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INFLUENCE OF PHOTOPERIOD AND LIGHT SOURCE ON SEMEN CHARACTERISTICS, PHYSIOLOGICAL RESPONSES AND SOME BLOOD PARAMETERS OF RABBIT BUCKS.

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ABSTRACT: This experiment aimed to study the impact of photoperiod-length and light source on semen quality, physiological responses and some blood parameters in rabbit bucks. Twenty Bouscat bucks were equally assorted to two experimental groups. In the first group (control), bucks were exposed to a long photoperiod (16Lhrs), while those of the second were subjected to a short photoperiod (6Lhrs). In each group, bucks were classified into two equal subgroups. The lighting source in the first subgroup of both lighting regimens was the incandescent lamp, while the compact saving lamp was used in both of the second subgroup. All bucks were individually housed in wire galvanized battery cages and raised under similar normal managerial conditions. The obtained results could be concluded as follow:

1- The ejaculate volume (ml), advanced motility (%) and total sperm output/ejaculate×10^6 of bucks exposed to the long photoperiod (16Lhrs) increased significantly than those of the short photoperiod (6Lhrs), while their sexual libido (sec) and sperm abnormalities (%) decreased significantly.
2- The advanced motility (%) and sperm output/ml×10^6 of bucks exposed to light produced from incandescent lamps increased significantly ($P<0.05$) than those of bucks subjected to light from saving lamps.
3- Physiological responses (Rectal temperature/˚C, Skin temperature/˚C, Ear temperature/˚C, Scrotal temperature/˚C and Respiration rate/rpm) of bucks exposed to long photoperiod increased significantly ($P<0.05$) than those of the short photoperiod.
4- All blood parameters (Total protein, Albumin and Globulin) and daily feed intake/g of bucks exposed to the long photoperiod increased significantly ($P<0.05$) than their corresponding values of bucks subjected to the short photoperiod.
5- In contrast, there were no significant differences in most studied criteria between bucks exposed to light from incandescent and saving lamps.

Key Words: Rabbit Bucks, Semen Characteristics, Photoperiod And Light Source..

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Finally, it could be concluded that the use of compact saving lamps is highly recommended, since it minimized the lighting costs by about 54.2% during the experiment, as estimated by the power and the lamp depreciation costs, according to the prevailing prices in the local market during the experiment

INTRODUCTION

Under tropical and subtropical climatic conditions, many environmental factors affect the productive and reproductive potentiality of rabbits (Marai et al., 2002, Daramola et al., 2006 and Theau-Clément et al., 2008).

Among these effective factors, ambient temperature, relative humidity, air quality and velocity as well as length and source of photoperiod play important roles in reproductive performance of rabbits (Garica-Tomas et al., 2008, Kalaba and Abdel-Khalek 2011 and Oke and Iheancho 2011).

Commercial rabbit producers in Europe adopted a 16 continuous light hours with 8 hours darkness to minimize the worse effects of the short daily photoperiod on reproduction (Alvarino and Ubilla, 1993). Many studies revealed that photoperiod manipulations coinciding with increasing artificial daylight length significantly improved the receptivity and fertility of rabbits (Mahrose et al., 2010 and Abdel-Kareem, 2012).

Similarly, Arveux and Troislouches, (1994) found that subjecting rabbit does to both of 16Lh daily natural continuous and discontinuous lighting photoperiod (2 periods of 8hrs light followed by 4hrs dark), increased the fertility to amount 82.6 vs. 67.6%. Also, the maximum stimulating effect of light on the reproductive efficacy of rabbits was achieved by exposing them to either natural or artificial photoperiod for 12-16 hours continuous light (Marai et al., 2007).

Since rabbits are nocturnal animals, the present study was planned to investigate and compare between the effects of a short (6Lhr) versus a long photoperiod (16Lhr) as well as the lighting source (incandescent vs. saving lamps) on semen physical characteristics, physiological responses and some blood parameters of rabbit bucks.

