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EFFECT OF SEASON AND AGE RAMS BREED "OULED DJELLAL" ON QUALITY OF THEIR SEED AND REPRODUCTION *IN VIVO*

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Abstract

With the aim of sheep breeding, the use of biotechnological processes such as insemination is not common practice for the breed Ouled Djellal. An evaluation of the semen quality in ten rams is performed during different seasons, then the data is established according to age, 5 young and 5 adults. The semen is put in flakes and then used to inseminate 128 females separated by age and then by age of the parents. The results showed that the sheep Ouled Djellal has a comparable semen quality for some parameters such as volume and the number of flakes obtained for each ejaculation. While the concentration (4.25 vs. 4.01) and mass motility (4.42 vs 3.80) are higher in the elderly compared to the young rams. The effect of season was shown significant only on the volume regardless of age, yet remaining in the standards. Indeed, the fall and spring are favorable to the volume than the summer and winter. The in vivo study showed that only prolificacy changes depending on the age of young or mature rams (121 vs. 162) and depending on the age of the females. The females aged 3 yearshave a prolificacy of 167 compared to older females which is between (129 and 138).

Keywords: Sheep, Ouled Djellal, semen, age, season, reproductive parameters.

Introduction

The Algerian sheep population was in 2010 estimated at 22.5 million sheep (Boughanem, 2010). The predominant breed is the "Ouled Djellal". It is also known as the great white Arabian breed, bred in the arid and semi-arid regions.

Most sheep are known to be seasonal, in the northern hemisphere their season coincides with the decreasing days. However, the "Ouled Djellal" is known to be a breed that doesn't coincide with the season.

Lots of work characterize it in terms of performance of growth as well as of reproduction. This breed is known for its good zootechnical performance of growth and conformation. However, its prolificacy is among the lowest at 121 (Chellig, 1992). Nevertheless, we ignore its ability to be used in artificial insemination. This biotechnological technic actively contributes to improving the genetic progress with time, if the breeders are selected with the objectives and criterion used in the genetic improvement program fit for this breed.

Materials and Methods

The experiment took place at the "Regional Center for Artificial Insemination of Sheep" in the region of Ouled-Djellal (Biskra). It involves two steps.

First step: Ten (10) males of the breed of Ouled Djellal were used for semen collection using an artificial vagina. The rams are divided into two lots, each of five individuals based on their age (young with 2 years, adults with 3 years and more). The body condition score is 3 and 3.5.

The test sample is made up of all the individual collection of semen of rams according to the age or depending on the season of collect. Evaluation of the semen is based on the protocol indicated in fig.1.

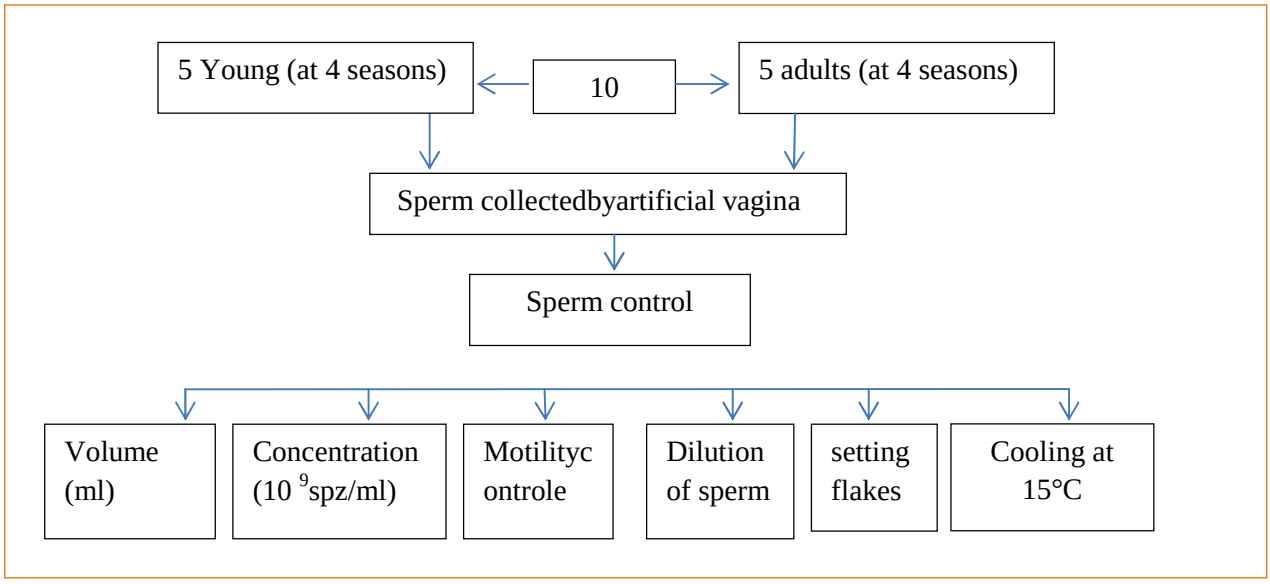

Fig. 1: Protocol for the of ovine fresh semen

Second step: One hundred and twenty-eight (128) ewes of the breed Ouled Djellal whose age varies between 3 and7 years were used for artificial insemination. The age determination of the sheep was evaluated by dental chronology.

