

FERTILITY AND HATCHABILITY OF FAYOUMI BIRDS AS AFFECTED BY CORN CONTENT IN THE RATION

By

A.A. ABOUL-SOUD⁽¹⁾, M. A. GHANY⁽²⁾ AND A.D. SELIM⁽²⁾

SUMMARY

In an attempt to lower cost of poultry production, three rations differing in corn content (10%, 25% and 50% designated as G₁, G₂ and G₃ respectively), but having approximately the same percentage of digestible protein, were compared in three feeding groups of 149 Fayoumi pullets. Fertility, hatchability and embryonic mortality were recorded. The work was carried out at Dokki Poultry Experimental Farm Ministry of Agriculture, Cairo, U.A.R. During January, February, March and April 1960 a total of approximately 5300 eggs were incubated for the three groups. The findings are summarized as follows:

(1) The average infertility percentages were 9.41, 9.90 and 6.76 for G₁, G₂ and G₃ respectively.

(2) Group 2 had the highest average hatchability (89.4%) while G₁ and G₃ showed about the same hatchability (around 84%). Differences between G₂ and either G₁ or G₃ were statistically significant.

(3) Weekly embryonic mortality, relative to total mortality was highest during the first week for G₁ and highest during the second and third weeks in G₃.

It can be concluded that better hatchability can be achieved by feeding rations containing an intermediate level of corn.

INTRODUCTION AND PREVIOUS WORK

The fact that hatchability of eggs may be affected by the breeding ration is always considered in feeding and hatchability studies. Vitamins and minerals have received the greatest attention in this respect and the role of carbohydrate sources, such as grains and grain by-products have received less attention. Call and Wilcke (1939) found that hatchability and vigor of hatched chicks were better when wheat rather than oats was fed. The corn ration produced poor results. On the other hand, Buchner et al (1948) observed that the highest fertility and hatchability were obtained when high percentage of maize was included in the ration.

(1 & 3) Animal Prod. Dept. Min. of Agric. Dokki, Cairo, UAR.

(2) Animal Prod. Dept. Fac. of Agr. Cairo Univ. Giza, UAR.

The effect of energy in rations on fertility and hatchability was studied in many investigations. Bearnse *et al* (1950) found that energy content of the diet had no effect on hatchability. Singesen *et al* (1952) found that high content of corn slightly improved hatchability. On the other hand Sherwood and Milby (1961) reported better hatchability for medium energy than for high energy rations.

Reports on hatching results with Fayoumi birds showed that fertility percentages were generally high, ranging from 80-90%, while the hatching percentages ranged between 70-89% (Gawad 1955, Amer 1956, 1959, Hossary 1958, Helmy 1958, Omara 1959, Ghany 1960, El-Boushy 1961, Ghany *et al* 1962, Samkari 1962 and Kheireldine 1966). Hafez and Kamar (1955) calculated the average first and third week mortality of Fayoumi fertile eggs as 7.91% and 24.25% respectively. El-Boushy (1961) found 7.0%, 1.7% and 11.0% dead embryos during the first, second and third weeks of incubation respectively. Samkari (1962) reported that the weekly percentages of dead embryos in Fayoumi, expressed as a percentage of total mortality, were 21.7, 7.1 and 71.2% in the 1st, 2nd and 3rd weeks of incubation respectively.

Since grains, and especially corn, form an expensive constituent of poultry rations in U.A.R., the present experiment was undertaken to study the effect of different levels of corn in breeding rations on the fertility and hatchability of eggs.

MATERIALS AND METHODS

The experimental work was carried out at Dokki Poultry Farm, Ministry of Agriculture to compare the effect of using different levels of corn and cereal by-products on fertility and hatchability. Fifty, 46 and 53 Fayoumi breeding pullets were allotted to three feeding groups (G_1 , G_2 , and G_3 respectively). They were pen mated and housed in separate houses with sun porches. The rations used differed in corn content (10, 25 and 50% respectively) but had approximately the same percentage of protein (Tables 1 and 2). Feed was offered ad libitum. During January - April 1960, 1700 eggs were incubated for G_1 while 1586 and 1996 eggs were set for G_2 and G_3 respectively. Eggs were set at weekly intervals using Secura electric forced draft incubator. Testing for infertility and dead embryos was done on the 7th and 18th days of incubation. All dead embryos and those failing to hatch were examined. Percentage hatchability was related to fertile eggs while daily embryonic mortality was related to total embryonic mortality. For testing the differences in fertility and hatchability between groups, percentages were transformed to their arcsins then analysis of variance was carried out (Snedecor 1956).

