

Effect of Light Stimulus on Pekin Ducks in the Subtropics. II. On Mode of Laying

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This work was carried out to study the effect of light stimulus (natural, gradual and abrupt) on mode of laying of Pekin ducks in the subtropics.

The results obtained could be summarised as follows :

1. The extension of the day by artificial light make the ducks lay earlier in the night than the unlighted ducks.
2. It seems that the duck completes the formation of the egg then lays the egg irrespectively of the availability of light hence more than 90% eggs were laid before sunshine in either treated or untreated ducks.
3. Night feeding beyond light stimulus enables the duck to form the egg in a shorter time rather than coincidence of light with the time of laying.
4. The subjection of ducks to light (14 hr/day) induced long egg-clutches and short pauses.
5. The long egg-clutches are more pronounced when gradual or abrupt lighting is accompanied by night feeding.

Data on time of oviposition of the preceding egg and time of egg formation for ducks, either under natural or artificial light, are lacking in literature. However, Ma (1968) pointed out that the oviduct of ducks (*Anus platyrhynchos var-domestica*) spent about 24 hr and 25 min to form a complete egg after the entrance of the ovum in the oviduct. He also, stated that oviposition generally occurred between midnight and 8.00 a.m. and ovulation occurred in 10-15 min after oviposition.

Woodward *et al.* (1963) stated that turkey hens received light from 6 a.m. to 2 p.m. laid 47% of all eggs during the period from 12 at noon to 2 p.m., while 20% were laid during the period from 6 a.m. to 12 at noon. 5.5% of all oviposition occurred in darkness, 47.0% of these occurred during the first hour of darkness, *i.e.* between 2 to 9 p.m. Long clutch of 6 or more eggs were initiated in the morning at 9.30 a.m. and terminated in the evening at 7 p.m. Woodward *et al.* also, stated that mean time of laying for inter-clutch eggs became progressively earlier in the day as the size of clutch increased. Time between successive 2, eggs in clutches was reduced as size of clutch

Increased time of exposure to light have been shown to lengthen the laying cycle in chickens (Byerly and Moore, 1941).

This work is carried out to study the effect of light stimulus (natural, gradual and abrupt) on mode of laying of Pekin ducks in the subtropics.

Material and Methods

General management, experimental and light techniques were previously described by Kamar *et al.* (1976).

Data collection

Time of oviposition was recorded for each bird in each group throughout 4 weeks period stated in October 22 and terminated in November 17, 1971. The recording was started from midnight to 9 a.m. every day then, the ducks were freed from the trapnets. Time of egg formation, clutch and pause lengths were estimated. The frequency and percentages of different clutches and pauses were estimated.

The statistical analysis was performed after Snedecor (1956) for analysis of variance.

Results and Discussion

Timing in mode of laying

The extension of the day by artificial light make the ducks to lay earlier in the night than the unlighted ducks (Table 1). It seems that the duck completes the formation of the egg then lays the egg irrespective of the availability of light hence more than 90 per cent of eggs were laid before sunshine in either treated or untreated ducks (Table 2).

Ma (1968) stated that oviposition generally occurred between midnight and 8.00 a.m. Woodward *et al.* (1963) stated that turkey hens received light from 6 a.m. to 2 p.m. laid 47% of all eggs during the period from a.m. to 12 at noon. 5.5% of all ovipositions occurred in darkness, 47% of these occurred during the first hour of darkness between 2 to 9 p.m.

It seems that the stimulatory effect of light in ducks is due to extension of the time which enables the duck to form the egg in a shorter time rather than coincidence of light with the time of laying (Tables 3 and 4). This is clearly evidenced with feeding which enables the duck to form the egg in a shorter time when the light and food are available.

The subjection of ducks to light induced loss clutches, (Table 5 and 6). This is more pronounced when gradual or abrupt lighting is accompanied by night feeding, (Table 5).

TABLE 1. Effect of lighting programme on percentages of egg laid at hourly intervals.

Time of oviposition at hourly intervals	Egg laying (%)				
	Control	A	B	C	D
1-2 a.m.	—	5.5	1.6	2.1	0.5
2 a.m.	26.5	36.6	39.4	23.9	26.4
3 a.m.	19.8	17.9	20.3	16.9	22.9
4 a.m.	29.0	23.3	21.0	32.2	26.8
5 a.m.	14.8	10.0	10.5	14.9	13.2
6 a.m.	5.7	6.4	3.5	4.5	5.0
7 a.m.	3.5	0.3	2.5	3.4	2.7
8 a.m.	0.7	—	1.2	1.7	2.2
9 a.m.	—	—	—	0.4	0.3

TABLE 2. Effect of lighting programme on percentages of eggs laid before and after sunshine.

Groups	Egg laying (%)	
	before sunshine	after sunshine
Control	91.2	8.8
A	95.9	4.1
B	93.3	6.7
C	92.3	7.7
D	92.1	7.9

TABLE 3. Effect of lighting programme on time of egg formation in different clutches.