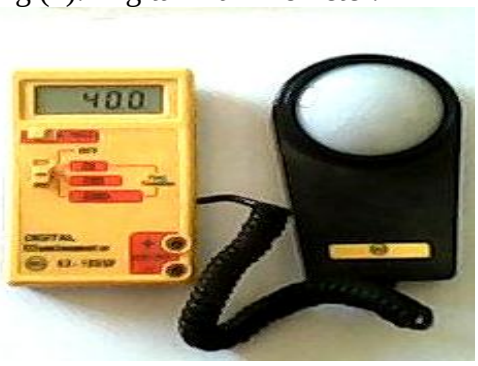
MATERIALS AND METHODS

This experiment was carried out at the Poultry Research Farm, Faculty of Agriculture, Al-Azhar University, Assiut Branch, Egypt. It lasted 150 days from December to April (2012) under Assiut conditions.

Experimental animals and design: Twenty Bouscat rabbit bucks, seven months old, with 3.22kg average body weight were classified in two equal groups. Bucks in the 1st group (control) were daily exposed to a long photoperiod (16Lhrs), while in the 2nd group they were subjected to a short photoperiod (6Lhrs).

In each group, bucks were assorted in two equal subgroups with two lighting sources. The first source (incandescent /60 Watt) was used in the first subgroups, while the second source (compact saving lamp 26 Watt) was applied in the second subgroups. The incandescent lamp was hanged at the level 95 cm, while the saving lamp was placed at a level of 55 cm over the cages. The light intensity was adjusted to be approximately 40.0 lux at the center of upper surface of cage.

Fig (1): Digital illuminometer.



All bucks were individually housed in wire galvanized cages (50L×50W×40Hcm) under the same managerial and hygienic conditions and fed ad-libitum on a commercial pelleted

breeder ration, contained (18.25% crude protein, 2.29% crude fat, 13.40% crude fiber and 2670 Digestible energy/kg feed). All rabbitry cages were equipped with feeders and automatic nipples. Fresh and clean drinking tab water was automatically available all the time.

Interior ambient temperature, realative humidity and temperature humidity indices:

The interior AT (˚C) and RH (%) were daily recorded by using thermo-hygrograph throughout the experimental period. The average temperature humidity indices (THI; unit) were calculated according to equation of Marai et al., (2002):

THI = db˚C – [(0.31- 0.31 RH)(db˚C-14.4)]

Where: db˚C= dry bulb temperature in Celsius and RH = RH% /100.

The interior AT (˚C) and RH (%) were recorded allover the day at the hours 02, 08, 10.0, 12.0, 14.0, 16.0, 18.0, 22.0, and 24.0.

Feed intake (g):

Feed intake (g) for each buck was weekly estimated and recorded during the experimental period.

Semen evaluation:

The sexual libido/sec (the interval between introducing the doe to buck until the incidence of ejaculation) was measured by using stopwatch according to (Luzi et al., 1996).

At 24 weeks of age, bucks started a four weeks training period to collect semen by using artificial vagina containing water at 50ºC and a teaser mature doe as described by Boussit, (1994).

A total of 400 ejaculates i.e. 200 per group were collected to evaluate the semen quality. One ejaculate per buck was weekly collected at 11.0 am allover the five successive experimental periods (28 days/each). The ejaculate volume (ml) was recorded by using a graduated collection tube after removing the gel mass. The percentage of motile sperm (%) was estimated by visual examination under low-power magnification (x10), of a phase-contrast microscope according to Melrose and Laing (1970).

The sperm concentration ($\times 10^6$) was evaluated using haemocytometer according to the method of Smith and Mayer (1955), while the total sperm output ($\times 10^6$) was calculated by multiplying the ejaculate volume and sperm concentration.

The assessments of sperm morphologic abnormalities (head, mid-piece and tail defects) were evaluated by using the eosin–nigrosin blue staining mixture (Roca et al., (2000).

