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SEASONAL AND BREED DIFFERENCES IN GROWTH, FEED EFFICIENCY, MORTALITY RATE AND PROFITABILITY OF CHICKENS UNDER EGYPTIAN ENVIRONMENTAL CONDITIONS

By

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SUMMARY

The study was undertaken as a pilot broiler project to compare the efficiency of some foreign breeds of chickens hatched locally at different seasons. A total of 6504 chicks were used representing W.P.R., N.H., C. × W.P.R. and W.P.R. × N.H. in equal numbers, hatched in January, May and August, 1961. The January hatched chicks showed higher body weights than either May or August groups. The average body weights were 1231, 1078 and 871 grams at 12 weeks of age for the three seasons respectively. Feed efficiency and mortality rate were better for May than for the January or August hatches. The figures were 3.54, 2.97 and 4.61 Kgs. for feed efficiency, and 18.3, 14.8 and 24.2% for mortality rate from 0-12 weeks of age for the January, May and August groups in respective order. The May group produced the most net profit, that is +45.9% of production costs compared with +38.4% for January hatch and —2.6% for the August lot.

Considering all seasons, the W.P.R. birds gave the best results followed in order by C. × W.P.R. and W.P.R. × N.H. The pure N.H. chicks showed the poorest performance. Average body weights ranged from 1164 grams in W.P.R. to 916 grams for N.H. while the average feed efficiency ranged from 3.42 in W.P.R. to 4.28 for N.H. Mortality rate was 16.0% for W.P.R. and 23.1% for N.H. The percentage profit was 42.5. 34.0 and 30.6 for W.P.R., C.× W.P.R. an W.P.R. × N.H. respectively. N.H. chicks yielded a very low profit value, 9.4%, which was largely due to their lower feed efficiency and higher mortality. It was concluded that except for summer hatches there is good economic potential for successful broiler production in Egypt if good stock is used and adequate feeding and disease control methods are practised.

INTRODUCTION

The sharp increase in human population in U.A.R. during the last decades has precipitated a parallel increase in the necessary food material in general and more particularly in animal protein resources. Different attempts were sought for solving this grave situation. Introduction of standard improved breeds of poultry from American as well as European sources has been practiced by different governmental bodies. Crossbreeding trials between such breeds and indiginous Fayoumi and Baladi breeds has also been employed, (Ghany *et al.* 1962) The present investigation was carried out to test, under Egyptian conditions, the meat production characteristics of some imported breeds and their crosses.

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MATERIALS AND METHODS

The study was undertaken at Kaha station, Ministry of Local Administration, during 1961. A total of 6504 chicks were used representing New Hampshire (N.H.), White Plymouth Rock (W.P.R.), White Plymouth Rock x New Hampshire (W.P.R. x N.H.) and Cornish x White Plymouth Rock (C. x W. P. R.). Table 1 shows the numbers of chicks and the hatch dates. Two hatches were obtained every month and chicks were reared in concrete floor brooding houses divided into 12 sections, each of which accommodating 200 chicks to 12 weeks of age. Kerosene heaters were used along with electric fans. Deep litter of wheat straw was used. The diets shown in Table 2 was fed ad lib. Nasal and intramuscle Newcastle vaccins were used at hatching and 8 weeks of age respectively. Individual body weights, mortality and group feed consumptions were recorded. Statistical analyses were patterned after Snedecor, (1956).

TABLE 1.—**Number of Birds Used in Each Breed or Cross at the Three Months of Experiment.**

Months	Breeds and crosses			
	N.H.	W.P.R.	W.P.xN.H.	C.xW.P.R.
January (17,31)	682	682	682	682
May (9,18)	454	454	454	454
August (25,31)	490	490	490	490
Total	1.626	1.626	1.626	1.626

TABLE 2. **Ingredients Used (Percent) in the Broiler Ration.**

Ingredients	Percent
Ground yellow corn	30
Wheat bran	20
Rice bran	10
Corn gluten meal	8
Decorticated cotton seed cake . . .	18
Fish meal	3
Dried milk	2
Ground dried clover	5
Steam bone meal	1.5
Ground lime-stone	1.5
Salt	0.5
Minerals	0.5
Vitamins mixture*	200grs/ton

* Daheferal Premix.