Clutches	Time of egg formation											
	Control		A		B		C		D		Average	
	hr	min	hr	min	hr	min	hr	min	hr	min	hr	min
1—egg . . .	69	37	49	20	57	05	63	50	63	24	60	39
2—eggs . . .	48	19	35	06	43	19	42	56	43	04	42	32
3—eggs . . .	39	42	32	59	39	16	38	09	42	56	37	12
4—eggs . . .	35	09	31	56	40	50	30	14	36	12	34	52
5—eggs . . .	35	27	29	05	35	28	30	59	33	32	32	54
6—eggs . . .	33	13	29	43	29	54	28	58	29	50	30	08
7—eggs . . .	28	40	26	14	25	33	27	14	27	31	27	02
Average . .	41	27	33	20	38	47	36	29	39	30	37	55

TABLE 4. Effect of lighting programme on time of oviposition in different clutches.

Clutches	Time of oviposition											
	Control		A		B		C		D		Average	
	hr	min	hr	min	hr	min	hr	min	hr	min	hr	min
1—egg . . .	4	50	4	18	4	08	4	41	4	30	4	29
2—eggs . . .	4	07	4	07	3	58	4	23	4	15	4	10
3—eggs . . .	4	07	4	06	3	54	4	03	4	15	4	05
4—eggs . . .	3	56	4	01	3	52	3	41	3	36	3	48
5—eggs . . .	3	37	3	29	3	44	3	31	3	30	3	34
6—eggs . . .	3	36	3	25	2	23	3	03	3	22	3	22
6—eggs . . .	3	26	2	50	3	15	3	01	3	10	3	08
Average . .	3	57	3	45	3	45	3	46	3	48	3	48
Range From To	2 8	05 50	1 7	50 —	1 8	50 45	1 9	50 05	1 9	50 15		

TABLE 5. Effect of lighting programme on clutch size per duck and their percentages to total eggs of the first laying season.

Group item	Duration of clutch length							Total
	1—egg	2—egg	3—egg	4—egg	5—egg	6—egg	7—egg	
Control ⁺	No. 5.7	4.9	4.2	1.6	1.1	0.7	0.9	19.1
	% 29.8	25.7	22.0	8.4	5.8	3.6	4.7	10.0
A	No. 3.3	4.7	5.0	3.5	2.0	5.2	31.9	55.6
	% 5.9	8.4	9.0	6.2	3.6	9.4	57.5	100
B	No. 6.4	6.5	5.2	4.0	3.3	4.0	7.1	36.5
	% 17.5	17.8	14.2	11.0	9.1	11.0	19.4	100
C	No. 2.8	3.8	3.0	4.7	4.2	3.0	23.3	44.8
	% 6.2	8.5	6.7	10.5	9.4	6.7	52.0	10.0
D	No. 5.9	6.7	4.9	4.9	3.5	2.0	2.6	30.5
	% 19.3	21.9	16.1	16.1	11.5	6.6	8.5	100
L.S.D.: 1%**	2.6	2.5	—x—	3.0	2.9	—x—	7.5	
L.S.D.: 5%**	2.0	1.9	—x—	2.2	2.2	—x—	5.7	

* Number of eggs/duck.

** Significant least significant difference for clutch length per duck

—x— Not significant.

TABLE 6. Effect of lighting programme on clutch size per duck and their percentages to total eggs of the second laying season.

Group item	Duration of clutch length							Total
	1—egg	2—egg	3—egg	4—egg ^{**}	5—egg	6—egg	6—egg	
Control ₂	No.* 4.8	6.5	2.0	0.7	1.3	—	—	15.3
	% 31.4	42.5	13.1	4.6	8.4	—	—	100
Control ₁	No. 5.6	5.5	2.5	2.0	2.1	2.5	0.8	21.0
	% 26.7	26.2	11.9	9.5	10.0	11.9	3.8	100
D ₁	No. 3.9	4.7	4.5	4.3	1.3	1.0	1.7	21.4
	% 18.2	22.0	21.1	20.1	6.1	4.7	7.8	100
D ₂	No. 5.4	5.8	3.3	1.0	0.4	0.5	—	16.4
	% 32.8	35.2	20.1	6.6	2.3	3.0	—	0.0

* Number of eggs/duck.

** Significant least significant difference (L.S.D.) at 1% level=2.7 and at 5% level 2.0 eggs. The other clutches did not show any significant difference between light treatments.

TABLE 7. Effect of lighting programme on pause length per duck and their percentages to total pause of the first laying season.