Females are synchronized by blocking the cycle in the luteal phase by progestogens in a vaginal sponge supplemented by an injection of PMSG. The semen is deposited carefully at the entrance of the cervix with a speculum guide.

The experimental protocol (tab. 1) is as follows:

- Two groups of females each 64 in number were formed with uniform age, each inseminated with semen from youth or adult males.
- The female group of 128 individuals (such as inseminated in the first stage) is divided into 4 groups each of 28 ewes based on their age.

Table 1: Step of experimentation and complete random groups (1st and 2nd stage are independent)

	1st stage	2nd stage
128 sheep inseminated	**Lot 1:** 64 ewes of different ages inseminated by young rams.	**Lot 1 :**28 ewes (3 years)
		Lot 2 :28 ewes (4 years)
	Lot 1: 64 sheep of different ages inseminated by adult rams	**Lot 3 :**28 ewes (5 years)
		Lot 3:28 ewes (6 years and more)

The sorting of the sheep is based on the body condition score, whose average is 3.
The daily ration is of mainly hay supplemented with 1 kg of barley.

The calculated parameters are:

$$\text{Fertility rate}(\mathbf{Fr}) = \frac{\text{number of ewes giving birth}}{\text{number of ewes put for reproduction}} \times 100$$

$$\text{Prolificity rate } (\text{Pr}) = \frac{\text{number of lambs born}}{\text{nombre ewes giving birth}} \times 100$$

$$\text{Fecondity rate } (\text{FR}) = \frac{\text{number of lambs born}}{\text{number of ewes put for reproduction}} \times 100$$

Statistical Analysis

It's about comparing the mean values of complete random groups by the statistical software SYSTAT version 7.

Results and Discussion

Assessment of spermatic parameters

Effect of ramage on the sperm quality

The difference in age of rams of the breed Ouled Djellal had no effect on the volume and the number of flakes per ejaculation obtained (tab. 2). However, the concentration and the mass motility are high in adult males. The effect of age category of rams was very significant,(P <0.000) for mass motility, and significant for the concentration (P <0.036), but not significant for the other parameters (volume and number of flakes).

The volume of 1.18 obtained in young rams and 1.29 in adults belong to the range of variation between 0.1 and 1.5 as indicated by ***Gilbert et al, 2005***.

The average concentration of 4.13 spz × 109 / ml is contained in the interval reported by ***Gilbert et al., 2005*** is between 1.5 to 6 spz × 109 / ml. "

Hahn et al. (1969) prove that in males a positive and significant correlation between the age of the animal and the number of spermatozoids per ejaculation. According ***Salhab et al (2003)***, it has been proved an increase in motility with age, supporting the same observation on the Ouled Djellal.

Table 2: Semen quality depending on the age of rams.

Parameter	Age Jeunes		Moyenne	Signification
	Young	Adults		
Volume (ml)	1,18 ± 0,39 a	1,29 ± 0,23 a	1,23 ± 0,31	0,842
Concentration (10 ^{9}spz/ml)	4,01 ± 0,27 b*	4,25 ± 0,19 a*	4,13 ± 0,23	0,036
Number of Flakes	10,88 ± 1,04 a	13,89 ± 2,22 a	12,38 ± 1,53	0,075
Mass Motility	3,80 ± 0,21 b***	4,42 ± 0,14 a***	4,11 ± 0,08	0,000

Means followed by the same letter are statistically similar.
Means followed by different letters are statistically not similar.
*NS = not significant; * P <0.05; *** P <0.001.*

Effect of season

The ANOVA results indicate that the seasonal factor has a highly significant influence on the volume (P <0.001) (Tab. 3). Indeed, the fall and spring seasons are favorable compared with the winter and summer. These volumes are in line with the range of variation reported by ***Gilbert et al.2005***. According ***Kafi et al, (2004)***, the sperm volume of the rams of the breed "Karakul" in Iran increase significantly from the end of summer and during the fall.

The concentration, the number of flakes and mass motility are statistically comparable between seasons. From this, we can say that the ram of Ouled Djellal undergoes a continuous spermatogenesis with a decline of volume during extreme winter and summer seasons.