RESULTS AND DISCUSSION

A.—*Body weight* :

The average body weights of chicks hatched during the three seasons of study are shown in Table 3 and are graphically illustrated for pooled groups in

TABLE 3.—**Average Body Weights of Chicks in the Different Breeds and Crosses According to Age in the Different Months of Experiment** (grams).

Ages and Months	N.H.	W.P.R.	C.xW.P.R.	W.P.R.xN.H.	Average
Hatching :					
January	36	38	39	38	38
May	38	42	37	37	38
August	33	34	36	29	33
Average . .	36	38	37	34	—
4 *Weeks* :					
January . . .	217	257	250	255	245
May	184	245	238	230	217
August	167	189	205	178	185
Average . .	192	227	230	222	—
8 *Weeks* :					
January . . .	612	772	718	672	693
May	422	483	479	515	475
August	511	521	595	494	530
Average . .	516	593	598	560	
12 *Weeks* :					
January . . .	1·019	1·308	1·254	1·248	1·231
May	940	1·187	1·080	1·126	1·078
August	770	903	957	855	871
Average . .	915	1·164	1·097	1·080	

L.S.D. at 0.5 = 3 grams at hatching, 56 grams at 4 weeks 67 grams. at 8 weeks, and 129 grams. at 12 weeks.

Fig. 1. Chicks hatched in January grew best, followed in order by those hatched in May then those of August. This general trend was noticed at each weighing period with only one exception. This exception was the 8th week of the May chicks which was 475 grams compared with 530 grams for those of the August hatch. These differences between seasons may be attributed to the differences prevailing in environmental temperatures and humidity at the different rearing seasons. (Table 4). The average atmospheric temperature and relative humidity was 14.3°C and 80% in Jan.-March,, compared to 27.0°C and 60% for May-July and 25.8°C and 80% for Aug.-Sept. of the experimental year. Early findings by Hays and Sanborn (1929), Asmundson and Lerner (1933), Yadoo (1936), Galpin (1939), Jeffer and Platt (1941), Smetner (1944), Kusner (1947), Ryan *et al.* (1954), Ghany (1955), and Kotby (1958) all agreed that early winter hatches obtained more wieghts and had more gains than summer hatches. Such differences were related to the influences of atmospheric temperatures and relative humidities on the different functions and the general physiology of the body.

TABLE 4.—**Monthly Maximum and Minimum Environmental Temperature (C°) and Relative Humidity (%) during the Year of Experiment.**

Temp. (C°) Humidity (%)	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Max. temp. . . .	21.1	19.7	22.9	29.9	33.9	36.9	35.8	34.9	31.9	30.5	26.2	21.0
Min. temp. . .	5.9	7.5	8.7	12.6	15.6	19.7	20.1	21.1	18.1	18.2	12.6	8.9
Relative Hum. .	86	80	73	63	56	64	77	77	81	83	84	65

A marked decrease in body weight of May chicks between their 4-8 weeks of age coincided with an abnormal wave of high air temperature that took place between May 20 and June 9, 1961. As high as 44°C was recorded during this period. Similar growth depressions of chicks were reported by Hall (1932), Kempester (1938), Prince *et al.* (1961), and Adams *et al.* (1962).

Table 3 and Fig. 2 show that the overall average body weight of W.P.R. was the highest at 12 weeks of age (1164 grs.) and that the N.H. chicks were the lightest. The C. x W.P.R. chicks were heavier than the W.P.R. x N.H. The W.P.R. x N.H. chicks tended to approximate the weight of their paternal parent more closely than that of the maternal parent. Differences between hatching seasons and groups were highly significant especially at 8 and 12 weeks of age. Similar results were reported by Bostani *et al.* (1942), Massey and Hoffman (1948), O'Neil and Rae (1948), Knox *et al.* (1949), Glanzer *et al.* (1952), Ragab *et al.* (1955-1956), Mostafa (1958), Nordskog and Phillips (1960), Khalifa (1961), and Samkari (1962).

