Influence of temperature on the quality of sperm from synthetic strain rabbits

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Summary

The harmful effects of hyperthermia on testes and secondary sexual characteristics are not well understood. Our aim was to study the effect of temperature on the quality of rabbit semen. The experiment was carried out on 40 male rabbits of the ITELV 2006 synthetic strain. The rabbits were divided into two experimental batches that were exposed to two different temperatures, from 18 to 20°C for the first batch, and from 33 to 35°C for the second. During the experimental period, which lasted from the end of May to the beginning of July 2022, two successive ejaculates, spaced 10 minutes apart, were collected from each male and evaluated once a week. Weekly libido measurements also were taken. The rabbits responded well to solicitation, providing a 100% useful harvest rate. Seed analysis showed a significant difference between the two batches for all parameters studied ($p < 0.05$). The first batch produced a higher volume of sperm, with an average of 0.480 ± 0.106 ml, and a higher concentration of spermatozoa (spz), with an average of 462.797 ± 55.376 × 10^6 spz/ml. In comparison, the second batch had an average volume of 0.448 ± 0.115 ml and an average concentration of 409.745 ± 69.003 × 10^6 spz/ml. In terms of mass motility and individual motility, the averages recorded were respectively 5.058 ± 0.631 and 3.979 ± 0.957 for the first batch, and 3.246 ± 0.527 and 2.746 ± 0.769 for the second batch. The study shows that rearing temperature has a major effect on sperm quality.

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■ INTRODUCTION

Rabbits are highly sensitive to environmental factors such as humidity, air speed, light, and temperature (Lebas, 1983). Variations in these factors, particularly temperature, therefore can impact rabbit breeding. In female rabbits, variations can influence reproductive parameters (Boudour et al., 2020), while in male rabbits, they can interfere with the spermatogenesis process and alter sperm quantity and quality. Fewer experimental studies have been carried out on male breeding rabbits than on females and growing young males. However, since the advent of artificial insemination, research has focused on improving male performance, either through genetic improvement or by improving environmental parameters to optimize libido and sperm quality (Nizza et al., 2000).

Although sperm production varies widely between males and between ejaculates from the same male, the temperature of the rearing environment has a direct influence on the quantity and quality of the sperm collected, and therefore of the semen (Joly and Theau-Clément, 2000). To obtain an optimum quantity and quality of sperm and semen, it is therefore important to determine the most favorable rearing conditions for breeding males. Our work aimed to study the influence of rearing temperature on the characteristics of ejaculates collected from Algerian synthetic strain ITELV 2006 rabbits. This strain was created in 2003 as part of a cooperative program between INRA and ITELV, the Algerian technical institute for livestock breeding. It was obtained by an initial cross between the local Algerian population and the French INRA 2666 strain (Gacem and Bolet, 2005).

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■ MATERIALS AND METHODS

Animals

Forty male rabbits of the ITELV 2006 synthetic strain, aged 7 to 8 months (i.e., at sexual maturity), were housed in a breeding building (three rooms and a laboratory separated by a corridor) equipped with cooling and heating systems at the University of Chlef, 200 km west of the Algerian capital. The rabbits had an average weight of 3660 ± 130 g. Throughout the experimental period, the animals were fed a granulated rabbit feed, watered *ad libitum* and placed in individual wire cages 75 cm long, 45 cm wide and 30 cm high.

Study design

The 40 males used in the study were divided into two homogeneous batches (n=20). Batch A was maintained at an optimum temperature of 18-20°C, and batch B at a high temperature of 33-35°C, over a period of one and a half months (late May to early July). Sperm was collected from each male once a week. Collections were made on Sundays, Mondays, and Tuesdays for the rabbits in batch A, and on Thursdays, Fridays, and Saturdays for those in batch B. The collections were undertaken using an artificial vagina and in the presence of a female teaser, with two successive ejaculates 10 minutes apart. We designed the artificial vagina ourselves, and the males were trained to use it starting from the age of 5 months.