Group item	Duration of pause length							
	1-day	2-day	3-day	4-day	5-day	6-day	6-day	Total
Control *	No. 3.5 % 7.5	No. 3.7 % 8.0	No. 2.3 % 5.0	No. 3.7 % 8.0	No. 3.6 % 7.5	No. 3.3 % 7.1	No. 26.5 % 56.9	No. 46.5 % 100
A	No. 7.1 % 34.7	No. 5.9 % 28.8	No. 2.6 % 12.7	No. 1.3 % 6.3	No. 1.3 % 6.3	No. 0.8 % 3.9	No. 1.5 % 7.3	No. 20.5 % 100
B	No. 6.7 % 19.1	No. 4.7 % 13.4	No. 6.2 % 17.7	No. 5.1 % 14.5	No. 2.7 % 7.7	No. 2.4 % 6.7	No. 7.3 % 20.8	No. 35.1 % 100
C	No. 4.7 % 16.9	No. 4.2 % 15.1	No. 3.5 % 12.6	No. 3.3 % 11.9	No. 2.1 % 7.6	No. 4.0 % 14.4	No. 6.0 % 21.5	No. 27.8 % 100
D	No. 6.4 % 15.7	No. 4.8 % 11.8	No. 3.4 % 8.4	No. 2.4 % 5.9	No. 3.5 % 8.6	No. 2.4 % 5.9	No. 17.8 % 43.7	No. 40.7 % 100
L.S.D. : 1% **	2.7	—×—	2.8	2.9	—×—	—×—	6.9	
L.S.D. : 5% **	2.0	—×—	2.1	2.2	—×—	—×—	5.2	

* Number of days/duck.

** Significant least significant difference for pause length per duck.

—×— Not significant.

TABLE 8. Effect of lighting programme on pause length per duck and their percentages to total pause of the second laying season.

Group item	Duration of pause length**							
	1-day	2-day	3-day	4-day	5-day	6-day	6-day	Total
Control ₂ *	No. 2.3 % 5.6	No. 4.8 % 11.8	No. 4.0 % 9.8	No. 3.3 % 8.1	No. 5.0 % 12.3	No. 3.5 % 8.6	No. 17.9 % 43.8	No. 40.8 % 100
Control ₁	No. 4.4 % 12.4	No. 5.8 % 16.4	No. 3.0 % 8.5	No. 3.7 % 10.5	No. 2.1 % 6.0	No. 2.5 % 7.1	No. 13.8 % 39.1	No. 35.3 % 100
D ₁	No. 3.7 % 10.7	No. 4.0 % 11.2	No. 3.8 % 11.0	No. 3.3 % 9.6	No. 2.5 % 7.2	No. 2.0 % 5.6	No. 15.4 % 44.5	No. 34.7 % 100
D ₂	No. 3.3 % 8.4	No. 3.7 % 9.5	No. 3.8 % 9.7	No. 4.3 % 11.0	No. 3.3 % 8.5	No. 2.5 % 6.4	No. 18.2 % 46.5	No. 39.1 % 100

* Number of days/duck.

** There was no significant difference between light treatments concerning the different pause length.

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Lengthening the day permits the ducks to lay later in the day and this lengthens clutch size. This effect is doubled by beeding the ducks during the extension of the day. Accordingly, when the ducks in all the groups in the second laying season do not fed in the lighted part of the night shorter clutches were observed.

Pause length

The subjection of ducks to artificial light during the first laying season induced, relatively, short pauses between clutches (Table 7). However, the gradual increase in light with night feeding induced longer clutches and higher frequency in short pauses than in the other treated and control groups Table 7. On the other hand, the subjection of ducks to artificial light in the second laying season showed slight differences in the frequency of pause length between the treated and control groups (Table 8).

Statistically, there was no significant difference between all lighted groups and control in this respect.

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تأثير التنبيه الضوئي على البط البكىنى فى المناطق شبه الحارة

٢ - على طريقة وضع البيض

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أجريت هذه التجارب لدراسة تأثير التنبيه الضوئى (الطبيعى والصناعى ،
التدرجى والفجائى) على طريقة وضع البيض للبط البكىنى فى المناطق
شبه الحارة .

ويمكن تلخيص أهم النتائج المتحصل عليها فى الآتى :

١ - إطالة اليوم بالإضاءة الصناعية يجعل البط يبيض مبكرا فى الليل
بالمقارنة بالبط الذى يتعرض للإضاءة الصناعية والإضافية .

٢ - وجد أن أكثر من ٩٠٪ من البط يضع البيض قبل شروق الشمس
سواء فى المجميع الماملة بالإضاءة الصناعية أو فى مجموعة الكنترول ، ويبدو
من ذلك أن البطة تكمل تكوين البيضة ووضعها فى عدم وجوه الضوء فى
النصف الأخير من الليل .

٣ - التغذية الليلية مع الإضاءة الصناعية تمكن البطة من تكوين البيضة
فى وقت أقصر .

٤ - معاملة البط بالإضاءة الطبيعية والصناعية (١٤ ساعة يوميا) ينتج
هته زيادة فى طول سلسلة وضع البيض وزيادة نسبة السلاسل الطويلة
وقصر فترات الراحة بين السلاسل .

٥ - عندما كانت المعاملة الضوئية تدرجية أو فجائية مع التغذية الليلية
كانت سلاسل وضع البيض الطويلة ملحوظة أكثر عما لو كانت هذه المعاملات
بدون تغذية ليلية .