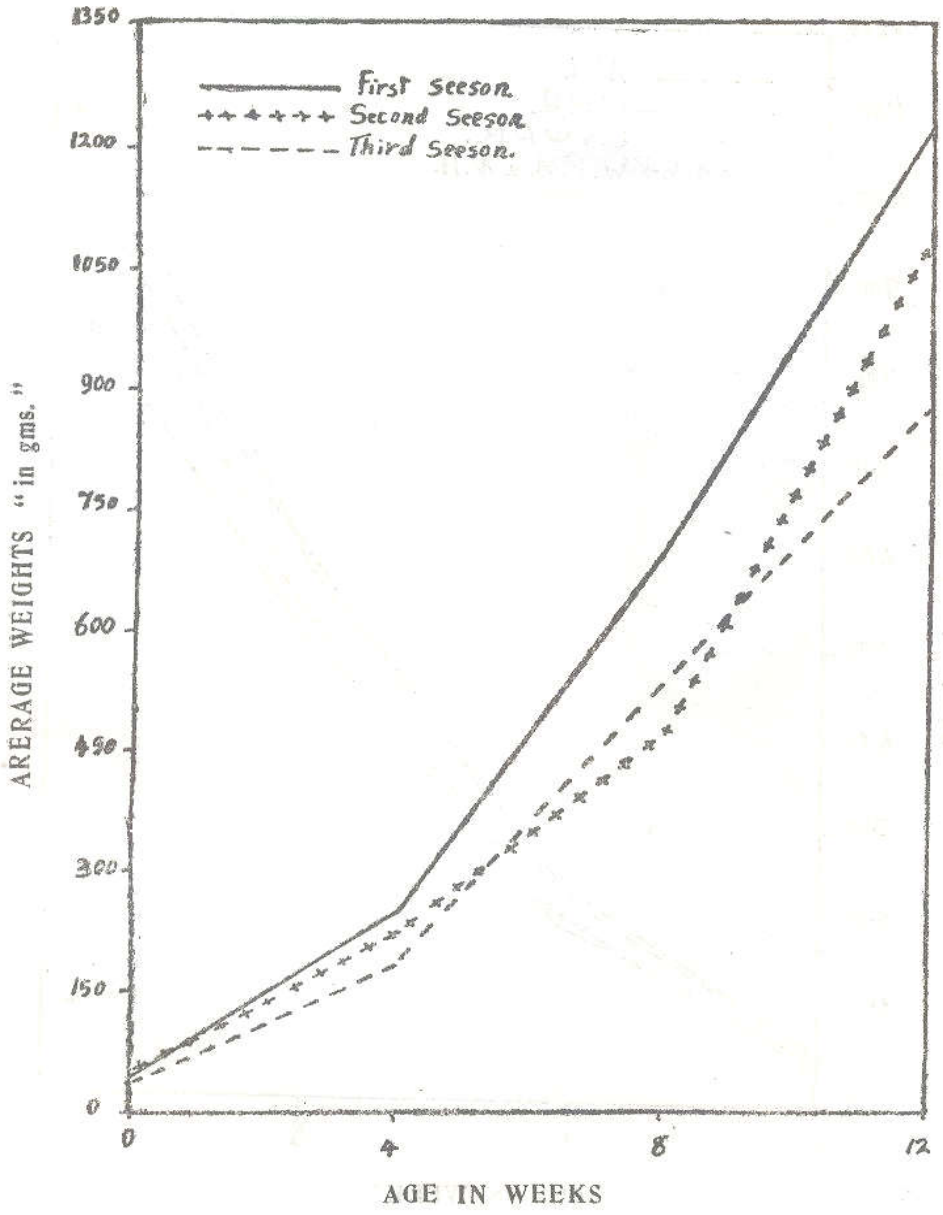

FIG. 1.—Average body weights "gms" for chicks hatched at the different seasons.

