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Effect of some Modifications in Feeding System, Managemental and Environmental Conditions on Fertility and Hatchability of Fayoumi Eggs

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On ootober, 500 hens and 50 cocks were divided into 10 equal groups to study the effect of artificial light (from 3-7 a.m.), night heating (65°F), warm feeding, soft and grain feeding and deep litter on fertility and hatchability during winter.

On March, the birds were turned to conventional management system. By first of May ten new groups (40 females + 4 males) were randomly formed to study the effect of artificial light (from 3-7 a.m.), mid-day darkness, ventilation, shading and cold feeding on fertility and hatchability during summer.

The control groups gave the least percentages of fertility and hatchability results either in winter or summer treatments. Fertility and hatchability percentages were higher in winter than summer months for all the treatments. The use of artificial light during winter or summer seemed to increase fertility and hatchability. These effects were more pronounced when light was combined with further modifications. During winter, the least results were observed for the deep litter group. Meanwhile, during summer the best results were observed for the treatments with shaded yards alone or in combination with light or cool feeding.

Wide seasonal variation was observed in incubation results of different workers. Fertility decreased considerably during summer and increased in spring (Hafez and Kamar, 1954, Parker, 1957 and Ishibashi, *et al.*, 1962). Conkov (1961) and Ishibashi, *et al.*, (1962) observed progressive decrease in fertility between summer, autumn and winter, respectively. Parker (1957) found the highest fertility in autumn and the lowest in summer.

Kaufman and Gancanrczyk (1954) found the least fertility in December and the highest in February. While Ragab and Helmy (1962) showed the maximum fertility in November and February, and minimum in May and July. On the other hand, Ghany (1960) and Ghany, *et al.*(1963) showed that no clear trend was observed between fertility and monthly variation, while there was a general trend for incrasing hatchability from November to March.

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Hatchabilty was lowest in september and highest in December (Kaufman and Gancanruzyk, 1954). In general, chicks hatched better in spring and winter than in summer and autumn (Conkov, 1961 and Ishibashi, *et al.*, 1962).

Fertility corresponded positively with daylength (Kaufman Gancanruzyk 1954). Hens exposed to light for 9 and 13 hours daily showed higher fertility than those exposed to 1 and 3 hours daily light (Mc cluskey and Parker, 1963). There was no difference in hatchability between birds exposed to light for 14 hours & those exposed to continuous light (Lanber, *et al.* 1963).

Fertility decrased at temperature near 32°F. (Weber and Lortscher, 1954). When the average outside temperature droped below 3°F., fertility declined sharply . This reduction continued till the temperature increased above freezing (Hays and Sanborn, 1939; and Lamoreux, 1942). Meanwhile, by air temperature increase from 82.8°F. Fertility declined from 94 to 68% (Hoywang, 1944).

Females held in variable temperature showed higher fertility than females held at constant high environmental temperature of 98°F (Huston and Carmon, 1958. Glick, *et al.*, (1959) observed that fertility was slightly higher in an insulated house of 70-72° F than in a conventional house of 76-86°F. Keeping hens under constant temperature of 60-65°F, 60-65% humidity and equal periods of artificial day light and darkness (12 hours) increased hatchabilty than in natural conditions (Warren; *et al.*, 1950; Greenwood, 1954; and 1955). In general, fertility and hatchability were highest from hens kept under a constant temperature of 65°F (Wilson, *et al.*, 1957).

This work was carried out at the Poultry Experimental Centre, Animal Production Department, Faculty of Agriculure, Cairo Univrsity. Birds used in this study were hatched in late December. At the beginning of October, the birds were divided into 10 grousps each composed of 50 hens and 5 cocks for winter treatment (Table 1). Winter treatment lasted until the end of February, where the birds were turned to conventional management system during March and April. By first of May ten new groups each consisted of 40 females and 4 males were randomly formed for summer trials (Table 2), which ended on the 31st of August of the same year.

General procedure

Each group was housed separately in brick houses with open, fenced yards. Trapnets, feeders and waterers were supplied with adequate number.

The ration used for all groups was composed of 10% barley, 25% maize, 10% wheat, 10% horse beans, 12.5% wheat bran, 12.5% rice bran, 15% decorticated cottonseed meal, 4% fish meal and 1% meat meal. Half percent salt, 2% bone meal, 1% vitamin A+D_3 and 0.1% terramycin egg formula were added as feed supplements. Meals were offered twice daily as whole ration or in separate portions of mash and grains, as experimentally designed.

TABLE 1. General outline of experimental modifications for winter treated and control groups (from October to February)

Groups	Specifications				
	Light L	Night heating H	Warm feeding WF	soft and grain feeding SCF	Deep litter DL
1	+	—	—	—	—
2	+	+	+	—	—
3	+	+	—	+	—
4	+	+	—	—	+
5	—	+	—	—	—
6	—	—	+	—	—
7	—	—	—	+	—
8	—	—	—	—	+
9	+	+	—	+	+
Control	—	—	—	—	—

Experimental treatments

Treatments given in Table 1 and 2 were followed , besides, the control groups which were treated under normal conditions of whole feeding, daylength and temperature, and were kept with no floor litter.