TABLE 1.—Ingredients and Percentage Composition of The Laying Rations

Ingredients	Rations		
	I	II	III
	%	%	%
Corn	10	25	50
Rice bran	30	20	8
Wheat bran	20	15	8
Rice starch by-product	11	9	0
Corn gluten feed (protilan)	8	9	12
Decorticated cotton seed meal	9	10	10
Dried skim milk	7	7	7
Bone meal	2	2	2
Lime stone	2	2	2
Mineral mixture	0.5	0.5	0.5
Sodium chloride	0.5	0.5	0.5
Cost per one kg. (mills)	18.22	21.33	26.17

Note : Each ton of ration was supplemented with :

$\frac{1}{2}$ kg. vit. A (each gram contains 10,000 I.U.)

$\frac{1}{2}$ kg. vit. B (each pound contains 4 grs. riboflavin, 4 grs.

pantothenic acid, 24 grs. niacin and 104 grs. choline chloride).

180 grs. manganese sulphate.

TABLE 2.—Chemical Composition and Metabolisable Energy Content In The Three Rations

Items	Rations		
	I	II	III
	%	%	%
Moisture	9.01	8.98	9.79
Crude protein	16.44	16.62	16.08
Crude fat	4.98	4.40	3.53
Crude ash	12.43	10.30	7.87
Crude fiber	7.30	5.94	4.37
Carbohydrates	49.84	53.76	58.36
Digestible protein	12.17	12.26	12.34
Starch value	63.41	65.90	69.37
Metabolisable energy calorie/kg.	2319	2513	2793

Digestible protein and starch value were calculated using the digestibility coefficients of the "Animal and Poultry Nutrition", Ministry of Agriculture (1961).

Metabolizable energy was calculated using the "Percentage Multipliers" worked by Titus (1961).

RESULTS AND DISCUSSION

Group 3 had the lowest infertility followed by Groups 1 and 2 (Table 3). Analysis of variance proved that the observed differences were not significant (Tables 4 and 5). Infertility tended to increase in April especially in G_2 . Group 3, however, showed no such trend. This increase in fertility may be the result of extra Vitamin A provided by the high corn diet. Almquist and Mecchi (1939) Bucker *et al* (1948) and Haywang (1962) found that the need for Vit. A is increased in hot weather.

TABLE 3.—Number of Eggs set and average percentages of infertility and hatchability per month for the three groups.

Groups Month	1			2			3		
	Eggs set	% Infer.	% Hatch.	Eggs set	% Infer.	% Hatch.	Eggs set	% Infer.	% Hatch.
January	503	9.15	84.25	440	4.77	91.65	513	6.04	85.27
February	473	8.88	88.86	472	6.99	92.03	614	7.33	86.64
March	355	9.02	85.45	345	10.41	87.70	422	7.58	81.79
April	369	10.84	73.76	329	20.36	83.59	447	6.04	83.39
Total	1700	9.41	83.57	1586	9.90	89.43	1996	6.76	84.52

Group 2 had a higher average hatchability percentage than G_1 and G_3 . These differences were statistically significant. (Tables 4 and 5). In April; hatchability tended to decrease especially for G_1 . The general tendency for low hatchability in G_1 may be due to the high content of ash (12.4%) and fiber (7.3%) in ration one. Dymaza *et al* (1954) reported that hatchability was related inversely to fiber content of the diet. Meanwhile, the relative low hatchability in G_3 may be related to the deficiency of nicotinic acid. Sarma and Elvehjen (1946), Scott *et al* (1946), Mishler *et al* (1946) and Briggs *et al* (1946) showed that with a high percentage of corn in the ration nicotinic acid supplementation is indispensable for good hatchability. Meanwhile, Heuser (1955) found that wheat by-products and rice by-products are rich sources for this vitamin. In the light of the above findings; the relatively high hatchability of group 2 may have resulted from the combination of corn and grain by-products. A similar explanation was offered by Smith (1935) and Smith and Branion (1936).