Following Castellini et al. (2006), rabbit libido was defined by two time periods, T1 and T2, that were measured with a stopwatch. T1 corresponded to the time (in seconds) that elapsed between the introduction into the male's cage of the female teaser (used to elicit ejaculation from the male) and the first overlap. T2 corresponded to the time elapsed between the introduction of the female teaser and the actual ejaculation by the male.

The quality of the ejaculate was evaluated immediately after collection, with a delay of no more than 15 min. During this time, the sperm was placed in a 37°C water bath, with an insulating rack, to protect it from light and thermal shock. The total volume of ejaculate collected was measured by a direct reading on the graduated collection tube. When gel was detected in the collection tube, it was removed. Semen pH was measured using a pH meter. Color was determined by observing the semen in the transparent collection tube, and a notation was applied to semen color using the Roca et al. (1993) grid, ranging from 0 (semen contaminated with urine (yellowish) or blood (pinkish or reddish)) to 3 (pearly white or ivory-white semen). The mass motility of the spermatozoa was assessed by placing a drop of pure sperm between a slide and a coverslip and observing it under a light microscope at 10x magnification. A score ranging from 0 to 9 then was assigned using the Petitjean (1965) grid. Similarly, individual motility was assessed after dilution of sperm in saline. A drop of semen (diluted sperm) was placed between a slide and a coverslip and observed at 40x magnification. The type of individual spermatozoa movement was noted using the Andrieu (1974) scale, with scores ranging from 0 to 4. The percentage of dead spermatozoa was determined by vital eosin-nigrosin staining (Baril et al., 1993). The number of live spermatozoa corresponded to colorless spermatozoa with functional membranes that did not allow the dye to diffuse. The percentage of abnormal spermatozoa and the spermatozoa concentration (in millions/ml) were determined using the technique presented by Boussit (1989).

Statistical analysis

The results obtained for all variables were processed using SPSS/PASW 21 software, enabling a one-factor analysis of variance with a group of variables including the effect of rearing temperature. In the event of significance, the means of the analyzed characteristics were compared in pairs using Student's *t* test.

■ RESULTS

Useful harvest rate for rabbits

Overall, we obtained a very high overall useful harvest rate of 100%, which indicates that the synthetic strain responded well to artificial sperm harvesting.

Libido or sexual ardor

The time taken for the males to overlap after the introduction of the female teaser (T1) was shorter on average for the males in batch A than for those in batch B. Batch A rabbits had a shorter libido than batch B rabbits (Table I). This significant difference ($p < 0.05$) seems to be due to the ambient temperature.

Macroscopic characteristics of the seed

Observation of the collection tube showed a creamy ivory-white color in most cases. Semen from batch A rabbits was more opaque ($p < 0.0001$) than semen from batch B (Table II). The volume of sperm obtained from rabbits in batch A was significantly higher ($p < 0.001$) than that obtained from rabbits in batch B. The same result was obtained for pH, which was significantly different ($p < 0.0001$) between the two batches.

Microscopic characteristics

The increase in ambient temperature to which batch B rabbits were exposed appeared to have a negative effect on sperm concentration. The sperm from these rabbits was less concentrated ($p < 0.0001$) than that obtained from batch A rabbits (Table III).

When we examined the semen from batch A under the microscope, we found that almost all of the sperm moved homogeneously. This motility is rated as good on the Petitjean scale of 0 to 9. On the other hand, microscopic examination of the semen from batch B revealed

Table I: Sexual ardor in rabbits from both batches /// *Ardeur sexuelle chez les deux groupes de lapins*

Variable	n	Min	Max	Average	S-dvt	p-value
T1 (A)	240	5.00	22.00	10.37	3.25	0.005
T1 (B)	240	6.00	17.00	11.20	2.36	
T2 (A)	240	9.00	29.00	16.23	3.67	0.002
T2 (B)	240	11.00	26.00	17.14	2.65	

n: Number of ejaculates; Min: minimum; Max: maximum; S-dvt: standard deviation /// *n : Nombre d'éjaculats ; Min : minimum ; Max : maximum ; S-dvt : écart-type*