A— The atmospheric trials

1. The birds were shut-in from 12 to 4 p.m. inside their houses. House openings were throughly covered with heavy canvas for complete inside darkness.

2. Houses were artificially lighted during winter treatment (October to February,) for four hours, from 3 to 7 a.m. in October, five hours, from 2 to 7 a.m. in December and January and four hours, from 3 to 7 a. m. in February.

During summer treatments (May to August, 1965), the houses were lighted for four hours from 3 to 7 a.m A 60- watt lamps were used that allowed a light exposure of nearly 0.5 foot-candle in the illuminated houses.

3. An electric thermostatic heater was used to keep the inside temperature almost constant at 65°F at night during the winter months.

TABLE 2. General outline of experimental design for summer groups (from May to August)

Groups	Specifications				
	Light L	Darkness D	Ventilation V	Shading S	Cool feeding CF
1	—	+	—	—	—
2	—	—	+	—	—
3	—	—	—	+	—
4	+	+	—	—	—
5	+	+	+	—	—
6	+	—	—	+	—
7	+	—	—	—	+
8	+	+	—	—	+
9	+	+	+	—	+
Control	—	—	—	—	—

4. Yards were shaded by mat to prevent any direct sunshine during summer.

B— Feed trials

1. *Whole feeding*

Meals were offered containing the whole mixtures of mash and grain food ingredients at the two feeding times.

2. *Soft (mash) and grain feeding*

Meals were offered in separate mixtures of mash or grains at feeding times. The mash was given in the morning while the grains were given in the afternoon

3. *Wetted feeding*

The mash meal was warmed, or cooled, by adding water (boiled or tap) according to winter or summer treatments.

C— Floor trials

1. *Deep litter*

Rice straw deep litter was maintained all through the whole months of experiments.

2. *Fresh litter*

Fresh rice straw was supplied weekly, allowing 5 c.m. in depth in winter and 3 c. m. in summer.

Data collection and statistical analysis

Fertility and hatchability percentages were obtained monthly for each group for 100 eggs each.

Analysis of variance was used for testing the differences of fertility and hatchability percentages were transferred to other corresponding arcsins before applying analysis of variance.

The observed differences and least significant differences (L.S.D.) were considered significant or highly significant when the probability was less than 0.05 or 0.01 respectvicly

The atmospheric changes during the months of the study are shown in Table 3.

TABLE 3. Average air temperature day-length and air velocity during winter and summer months.

Months	Air temperture "C"	Daylength		Air velocity "knote"
		hr	m	
October.	23.3	11	27	5.9
November. . . .	18.4	10	36	4.8
December	13.9	10	12	4.6
January	12.5	10	30	4.5
Febraury	14.0	11	7	4.3
May	23.5	13	35	5.6
June	28.2	13	29	5.0
July	27.4	13	49	4.3
August	26.7	13	11	5.0

Results and Discussion

Percentages of fertility and hatchability as affected by different feeding systems, managemental and environmental conditions are shown in Tables 4 and 5.

Results given in this particular study revealed that the lowest percentages of fertility and hatchability was that of the control groups. The low values obtained for the control groups were higher in summer season. This observation may indicate that winter stress in this study was less harmful or more tolerable than it was the case with summer stress. As shown in Tables 4 and 5 the use of warm feeding system in winter season increased the percentages of fertility and hatchability of Fayoumi eggs. The use of soft and grain feeding system also increased such percentages than the control groups. However, hatchability percentage was higher when the warm feeding system was applied.

TAPIE 4. Average percent in fertility and hatchability per groups during winter summer trials.

Winter			Summer		
Groups	Fertility	Hatchability	Groups	Fertility	Hatchability
L	94.4	88.8	D	89.7	79.6
L+H+WF .	97.4	92.6	D+V. . . .	94.5	75.0
L+H+SGF.	95.0	91.0	S.	91.0	83.2
L+H+DI .	96.6	91.1	L+D. . . .	88.5	79.0
H	93.8	88.3	L+D+V . .	94.5	81.1
WF	94.0	89.4	L+S	93.5	84.5
SCF	91.8	90.1	L+D+CF .	97.2	89.0
DL.	89.8	87.1	L+D+CF .	92.2	82.9
L+H+SCF +DL. . .	98.8	94.7	L+D+F+C F	94.7	89.4
Control . .	87.2	86.5	Control . .	81.0	72.1
L,S,D. 5%		1.85	2.53	4.10	4.85
1%		2.12	2.90	5.54	6.28

TABLE 5. Analysis of variance in fertility and hatchability during winter and summer trials.

