

**ARTIFICIAL INSEMINATION OF CARPATHIAN GOATS WITH SEMEN  
PRESERVED IN DIFFERENT FORMS**

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**Abstract**

*The artificial insemination (AI) technique is an essential tool in goat breeding programs, since it increases the efficiency of sire genetic evaluation and the extension of genetic improvements; at the same time, it enables control of parturition dates with a view to meeting market demands. The objective of this study was to determine the fecundity rate according to the mode of semen preservation before artificial insemination. The percentage of kidding was influenced by the duration of storage: 3 h = 88%; 14 h = 821%.*

Keywords: Goat, artificial insemination, fresh semen

**1. INTRODUCTION**

At European level, there is a growing demand for goat cheese as well as increasing quality and hygiene claims for products. Thereby, the need for increasing the milk production and improving its composition (fat, protein), in order to increase the efficiency of cheese manufacture, grew [10]. An example is one of the informed consumers from developed countries, especially regarding goat cheese and yogurt. There is an increased number of this kind of consumers, thanks to the growth of the average individual income. Several countries, which include France, were pioneers of a new industry of production, processing, marketing, promotion and research of dairy goats. The result was the creation of devoted customers and an eco-industrial model, which was borrowed by other countries thanks to the benefits it offers to human alimentation. The new concept of healthy eating meant to satisfy the human nutritional demands takes in account goat milk and its products (e.g. the butter made from goat milk which concentrates short and medium length fatty acids, a less known product) which are of high value to the human alimentation [5].

Increasing the milk yield and lactation period of dairy goats can be achieved by improving the technological parameters (nutritional, microclimate and especially light program) and the genetics. Using modern systems of goat production improvement is about upgrading the classical ones in order to improve the genetic potential with hereditary basis evaluation methods and their production capacity in such way that there can be made quick and efficient decisions in the improvement and selection process [11]. The artificial insemination (AI) technique is an essential tool in goat breeding programs, since it increases the efficiency of

sire genetic evaluation and the extension of genetic improvements; at the same time, it enables control of parturition dates with a view to meeting market demands.

The objective of this experiment was to determine the fecundity rate according to the mode of semen preservation before AI.

**2. MATERIAL AND METHOD**

The experiment took place during September- October 2015 in 2 farms from Constanta County. There were 2 experimental groups established, each having 100 goats. The goats from the experimental groups were inseminated with fresh diluted semen at the second farm (Farm II) and refrigerated semen at the first farm (Farm I), after hormonal induction and synchronization of oestrus.

The semen was collected from the 10 reproduction bucks from Saanen and French Alpine breeds. In each farm, the control groups were made from Carpathian goat females which were mounted in natural oestrus by controlled mounting with Carpathian goat bucks. Goat synchronization was made by using fluorogestone acetate impregnated sponges (Chronogest sponges, with FGA 45 mg), which is a synthetic progesterone derivative. In day 9 after the insertion of the sponges, a substance similar to PGF2 $\alpha$  (Proliz), was injected in dosage of 0,75 $\mu$ g cloprostenol /goat. This substance produces the lysis of the persistent corpus luteum, which by secreting the luteotropic hormone stops the maturation of other ovarian follicles and blocks the ovulation. In the same time of the administration of the cloprostenol, pregnant mare serum gonadotropin

PMSG (Folligon) was injected, in dosage of 400 UI. The goats were artificial inseminated, in fixed point, 43 ± 2 hours after the removal of the sponges.

The Carpathian goats from the control group were mounted in natural oestrus by natural controlled mounting with bucks from the same breed, after previously detecting goats in heat with teaser bucks.

The semen was collected using an artificial vagina and after that it was analyzed and processed for insemination. Cooled semen was used for insemination in Farm I. There were 12-14 h from the moment when the semen was collected until the insemination was made. Freshly collected and diluted semen was used at Farm II, 2-3 h after the collection took place.

In order to use the raw diluted semen for insemination, 20 ejaculates from 5 French Alpine and 5 Saanen bucks were processed, whilst for the insemination using refrigerated semen, 24 ejaculates, coming from 6 bucks of each breed, were collected and processed.

