwin, M.R., E.P. Reineke, and C.W. Turner, 1943. Effect of feeding thyroactive iodocasein on growth, feathering and weights of glands of yound chicks. Poultry Sci.22;374.

Mueller, W.J., and A.Amezcua 1959. The relationship between certain thyroid characteristics of pullets and their egg production,body weight and environment.
Poultry Sci.38:620.

Parker,J.E.1943 Influence of thyroactive iodocasein on growth of ohicks.Proc.Soc.Exp.Biol.& Med. 52:234.

Paulson,S,G,, C.W.Roberts and L.M.Staley, 1973.The effect of environmental on body weight heritability estimates.
Poult. Sci. 52:1557-1563.

Ragab. M.T. and S.Kotby(1958).Some factors effecting growth rates and body weight of Fayoumi fowl. Ann.Agric. Sci.(Cairo) 3,2,1 : 121-151.

Reineke ,E.P.,and C.W.Turner 1945 Seasonal rhythm in the thyroid hormone secretion of the chick. Poultry Sci.24:499.

Rizk, Y.G.,1958.A comparative study of brioler pr.
uction in Fayoumi, leghorn, and Rhode Is.
Red chicks.
M.Sc.Thesis, Univ.of Alesxandris.

Riberts, C.W.,1965. One-week body weight and bi-
weekly early grwoth rate as related to 7-
week body weight in the chicken.
Polut.Sci. 44:947-952.

Strurkie, P.D., 1965: Thyroide.
Avian physiology:Chapter 19.P.592-633
Cornell University Press, New Yourk.

Table(3): Compositions of experimintal rations.

Ingredients	Low protein and energy ration. %	Medium protein and energy ration. %	High protein and energy ration. %
Maize	38.2	34.0	44.9
Wheat	10.0	22.0	7.0
Wheat bran	10.0	---	---
Rice bran	7.0	---	---
Barley	13.0	10.0	---
Soya bean meal	17.0	27.0	34.0
Fish meal(60% protein)	1.5	3.0	4.0
Meat meal(50% protein)	1.5	2.0	3.0
Butter fat	---	---	5.0
Bone meal	1.0	1.0	1.0
*Vit.mixture	0.20	0.20	0.20
Sodium chloride	0.50	0.50	0.50
Mineral mixture	$\frac{0.10}{100}$	$\frac{0.10}{100}$	$\frac{0.10}{100}$
Crude protein%	16.39	20.29	24.4
M.E.(Kcal./Kg.)	2666.9	2778.9	3171.3
C/P ratio	1.62	1.36	1.30

* Every K_g.Vit.B complex contains:
20 gm.Niacin,4.5 gm.Riboflavin,3 gm.Pyridoxin(B_6)
13 Mg Cyanocobalamine(B_{12}) and 100 gm. Cholin chloride.
- Every Kg.Vit. AD_3E contains:
20000000 I.U. Vit.A,20000000 I.U. Vit.D_3, and 400 I.U. Vit. E.

Table(1): Average body weights in grams of Leghorn and Fayoumi during winter and summer hatching seasons.

Age	Sex	Leghorn				Fayoumi			
		Winter		Summer		Winter		Summer	
		$\bar{X}$	C.V.	$\bar{X}$	C.V.	$\bar{X}$	C.V.	$\bar{X}$	C.V.
4 Weeks	M	245	12.95	129	27.62	217	17.36	155	28.27
	F	213	12.37	123	24.42	210	12.00	145	23.73
8 Weeks	M	668	13.33	328	20.44	520	16.69	318	24.25
	F	531	11.15	305	21.29	466	5.68	291	15.14
12 Weeks	M	1097	13.76	596	31.56	894	10.26	616	18.71
	F	836	10.48	535	27.42	766	12.08	543	13.10
16 Weeks	M	1167	13.21	1000	15.40	952	16.29	869	12.83
	F	1044	11.61	822	17.95	953	18.22	692	7.84

Table(2):Analysis of variance of body weight for Leghorn and Fayoumi male chicks during winter and summer hatching seasons.

Source of variation	4 Weeks		8 Weeks		12 Weeks		16 Weeks	
	d.f.	m.s	d.f.	m.s.	d.f.	m.s	d.f	m.s.
T.S.S.	175		169		157		67	
Bet.breeds	1	8193*	1	90511**	1	1703208	1	433097
Bet.seasons	1	368900**	1	3441296**	1	5628240**	1	19
Breeds X seasons	1	1351	1	487347**	1	951075**	1	62489
Error	172	1899.7	166	1245.1	154	77799.5	63	240411.2

Table (3) Analysis of variance of body weight for Leghorn and Fayoumi female chicks during winter and summer hatching seasons.