	Item	S. V.	d.F.	P.	M. S.	F. Valu
WINTER	Fertility.	Groups	9	580.3	62.2	29.8**
		Months	4	258.7	64.6	30.7**
		Error	36	78.3	2.1	
		Total	49	897.3		
	Hatchability . .	Group	9	283.6	31.5	8.07**
		Months	4	123.0	30.7	7.87**
		Error	30	142.1	3.9	
	Fertility	Total	39	548.7		
SUMMER		Groups	9	722.0	80.2	10.0**
		Month	3	142.5	47.5	5.9**
		Error	27	216.9	8.0	
		Total	93	1081.4		
	Hatchability . .	Groups	9	1089.75	121.08	11.7**
		Months	3	485.80	181.9	15.7**
		Error	27	280.67	10.3	
		Total	39	186.22		

In summer season, cool feeding system was not applied as single treatment, but combined with light and shading (L+S+CF) or combined with light, darkness and ventilation (L +D+V+CF). It is clear from Table 4 that both of the two treatments gave the highest percentages of fertillty and hatchability . When light was combined with darkness and cool feeding the percentages tend to be lower than the percentages obtained in the other two combinations. With winter trials, the use of light seemed to improve fertility and increase hatchability of the incubated eggs. These effects were more pronounced when light was combined with other warming trials in house temperature, feed or litter. The effect of light on gonadal hormone stimulation and semen

viable production may be responsible in part for these findings (Kaufman and Genacanczyk, 1954 and Kamar, 1954). Associated with the better maintenance of body heat and the more efficiency in egg formation when warming up the houses, light would thus be expected to yield better hatching results. It seems that egg quality of eggs were of better quality in such lighted + warmed groups than the unlighted ones. Under similar incubation conditions one would be more responsive to such egg quality differences. It seems also fitting here to relate the obivous decline in hatchability percent of the summer control group to the expected decline in yolk percent, shell percent and albumen index as compared to the treated summer groups, or to the conventional winter controls.

The least improved group over the controls was the one supplied solely with deep litter, as a crude method for body warming and suspected beneficial supplementation of Vit. B_{12} and other promoting manure residuals. It seems that, for the sake of better fecundity, using sole deep litter treatment was not as successful as other single treatments, and it obviously lacked more behind the combined treatments. The best results in fertility and hatchability in the winter trials were those of group 9, where the combined effects of modification treatments seemed to show up.

The summer modifications showed less differences due to treatments, apart from their advantages in fertility and hatchability over the control.

In general, the groups exposed to light showed higher fertility and better hatchability than the nonlighted groups. Yard shading alone or in combination, seemed to be better advantage than mid-day shutting-in. Meanwhile, the physiological observation on such groups revealed more comfort in the shaded birds, a fact which could have some benefit in egg formation and fertility responses. It is interesting to note that, with only shading the birds in the afternoon, there was an increase of over 10% in their incubation results over the control. This might be a consequent result to the accumulative advantages of shade in minimumizing the heat stress, and thus for maintaining better productive and reproductive abilities. Moreover, where light was in excess of shade, the advantage was always better than shade alone, an addition which might be attributed to the beneficial effects of light on the pituitary and its chain-reaction production and reproduction hormones.

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تأثير بعض التحسينات فى نظم التغـذية والظروف البيئيـة والرعاية على نسبة الخصب والفقس فى بيض الفيومى

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أجرى هذا البحث بمركز أبحاث الدواجن بكلية الزراعة جامعة القاهرة على الدجاج الفيومى • فى أول أكتوبر ، ٥٠٠ دجاجة ، ٥٠ ديك قسمت الى عشرة مجاميع متساوية لدراسة تأثير الضوء الصناعى (من٣–٧صباحا) اتدفئة الى ٦٥°ف ، الغذاء المبتل بالماء الدافىء غذاء ناعم وحبوب ، فرشة مستديمة على الخصب والفقس خلال الشتاء • فى أول مارس وضعت الطيور تحت رعاية متساوية حتى أول مايو حيث قسمت مرة ثانية الى عشرة مجاميع متساوية (٤٠ دجاجة ، ٤ ديك) لدراسة تأثير الضوء الصناعى (من ٣ – ٧ صباحا) الاظلام من ١٢ – ٣ مساء ، التهوية ، التظليل ، الغذاء المبتل بالماء البارد على نسبة الخصب والفقس خلال الصيف •

وقد وجد أن مجموعة المقارنة أعطى أقل نسبة فى الخصب والفقس عن المعاملات فى فصل الشتاء والصيف ، كذلك وجد أن نسبة الخصب والفقس فى الشتاء كانت أعلى من الصيف فى كل المعاملات ، الاختلافات كانت واضحة عندما أعطى الضوء مع المعاملات البيئية الاخرى •

خلال الشتاء ،أقل نسبة خصب أمكن الحصول عليها من المجموعة التى أعطيت فرشة مستديمة • بينما خلال الصيف كانت أعلى نسبة خصب وفقس أمكن الحصول عليها من المعاملات التى أعطيت ضـوء مع تظليل او ضـوء مع غذاء مبتل بالماء •