The Effect of Regulin on Reproductive Performance of Afshari Sheep Breed

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Abstract

Near the center of the brain, there is a small gland named Pineal which produces and releases melatonin during night; which in turn affects hypothalamus and with the help of GnRH, stimulates pituitary gland. Anterior pituitary then releases gonadotropin hormones (LH, FSH), which stimulate and trigger the development of follicles and subsequently ovulation. Therefore, melatonin has a vital role in starting and general performance of reproductive processes. In order to assess the effect of Regulin (melatonin) on reproductive performance of Iranian Afshari sheep breed inside and outside the breeding season, 1590 ewes were evaluated in 6 groups. All ewes were 4 to 5.5 years old and had 2 to 4 times previous breeding. For each 30 ewes, there was one ram in the flock. The experimental treatments were included 1- 18 milligrams of regulin outside breeding season, 2- zero milligram of regulin outside breeding season, 3- 18 milligrams of regulin inside breeding season, 4- zero milligram of regulin inside breeding season. This study was done using a completely random design analysis and the data was analyzed using 2x2 factorial method. Breeding percentage and the rate of twin bearing in the group which received regulin outside breeding season had a significant difference with the control group (without regulin). Moreover, fertility percentage, reduction of infertile ewes, and reduction of breeding period in the group with regulin outside the breeding season had a significant difference to the group without regulin inside breeding season ($p<0.05$). Abortion percentage on the other hand did not have a significant difference between regulin and control groups. Using regulin has a considerable effect on the reproductive performance of Afshari sheep breed outside the breeding season and given the findings of this study is highly recommended in sheep flocks.

Keywords: Regulin, Reproduction, Breeding Percentage, Twin-bearing, fertility Percentage, Infertile Ewe, Breeding Period, Afshari Sheep Breeding

1. Introduction

Reproductive traits are qualitative traits that are affected by genetic and environmental parameters. Season or light periodicity are among environmental parameters that are very influential on the starting date and performance of animals' reproduction, especially those with seasonal breeding such as sheep. The seasonal nature of this activity is depends on daily light periodicity (photoperiod). Shorter days (autumn) are arousing the sexual activity of the sheep while longer days (spring) are preventing and weakening such activities. Sexual activity control is only possible through the changes in long and short days. In recent years various instruments have been introduced to help manage reproduction activities of animals. One of the most important of such tools is regulating drugs which are controlling the estrous cycle and mating time. Regulin, one of these modern regulating drugs, is an implant containing 18 mg of Melatonin hormone. This hormone is synthesizes during the night from a small gland at the base of the brain named pineal. Melatonin then affects hypothalamus and with the help of GnRH, stimulates pituitary gland. Anterior pituitary then releases gonadotropin hormones (LH, FSH), which stimulate and trigger the development of follicles and subsequently ovulation which has a vital role in starting and general performance of reproductive processes. This product is a very small implantable tablet (only several millimeters long) which is placed beneath the base of the ear using a special implanter and does not need to be removed later. This tablet slowly releases melatonin which will recreate the effect of shorter days and longer nights.

Implanting melatonin in ewes can increase pregnancy and breeding rate{4}. This is even visible in non-breeding seasons {2}. The same improvement can also be seen in rams, although in some breeds such as Atabay this improvement has not been significant which indicates that the effect can also be dependent on breeds and races {10,1}. In another study, using melatonin in hybrid ewes such as Rambouillet-Targhee did not show a significant improvement in follicle growth and oocyte quality of anestrus ewes {6}.

The link between day length and seasonal changes in improving the breeding of adult sheep is closely related to pineal-melatonin system {3}. Therefore, the use of melatonin can help advance mating season. Goats and ewes that live in tropical and nearby regions are seasonal polyestrous and show the estrous cycle during autumn and winter. Constant release of melatonin from the implanted tablet can simulate the stimulus effect of short days and therefore advance the onset of breeding season in such regions' ewes. In an experimental case, use of melatonin in spring in ewes and goats born in autumn, not only brought forward

the onset of breeding for over 80 days, it also resulted in heavier lambs as well as lower mortality rate and more milk-producing lambs and goats {8}. Nett et al (2003)showed that using melatonin in ewes can either advance the onset of mating season in autumn or prolong the mating season in spring; but in case of delayed application, ewes may resist treatments.

Due to significant difference between various breeds' races, breeding records, climate, and management, there is not a general time and calendar for applying melatonin hormone. Genetic background, latitude, climate, temperature, anestrous periodicity, and the applying month are other factors that can affect melatonin response {5}.

This research was done on a flock of Afshari breed in order to determine and evaluate the effects of melatonin outside the breeding season on breeding parameters such as birth rate, fertility rate, twinning, barren ewe, and breeding period.