Table 3: Semen quality depending on the season

Parameter	Season				Signification
	Autumn	Winter	Spring	Summer	
Volume (ml)	1,25 a***	1,06 b***	1, 29 a***	1,11 b***	0,001
Concentration (10^9spz/ml)	4,43a	3,78a	4,31a	3,95a	0,098
Number of Sequins	13,07a	9,655a	13,07a	10,97a	0,089
Mass Motility	4,00a	4,01a	4,11a	4,00a	0,19

Means followed by the same letter are statistically similar.
Means followed by different letters are statistically non comparable.
*NS = not significant; * P <0.05; *** P <0.001.*

Effect of two factors (season and age) on sperm parameters

The principal component analysis (Fig.2) shows that autumn and spring are the seasons favorable for sperm activity in Ouled Djellal rams regardless of their ages. As winter and summer are the seasons of extreme sperm quality without becoming zero.

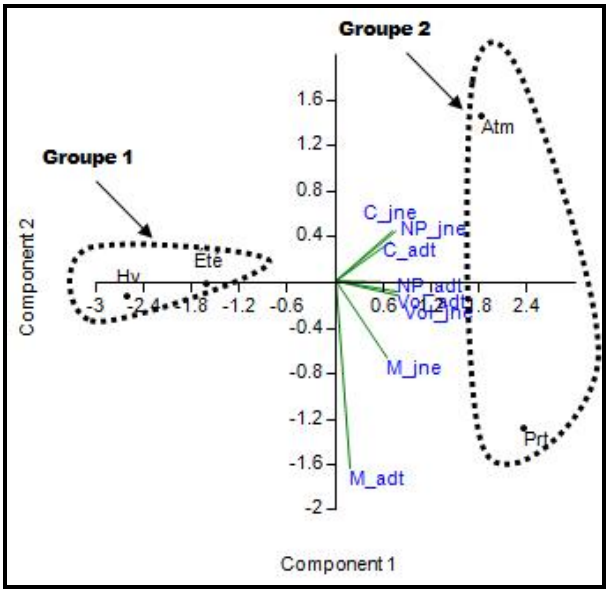

Fig. 2: Effect of age and season (Principal Component Analysis)

The effect of male age on reproductive parameters (Step 2)

Among the zootechnical reproductive parameters studied; fertility, fecundity and prolificacy of ewes inseminated by semen from young rams and adult rams (tab. 4). The parameters of reproduction, fertility and fecundity showed no significant differences in terms of semen from younger and older males. Semen from aged males generated higher prolificacy in females whose age component is the same in the two groups studied. The highest prolificacy rate of 161.87% in females that are inseminated by semen adult rams, approaches the work reported by Chouya (2002) is 164.44%.

Table 4: The effect of age of reproducing rams on reproductive parameters.

Parameter reproduction (%)	Reproducing rams		Signification
	Young	Adult	
Fertility rate	50,08±7,24 a	74,88±26,83 a	0,947
Fecundityrate	63,09±37,72 a	118,01±14,14 a	0,449
Prolificacy rate	120,91±21,1 b***	161,87±21,71 a***	0,005

Means followed by the same letter are statistically similar.
Means followed by different letters are statistically comparable.
** P <0.05; *** P <0.001.*

The effect of the age of the female on the examined reproductive parameters

The fecundity and fertility are comparable across 4 lots of females, despite an apparent superiority of females aged 6 years and above (Tab. 5). The statistical analysis showed no effect of age on both reproductive parameters examined. Regarding fertility, ***Dekhili (2002)*** had found instead a significant influence of age on the female fertility.

It has been shown that prolificacy is higher in females aged 3 years which is consistent with findings by ***Dekhili (2002).***

In different species, it was shown that the efficiency of artificial insemination can be influenced by order of parity and / or age of the female. ***(Anel et al., 2006; David, 2008.)***.

Table 5: Effect of the age of the female on the examined reproductive parameters

Reproduction parameter(%)	Age of the female (years)				Significance
	3	4	5	6and over	
Fertility rate	60.60 a	49.17 a	57.71 a	77.93 a	0.603
Fecundity rate	100.00 a	60.46 a	86.62 a	103.10 a	0.518
Prolificacy rate	166.66 a*	128.75 b*	138.33 b*	131.83 b*	0.025

Means followed by the same letter are statistically similar.
Means followed by different letters are statistically comparable.
** P < 0,05;*

Conclusion

The concentration of the sperms and the mass motility are higher in older males. However, neither the volume nor the number of flakes obtained is affected by the age of the parents.

The season effect showed that volume increased only in spring and autumn seasons compared to extreme winter and summer, and this is independent of the age of rams. Standard volume is maintained in extreme season, hence proving reproductive activity during the whole year.

Save for the seed storage conditions which influence the success of artificial insemination adding intrinsic factors related to the male and the female. The ewes that are inseminated by semen from adult rams are more prolific compared to those inseminated with semen from young rams. This comes down to the concentration and the high motility in semen of adults rams.

The ewes of 6 years and over are apparently more fertile than other female groups, more fecund though not being significant. Contrary, those aged 3 years are statistically more prolific. To improve the numeric productivity of the breed Ouled Djellal, it makes sense to inseminate young females with semen from adult males so as to keep this potential in a breed that is not deemed to be prolific.

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