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EFFECT OF FLOOR SPACE, BROODING TEMPERATURE AND TYPE OF BROODING ON THE GROWTH PATTERN OF FAYOUMI CHICKS

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SUMMARY

A comparison of growth performance was initiated to evaluate the use of variable floor space, brooding temperature and brooding accomodation for 2583 Fayoumi chicks hatched during Dec. 1963 and Jan. 1964 at the Poultry Research Station, Fac. of Agric. Cairo Univ. Treatments for floor space were allowing 2/3, ½ and ⅓ sq. ft. per bird, while trials on brooding temperature dealt with different starting temperatures of 85°F, 90°F and 95°F. to be reduced weekly by 3°, 4° and 5°F. respectively till 70°F. Battery brooding was compared with floor brooding. Records on body weight, feed consumption and mortality were followed till eight weeks of age.

Results were as follows:

1. Allowing ½ sq. ft. per bird in floor space yielded the best result in return over feed cost, while only permitting ⅓ sq. ft. area gave the poorest yield.

2. Starting with 85°F. in brooding temperature resulted in the best growth response, yet the feed efficiency was much penalized. Contrary results were found with the group starting at 95°F. with considerably high mortality.

Irrespective of low feed efficiency, the returns over feed cost were still higher for the group reared at 85°F. The 90°F. group showed slightly less advantage than the 85°F. groups, with no estimation considered on heat cost.

3. Battery brooding was more beneficial in growth, feed efficiency and mortality rate than floor brooding. Consequently the returns expected over feed cost were exceptionally higher.

4. Based on expected gains over feed cost, it is advisable to consider the maximum gains in chick production to be dependent upon combined success in rapid growth rate, improved feed efficiency, least mortality and reduced cost of production.

INTRODUCTION AND REVIEW OF LITERATURE

The deleterious effects generally attributed to crowding such as slow rate of growth, high mortality and more culls were encountered to variable extents in various experiments involving different breeds of chickens. (Tomhave and Seeger, 1945; Bausman, 1947; Haishman *et al*, 1952; Siegle and Coles, 1958; Brooks *et al*, 1958; Hansen and Walter, 1960 and Moreng *et al*, 1961). In the series of trials on the effects of high environmental temperature upon growth, feed efficiency and mortality rate of chickens,

body weight and vitality of chicks were found to be lowered but less feed was required for body weight gains. (Milligan *et al*, 1957; Prince *et al*, 1960, 1961 and 1965, and Huston *et al*, 1961). Comparisons on type of brooder showed that battery brooded birds were of better growth and viability than floor brooded ones (Charles, 1936 ; Mehrhof et al. 1943 ; Anderson and Jones 1957 and Sullivan *et al*, 1961).

The purpose of the present study was to investigate the use of different levels of floor space, temperature degrees and type of brooders as a mean for improving growth response of Fayoumi chicks with special attention to their mortality rate and cost of production.

MATERIALS AND METHODS

The experimental work included 2583 Fayoumi chicks hatched during three successive weeks during December 1963 and January 1964 at the Poultry Research Station, Animal Production Dept. Fac. of Agric. Cairo University.

Specific details covering the number of chicks and treatments are given in Table (1). Chicks were grouped according to their hatching weights and all groups of chicks were treated in the same way except for the factors meant to be studied.

Body weight, feed efficiency and relative growth rates were recorded and presented here at biweekly intervals.

Assumptions for the savings in cost of production are explored in different trials.

TABLE 1.—NUMBER OF CHICKS, PER GROUP AND TREATMENT, IN THE DIFFERENT INVESTIGATIONS ON FLOOR SPACE, BROODING TEMPERATURE AND TYPE OF BROODING.

Items studied	Groups	No. of chicks	Treatments
1. Floor space	A	250	Chicks were allowed 2/3 sq. ft./bird.
	B	333	,, ,, ,, 1/2 ,, ,, ,,
	C	500	,, ,, ,, 1/3 ,, ,, ,,
2. Brooding temperature	A	300	The initial temp. of 85 F. was decreased weekly by 3 F. till 70 F.
	B	300	The initial temp. of 90 F. was decreased weekly by 4 F. till 70 F.
	C	300	The initial temp. of 95 F. was decreased weekly by 5 F. till 70 F.
3. Type of brooding..	A	300	Chicks were brooded in a modern 5 deck TLF. Horve 138 Battery.
	B	300	Chicks were brooded in floor compartments of 14 × 12 ft.