Physiological responses:

Physiological responses of all experimental bucks were recorded on individual basis at 11:00 am every 4 days. Rectal temperature (ºC); was measured by using a digital clinical thermometer inserted into the rectum at depth of 2.0 cm for one minute.

Skin, ear and scrotal temperatures (ºC); were measured by using a clinical thermometer according to Shafie et al., (1970). Respiration rate (rpm) was measured by visually counting the chest flank movements for one minute by using a stopwatch. The measurement was done as rabbits were sitting quietly and breathing regularly according to Gonzalez et al., (1971).

Blood parameters:

Blood samples were taken at 9:00 am every 4 weeks from the marginal ear vein and collected in 5.0 ml heparinized test tubes before semen collection (n = 100 samples). Thereafter, blood serum was separated by centrifugation at 3000 rpm for 20 minutes and kept in a deep freezer at (-20°C) until analysis.

Colorimetric commercial kits were used for the determination of total protein and albumin (g/dl) according to Armstrong and Corri (1960) and Doumas et al., (1971), respectively. Globulin values (g/dl) were obtained by subtracting the values of albumin from the corresponding values of total protein.

Statistical analysis:

Data were analyzed by the least square analysis of variance using the General Linear

Models procedure of the statistical analysis model (SAS, 1998) as follows:

$Yij = \mu + PHi + Sj + PhS (Ij) + eij$

Where: Y_{ij}= the individual observation
μ= Overall mean
Ph_i= Effect of photoperiod (i = 1 and 2)
Sj= Effect of light source (j = 1 and 2)
PhS (Ij) = The fixed effect of interaction between photoperiod and light source;
Eij=Random error component assumed to be normally distributed. Significant differences between treatment means were determined by using Duncan's new multiple ranges test (Duncan, 1955).

RESULTS AND DISCUSSIONS

Impact of photoperiod-length and light source on semen characteristics:
A. Effect of photoperiod:
Results presented in Table 2, revealed that bucks subjected to the long photoperiod (16Lhrs) had significantly (P<0.05 and 0.0001) better values of semen volume/ml, advanced motility/% and total sperm output/ejaculate×10^6 than those of the short photoperiod (6Lhrs). This improvement could be attributed to the potent effects of the longer photoperiod on the hypothalamus-pituitary axis, which lead to more hormonal release and semen production on quantitative and qualitative basis. These results are in agreement with those of Abd Elhakeem et al., (1992), who found that both of 13 and 18 photoperiod increased significantly (P<0.05) the sperm concentration (×10^6/ml) and the motility (%) as compared with those of the shortest photoperiod (6Lhrs). Also, Theau-Clément et al., (1995) stated that subjecting male rabbits to 16Lhrs photoperiod improved the quantity and quality of spermatozoa in the ejaculates than their corresponding values of the short photoperiod (8Lhrs).
Also, the results of Daramola et al., (2006) indicated that the mass motility (%) and sperm concentration (×10^9/ml) of bucks exposed to 18Lhrs increased significantly (P<0.05) than those of West African Dwarf bucks subjected to 13Lhrs photoperiod. Similarly, Mousa-Balabel (2011) found that the averages of semen volume (ml), sperm concentration (10^6/ml) and progressive sperm motility (%) of NZW bucks exposed to 16Lhrs photoperiod amounted 0.84ml, 324.0×10^6/ml and 73.0% increasing significantly than those 0.72ml, 252.0×10^6/ml and 67.0% of bucks subjected to the short photoperiod (8Lhrs).
In contrast the findings of Mahrose et al. (2010) showed that all studied semen properties of bucks exposed to 12Lhrs photoperiod were significantly improved than those of 16Lhrs/day, except dead spermatozoa percentage which significantly decreased with increasing the photoperiod. Similarly, Roca et al., (2005) found that the semen volume (ml) of hybrid rabbit bucks exposed to 16Lhrs natural light 0.83ml increased significantly (P<0.05) than that (0.64ml) of bucks exposed to constant long-day group (16L+200 lux).
Similarly, the sexual libido (sec) and sperm abnormalities g(%) decreased significantly (P<0.05) in the case of the long photoperiod, since they amounted 12.75sec and 10.53% versus 15.02sec and 12.49%. This may be attributed to the improved testicular size and the increased testosterone release in bucks exposed to the longer photoperiod. These findings are also in harmony with those of Boyd (1986), who found that the reproductive regression in wild rabbits coincided with the pronounced decrease of day length, since the maximal sexual activity of rabbits under natural climatic conditions, was achieved during the longest-days.
The lowest percentage of sperm abnormalities were recorded in the semen of bucks exposed to the longer photoperiod (16L: 8D). This is in agreement with the findings of Luthman and Slyter, (1986), who found that the males exposed to long photoperiod had lowest sperm abnormalities, which positively affected sperm quality and the fertility.
B. Effect of light source:
Data presented in Table 2, showed that bucks exposed to the light produced from