Table II: Macroscopic characteristics of rabbit sperm /// *Caractéristiques macroscopiques du sperme de lapin*

Variable	Batch	n	Distr	Average	S-dvt	p-value
Color	(A)	240	2.00 - 3.00	2.99	0.09	< 0.0001
	(B)	240	2.00 - 3.00	2.78	0.41	
Vol (ml)	(A)	240	0.23 - 0.80	0.48	0.11	< 0.001
	(B)	240	0.25 - 0.70	0.45	0.11	
pH	(A)	240	6.50- 7.57	6.99	0.25	< 0.0001
	(B)	240	6.59 - 7.60	7.17	0.25	

n: number of ejaculates; Distr: distribution; S-dvt: standard deviation; Vol: volume /// *n : nombre d'éjaculations ; Distr : distribution ; S-dvt : écart-type ; Vol : volume*

Table III: Macroscopic characteristics of sperm from both batches /// *Caractéristiques macroscopiques du sperme des deux lots*

Variable	Batch	n	Distr	Average	S-dvt	p-value
Con ($x10^6$ spz/ml)	(A)	240	305.30 - 564.20	462.80	55.38	< 0.0001
	(B)	240	276.00 - 567.00	409.74	69.00	
MM	(A)	240	4 - 6	5.06	0.63	< 0.0001
	(B)	240	2 - 6	3.98	0.96	
IM	(A)	240	2 - 4	3.25	0.53	< 0.0001
	(B)	240	1 - 4	2.75	0.77	

Con: concentration; spz: spermatozoa; MM: mass motility; IM: individual motility; n: number of observations; Distr: distribution; S-dvt: standard deviation /// *Con : concentration ; spz : spermatozoïdes ; MM : mobilité de masse ; IM : mobilité individuelle ; n : nombre d'observations ; Distr : distribution ; S-dvt : écart-type*

a few immobile spermatozoa, a few agitated spermatozoa, and a few mobile spermatozoa. On the Petitjean scale, a motility score of 4 is considered average.

The spermatozoa from batch A had bumpy movements and moved along a helix with a diameter roughly equal to their length. A score of 3 to 4, corresponding to this individual motility (IM), was assigned (Table III) in line with the Andrieu grid (1974) cited by Boussit (1989). Spermatozoa in batch B moved slowly, with circular motions predominating. An IM score of 2 was assigned to batch B using this same grid.

The rate of spermatozoa anomalies in batch A was significantly lower ($p < 0.05$) than in batch B. This variation may be linked to the increased temperature to which batch B rabbits were subjected.

The results presented in Table IV show that the percentage of live spermatozoa in batch A is high ($p < 0.05$) compared with batch B.

Table IV: Rates of sperm anomalies and mortalities in both batches /// *Taux d'anomalies et de mortalité des spermatozoïdes dans les deux lots*

Variable	Batch	n	Distr	Average	S-dvt	p-value
ANO %	(A)	240	7.00- 18.00	11.09	1.94	< 0.0001
	(B)	240	6.00- 22.00	13.87	3.28	
DEAD %	(A)	240	24.00- 35.00	27.57	2.28	< 0.0001
	(B)	240	19.00 - 42.00	30.00	4.54	

ANO %: anomaly rate, DEAD %: mortality rate, n: number of observations, Distr: distribution, S-dvt: standard deviation /// *ANO % : taux d'anomalie, DEAD % : taux de mortalité, n : nombre d'observations, Distr : distribution, S-dvt : écart-type*

■ DISCUSSION

Numerous studies have described seasonal variations in the sexual activity of male rabbits in the wild. For example, reproductive activity is high when days are growing longer, and becomes almost non-existent in autumn (Lebas, 2009).