RESULTS AND DISCUSSIONS

1. *Floor space experiment*:

The average body weight gains, relative growth rates and feed efficiency factors per group are shown in Table (2). It could be seen that better gains and higher rates of growth could be attributed to less condensation of chicks. Average body weights for the three groups A, B and C, were 387.7, 372.1 and 345.7 gms. in respective order at 8 weeks of age. These differences in body weights were proved to be highly significant.

Feed efficiency was significantly lowered in the group allowed 1/3 sq. ft. per chick than in the other two groups allowed 1/2 and 2/3 sp. ft.

The above results are in full agreement with earlier findings in this area of study as reviewed here. The uneven chances to move fairly for feed, fighting, feather picking, damp of litter and sometimes cannibalism are among the causes generally attributing to the drawbacks of crowding in this respect.

TABLE 2.—AVERAGES FOR BODY WEIGHT GAINS, RELATIVE GROWTH RATES AND FEED EFFICIENCY, AT BIWEEKLY INTERVALS, FOR CHICKS BROODED AT 1/3, 1/2, AND 2/3 SQ. FT. OF FLOOR SPACE PER BIRD.

Age (weeks)	Body weight gains (gms.)			Relative growth rates %			Feed efficiency (kgs.)		
	Floor space sq. ft.			Floor space sq. ft.			Floor space sq. ft.		
	2/3	1/2	1/3	2/3	1/2	1/3	2/3	1/2	1/3
0–2	38.05	35.64	33.90	80.40	74.80	73.10	3.68	3.64	3.39
2–4	77.35	62.57	62.74	73.60	64.60	66.20	7.69	2.67	3.51
4–6	109.95	108.55	92.79	55.60	59.50	53.80	4.64	4.42	4.00
6–8	135.13	135.61	126.90	42.20	44.50	44.90	5.03	4.47	4.20
0–8	359.50	342.30	316.30	172.80	170.29	168.63	4.49	4.22	3.94

The decreased feed efficiency in the less condensed chick groups may be due to their more liberty in moving around and hence losing extra energy than the more condensed ones which are bound to settle down and consequently reserve more heat and energy. However, this point needs more biophysiological studies to classify the specific nature of heat and energy under vairiable conditions.

2. *Brooding temperature experiment:*

The results given in Table (3) indicate to a progressive decrease in relative body weight gains and rate of growth of chicks brooded at high brooding temperature.

Average body weights at 8 weeks of age for the three groups brooded at starting temperatures 85°, 90° and 95° F. were 378.0, 357.8 and 317.6 gms. respectively and these differences were highly significant.

TABLE 3.—AVERAGES FOR BODY WEIGHT GAINS, RELATIVE GROWTH RATES AND FEED EFFICIENCY, AT BIWEEKLY INTERFALS, FOR CHICKS BROODED AT 85°, 90° AND 95° F. BROODING TEMPERATURE.

Ages (Weeks)	Body weight gains (gms)			Relative growth rates %			Feed efficiency (kgs.)		
	Initial			Brooding			temperature °F		
	85	90	95	85	90	95	85	90	95
0–2	39.30	35.09	34.31	84.40	76.00	75.90	3.61	3.25	3.00
2–4	67.35	69.31	66.52	67.40	70.40	69.50	3.56	3.26	3.10
4–6	140.11	123.99	104.74	68.80	63.80	57.70	4.18	4.05	4.00
6–8	104.34	100.90	84.06	32.00	32.80	30.40	5.67	5.22	5.20
0–8	351.10	329.30	289.60	173.43	170.42	167.53	4.39	4.19	3.97

However, feed efficiency at the higher temperatures was significantly better.

These results correspond with other findings reviewed earlier, notably those of Prince *et al*, 1960, 1961 and 1965, and are generally related to the effects of environmental temperature on the physiological mechanisms in feed utilization and heat regulation. High temperature is known to suppress hormonal as well as digestive and growth activites in the body.

The efficiency in feed utilization for growth in rather-hot atmosphere may be through the less need in using feed energy for body heat as compared to less warm environments.

3. *Battery and floor brooding experiment*:

Averages for body weight gains, relative rate of growth and feed efficiency for battery and floor brooded chicks are shown in Table (4). The average body weigths at eight weeks old were 394.1 and 364.6 grams for the two groups respectively. Each difference was highly aignificant. Meanwhile, the battery reared chicks used their feed more efficiently than the floor brooded ones. This advantage may be due to the fact that chicks brooded in battery, being comparatively less free to move, especially at later ages, and of considerably less in feed waste, are more likely to be more efficient in feed use. Also, with less susceptibility to coccidiocis and other litter infections, birds reared in batteries have a better chance for growth and vitality than their floor mates. Similar observations were discussed by Sullivan et al. (1961) with growing poults.