incandescent lamp had significantly (P<0.05) better values of advanced motility/% and sperm concentrate per ml×10^6 than those of the saving lamp. These results disagree with those of Wall and Jones (1976), who found insignificant differences in sperm concentrations due to the effect of light source in turkey toms. The present findings showed that exposing bucks to light produced from incandescent and saving lamps had no significant effects on sexual libido, ejaculate volume, total sperm output per ejaculate×10^6 and sperm abnormalities.

C. Effect of interaction (Photoperiod × light source):

Neither light source nor the interaction (photoperiod × light source) had significant effects on sexual libido, ejaculate volume, sperm motility, sperm concentrate per ml×10^6, total sperm output per ejaculate×10^6 and sperm abnormalities.

Impact of photoperiod and light source on physiological responses:

A. Effect of photoperiod:

From Data presented in Table 3, physiological responses (Rectal temperature/˚C, Skin temperature/˚C, Ear temperature/˚C, Scrotal temperature/˚C and Respiration rate/rpm) for bucks raised under the long photoperiod increased significantly (P<0.001) than those of bucks exposed to the short photoperiod. This could be attributed to the increased physiological activities, vitality, appetite, feed intake and consequently to the retained nutrients, especially in winter and autumn seasons due to the increased perception of warmth under subtropical climatic conditions.

These results disagree with those reported by Ahmed et al., (1993), who stated that the rabbit bucks exposed to 14 lighting hours had significantly (P<0.05) lower body temperature and respiration rate than those of bucks subjected to the natural day light.

B. Effect of light source and interaction (Photoperiod × light source):

Either light source or its interaction with the photoperiod had insignificant effects on all physiological responses (Rectal temperature/˚C, Skin temperature/˚C, Ear temperature/˚C, Scrotal temperature/˚C and Respiration rate/rpm).

Impact of photoperiod and light source on some blood parameters and daily feed intake:

A. Effect of photoperiod:

From data presented in Table 4, it could be noticed that the total protein (g/dl), albumin (g/dl) and globulin (g/dl) increased significantly (P<0.001) in bucks exposed to long photoperiod than those subjected to short photoperiod. The reductions in blood metabolites in bucks raised under the shorter (6Lhrs) than those of the longer photoperiod (16Lhrs) may be attributed to the decreased feed intake and the retained metabolites.

Therefore the significant decrease in serum globulin (g/dl) of bucks exposed to the shorter photoperiod may be attributed to the decreased efficiency of feed utilization. These findings are in agreement with those of Marai et al., (2007), who found a significant increase of total protein (8.4g/dl) in bucks exposed to the longer photoperiod (16Lhrs) than that (8.0g/dl) of bucks subjected to the shorter photoperiod (8Lhrs).