1-1. Methodology and Instruments

For this research 1590 heads of Afshari ewes were used which had an average age of 4 to 5.5 years and had 2 to 4 previous breeding. After marking, ewes were separated into 6 groups in a way that in each group ewes were relatively similar regarding their weight and in each group there were all types regarding their bred record. Moreover, a healthy ram were considered per each 30 ewes for mating purpose. All ewes were examined by a qualified veterinarian two months before research regarding their health and reproductive system and possible problematic cases were separated from the rest of the flock.

This research was done in Jolgeh Rokh District of Torbat-e Heydarieh County located in Razavi Khorasan Province. This region is consisted of plains and foothills and is located at 35° latitude and 57° longitude and 1925 meters above sea level. It has a moderate summer climate and a cold winter. The lowest and highest temperature are -22 and +35 degrees of centigrade respectively. Full research period, from the first implantation to the last breeding and data recording were nearly 250 days. All sheep were maintained in regular farm conditions and have feed on nearby pastures.

1-2. Experimental Implantations

This phase were consisted from 4 implantations with different levels of 0 and 18 milligrams, inside and outside of breeding season, and in 6 iterations. These implantations were as following: 1. 18 mg of regulin outside of breeding season 2- 0 mg of regulin outside

of breeding season 3- 18 mg of regulin inside breeding season 4- 0 mg of regulin inside breeding season

Outside season implantations were done on 10th of bahman for rams and 19th of bahman for ewes, and rams were entered the flock on 28th of esfand. On 15th of ordibehesht rams were isolated and during mordad which were breeding season all required data were collected. Inside season implantations were done on 30th of tir for rams and 7th of mordad for ewes and rams entered the flock on 15th of shahrivar. On 8th of aban rams were isolated and midway through bahman data collecting were started.

1-3. Implantation Method of Regulin

An applicator or a special regulin implantation gun were used to implant 3 tablets of regulin beneath the base of the ear of rams and 1 tablet of regulin in the same spot for ewes. Since regulin does not need to be removed, implantation phase was completed at this stage.

1-4. Planning and scheduling The Time of Regulin Implantation

Rams were implanted 8 to 9 days before ewes and were entered the flock 49 days after ewes implantation. 51 days later (100th day of the research) rams were isolated and after 195 days, for a 60 days period ewes were controlled and maintained for breeding and data collecting.

1-5. Data Collecting

145 to 150 days after rams entered the flock, in each group parameters such as birth rate, number of barren ewes etc. were collected and recorded. Data collecting phase were continued until the end of breeding season.

Fertility Rate: is the quotient of pregnant ewes divided by the number of ewes which are ready to mate, multiplied by 100 in a given breeding period.

Barren Rate: is the quotient of non-pregnant ewes divided by the number of ewes which are ready to mate, multiplied by 100 in a given breeding period.

Birth Rate: is the quotient of the number of labored ewes divided by the number of ewes which are ready to mate, multiplied by 100 in a given breeding period.

Breeding Rate: is the quotient of the number of produced lambs divided by the number of ewes which are ready to mate, multiplied by 100 in a given breeding period.

Multiple Births Distribution: is the quotient of the single birth ratio divided by twinning or higher birth ratio.

1-6. Statistical Model of The Research

This study was done using a completely random plan. Data analyzing was done using 2x2 factorial method with the help of SAS version 9.2 and GLM procedure. Average implantation was determined using Duncan's test on a 5 percent level. Percentage data were converted using this formula:

$$A = Arc\ Sin\ \sqrt{P\%}$$

2. Findings and Discussion

Main effects of regulin implantation, seasonality, and their mutual effects in Afshari ewes are summarized in Table 1. As is evident from the table, regulin implantation does affect breeding.

Table 1. Using regulin implantation in different seasons on Afshari ewes

	Birth Rate	Barren Rate	Abortion Rate	Lambing Period	Twinning Rate	Fertility Rate
0 mg of Regulin	61.933^{b}	23.286^{a}	2.259	107.750^{a}	4.887^{b}	64.625^{b}
18 mg of Regulin	81.811^{a}	10.153^{b}	2.497	23.750^{b}	20.019^{a}	84.744^{a}
Standard Error	0.03745136	0.03484975	0.21080649	5.485302	0.02804340	0.03502231
Probability Level	0.0026	0.0014	0.5572	0.0001	0.0001	0.0015
Outside Breeding Season	56.605^{b}	6.992^{a}	2.030	61.375	6.802^{b}	59.743^{b}
Inside Breeding Season	89.512^{a}	33.813^{b}	2.863	70.125	14.988^{a}	91.669^{a}
Standard Error	0.03745136	0.03484975	0.21080649	5.4853023	0.02804340	0.03502231
Probability Level	0.0003	0.0001	0.6564	0.2814	0.0073	0.0001
Regulin – Season						
0 – Outside Breeding Season	44.374^{b}	48.901^{a}	2.924	96.25^{a}	1.817^{c}	47.069^{c}
0 – Inside Breeding Season	86.440^{a}	11.089^{c}	1.861	119.25^{a}	10.262^{b}	88.729^{a}
18 – Outside Breeding Season	72.207^{a}	23.380^{b}	2.817	26.50^{b}	18.306^{a}	75.830^{b}
18 – Inside Breeding Season	96.692^{a}	4.409^{c}	2.213	21.00^{b}	21.892^{a}	94.707^{a}
Standard Error	0.05296422	0.04928499	0.29812539	7.757389	0.03965936	0.04952903
Probability Level	0.0234	0.1140	0.7654	0.0911	0.0319	0.1118

During the research it was observed that in two cases (birth rate and twinning rate) there is a mutual effect between regulin and season; therefore, related charts are included in following section.