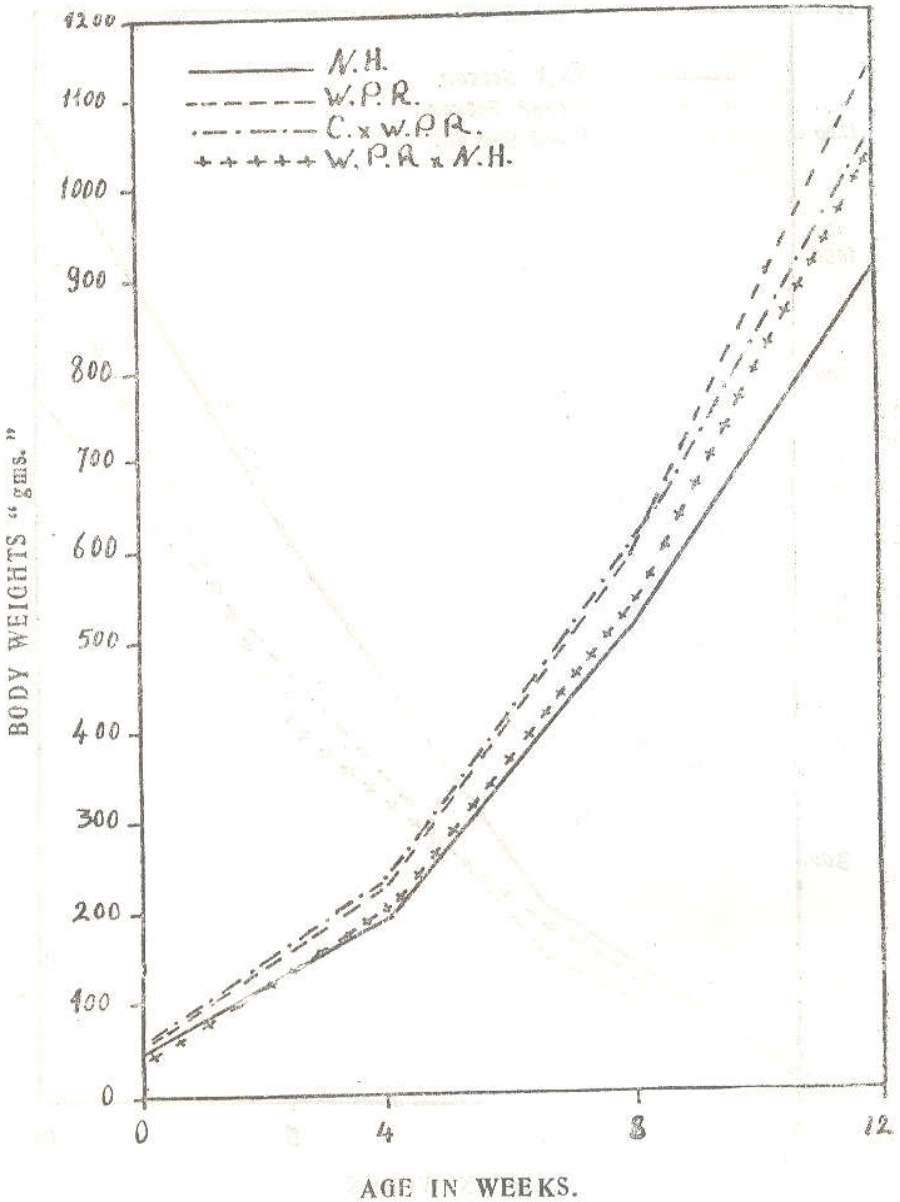

FIG. 2.—Average body weights "gms." for the different breeds and crosses from hatching till 12 weeks of age.

B.—Feed efficiency ;

For each increase of one kilogram in body weight 3.54, 2.97 and 4.61 kgs of feed were required per chicks of January, May and August hatches respectively (Table 5). The poor feed efficiency of August chicks is an expected result of their poor growth rate and body weight gains during the summer months. The possible explanation for the lower feed efficiency of January hatch compared with May hatch might be due to the cooler atmospheric temperature of the first season. Heiningers *et al.* (1960), Haston *et al.* (1961), Prince *et al.* and Adams *et al.* (1962) all came to conclude that with colder temperatures average feed consumptions tend to increase with a possible result of decreasing feed efficiency.

Comparing feed efficiency for the different breeds and crosses, it can be seen from Table 5 that at 0-4 weeks of age, the best feed efficiency was attained by C. x W.P.R. chicks. W.P.R. chicks were superior during the 4-8 weeks and 8-12 weeks periods. The lowest figure for feed efficiency for the total0-12 weeks period was for N.H., being 4.28 kgs. compared with 3.42, 3.49 and 3.65 Kgs. for W.P.R., C. x. W.P.R., and W.P.R. x N.H. groups in respective order. It is also observed in the table that feed efficiency decreased as age of birds increased. This was more pronounced in the N.H. birds, especially in the August hatch. This fact may be due to their slow growth gains particularly at 8 - 12 weeks of age.

