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EFFECTS OF PHOTOSTIMULATION ON SEMEN PRODUCTION IN RHODE ISLAND ROOSTERS

EFECTELE FOTOSTIMULĂRII ASUPRA PRODUCŢIEI SPERMATICE LA COCOŞEI RHODE ISLAND

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In mammals the length of daylight has an oscillatory influence on semen production. It is known that in mammalian males highest semen output occurs mainly in spring and fall. It is possible that there is the same pattern in rooster semen production despite the anatomic differences regarding the testis location and, obviously local temperature. Considering these facts the present trial was set up in order to reveal effects of prolonged daylight – photo stimulation – on semen production in young roosters. All young roosters in the trial were divided in 3 groups, according to the age when photo stimulating schedule started. Photo stimulation was performed by moving young roosters from an 8h/day light to 14h / day light. Attempts of collecting semen up to the age of 20 weeks have failed showing relationship between body general development and semen output. Under prolonged light semen parameters as volume, motility and concentration changed from one week to the other. However, light is not the single factor inducing sexual maturity of the genital tract, but it could be used in young roosters in order to stimulate feed intake and thus overall body growth and development.

Key words: roosters, photo stimulation, reproduction, precocity

Materials and Methods

Semen was collected from young Rhode Island roosters which were divided in 3 trial groups. Semen collection was performed on weekly basis considering the age. Thus in Group 1 semen collection was performed at the age of 20, 21, 22, 23 and 24 weeks; Group 2 – at the age of de 22, 23, 24 weeks; Group 3 – at the age of 23, 24 and 25 weeks respectively. In order to identify effects of photo stimulation on semen parameters their dynamics was assessed both within each group and among groups targeting 3 age levels: 22, 23 and 24 weeks, under different lighting schedules.

Semen collection was performed under similar conditions and using same methods and personnel, in order to avoid bias generated by this factor. Same precautions were applied regarding semen handling, processing and analysis. Main recorded semen parameters were: a) volume – performed with a collection tube; b) pH; c) motility – using a Zeiss microscope; d) concentration – with the Burker-

Turk chamber following diluting at a 1:800 ratio. Diluting semen was compulsory due to the high sperm density in the raw semen. Lab temperature during semen collection, processing and analysis was set at 21 degrees Celsius, in order to avoid thermal shock.

Results and Discussions

Attempts to collect semen started following transfer from 8 h / day light to 14 h / day light. It seems that this was an early stage as there was not yet achieved a full correlation between body size / weight and maturity of the genital tract. In Group 1 semen collection was successful only in 30% of the males and only after 4 weeks of photo stimulation at 14 h / day, age 20 weeks. Before this age collecting semen through usual methods was impossible, probably due to insufficient development of ducts deferens. Thus it can be concluded that even at average 20 weeks of age only a limited proportion of the males are developed enough to be collected, correlation between body weight and genital tract being highly important.

Main semen parameters were not different from the ones found in literature.

Table 1

Semen parameters in Group 1 young roosters

Age (weeks)	Weeks of photo stimulation	Volume (ml)	pH	Motility	Concentration x 10^9
20	4	0.2	7.0	3	2.8
		0.4	7.0	4	2.2
		0.1	7.0	1	2.0
Average		0.23	7.0	2.66	2.33
22	6	0.1	7.2	4	42.3
		0.6	7.2	4	18.2
		0.1	7.0	3	24
Average		0.26	7.13	4	28.16
23	7	0.3	7.0	2	17.1
		0.25	7.5	3	21.8
		0.25	7.0	3	24.2
Average		0.26	7.16	2.66	21.03
24	8	0.25	7.0	4	29.2
		0.3	7.0	3	29
		0.2	7.0	2	13.6
Average		0.25	7.0	3	23.93

There are no remarkable differences among Group 1 and Group 2 in terms of semen parameters. However, we could note the semen concentration increase to 18,46 x10^9 sperm / ml following 4 weeks of photo stimulation by comparison to

only 2.33 x 10^9 sperm / ml in Group 1. This means that seminiferous ducts are much more developed at the age of 22 weeks in comparison to 20 weeks.