TABLE 4.—Analysis of variance between groups and months for infertility and hatchability.

Source of Variation	D.F.	Infertility			Hatchability		
		S.S.	M.S.	F. Value	S.S.	M.S.	F. Value
Groups . . .	2	27.06	13.63	1.07	49.26	24.73	4.76
Months . . .	3	45.09	15.03	1.02	83.54	27.85	5.39*
Error	6	73.80	12.60	—	31.01	5.17	—
Total	11	145.95	—	—	163.81	—	—

* Significant at 5% level.

TABLE 5.—Observed differences and least significant differences (L.S.D.) for infertility and hatchability of groups and months.

Items	Infertility			Hatchability		
	Obs.	L. S. D.		Obs.	L. S. D.	
	diff.	5 %	1 %	diff.	5 %	1 %
G2 vrs. G1	0.50	6.150	9.31	*4.58	3.94	5.97
G2 vrs. G3	3.41	6.150	9.31	*4.05	3.94	5.97
G1 vrs G3	2.91	6.150	9.31	0.63	3.94	5.97
Jan. vrs. Feb. . .	1.30	6.880	10.43	1.76	4.56	6.90
Jan. vrs. Mar. . .	2.59	6.880	10.43	1.84	4.56	6.90
Jan. vrs Apr. . . .	5.24	6.880	10.43	*5.37	4.56	6.90

* Significant at 5% level. *obs.* = observed *diff.* = Differences.

The percentage of early dead embryos was highest in the three groups within the first days of incubation, (Fig 1). The average first week mortality was highest in group 1 followed by group 2 and group 3 (Table 6). During the second week, group 3 showed highest mortality at the 8th day of incubation while group 2 showed higher mortality on the 13th day. The death rate in all groups was more noticeable after the 19th day of incubation. However; the observed differences between groups in embryonic mortality are not so consistent or sharp to provide definite conclusions; and it is felt that further research is needed.

TABLE 6.—Distribution of embryonic mortality per week (w) from total mortality for the three groups.

Weeks groups	W ₁	W ₂	W ₃	Total	
C ₁	No.	58	19	176	253
	%	22.94	7.51	69.55	100
G ₂	No.	31	14	106	151
	%	20.53	9.26	70.21	100
G ₃	No.	46	33	209	288
	%	15.96	11.46	72.58	100

The above results on fertility and hatchability of Fayoumi eggs correspond closely with those given by Helmy, (1958) Samkari (1962) and Kheireldin (1966), although somewhat higher than that reported by Gawad(1955) Hossary (1958) Ghany (1960) and El-Boushy (1961). This may be explained by the variation in experimental conditions. The relative decrease in fertility and hatchability observed with the approach of hot weather in April was previously noted by El-Ayadi and El-Ibiary (1957) Helmy (1958) and Ghany (1960) and may be due to decreased feed consumption during hot weather.

It could be concluded that better results of hatchability would be achieved by feeding rations containing neither high nor low percentages of corn. Rations containing relatively low percentage of corn and high percentages of cereal by-products were found to be biologically satisfactory and economically sound.