Useful harvest rate for rabbits

The high useful harvest rate obtained for animals of the strain studied confirms the results obtained by Lankri et al. (2019) for the same synthetic strain, with extensive, intermediate and intensive collection rates of 100%, 99.4% and 100%, respectively. It is very close to that recorded by Bencheikh (1995) in rabbits of the Hyplus strain, with a rate of 99.6%.

Libido or sexual ardor

It would appear that, on average, the time between the presentation of the female teaser and overlap (T1) is longer than that obtained by Bencheikh (1993) for strains A 2066 (4 seconds) and A 1077 (5.5 seconds). A significant difference in libido ($p < 0.05$) was observed between the two batches in our study. Several authors have reported similar difference in libido due to variations in ambient temperatures. For example, Lebas (1980) found that high heat reduced the libido of animals. Nizza et al. (2003) and Safaa et al. (2008) stated that temporary sterility in male rabbits may be due to high ambient temperatures. The reduced reproductive capacity of male rabbits during the summer period is linked to reduced sexual ardor. On the other hand, male sexual ardor is better in spring than in winter (Rodriguez De-Lara et al., 2008). Safaa et al. (2008) reported a libido of 14.5 seconds in Black Baladi rabbits and 21.9 seconds in New Zealand White rabbits aged between 24 and 36 weeks. In general, we can say that the males of the synthetic strain were characterized by a shorter reaction time than the different types of rabbits studied in the literature, thus falling within the range of variation (between 5 and 300 seconds) stated by Alvarino (1993). This result could be due to a characteristic of the strain or to the collection methodology that we adopted. In fact, in addition to the same sampler, several teaser rabbits were used throughout the experiment.

Macroscopic examination of semen

Color

Roca et al. (1993) considered that a semen color score of 3 indicates good semen quality. Selcedo-Boca et al. (2004) gave an average semen color score of 2.03 for 10-month-old New Zealand and Chinchilla rabbits. In general, the semen observed in our study was more opaque than the semen of rabbits from the local population, to which Benchickh (1993) gave an average score of 2.3. According to Roca et al. (1993), the difference in color we observed between the two batches may be related to the higher sperm concentration in the semen of the rabbits in batch A compared to those in batch B. These authors found a positive correlation between color and sperm concentration. Furthermore, Boussit (1989) stated that color is a good indicator of sperm quality.

Volume

The greater volume of semen collected ($p < 0.001$) in batch A rabbits was confirmed by the results obtained by Boussit (1989), who found that ejaculate volume reaches its highest values from April to June. The comparatively low volume of gel-free semen in batch B rabbits is in line with the results reported by Safaa et al. (2008) and Theau-Clément et al. (2009). In addition, several authors (Theau-Clément et al., 1991; Safaa et al., 2008, and Theau-Clément et al., 2009) have reported that the volume of sperm harvested per ejaculate is highest during the spring, winter and autumn seasons, and lowest in summer. On the other hand, Battaglini et al. (1992) reported, in a study conducted from June to December, that the volume of ejaculate collected in June (0.99 ml) was higher than that collected in November (0.64 ml). Roca et al. (2005) also reported that the volume of gel-free semen was significantly higher in summer than in other seasons. Similarly, Nizza et al. (2003) found that the volume of semen collected was higher in summer than in winter. On the other hand, Garcia-Tomas et al. (2006) reported no effect of the summer period on semen volume. In general, the volume of all collections in our experiment was lower than that obtained by Salcedo-Baca et al. (2004) from different breeds (Californian, New Zealand White and

Mexican Chinchilla) aged between 32 and 48 weeks (1.15 ml). Similarly, Safaa et al. (2008) and Bencheikh (1995) obtained higher volumes (0.73 ml and 0.79 ml respectively) in the Egyptian breed Baladi Noir and strain INRA1077. On the other hand, our results are close to those obtained by Lankri et al. (2019), Boulbina (2011), Brun et al. (2006) and Salcedo-Baca et al. (2004), with volumes ranging from 0.44 to 0.73 ml.