Source of variation	4 Weeks		8 Weeks		12Weeks		16 Weeks	
	d.f.	m.s.	d.f.	m.s.	d.f.	m.s.	d.f.	m.s.
T.S.S.	166		153		146		142	
Bet.breeds	1	4285 *	1	194713	1	247864	1	356853 **
Bet.seasons	1	246041 **	1	1452960 **	1	2455505 *	1	1571889 **
Breeds X seasons	1	1439	1	12608.7 **	1	117113	1	1215036
Error	163	650.2	150	1370.3	143	487012.7	139	28112.2

Table(4): Analysis of variance of body weight for unsexed Leghorn and fayoumi chicks during winter and summer hatching seasons.

Source of	4 Weeks		8 Weeks		12 Weeks		16 Weeks	
variation	d.f.	m.s.	d.f.	m.s.	d.f.	m.s.	d.f.	m.s.
T.S.S.	342		323		304		210	
Bet.breeds	1	221**	1	7140**	1	8712**	1	46208**
Bet.seasons	1	15313**	1	111628**	1	218461**	1	47432**
Bet.sexes	1	450	1	7021**	1	30258	1	11705
BreedXseason	1	364	1	4559	1	12799	1	2493
BreedXsex	1	2	1	703*	1	1014	1	1568
SeasonXsex	1	98	1	2346**	1	6272	1	20402*
BreedXsea.Xsex	1	1254**	1	4376**	1	1623	1	26643*
Error	335	32.84	316	133.18	297	8363.6	203	4520.9
	n= 29.37		no.=36.25		no=33.72		no= 22.43	

Table: (5): The coefficients of determination (R^2) for the multiple Linear regressions of different growth rate periods on 16-week body weight of Leghorn and Fayoumi chicks during winter season.

Growth rate during				Leghorn		Fayoumi	
0-4 Wks.	4-8 Wks.	8-12 Wks.	12-16 Wks.	Males	Females	Males	Females
+	+	+	+	99	98	96	95
+	+	+		58	71	75	77
+	+		+	82	72	50	60
+		+	+	67	58	30	22
	+	+	+	35	43	33	18
+	+			44	60	39	55
+		+		52	48	22	22
+			+	49	58	19	21
	+	+		25	40	28	17
	+		+	15	40	12	16
		+	+	52	40	13	3
+				7	5	13	21
	+			13	0.4	9	16
		+		1	0.4	8	0.3
			+	8	27	3	3

Table(6): The coefficients of determination(R^2) for the multiple linear regression of different growth rate periods on 16-week body weight of Leghora and Fayoumi chicks during summer season.

Growth rates during 0.4 wks.	4-8 Wks.	8-12 Wks.	12-16 Wks.	Leghorn		Fayoumi	
				Males	Females	Males	Females
+	+	+	+	94	98	95	95
+	+	+		63	52	89	68
+	+		+	44	57	95	95
+		+	+	80	46	89	31
	+	+	+	59	6.2	50	63
+	+			18	52	89	43
	+	+		49	2.5	47	62
		+	+	56	5	5.9	5.8
+		+		48	20	5.9	29
+			+	31	20	5.9	21
	+		+	34	2.5	47	41
+				10	18	5.9	21
	+			1	25	47	35
		+		42	0.87	2.07	3.5
			+	27	0.006	2.9	0.46

تأثير اختلافات الموسم على وزن الجسم حتى عمر ١٦ أسبوع لدى دجاج اللجهورن والفيومى

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استخدم فى هذه التجربه كتاكيت فقست فى الصيف وكتاكيت فقست فى فصل الشتاء من كل من اللجهورن ابيضوحيد العرف والدجاج الفيومى .

وقد اظهرت النتائج ان الكتاكيت التى فقست فى الشتاء كانت اثقل من تلك التى فقست فى فصل الصيف بصورة جوهريه . وكانت كتاكيت اللجهورن اثقل من كتاكيت الفيومى بفارق معنوى خلال أغلب فترات التجربه . وكان وزن كتاكيت الفيومى أثقل فى فصل الصيف خاصه فى المراحل المبكرة من العمر ، وهذا قد يرجع لتكيف النوع المحلى لحرارة المنطقه شبه الاستوائية .

وقد اوضحت معاملات التقدير ان فترات النمو المبكره فى الكتاكيت التى فقست فى الشتاء كان لها اكبر الاثر على الاختلافات الموجودة فى وزن الجسم عند ١٦ أسبوع بينما فى فصل الصيف كانت الفترتين الثانيه والثالثه لهما أكبر الاثر .

وهذا يوضح تأثير ارتفاع حرارة الجو على وزن الجسم فى الكتاكيت .