Daily feed intake of rabbit bucks exposed to longer photoperiod (16Lhrs) increased significantly (P<0.05) than that of the shorter photoperiod (6Lhrs). This may be explained by the more potent effect of light stimulation on the pineal activities, which lead to increased cortisol hormone concentration in rabbit bucks exposed to the longer photoperiod (16Lhrs) as compared with that of the shorter one (6Lhrs).

This result is in accordance with the findings of Mousa-Balabel (2011), who attributed the increased daily feed intake of NZW bucks exposed to the longer (16Lhrs) than the shorter (6Lhrs) photoperiod to the more activated hypothalamic pituitary-adrenal axis as well as the consequent increase of plasma glucocorticoid concentrations.

B. Effect of light source and interaction (Photoperiod × light source):

Both of the light source and interaction (Photoperiod × light source) had

insignificant effects on total protein (g/dl), albumin (g/dl), globulin (g/dl) and daily feed intake (g).

Comparison between the costs of lighting, estimated by the power and lamp depreciation costs/ LE:

From data presented in table 5, it could be concluded that:

1- The lighting costs /LE during the experiment amounted (12.40LE) by applying the short photoperiod (6 Lhrs) decreasing obviously than that (33.08LE) of the long photoperiod (16 Lhrs) i.e. saving 62.5%.
2- The lighting costs /LE during the experiment amounted (14.29LE) by using the saving lamps decreasing remarkably than that (31.18LE) of the incandescent lamp i.e. saving 54.2%.
3- The use of saving lamps for 6 and 16 lighting hours minimized the lighting costs by 9.21 and 24.56LE i.e. 54.1% of the incandescent lamps.

CONCLUSION

The achieved findings could be concluded as follow:

1- Although, the longer photoperiod (16Lhrs) had significantly better effects on most of studied criteria than those of the shorter period (6Lhrs), but the use of the latter is still recommended, since its application had no adverse effects on either vitality or the reproductive efficacy of bucks, which are known as nocturnal animals.
2- The achieved results indicated that the differences in most of studied criteria by applying both of incandescent and saving lamps were little to a great extent. Therefore, the use of saving lamps is highly recommended rather than the incandescent, since its use reduced the lighting costs (power and depreciation) by about 54.2%.
3- Usage of the saving lamps for 6 and 16 lighting hours minimized the lighting costs by 9.21 and 24.56LE i.e. 54.1% of the incandescent lamps.

Table(1): Interior ambient temperature (˚C), relative humidity (%) and THI (units)

Month	Photoperiod/ light source	Ambient temperature (˚C)		Relative humidity (%)		Temperature humidity index (units)	
		ncandescent	Saving	Incandescent	Saving	Incandescent	Saving
December	16L: 8D	16.42	15.33	65.17	66.25	16.14	15.17
	6L:18D	15.75	15.50	67.17	67.42	15.54	15.32
	16L: 8D	13.67	12.77	67.83	68.33	13.73	12.78
January	6L:18D	13.42	12.75	68.75	69.17	13.43	12.86
	16L: 8D	15.33	14.50	64.25	65.00	15.20	14.41
February	6L:18D	14.25	13.79	65.83	66.25	14.22	13.82
	16L: 8D	19.17	18.92	63.42	64.08	18.65	18.39
March	6L:18D	18.33	18.08	64.16	64.58	17.87	17.63
	16L: 8D	20.83	19.77	62.50	63.00	20.00	19.03
April	6L:18D	19.33	18.67	63.00	63.00	18.76	18.15

Table(2): Semen physical characteristics of Bouscat rabbit bucks affected by photoperiod, source and their interaction (LSM).