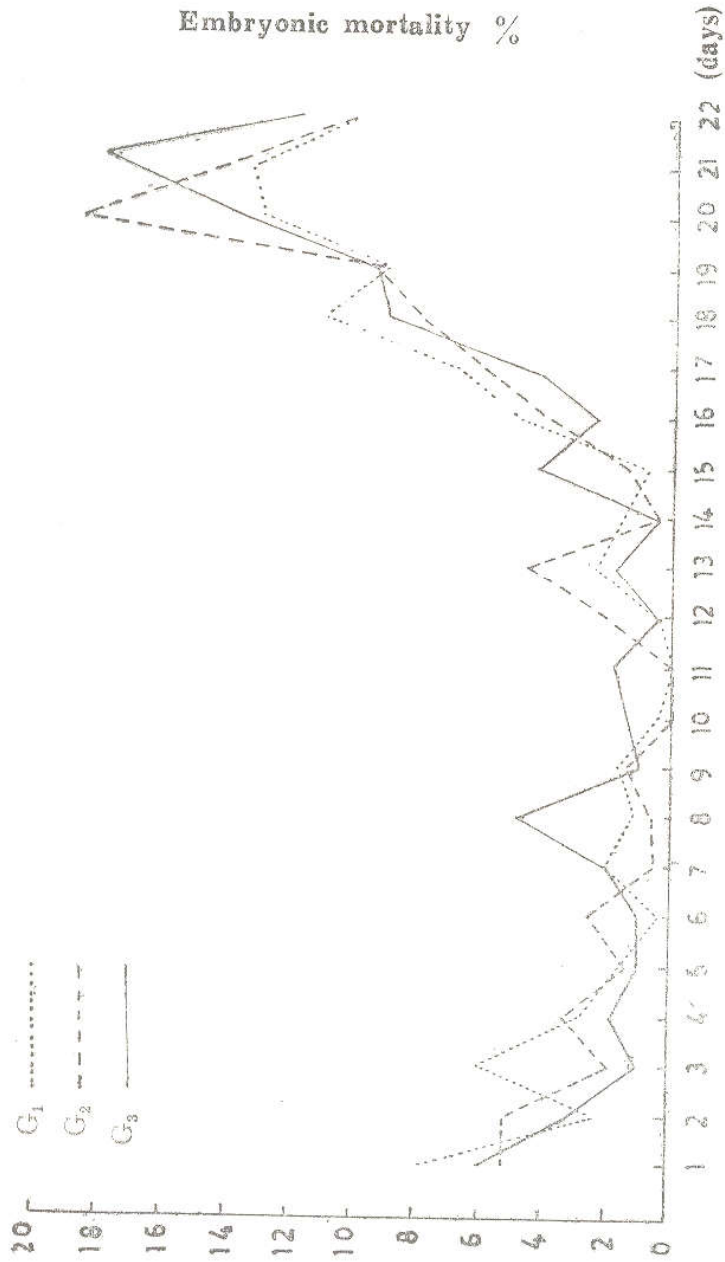


FIG. 1.—Distribution of embryonic mortality through out the incubation period in the three groups.

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تأثير محتويات العليقة من الذرة على الاخصاب والتفريخ في الدجاج الفيومي

الملخص

كمحاولة لتخفيض تكاليف التغذية باقلال نسبة الحبوب في علائق دجاج البيض ودراسة تأثير ذلك على الاخصاب والتفريخ أجرى هذا البحث في مزرعة الدواجن بالدقى بالإدارة العامة للإنتاج الحيوانى بوزارة الزراعة واستخدمت ١٤٩ دجاجة فيومي قسمت الى ثلاث مجموعات وغذيت على ثلاثة علائق تختلف في نسبة مكوناتها من حبوب الذرة (١٠ و ٢٥ و ٥٠ ٪) ولكنها تحتوى على نسبة واحدة من البروتين . وتم تفريخ ١٧٠٠ بيضة من المجموعة الأولى و ١٥٨٦ بيضة من المجموعة الثانية و ١٩٩٦ بيضة من المجموعة الثالثة . وتتلخص النتائج المتحصل عليها فيما يلى :

- ١ - كان متوسط نسبة البيض اللانح ٩٤١ ٪ ، ٩٩٠ ٪ ، ٦٧٦ ٪ للمجموعات الأولى والثانية والثالثة على التوالى .
- ٢ - ارتفع متوسط نسبة التفريخ في المجموعة الثانية اذ بلغت ٨٩٤٣ ٪ بينما كانت متساوية تقريبا في المجموعتين الأولى والثالثة (٨٤ ٪) وكان الاختلاف بين المجموعة الثانية وكل من المجموعتين الأولى والثالثة جوهريا .
- ٣ - كانت نسبة الأجنة الميتة أسبوعيا الى الأجنة الميتة الكلية مرتفعة في المجموعة الأولى خلال الأسبوع الأول بينما أظهرت المجموعة الثالثة ارتفاعا في تلك النسبة خلال الأسبوعين الثانى والثالث .
- ٤ - يستنتج أنه يمكن الحصول على نسبة تفريخ أفضل بالتغذية على علائق تحتوى على نسب متوسطة من حبوب الذرة .