Table 2

Semen parameters in Group 2 young roosters

Age (weeks)	Weeks of photo stimulation	Volume (ml)	pH	Motility	Concentration x 10^9
22	4	0.1	7.0	2	22.8
		0.3	7.2	3	12.2
		0.2	7.0	3	20.4
Average		0.2	7.06	2.66	18.46
23	5	0.1	7.0	3	23.4
		0.3	7.0	3	24.2
		0.25	7.0	3	16.5
Average		0.21	7.0	3	21.36
24	6	0.2	7.2	3	14.8
		0.25	7.1	2	17.2
		0.3	7.0	2	20.9
Average		0.25	7.1	2.33	52.9

Young roosters in Group 3 seems to have a spermatogenesis start up after only 3 weeks of photo stimulation, but this development was recorded only in 10 % of the individuals belonging to the same group. Sperm concentration is higher than in Group 2, while semen volume is double now (0.4 ml). It is worth mentioning that some individuals at this age had extremely high sperm concentration going up to even 118.75 billions / ml.

Table 3

Semen parameters in Group 3 young roosters

Age (weeks)	Weeks of photo stimulation	Volume (ml)	pH	Motility	Concentration x 10^9
23	3	0.4	7.0	3	23.2
Average		**0.4**	**7.0**	**3**	**23.2**
24	4	0.3	7.0	2	30.8
		0.1	7.0	3	22.8
		0.3	7.0	4	46.4
Average		**0.23**	**7.0**	**3**	**39.33**
25	5	0.7	7.2	3	20.7
		0.3	7.1	4	179.2
		0.5	7.0	3	69.2
		0.2	7.0	2	19.6
Average		**0.42**	**7.07**	**3**	**118.75**

It seems that the same as in mammals in roosters development of the seminal tubules and sperm production start up is delayed as comparison with the female genitalia, puberty being reached latter.

Collecting semen in Groups 1 and 2 has been realized only following 4 weeks of photo stimulation. Semen of roosters in Group 3 was collected after only 3 weeks of intensive light schedule. It seems that the semen volume is not influenced by light as much as sperm motility and concentration, but is clear that photo stimulation is better if it starts later rather than sooner.

Table 4

Semen parameters in young roosters at same age exposed to different photo stimulation schedule

Age (weeks)	Weeks of photo stimulation	Volume (ml)	pH	Motility	Concentration x 10^9
23					
Group 1	7	0.26	7.13	2.66	21.03
Group 2	5	0.21	7.0	3.00	21.36
Group 3	3	0.4	7.0	3.00	23.2
24					
Group 1	8	0.25	7.0	3.00	23.93
Group 2	6	0.25	7.1	2.33	52.9
Group 3	4	0.23	7.0	3.00	39.33

Tabular data is revealing the fact that at the age of 23 weeks irrespective of the time lighting schedule neither volume, pH or sperm concentration are influenced. One week difference of photo stimulation between Group 1 and 2 could not influence sperm concentration. This parameter is higher at the same age in Group 3 but only after 3 weeks of stimulation at 14 h / day. Here we could conclude that prolonging day light at is age is no longer beneficial.

Considering the same parameters at the age of 24 weeks it can be seen that semen volume, pH and motility is still constant. However, a sperm concentration increase to $52{,}9x10^9$/ml, was recorded in Group 2 roosters. It is difficult however to speculate that this increase was only due to photo stimulation. We rather consider that this improvement is related to age. Yet, by expanding daylight to 14 h / day this will stimulate feed intake and thus a faster growth and development both of the body and genital tract as well.

Conclusions

Regardless the trial group considered increasing lighting schedule seems to have positive effects on the semen quality parameters. Extended light induce the time needed for Group 3 roosters for the onset of puberty.

However, the overall impact of changing light patterns at the age of 16 -18 weeks is not influencing a lot the semen output, volume and concentration being to low to be used on AI.

There have not being found relevant differences between groups regarding semen parameters where the age was the main referring point. However, increased light schedule before puberty allows roosters to have an improved feed intake and hence a better body and genital development. Therefore, this kind of approach should be considered beneficial only when roosters designated for AI are to be included into a fast body developing program, where quality of nutrition plays the main role.

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