C.—Mortality rate :

The mortality rates of chicks hatched during the spell of hot weather was very high compared to that of chicks hatched at more favorable periods of the year (Table 6). The total average mortality percents for the 0-4 weeks period were 9.6, 9.0 and 16.1 percent for January, May and August hatches respectively. These percentages tended to decrease to around 3 percentage during 4-8 weeks of age. From 8 - 12 weeks of age there was another rise in mortality rate, mainly due to the reaction to Newcastle muscular vaccination. There seems to be considerable variation in this respect according to the environmental surroundings at vaccination time.

The highest overall mortality from hatching until twelve weeks of age was experienced by N.H. chicks (28.1%) while the lowest was that of W.P.R., being 16.0%. Figures for crosses were 18.0% for C. x W.P.R. and 18.4% for W.P.R. x N.H. No statistically significant differences were found between seasons, breeds and crosses as far as mortality rate is concerned.

TABLE 5.—Average Feed Efficiency (Kgs.) of Breeds and Crosses during the 4-weeks Periods of the Study Within the Different Months of Hatching.

Periods in weeks	N. H.				W. P. R.				C. x W. P. R.				W. P. R. x N. H.				T. Averages			
	Jan.	May	Aug.	Av.	Jan.	May	Aug.	Av.	Jan.	May	Aug.	Av.	Jan.	May	Ang.	Av.	Jan.	May	Aug.	Av.
0- 4	2.30	3.55	4.18	3.35	2.46	2.40	3.94	2.94	2.31	1.86	3.68	2.62	2.12	2.70	3.97	2.93	2.30	2.63	3.94	2.96
4- 8	3.37	2.94	4.37	3.56	2.60	3.48	3.67	3.25	2.63	3.74	4.45	3.61	3.00	2.70	3.15	2.95	2.90	3.22	3.91	3.34
8-12	5.64	3.68	10.1	6.48	3.75	2.97	5.62	4.12	4.37	3.06	6.37	4.60	3.91	3.31	5.89	4.38	4.42	3.26	7.00	4.89
0-12	4.16	3.33	5.35	4.28	3.15	2.97	4.33	3.42	3.39	2.88	4.18	3.49	3.46	2.39	4.59	3.65	3.54	2.97	4.61	3.68

TABLE 6.—Average Mortality Percent of Breeds and Crosses within 4-week Periods During the Months of Experiment

Periods in weeks	N. H.				W. P. R.				C. x W. P. R.				W. P. R. x N. H.				T. Averages			
	Jan.	May	Aug.	Av.	Jan.	May	Aug.	Av.	Jan.	May	Aug.	Av.	Jan.	May	Aug.	Av.	Jan.	May	Ang.	Av.
0- 4	10.3	8.1	17.1	11.5	9.4	8.1	15.6	10.7	9.4	7.5	17.3	10.5	9.2	12.3	14.4	11.5	9.6	9.0	16.1	11.2
4- 8	5.1	4.8	3.5	4.6	2.6	2.4	3.4	2.7	1.1	1.7	2.6	1.7	2.9	3.8	2.0	2.9	2.9	3.1	2.9	3.0
8-12	8.8	5.0	13.8	8.9	4.5	1.7	3.2	3.3	7.4	4.6	6.9	7.1	7.3	1.8	4.3	4.9	7.0	3.3	7.0	6.1
0-12	22.3	17.0	31.0	23.1	15.7	11.9	21.1	16.0	17.0	13.2	25.0	18.0	18.3	17.2	19.7	18.4	18.3	14.8	24.2	19.1

D.—Costs and Returns :

Costs of production and income are given in Tables 7 and 8. During the first season the net income figures were 56.0, 42.5, 39.6 and 13.9 percent of the total costs for the W.P.R., C. x W.P.R., W.P.R. x N.H. then the N.H. chicks respectively. The W.P.R. also attained the highest net profit (57.7%) during the second season and the N.H. continued to be lowest (29.1%). With the August hatch, although the C. x W.P.R. and W.P.R. chicks produced a net profits of 5.7 and 3.4% in order, the N.H. and W.P.R. x N.H. chicks caused total losses of 19.7 and 1.3% respectively. The higher profits of the second season (May) were mainly the result of better feed efficiency and lower mortality rates compared with other seasons.