The artificial insemination was made in fixed point, 43 ± 2 hours after the removal of the sponges, using a light-integrated vaginoscope. Insemination is carried out transcervically, and semen is deposited either at the entry of the cervix or, more rarely, in the uterus. 50 days after the insemination, ultrasounds were performed using the ultrasonograph WED 2000, with a linear probe of 5 MHz. After the ultrasounds, the gestational, non-gestational and pseudo gestational state was established. The ultrasound was made by placing the external probe with ultrasound gel applied onto the ventro-lateral area, between the hind leg and the udder. By sliding the probe onto the animal skin, we could observe on the ultrasonograph's screen, placental caruncles which indicate the gestational state. In pseudo gestational state, a membrane with liquid appeared on the screen, with no placentomes observed.

### **3. RESULTS AND DISCUSSIONS**

The first generation of half-breed descendants resulted in the spring of 2016, consecutively the insemination of local Carpathian goat with freshly collected and diluted semen or refrigerated semen from Saanen and French Alpine bucks.

The reproductive indices in goats that were artificial inseminated in induced oestrus are shown in Tables 1 and 2. The goats inseminated in Farm 1 with refrigerated semen registered a rate of non-returning to oestrus after 2 estrous cycles of 87%, fecundity rate of 82% and prolificacy 163,4%. The inseminated goats from Farm II, with freshly collected and diluted semen, registered a rate of non-returning to oestrus after 2 estrous cycles of 92%, a fecundity rate of 88% and prolificacy 168,2%.

The progestagens and prostaglandins hormonal based treatment allows the oestrus synchronization and ovulation, both in normal reproduction season and off season [3]. These treatments are essential in any artificial insemination programs at natural cyclic goats and for off season oestrus induction, with the purpose of joining them with the fixed point insemination [4]. Studies showed that the use of one dose of 45 mg of FGA can lead to a higher rate of kidding than the use of other doses [1],[12].

Our results showed that by using the refrigerated semen, the fecundity is lower than the fecundity registered with fresh and diluted semen (82%, 88%), because the transportation of refrigerated semen over long distances was reported as a limiting factor for artificial insemination programs (Table 2). [6]

Our results of the two farms, based on the cervical opening degree showed that the females of the two experimental groups showed a synchronized oestrus, the rate of females with third degree cervical opening being of 51%, second degree 38% and first degree 10%. The rate of females which didn't manifest oestrus was 1%.

Several studies showed that there is a direct connection between the semen deposition and fecundity, uterine insemination being associated with a higher fecundity rate. The results obtained showed that the uterine deposition (third degree cervical opening) of the semen is associated with a higher kidding rate, as demonstrated in other studies [8], [9].

**Table 1. The preliminary breeding indices of the two experimental groups of Carpathian goat females that were artificial inseminated**

Group	No. of inseminated goats	No. of non-return to oestrus goats	No. of goats diagnosed as pregnant at ultrasounds	No. of kidde d goats	No. of kids
Farm I	100	87	85	82	134
Farm II	100	92	90	88	148
TOTAL	200	179	175	170	282

**Table 2. The breeding indices of Carpathian goat females that were artificial inseminated**

Group	Gestation rate %	Fecundity %	Prolificacy %
Farm I experimental group	85	82	163,4
Farm I witness group		91	150,5
Farm II experimental group	90	88	168,2
Farm II witness group		92	155,4

Data concerning the morpho-productive parameters of F1 descendants, obtained after cross breeding, containing the weight of the kids at 30 days and at 60 days are shown in the tables 3-5 for descendants obtained at Farm I. In the control group (Carpathian goats naturally mounted with Carpathian bucks) the kids had at parturition an average body weight of 2.411 kg for females, respectively 2.563 kg for males and the crossbred descendants had an average body weight of 2.565 kg for females, respectively 2.686 kg for males. After 30 days the average body weight of the kids from the witness group was of 6,613 kg for females, respectively 7,123 kg for males and the crossbred descendants had an average body weight of 7.220 kg for females, respectively 8.108 kg for males. The values registered at 60 days old were: 9.643 kg for females, respectively 10.127 kg for males (in the control group) and the crossbred descendants had average body weights of 10.452 kg for females, respectively 11.388 kg for males.