Photoperiod / Light source		**Sexual libido (sec)**	**Ejaculate volume (ml)**	**Advanced motility (%)**	**Sperm concentrate / ml×10^6**	**Total sperm output /ejaculate×10**	**Sperm Abnormalities (%)**
Effect of photoperiod							
16L:8D		12.75^b	0.737^a	68.55^a	333.00^a	245.52^a	10.53^b
6L:18D		15.02^a	0.690^b	63.77^b	331.00^a	228.41^b	12.49^a
SE		0.33	0.01	0.64	2.08	3.70	0.32
p-value		0.0001	0.0013	0.0001	0.4978	0.0012	0.0001
Significance		***	**	***	NS	**	***
Effect of lighting source							
Incandescent		13.61	0.716	67.22	335.00	239.86	11.71
Saving		14.16	0.713	65.10	329.00	234.57	11.31
SE		0.33	0.01	0.64	2.08	3.70	0.32
p-value		0.3337	0.5948	0.0199	0.0424	0.3408	0.3823
Significance		NS	NS	*	*	NS	NS
Effect of interaction (Photoperiod× light source)							
16L:8D	Incandescent	12.34	0.734	69.24	335.20	246.04	10.56
	Saving	13.16	0.741	67.86	330.80	245.00	10.50
6L:18D	Incandescent	14.88	0.695	65.20	334.80	232.68	12.86
	Saving	15.16	0.685	62.34	327.20	223.98	12.12
SE		0.46	0.01	0.91	2.95	5.23	0.46
p-value		0.5589	0.4151	0.4153	0.5878	0.4510	0.4579
Significance		NS	NS	NS	NS	NS	NS

A and b Means with different letters within each column are significantly different (P<0.05). * P < 0.05, ** P < 0.01, *** P < 0.001

Table(3): Physiological responses of Bouscat rabbit bucks affected by photoperiod, light source and their interaction (LSM).

Photoperiod / Light source		Rectal temperatur (RT/˚C)	Skin temperature (ST/˚C)	Ear temperature (ET/˚C)	Scrotal temperature (Sc.T/˚C)	Respiration rate (RR/rpm)
Effect of photoperiod						
16L:8D		39.37[a]	37.84[a]	34.74[a]	37.62[a]	108.94[a]
6L:18D		39.17[b]	37.56[b]	34.44[b]	37.41[b]	104.33[b]
SE		0.03	0.04	0.06	0.05	0.95
p-value		0.0001	0.0001	0.0003	0.0048	0.0007
Significance		***	***	***	**	**
Effect of lighting source						
Incandescente		39.31	37.74	34.67	37.58	107.82
Saving		39.24	37.65	34.51	37.46	105.45
SE		0.03	0.04	0.06	0.05	0.95
p-value		0.8444	0.1428	0.0561	0.0894	0.0788
Significance		NS	NS	NS	NS	NS
Effect of interaction (Photoperiod × light source)						
16L:8D	Incandescent	39.41	37.89	34.80	37.72	110.83
	Saving	39.33	37.79	34.67	37.53	107.50
6L:18D	Incandescente	39.20	37.59	34.53	37.45	105.27
	Saving	39.14	37.52	34.35	37.38	103.40
SE		0.04	0.06	0.08	0.07	1.35
p-value		0.7600	0.7665	0.7023	0.3805	0.7068
Significance		NS	NS	NS	NS	NS

A and b Means with different letters within each column are significantly different (P<0.05). ** P < 0.01, *** P < 0.001

Table(4): Some blood parameters and daily feed intake of Bouscat rabbit bucks affected by photoperiod, light source and their interaction (LSM).