pH

The pH of the sperm collected during our experiment indicated an average of 6.997 ± 0.247 for batch A and a significantly different value ($p < 0.0001$) for batch B (7.17 ± 0.255). Our results confirm what (Garcia-Tomas et al., 2006; Brun et al., 2002a and Brun et al., 2009) have shown, highlighting the negative effect of season on sperm pH. Similarly, Alvarino (1993) indicated that the increased pH of rabbit semen reared in summer (when temperature exceeds 27°C) is responsible for the temporary sterility encountered during this period. Several studies on the effect of season on sperm pH have revealed considerable variability in the data. However, some authors reported no effect of season on this parameter (Battaglini et al., 1992; Nizza et al., 2003 and Theau-Clément et al., 2009).

Microscopic examination

Concentration

The results obtained for sperm concentration in our study confirm those of Roca et al. (2005), who showed that increasing the index linking ambient temperature to hygrometry (THI) has a negative effect on sperm concentration and sperm count per ejaculate. The same findings were made by Theau-Clément et al. (2009), who reported that low sperm concentrations were recorded in summer. Yan (1985) also found that sperm motility and concentration dropped significantly when the temperature rose from 28 to 30°C. Similarly, the differences in concentration that we recorded between batches A and B may be explained by the increase in the length of daylight reported by Boiti et al. (2005) and by temperature.

The concentrations obtained for both batches in our experiment are high compared with the results of Viudes-de-Castro et al. (1996), with an average spermatozoa (spz) concentration of 267 million/ml (ranging from 104 – 570 million). However, they are lower than those recorded by Bencheikh (1993), Brun et al. (2002b), Theau-Clément et al. (2009) and Brun et al. (2006) in line L (634 × 106 spz/ml) and line H (738 × 106 spz/ml). They are similar to those found by Nabi (2013) (429 ± 263 ×106 spz/ml). Indeed, Boulbina (2011) found a higher mean value (735 × 106 spz/ ml) for rabbits aged between 19 and 33 weeks, and 642 ×106 spz/ml in rabbits harvested from the 24th to the 33rd week of age. Safaa et al. (2008) reported concentrations of 703 × 106 spz/ml for the Baladi Noir breed and 590 × 106 spz/ml for the New Zealand White breed (in Egypt). However, lower concentrations of about 243 × 106 spz/ml have been found in various strains selected by INRA (1077, 2066, 2666 and 1001) (Brun et al., 2009). About 245 × 106 spz/ml also were reported for the two C and R lines by Garcia-Tomas et al. (2006).

Mass motility

Several authors have reported a negative effect of high temperatures on sperm motility. Roca et al. (2005), Rodriguez De-Lara et al. (2008), Safaa et al. (2008) and Theau-Clément et al. (2009) reported that motility is low in summer, increasing gradually to reach a peak in spring. Boulbina (2011) found a low rate of spermatozoa motility in local rabbits (64.2%), and 74.8% at an older age (between 24 and 33 weeks) in the same population. Brun et al. (2006) reported a rate of 76% using males from lines selected for growth. Spermatozoa motility seems to improve with age (Salcedo-Baca et al., 2004). In rabbits, studies indicate that good spermatozoa mass motility is associated with a good pregnancy rate (Brun et al., 2002b).

Individual motility

Statistical analysis revealed a significant difference ($p < 0.0001$) between individual spermatozoa movements in the two batches. According to Boiti et al. (2005), this difference is related to the increase in temperature. The effect of season was significant for most males, with sperm production lower in summer than in autumn (182 vs 291×10^6 motile spz/ejaculate). Semen quality parameters are also altered in summer, particularly compared with values observed in autumn (Theau-Clément et al., 2009).