TABLE 4.—AVERAGE BODY WEIGHT GAINS, RELATIVE GROWTH RATES AND FEED EFFCIENCY, AT BIWEEKLY INTERVALS FOR CHICKS BROODED IN BATTERY AND ON FLOOR.

Ages (weeks)	Body weight gains (gms.)		Relative growth rate %		Feed efficiency (kgs.)	
	Type of brooder					
	Battery	Floor	Battery	Floor	Battery	Floor
0–2	36.45	36.90	80.89	80.65	3.03	3.04
2–4	83.17	80.18	79.30	76.80	3.21	3.41
4–6	139.44	121.62	64.50	59.20	3.81	4.42
6–8	108.32	98.60	31.80	33.20	4.85	5.60
0–8	367.30	347.30	174.53	172.04	3.90	4.25

4. *Feed costs and expected returns*:

To devise sound recommendations for growing chicks more efficiently with regards to the studied environmental conditions, group comparisons, on 100 chick basis, were tried mainly to obtian the difference between selling price of chicks and total feed cost in the various treatments. Table (5) contains the items considered. It could be seen that owing to variable mortality rates and final body weights at 8 weeks of age, the gross weight of survivals to be

TABLE 5.—COMPARATIVE ESTIMATION FOR EXPECTED RETURNS OVER FEED COST IN THE DIFFERENT TREATMENTS BASED ON 100 STARTING CHICKS

No.	Item	Floor space per chick			Init. brooding temp. °F Type of brooder				
		$\frac{3}{3}$	$\frac{1}{2}$	$\frac{1}{3}$	85°F	90°F	95°F	Battery	Floor
1	No. of chicks	100	100	100	100	100	100	100	100
2	Percent moratlity %	3.600	3.000	6.600	4.000	4.000	7.300	3.000	6.000
3	Average body weight (gms.)	387.100	372.100	345.700	378.000	357.600	317.600	394.100	364.600
4	Total weight of survivals (kgs.)	37.400	36.100	32.300	36.300	34.600	29.600	38.220	34.370
5	Average feed efficiency (kgs.)	4.500	4.200	4.000	4.400	4.200	4.000	3.900	4.250
6	Feed cost per 1 kg. of live weight (P.T.)*	13.500	12.600	12.000	13.200	12.600	12.000	11.700	12.700
7	Total feed cost (pound)	5.050	4.550	3.880	4.792	4.360	3.550	4.472	4.365
8	Seling price of survivals (pounds) . . .	11.220	10.830	9.690	10.890	10.380	8.880	11.466	10.311
9	Difference over feed cost (pounds) . .	6.170	6.280	5.810	6.099	6.020	5.330	6.994	5.946

* Estimated feed cost is 30 pounds per ton.

** Estimated selling is 30 piasters per 1 kgs. of alive chicks.

sold varied considerably between extreme groups. For example, the group allowed 2/3 sq. ft. per chick in floor space yielded about 15% more liveweight than the group of 1/3 sq.ft. Also, chicks reared initially at 85°F. showed about 15% more body weight than those started at 95°F. Again the battery chicks averaged over 10% heavier than the floor ones. However, the feed efficiency results were found to modify the ranking of the compared groups in regard to the differences between the selling price of the considered group and its total feed cost. In this respect, although the group allowed 2/3 sq. ft. of floor space was of heavier total sellinge weight than the group allowed ½ qs. ft., the latter group, being of relatively higher feed efficiency and consquently less feed cost, yielded slightly better returns over feed cost, and if considerations were to be given to the returns of unit floor area occupied, the 1½ sq. ft. system would be more beneficial than in the 2/3 sq.ft. allowance.

From the preceeding discussions, it might be more appropriate to consider the maximum profit in production to be dependent upon a multifacotor environment largely due to more rapid growth rate, much improved feed efficiency, least of mortality and safely reduced cost of production. To deal with the present trials seperately, it might be recommended to allow 1½ sq. ft. in floor space, start with 85°F. to be progressively decreased to 70°F. in five weeks period, and apply battery brooding for more economic raising of Fayoumi chicks.

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تأثير الازدحام ودرجة حرارة الحضانة وطريقة المسكن على معدل نمو الكتاكيت الفيومى

الملخص

أجريت هذه التجارب بمحطة أبحاث قسم الانتاج الحيوانى بكلية الزراعة جامعة القاهرة بفرض دراسة تأثير بعض العوامل على كل من معدل النمو وكفاءة التحويل الغذائى خلال فترة الثمانية أسابيع الأولى من نمو الكتاكيت . وكانت العوامل الرئيسية التى تم بحثها هى :

١ ــ ازدحام الكتاكيت : ١/٣ ، ١/٢ ، ٢/٣ قدم مربع لكل كتكوت .