Photoperiod / Light source		Blood parameters				Daily feed intake (g)
		Total protein (g/dl)	Albumin (g/dl)	Globulin (g/dl)	Albumin/Globulin ratio	
Effect of photoperiod						
16L:8D		8.29[a]	4.62[a]	3.67[a]	1.264[a]	168.58[a]
6L:18D		7.49[b]	4.09[b]	3.40[b]	1.201[b]	147.82[b]
SE		0.16	0.11	0.06	0.02	2.17
p-value		0.0005	0.0007	0.0033	0.0326	0.0001
Significance		***	**	**	*	***
Effect of lighting source						
Incandescent lamp		8.02	4.43	3.59	1.234[a]	160.28
Saving lamp		7.76	4.28	3.48	1.231[b]	156.12
SE		0.16	0.11	0.06	0.02	2.17
p-value		0.2489	0.3250	0.2224	0.9052	0.1791
Significance		NS	NS	NS	NS	NS
Effect of interaction (Photoperiod × light source)						
16L:8D	Incandescent	8.44	4.68	3.76	1.248[a]	171.64
	Saving	8.16	4.57	3.59	1.279	165.52
6L:18D	Incandescent	7.61	4.19	3.43	1.219	148.92
	Saving	7.38	4.00	3.37	1.182	146.72
SE		0.22	0.15	0.09	0.03	3.08
p-value		0.9265	0.8020	0.5174	0.2454	0.5262
Significance		NS	NS	NS	NS	NS

A and b Means with different letters within each column are significantly different (P< 0.05). ** P < 0.01, *** P < 0.001

Table (5): Comparison between the costs of lighting during the experiment, estimated by the power and lamp depreciation costs/ LE:

Lighting photoperiod	Light source	Costs		
		Power (energy/ k watt)	Lamp depreciation	Total
16L:8D	Incandescent	16 Light hours×150 days = 2400 Lhrs = 2400 hours×60 watt =144.0 k watt 144.0 k watt×29.0 Piaster = 41.76 LE	2.4 Lamp×1.5 LE = 3.60 LE	45.36 LE
	Saving	16 Light hours×150 days = 2400 Lhrs = 2400 hours × 26 watt = 62.4 k watt 62.40 k watt × 29.0 Piaster = 18.10 LE	0.30 Lamp×9.0 LE = 2.70 LE	20.80 LE
	RD (%)	- 23.66LE (56.6%)	- 0.90 LE (25.0%)	-24.56LE (54.1%)
6L:18D	Incandescent	6 Light hours × 150days = 900 Lhrs = 900 hours × 60 watt = 54.0 k watt 54.0 k watt × 29.0 Piaster = 15.66 LE	0.90 Lamp×1.5 LE =1.35 LE	17.01 LE
	Saving	6 Light hours ×150 days = 900 Lhrs = 900 hours × 26 watt = 23.40 k watt 23.40 k watt × 29.0 Piaster = 6.79 LE	0.112 Lamp×9.0 LE =1.01 LE	7.8 LE
	RD (%)	- 8.87 LE (56.7%)	- 0.34 LE (25.2%)	-9.21LE (54.1%)
Effect of light photoperiod (hrs)				
16L:8D (mean)		29.93 LE	3.15 LE	33.08 LE
6L:18D (mean)		11.22 LE	1.18 LE	12.40 LE
RD (%)		- 18.71LE (62.5%)	- 1.97 LE (62.5%)	-20.68LE (62.5%)
Effect of lighting source (incandescent versus saving)				
Incandescent (mean)		28.71 LE	2.47 LE	31.18 LE
Saving (mean)		12.44 LE	1.85 LE	14.29 LE
RD (%)		- 16.26 LE i.e. (56.6%)	- 0.62 LE (25.1%)	-16.89 LE (54.2%)

* Incandescent lamp (60 watt) price = 1.5 LE.
* Saving lamp (26 watt) price = 9.0 LE.
* Energy cost (k watt) = 29.0 piaster according to Upper Egypt electrical company.
* Life span (time) of incandescent lamp (60 watt) = 1000 light hours, i.e. 60000 watt (60 k watt).
* Life span (time) of saving lamp (26 watt) = 8000 light hours, i.e. 208000 watt (208 k watt).
* Assuming incandescent lamp = 100%.
* Rd (%) = 6L/ 16L × 100.