Anomalies

The results of the spermatozoa anomaly rates obtained in this study confirm those of Safaa et al. (2008), who reported that sperm anomalies and the percentage of dead sperm per ejaculate increase in summer. Furthermore, Walter et al. (1968) confirmed that variation in spermatozoa anomaly rates may have a relationship with increasing temperature. On the other hand, Finzi et al. (1995) concluded that high ambient temperatures have a negative influence on sperm anomaly rates in semen collected from heat-stressed rabbits. However, Nizza et al. (2003) found no seasonal effect either on the percentage of abnormalities or on the percentage of live cells. Similarly, Roca et al. (2005) found no seasonal effect on sperm and acrosome membrane integrity or on the rate of abnormalities. In general, the total anomalies observed in the spermatozoa of our strain (11.09 for batch A and 13.87 for batch B) are lower than those found in the White New Zealand breed (Brazil), with an average rate of 24.3% (Cardoso and Bao, 2007).

Percentage of dead spermatozoa

The effect of rearing temperature on the percentage of live spermatozoa in the semen of both batches A and B also was observed by Finzi (1990) and Lebas (2009), who found that above an ambient temperature of 30°C, rabbit sexual activity is reduced, followed by a drop in spermiogenesis and semen quality. Therefore, when rabbits are exposed to 8 hours of heat stress at 34°C for one or five consecutive days, there is a significant increase in the rate of dead spermatozoa and pyriform cells. This is likely due to the increase in rectal or particularly scrotal temperatures (Kasa and Thwaites, 1992). From the results obtained and without taking into consideration the effect considered (temperature), the sperm vitality rate, in our study, is higher than the rates recorded by Bencheikh (1993), Brun et al. (2002b), Brun et al. (2006) and Theau-Clément et al. (2009), but lower than that found by Boulbina (2011), with mean values varying between 88.4 and 94.2%.

■ CONCLUSION

The response of male Algerian synthetic strain rabbits to the artificial vagina translated into a good useful harvest. The males seem to be adapting to sperm harvesting using the artificial vagina that we designed, and which could be used for artificial insemination. From the results of this study, we can conclude that temperature seems to influence male fertility, whatever the trait considered. Volume, motility (overall and individual) and concentration were higher ($p < 0.05$) in batch A than in batch B. The percentage of dead spermatozoa and the abnormality rate were significantly higher in batch B compared with batch A ($p < 0.01$). The results of this study confirm that, in the Algerian rabbit, the effect of temperature seems well established. High temperatures are a limiting factor for male productivity when they last for long periods. A high temperature impairs sperm production, with a decrease in sperm quality, notably concentration, volume, and motility. It also increases sperm mortality and abnormalities,

and reduces libido. Sperm production continues, but at a lower rate than at cooler temperatures. Based on the results of this study, several research avenues may be considered. One would be to continue this work over a longer period to better understand the effects of temperature, and to combine this with studying the effect of the length of daylight on the production performance of rabbits of this genetic type. Gene transfer studies also should be considered. They could be introduced into the breeding schemes of the synthetic strain rabbit in order to obtain individuals adapted to the conditions of the region, particularly temperature. An important aspect to study is the use of this semen in artificial insemination, which is not very common in Algeria, to determine the conditions for obtaining optimum performance from females. In order for artificial insemination to be successful and profitable, this biotechnology needs to be tested on a larger scale with this animal material, and the results need to be disseminated to breeders. It is necessary to take into account all production factors and their interactions, in particular livestock management.

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Conflicts of interest

The authors declare that there is no conflict of interest.

Declaration of authors' contributions

KB, NDZ and EHL were involved in the design and planning of the study; EHL and KB collected the data and drafted the first version of the manuscript; NDZ and EHL carried out the statistical analyses; MAM revised the manuscript.

Ethics approval statement

We followed the ethics recommendations of the "Local Natural Bioresources" research laboratory of Hassiba Benbouali University, Chlef, Algeria.