٢ ــ درجة الحرارة أثناء فترة الحضانة « درجة حرارة تبدأ من ٨٥° ف أو ٩٠° ف أو ٩٥° ف

٣ ــ طريقة المسكن « بطاريات أو حضانات أرضية » .

وقد استخدم فى هذه الأبحاث عدد ٢٥٨٣ كتكوتا من الفيومى خلال موسم التفريخ ١٩٦٣ ــ ١٩٦٤ كما تمت مقارنة هذه المعاملات فى ظروف بيئة واحدة .

ويمكن تلخيص النتائج التى تم الحصول عليها فى الآتى :

أولا ــ وزن الجسم :

(أ) الكتاكيت التى خصص لكل منها مساحة كبيرة نسبيا من الأرضية « ٢/٣ قدم مربع لكل كتكوت » أعطت وزنا أكبر نسبيا من تلك التى خصص لها مساحة أقل من الأرضية « ١/٢ و١/٣ قدم مربع لكل كتكوت » وكان الفرق فى الوزن يزداد وضوحا بتقدم العمر . وفى عمر ٨ أسابيع كان متوسط وزن الجسم ٣٨٧ر٧ جم ، ٣٧٢ر١٢ جم و ٣٤٥ر٧ جم للكتاكيت التى خصص لكل منها على التوالى ٢/٣ ، ١/٢ ، ١/٣ قدم مربع لكل كتكوت من مساحة الأرضية وكانت الفروق معنوية .

(ب) الكتاكيت التى تمت حضانتها فى درجة حرارة منخفضة نسبيا « ٨٥° ف » عند الابتداء كانت أسرع نموا من كتاكيت المجموعتين الأخريتين والتى تمت حضانتها فى درجة حرارة متوسطة « ٩٠° ف » ودرجة حرارة مرتفعة « ٩٥° ف » ،عند الابتداء كما كان هذا الاختلاف فى سرعة النمو ملحوظا بعد عمر الأربع أسابيع الأولى – وعند عمر ٨ أسابيع كان متوسط وزن الجسم ٣٧٨ جم ، ٨ر٣٥٧ جم ، ٦ر٣١٧ جم للكتاكيت التى تمت حضانتها على التوالى فى درجات حرارة منخفضة ومتوسطة ومرتفعة كما كانت الفروق معنوية .

(جـ) الكتاكيت التى حضنت فى البطارية كان وزنها أكبر من تلك التى تمت حضانتها فى حضانات أرضية – كما ظل هذا التفوق ملحوظا باضطراد وحتى عمر ٨ أسابيع حيث كان متوسط وزن الجسم للكتاكيت التى تمت حضانتها فى البطارية ١ر٣٩٤ جم مقابل ٦ر٣٦٤ جم لتلك التى تمت حضانتها فى حضانة أرضية وكان الفرق معنويا .

ثانيا – كفاءة التحويل الغذائى :

(أ) الكتاكيت التى خصص لكل منها ١/٣ قدم مربع مساحة الأرضية كانت أفضل فى كفاءتها التحويلية ٩٤ر٣ : ١ من تلك التى خصص لكل منها ١/٢ أو ٢/٣ قدم مربع من مساحة الأرضية (٢٢ر٤ : ١ و ٤٩ر٤ : ١ على التوالى) وذلك طوال فترة التجربة من وقت الفقس وحتى عمر ٨ أسابيع كما كانت الفروق معنوية .

(ب) أفضل كفاءة تحويل غذائى تحصل عليها (٩٧ر٣ : ١) كانت لتلك الكتاكيت التى تمت حضانتها فى درجة حرارة مرتفعة « ٩٥° ف » عند الابتداء بينما استهلكت الكتاكيت التى تمت حضانتها فى درجة حرارة منخفضة نسبيا « ٨٥° ف » عند الابتداء غذاء أكثر لزيادة وزن الجسم (٣٩ر٤:١) كما كانت الفروق معنوية .

(جـ) كانت كفاءة التحويل الغذائى للكتاكيت التى تمت حضانتها فى البطارية أفضل « ٩٠ر٣ : ١ » بمقارنتها بالكتاكيت التى تمت حضانتها فى حضانة أرضية حيث كانت تلك النسبة « ٢٥ر٤ : ١ » كما كان الفرق معنويا .