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الملخص العربي

تأثير الفترة الضوئية والمصدر الضوئي علي خصائص السائل المنوي ، الاستجابات الفسيولوجية وبعض مقاييس الدم في ذكور الأرانب.

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استهدفت هذه الدراسة تقييم تأثير طول الفترة الضوئية (١٦ساعة مقارنة بـ ٦ ساعات ضوئية) ، ومصدر الإضاءة (اللمبات الكمثرية مقارنة بالموفرة) على خصائص السائل المنوى ، الاستجابات الفسيولوجية وبعض مقاييس الدم في ذكور الأرانب.

اشتملت هذه الدراسة على ٢٠ ذكر من أرانب البوسكات ، قسمت بالتساوى الى مجموعتين. عرضت ذكور المجموعة الأولى (الكنترول) لفترة ضوئية طويلة (١٦ساعة اضاءة) ، بينما عرضت ذكور المجموعة الثانية لفترة ضوئية قصيرة (٦ ساعات إضاءة)، كذلك قسمت الذكور بكلتا المجموعتين إلى تحت مجموعتين متساويتين. إستخدمت اللمبة الكمثرية كمصدر للإضاءة فى تحت المجموعة الأولى ، بينما إستخدمت اللمبة الموفرة فى تحت المجموعة الثانية.

ولقد تم إسكان ورعاية جميع ذكور الأرانب بصورة فردية فى اقفاص بطاريات مجلفنة تحت نفس الظروف البيئية.

خلصت هذه الدراسة إلى ما يلي:

١- تحسنت بصورة معنوية صفات حجم القذفة/مل ، حركة التقدمية للحيوانات المنوية% و العدد الكلى للحيوانات المنوية بالقذفة $\times ١٠^{٦}$ لذكور الأرانب المعرضة للفترة الضوئية الطويلة (١٦ ساعة إضاءة) مقارنة بمثيلاتها المعرضة للفترة الضوئية القصيرة (٦ساعات إضاءة) ، بينما انخفضت معنوياً صفات الإثارة الجنسية (ثانية) ونسبة الحيوانات المنوية الشاذة (٪) لذكور الأرانب المعرضة للفترة الضوئية الطويلة عن مثيلاتها للفترة الضوئية القصيرة.

٢- ازدادت معنوياً حركة التقدمية للحيوانات المنوية% و تركيز الحيوانات المنوية/ مل $\times ١٠^{٦}$ للذكور المعرضة للضوء الناتج من اللمبات الكمثرية مقارنة بمثيلاتها المعرضة للمبات الموفرة.

٣- ازدادت معنوياً مقاييس استجابات التنظيم الحراري (درجة حرارة المستقيم، الجلد، الأذن ، كيس الصفن و معدل التنفس) لذكور الأرانب المعرضة لفترة ضوئية طويلة مقارنة بمثيلاتها المعرضة لفترة قصيرة.

٤- ازدادت بصورة معنوية جميع مقاييس الدم (البروتين الكلي، الالبيومين والجلوبيولين) بالإضافة إلي معدل استهلاك الغذاء اليومي للذكور المعرضة لفترة ضوئية طويلة (١٦ساعة) مقارنة بمثيلاتها المعرضة لفترة ضوئية قصيرة (٦ساعات).

٥- وعلى العكس، لم تكن هناك فروق معنوية فى جميع الصفات تحت الدراسة بين الذكور المعرضة للضوء من اللمبات الكمثرية والموفرة.

وأخيراً يمكن ان نخلص الي التوصية بإستخدام اللمبات الموفرة حيث قللت تكلفة الإضاءة خلال التجربة بحوالى ٥٤,٢ % مقدرة على اساس تكلفة الطاقة واستهلاك اللمبات وذلك طبقا لأسعارها السائدة فى الأسواق المحلية اثناء اجراء التجربة.

مفاتيح البحث:

ذكور الأرانب ، خصائص السائل المنوى ، طول الفترة الضوئية ومصدر الإضاءة.