The cost of feed represented the major item in the total costs of production, averaging from 56.4 - 64.0% in the different estimates (Table 8). Similar figures were reported by Anderson and Predwick in U.S.A. (1959). The cost of labor in the present studies (4.0 - 7.0%) is much less than reported by the previously mentioned workers (14.2%). The price of the day-old chick was estimated as 3 piasters (about 7 cents) and as a percentage of total cost it varied according to seasons of rearing from 16.6 to 20.1 percent. January heating costs were nearly double those of May and August. Costs of litter, labor and depreciation of housing and equipement, although constant, varied as a percentage according to variation in total costs of production in the different seasons.

GENERAL DISCUSSION AND CONCLUSTION

The above results would indicate that the prospects for establishing a broiler industry in U.A.R. are still encouraging with more attention to be paid to feeding and mortality. The growth potential of the breeds and crosses studied was not fully expressed when these results are compared with the standards from abroad. The mortality percentages were much too high. This may be largely due to the ration used in the present experiment which does not compare favorably with the well balanced and highly supplemented broiler rations used in America and Europe.

The only available cheap source of protein for chicken rations in U.A.R is decorticated cotton seed meal. High protein sources of animal origin or soybean oil meal have to be imported at high prices. It must be remembered that whatever is spent for feed ingredients must be rewarded with rapid growth, heavy weights and low mortality to insure financial returns.

The best gynotypes for meat production should always be encouraged. Adaptability as well as combinability of breeds or strains of chickens need further investigation. In this respect, it would have been expected that the crosses used here would have grown better than the pure breeds but this was not necessarily the case. The limited selection of Cornish cockerls for mating may limit the reliability of these findings with regared to generalization for breed as a whole. Other crosses ought to be studied involving different foreign breeds and strains of meat birds or crosses with improved types of local Egyptian breeds, such as Baladi or Fayoumi.

TABLE 7.—Costs of production and income for the different breeds and

Item	First Season			
	N.H.	W.P.R.	C × W.P.R.	W.P.R. × N.H.
A. *Costs* :				
No of chicks	682	682	682	682
Price of chicks (pounds) . . .	20.460	20.460	20.460	20.460
Number dead	152	107	116	125
Number marketed	530	575	566	557
Total marketed weight (kgs.) .	541	803	709	693
Feed consumed (kgs.)	2.250	2.529	2.403	2.398
Feed cost (pounds)	69.750	78.399	74.493	74.338
*Other costs (pounds)	24.170	24.170	24.170	24.170
Total Costs (pounds)	114.380	123.029	119.123	118.968
B. *Cross income* :				
Meat (pounds)	127.135	188.705	166.615	162.855
Manure (pounds)	3.200	3.200	3.200	3.200
Total gross Income (pounds) .	130.335	191.905	169.815	166.055
Total costs (pounds)	114.380	123.029	119.123	118.968
C. *Net income* (pounds)	15.955	68.876	50.692	47.087
Net income (%)	13.9	56.0	42.5	39.6
Total net income for the season (pounds)	182.610			
Total net income for the season (percent)	38.40			

Other costs include=heating, litter, labour, depreciation of housing and equipments.

crosses of chicks raised to 12 weeks of age during the different seasons.

Second Seagon				Third Season			
N.H.	W.P.R.	C. × W.P.R.	W.P.R. × N.H.	N.H.	W.P.R.	C. × W.P.R.	W.P R. × N.H.
454	454	454	454	416	416	416	416
13.620	13.620	13.620	13.620	12.480	12.480	12.480	12.480
77	54	60	78	129	88	104	82
377	400	394	376	287	328	312	334
358	476	425	428	222	296	298	286
1.156	1.328	1.228	1.237	1.187	1.282	1.246	1.313
35.836	41.168	38.068	38.347	36.797	39.742	38.626	40.703
18.170	18.170	18.170	18.170	18.170	18.170	18.170	18.170
67.626	72.958	69.85	70.137	67.447	70.392	69.286	71.353
84.130	111.680	99.875	100.580	52.170	69.560	70.030	67.210
3.200	3.200	3.200	3.200	3.200	200	3.200	3,200
87.330	115.060	103.075	103.780	55.370	72.760	73.230	70.410
67.626	72.958	69.858	70.137	67.447	70.392	69.276	71.353
19.704	42.102	33.217	33.643	12.077	2.38	3.954	0.943
29.1	57.7	47.5	48.0	17.9	3.4	5.7	1.3
	126.149				6.698		
	45.90				2.40		

TABLE 8.—Costs of Production as a percentage of the different breeds and crosses of chicks raised to 12 weeks of age during the different seasons. (As compared to the results, by Anderson and Prestwick 1959).

