

### Effect of Light Stimulus on Pekin Ducks in the Subtropics. III. on Reproduction

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**T**HIS WORK was carried out to study the effect of light stimulus (natural, gradual and abrupt) on semen characteristics, fertility and hatchability of Pekin ducks in the subtropics. The results obtained could be summarised as follows :

1. Night feeding has no reliable effect on semen production and characteristics in drakes. Hence, improvement in semen characteristics of different treated groups compared to the control may be due essentially to light stimulus only.
2. Light stimulus showed a favourable effect on semen volume and sperm motility, concentration, viability and normality during the two laying seasons.
3. Subjection of ducks to artificial light showed a favourable effect on fertility and hatchability.

Testicular response of birds to photoperiodism or photostimulation have been reported by Lamoreux (1943), Romanoff (1960), and Amoroso and Marshall (1960).

Benoit (1936) found that the administration of artificial light resulted in a rapid development of the gonads of immature drakes. In young drakes under 3 to 4 months, the testes were insensitive, or reacted only slowly to extra illumination. Benoit also studied the administration of a standard amount of light in different ways once a week, every night, but in increasing amount, fractioning a daily quantity into repeated small doses. The later method was found to be the most effective one. This suggested that the light releases gonado-stimulating mechanism that continues to act after its removal. Under prolonged treatment (5 months) the testes, after development, regressed spontaneously despite continued illumination. The immature ovary of the duck was also stimulated by artificial light, but 4 to 5 weeks were required to bring it to the point of ovulation.

An increase in normal daylength caused a rise in fertility when the atmospheric temperature was relatively low (Poso Lora, 1959). The normally low fertility in Khaki Campbell can be improved daily when the atmospheric temperature was relatively low (Poso Lora and Carranza, 1959) 13 hr of light supplementation improved the rate of laying in Khaki Campbell ducks, but did not effect fertility (Poso Lora and Carranza, 1960).

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

### Material and Methods

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

#### Data collection

##### Semen production

Three drakes from each group including the control in the first experiments were used to study semen production throughout the two laying periods. The first test started in November 27, 1971, while the second test started in April 28, 1972. Semen was collected from each drake once a week throughout 4 weeks period by the massage method previously used for chickens by Kamar (1958). Semen volume (c.c.), motility (Kamar, 1960), concentration per c.c. (millions), total number of sperms per ejaculate (millions, live sperms percentage in fresh semen (Kamar, 1959 a), headless, tailless and total abnormal percentage were estimated by the methods previously used for chickens (Kamar, 1959 b).

##### Incubation

The eggs were collected from each group separately and were placed in egg holding room for 1 to 7 days under suitable environmental condition. Non-defected and normal 1315 and 608 eggs were available for incubation during the first and second laying seasons, respectively. The eggs were set in a forced draft incubator at weekly intervals October 18 to December 2, 1971 and from April 24 to June 6, 1972 during the first and the second experimental periods, respectively. The eggs were incubated in separate groups according to light treatments. The hatching procedure was adapted after Kiss (1968). Eggs were examined by candling at the 10th and 23rd days of incubation to determine fertility at 10th day and embryonic mortality at 10th and 23rd days. The eggs were also examined at the end of the incubation period to determine embryonic mortality and hatchability. The incubation period was 28 to 29 days.

### Results and Discussion

#### Semen characteristics

Light stimulus showed a favourable effect on semen volume and sperm motility, concentration, viability and normality during the two laying periods (Tables 1 and 2). Difference was not observed between all the lighted groups in the two laying periods that may suggest that night feeding has no reliable effect on semen production and characteristics in ducks. It may be concluded that improvement in semen characteristics of different treated groups compared to the control may be due essentially to light stimulus only. This phenomenon may be in agreement with results of Benoit (1936) on drakes.

TABLE 1. Effect of lighting programme on semen production in the first experimental period.

Traits	Treatments				
	Control	A	B	C	D
Volume (cc) . . . . .	0.183	0.214	0.240	0.236	0.227
Motility . . . . .	4.50	6.20	6.66	5.60	5.17
Concentration (10 <sup>6</sup> /cmm) . . . .	2.324	3.426	3.653	3.138	3.379
Sperms/ejaculate (10 <sup>6</sup> ) . . . .	423.0	823.0	899.0	969.0	867.0
% live sperm in fresh semen . .	59.25	63.25	62.00	64.00	62.50
% Abnormals :					
Headless . . . . .	12.50	13.20	13.66	11.75	11.50
Tailless . . . . .	30.25	21.00	24.33	20.50	24.50
Total of abnormals	42.75	34.20	37.99	32.35	36.00

TABLE 2. Effect of lighting programme on semen production in the second experimental period.