2-1. Birth Rate

As is evident from following chart, increasing regulin level from 0 to 18 would improve birth rate. This effect is more prominent in sheep lambed outside breeding season comparing to inside-season lambing sheep.

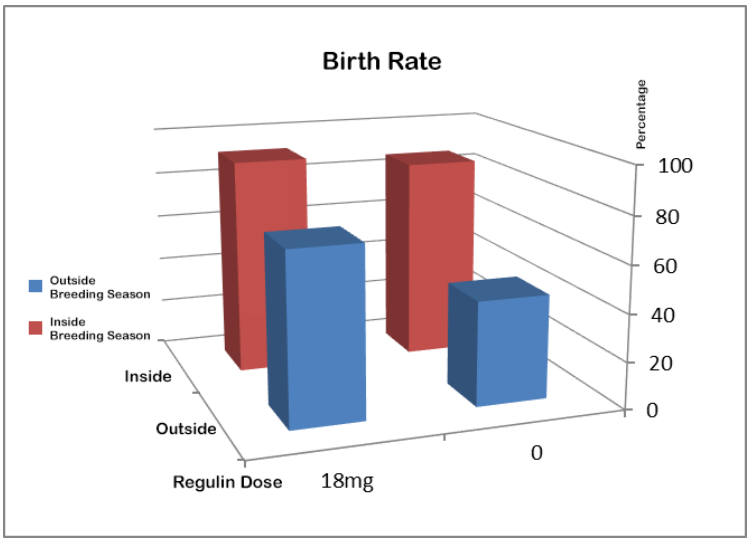

Chart 1. Birth Rate

In a research done by Laliotis et al (1998), it was indicated that the birth rate in the group that received an 18 mg dosage of melatonin implant was significantly higher than the group that didn't receive melatonin implantation which is in line with the results of this research. On the other hand, a study by Gomes et al (1995) did not showed a significant difference in birth rate of research group which received implanted melatonin and control group.

2-2. Twinning Rate

As is evident from the following chart, increasing regulin dosage from 0 to 18 mg have had a significant effect on twinning rate. This effect has been more prominent outside breeding season which is due to aforementioned regulin qualities.

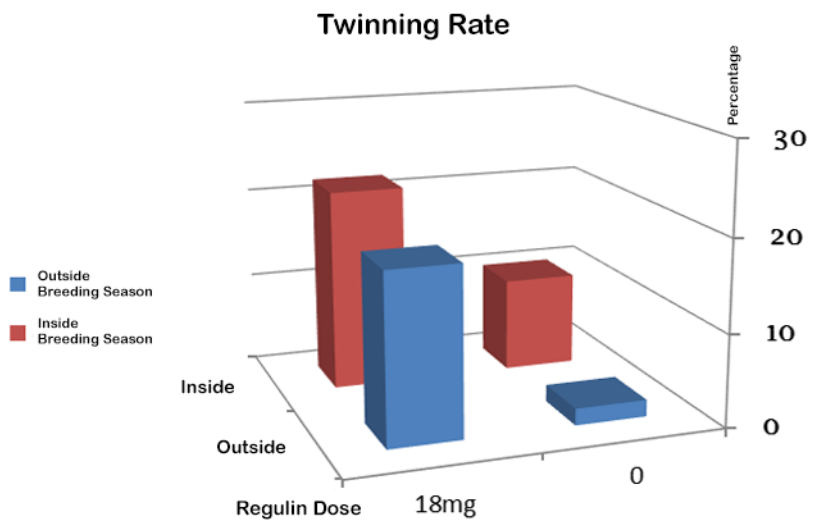

Chart 2. Twinning Rate

In a research done by Padeanu et al at (2011) on Tsurcana breeding in Romania, melatonin implantation significantly increased main breeding parameters such as twinning rate in the research group comparing to control group which did not received such implantations. This effect can be attributed to increased level of FSH and LH due to release of melatonin and subsequent improvement in follicle releasing.

3. Conclusions

This research showed that increasing regulin level from 0 to 18 mg can significantly improve birth rate as well as twinning rate which is in line with other similar studies. Increasing regulin dosage in Afshari sheep reduced lambing period. It also significantly decreased the number of barren ewes which was even more prominent outside breeding season. Moreover, using regulin also increased estrous fertility rate of ewes as well as reducing the atresia of large and moderate follicles and increasing the number of follicles with ovulation ability. Findings of this research were in line with aforementioned attributes of regulin.

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