Items	And Prest-wick 1959	First season				Second season				Third season			
		N. H.	W. P.	C. × W. P.	W. P. × N. H.	N. H.	W. P.	C. × W. P.	W. P. × N. H.	N. H.	W. P.	C. × W. P.	W. P. × N. H.
Price of chicks	15.1	17.9	16.6	17.2	17.2	20.1	18.7	19.0	19.4	18.5	17.7	18.0	15.7
Feed	62.0	61.0	64.0	62.5	62.5	53.0	56.4	54.5	54.7	54.6	56.5	55.8	57.0
Heating		7.4	6.8	7.1	7.1	3.6	3.3	3.5	3.5	3.6	3.4	3.5	3.4
Litter		2.1	2.0	2.0	2.9	3.5	3.3	3.4	3.4	3.5	3.4	3.5	3.4
*Labour	14.2	2.1	3.8	3.9	3.9	6.9	7.5	6.7	6.7	6.9	6.6	6.8	6.6
Housing depreciation. . .	1.3	2.6	2.4	2.5	2.5	4.4	4.1	4.3	4.5	4.4	4.3	4.3	4.2
Equipment depreciation .		4.9	4.4	4.8	4.8	8.5	7.1	7.8	8.0	8.4	8.1	8.1	7.9
Total	—	100	100	100	100	100	100	100	100	100	100	100	100

* Labour include : Manager, Directors, and vetrinary services.

In all cases, it should always be remembered that the success of any broiler project depends mainly on the accurate selection of the stock as well as on the application of proper technical feeding, disease control and other managerial factors. The success of a broiler industry in Egypt not only will share in easing the meat problem for the people, which is becoming a tight and serious cause of discomfort, but also will offer great possibilities of successful economic development all over the country.

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تأثير شهور السنة ونوع الدجاج على الكفاءة الغذائية والنفوق والأربحية تحت الظروف المحلية

الملخص

شمل البحث ٦٥٠٤ كتكوتا من أنواع البليموث الأبيض والنيوهامبشير وخليط الكورنيش مع البليموث وخليط النيوهامبشير مع البليموث بأعداد متساوية . وقد فقست هذه الكتاكيت فى شهور يناير ومايو وأغسطس سنة ١٩٦١ وقد اتضح من البحث أن الكتاكيت التى فقست فى يناير كانت أعلى وزنا من التى فقست فى كل من مايو وأغسطس . وكان متوسط الوزن ١٢٣١ ، ١٠٧٨ ، ٧٧١ جراما فى عمر ١٢ أسبوعا للثلاثة شهور السابقة وقد اتضح أيضا أن الكفاءة الغذائية ونسبة النفوق كانت أحسن فى الكتاكيت التى فقست فى شهر مايو عن مثيلتها التى فقست فى الشهور الأخرى وكان معامل التمثيل الغذائى ٣ر٥٤ ، ٢ر٩٧ ، ٤ر٦١ كيلو كما كانت نسبة النفوق ٣ر١٨٪ ، ٨ر١٤٪ ، ٢٢ر٢٤٪ فى المدة من يناير ومايو وأغسطس على التوالى . وقد تبين أن الكتاكيت التى فقست فى شهر مايو هى التى حققت أحسن ربح يليها التى فقست فى يناير أما التى فقست فى أغسطس فقد حققت خسارة .

أما بالنسبة للأنواع وفى كل شهور الفقس فقد تبين أن البليموث روك حقق أحسن النتائج يليه خليط الكورنيش مع البليموث روك ثم خليط النيوهامبشير مع البليموث روك .

أما النيوهامبشير فقد كانت نتائجه أسوأ النتائج .