Traits	Treatments				
	Control	A	B	C	D
Volume (cc) . . . . .	0.184	0.226	0.225	0.196	0.233
Motility . . . . .	4.67	5.00	5.08	5.50	6.17
Concentration (10 <sup>6</sup> /cmm) . . . .	2.645	2.960	2.947	3.897	3.286
Sperms/ejaculate (10 <sup>6</sup> ) . . . .	593.0	710.0	724.0	747.0	757.0
% Live sperms in fresh semns	63.84	69.38	67.87	70.80	67.07
% Abnormals					
Headless . . . . .	10.53	9.00	6.43	8.61	6.82
Tailless . . . . .	19.14	12.67	13.63	11.92	15.16
Total of abnormals	29.67	21.67	20.06	20.53	21.98

TABLE 3. Effect of lighting programme on percentages of fertility, hatchability and abnormal hatches in the first laying season.

Groups	Total			Abnormal			
	Eggs set	Fertile		Hatched			
		No.	No.	%	No.	%	No.
Control	272	198	72.8	116	58.6	7	3.5
A	301	274	91.0	205	74.8	5	1.8
B	205	186	90.7	124	66.7	4	2.2
C	217	193	88.9	129	66.8	6	3.1
D	320	280	86.5	175	62.5	5	1.8
Total	1315	1131		749		27	
Average			86.0		66.2		2.4

#### *Fertility and hatchability*

Concerning fertility and hatchability during the first and second laying seasons, it can be observed that artificial light regime, has a favourable effect as compared with the control group (Tables 3 and 4). However, the low hatchability during the last 4 - weeks in treatment D<sub>2</sub> which was subjected to abrupt light after natural daylight may be due to hot weather during this period. Subjection of ducks to gradual light with night feeding gave better fertility and hatchability percentages than the other treated or untreated groups. Buryakovskii and Gapevakii (1973) reported that turkey hens subjected to 10-14 hr light/day were of 80.8% fertility and 75.0% hatchability, while those subjected to natural daylight were of 79.6% and 72.8%, respectively. The abnormal chicks percentages was not affected by neither light nor night feeding regimes.

Pozo Lora (1959) indicated that artificial light supplement improved fertility when the atmospheric temperature was relatively low, however Pozo Lora and Carranza (1960) reported that light stimulus did not affect fertility in khaki Campbell ducks. The results in this study may emphasize the favourable effect of light stimulus on fertility and gave an answer to the contradictions of the other findings.

TABLE 4. Effect of lighting programme on percentages of fertility hatchability hatches in the second laying season.

Groups	Total			Abnormal			
	eggs set	Fertile		Hatched		Hatched	
		No.	No.	%	No.	%	No.
Control <sub>2</sub>	160	142	88.8	93	65.5	6	4.2
D <sub>1</sub>	162	137	84.6	93	67.9	5	3.7
D <sub>2</sub> *	79	68	86.1	47	69.1	2	2.9
D <sub>2</sub> **	62	55	88.7	27	49.1	5	9.1
Control <sub>1</sub>	145	125	86.2	78	62.4	6	4.8
Total . .	608	527		338		24	
Average			86.7		64.1		

\* Natural daylight for the 1st 4 weeks.

\*\* 14 hr abrupt daylight for the 2nd 4 weeks.

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### تأثير التنبيه الضوئي على البط البكينى في المناطق شبه الحارة ثالثا : على التناسل

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اجريت هذه التجارب لدراسة تأثير التنبيه الضوئي ( الطبيعي والصناعي التدريجي والفجائي ) على التناسل للبط البكينى في المناطق شبه الحارة .

ويمكن تلخيص اهم النتائج المتحصل عليها في الاتي :

١ - التغذية الليلية مع المعاملات الضوئية المختلفة لم يكن لها أى تأثير على انتاج وصفات السائل المنوي في ذكور البط ، ولكن تحسين انتاج وصفات السائل المنوي في الجاميع العاملة بالاضاءة الصناعية مقارنة بمجموعة الكنترول قد يرجع غالبا الى تأثير الضوء فقط .

٢ - كان للتنبيه الضوئي تأثير أفضل على حجم السائل المنوي وحركة وتركيز وحيوية وطبيعة الحيوانات المنوية خلال موسم وضع البيض .

٣ - تعرض البط للاضاءة الصناعية كان له تأثير أفضل على الخصوبة والفقس