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Résumé

Boutebel-Boudour K., Lankri E.H., Meziane-Ahmed M., Zerrouki-Daoudi N. Influence de la température sur la qualité du sperme de lapins de souche synthétique

L'action nocive de l'hyperthermie sur le testicule et sur les caractères sexuels secondaires est assez mal expliquée. C'est dans ce sens que s'inscrit notre objectif qui est l'étude de l'effet de la température sur la qualité de la semence du lapin. L'expérience est réalisée sur un total de 40 lapins mâles de la souche synthétique ITELV 2006, répartis en deux lots expérimentaux, dans deux températures différentes, de 18 à 20°C pour le premier lot, et de 33 à 35°C pour le deuxième. Durant toute la période expérimentale, allant de la fin du mois de mai jusqu'au début du mois de juillet 2022 et sur chaque mâle, deux éjaculats successifs, espacés de 10 minutes, ont été récoltés et évalués une fois par semaine. Des mesures hebdomadaires de la libido, ont été effectuées. Les lapins ont bien réagi aux sollicitations avec un taux de récolte utile très élevé (100%). L'analyse de la semence montre, pour tous les paramètres étudiés, une différence significative entre les deux lots ($p<0,05$). En effet, le premier lot présente une meilleure production spermatique avec un volume moyen de 0,480±0,106 ml et une concentration moyenne de 462,797 ± 55,376 x 10^6 spermatozoïdes par ml de sperme (spz/ml) contre un volume de 0,448±0,115ml et une concentration de 409,745±69,003x10^6 spz/ml pour le deuxième lot. L'analyse de la motilité enregistre en moyenne 5,058 ±0,631 et 3,979 ±0,957 pour le premier lot et 3,246±0,527 et 2,746±0,769, pour le deuxième lot, respectivement pour la motilité massale et individuelle. L'étude montre que la température d'élevage a un grand effet sur la qualité du sperme.

Mots-clés : Lapin (oryctolagus), effet de la température, système génital mâle, reproduction animale, Algérie

Resumen

Boutebel-Boudour K., Lankri E.H., Meziane-Ahmed M., Zerrouki-Daoudi N. Influencia de la temperatura en la calidad del esperma de conejo de estirpe sintética

La acción nociva de la hipertermia en el testículo y en los caracteres sexuales secundarios está bastante mal explicada. Por ello, nuestro objetivo es estudiar el efecto de la temperatura en la calidad del semen de conejo. La experiencia se realizó en un total de 40 conejos macho de la estirpe sintética ITELV 2006, distribuidos en dos lotes experimentales, en ambientes con dos temperaturas diferentes, de 18 a 20 °C para el primer lote, y de 33 a 35 °C para el segundo. Durante todo el período experimental, desde finales del mes de mayo hasta principios del mes de julio de 2022, y para cada macho, se recogieron dos eyaculaciones sucesivas, separadas por intervalos de 10 minutos, una vez a la semana. Se realizaron también medidas semanales de la libido. Los conejos reaccionaron bien ante las demandas, con una tasa de recogida útil muy elevada (100 %). El análisis del semen muestra, para todos los parámetros estudiados, una diferencia significativa entre ambos lotes ($p<0,05$). Efectivamente, el primer lote presenta una mejor producción espermática con un volumen medio de 0,480 ± 0,106 ml y una concentración media de 462,797 ± 55,376 x 10^6 espermatozoides por ml de esperma (spz/ml) frente a un volumen de 0,448 ± 0,115 ml y una concentración de 409,745 ± 69,003 x 10^6 spz/ml para el segundo lote. El análisis de la motilidad registra de media 5,058 ± 0,631 y 3,979 ± 0,957 para el primer lote, y 3,246 ± 0,527 y 2,746 ± 0,769, para el segundo lote, respectivamente para la motilidad masal e individual. El estudio muestra que la temperatura ambiente tiene un efecto importante en la calidad del esperma.

***Palabras clave*:** Conejo (oryctolagus), efectos de temperatura, aparato masculino, reproducción animal, Argélia