**Table 3. The average body weight at parturition for kids from experimental groups (F1 Cross breed descendants) and witness group (Carpathian x Carpathian) at farm I**

Body weight	Carpathian goat X Carpathian goat			Cross breed descendants F1		
	n	X ± Sx	CV	n	X ± Sx	CV
Females	63	2.411 ± 0.0543	9.85	71	2.565 ± 0.0410	7.85
Males	74	2.563 ± 0.0580	9.32	63	2.686 ± 0.0610	8.56

**Table 4. The average body weight at 30 days old for kids from experimental groups (F1 Cross breed descendants) and witness group (Carpathian x Carpathian) at farm I**

Body weight	Carpathian goat X Carpathian goat			Cross breed descendants F1		
	n	X ± Sx	CV	n	X ± Sx	CV
Females	63	6.613 ± 0.3216	7.53	71	7.220 ± 0.1872	11.58
Males	74	7.123 ± 0.1432	8.38	63	8.108 ± 0.1901	10.54

**Table 5. The average body weight at 60 days old for kids from experimental groups (F1 Cross breed descendants) and witness group (Carpathian x Carpathian) at farm I**

Body weight	Carpathian goat X Carpathian goat			Cross breed descendants F1		
	n	X ± Sx	CV	n	X ± Sx	CV
Females	63	9.643 ± 0.4234	14.81	71	10.452 ± 0.412	21.33
Males	74	10.127 ± 0.3423	15.25	63	11.388 ± 0.612	22.32

For descendants obtained at Farm II (Tables 6-9), in the control group, the average body weight of the kids at parturition was of 2.531 kg for females, respectively 2.723 kg for males and the cross breed descendants had average body weights slightly increased, of 2.678 kg for females, respectively 2.765 kg for males. At 30 days old, the average body weight of the kids was of 6.733 kg for females, respectively 7.263 kg for males and the cross breed descendants had average body weights of 7.362 kg for females, respectively 8.405 kg for males. The values registered at 60 days old were: 9.682 kg for females, respectively 10.635 kg for males (in the control group) and the cross breed descendants had average body weights of 10.577 kg for females, respectively 11.763 kg for males.

**Table 6. The average body weight at parturition for kids from experimental groups (F1 Cross breed descendants) and witness group (Carpathian x Carpathian) at Farm II**

Body weight	Carpathian goat X Carpathian goat			Cross breed descendants F1		
	n	X± Sx	CV	n	X± Sx	CV
Females	70	2.531 ± 0.0623	10.17	80	2.678± 0.0362	11.56
Males	73	2.723 ± 0.0458	9.78	68	2.765± 0.0502	10.54

**Table 7. The average body weight at 30 days old for kids from experimental groups (F1 Cross breed descendants) and witness group (Carpathian x Carpathian) at Farm II**

Body weight	Carpathian goat X Carpathian goat			Cross breed descendants F1		
	n	X± Sx	CV	n	X± Sx	CV
Females	70	6.733 ± 0.2116	10.33	80	7.362± 0.1922	11.08
Males	73	7.263 ± 0.2232	9.28	68	8.405± 0.1362	12.85

**Table 8. The average body weight at 60 days old for kids from experimental groups (F1 Cross breed descendants) and witness group (Carpathian x Carpathian) at Farm II**

Body weight	Carpathian goat X Carpathian goat			Cross breed descendants F1		
	n	X± Sx	CV	n	X± Sx	CV
Females	70	9.682± 0.4587	17.31	80	10.577± 0.3957	21.61
Males	73	10.635 ± 0.3324	16.25	68	11.763± 0.6011	18.41

#### 4. CONCLUSIONS

The fertility rate decreased when the duration of storage before AI increased from 3 to 14 hours. The goats inseminated at Farm I with cooled semen achieved a rate of non-returning to oestrus after two estrous cycles of 87 %, a fecundity of 82 % and a prolificacy of 163.4%. The goats inseminated at Farm II with fresh diluted semen achieved a rate of non-returning to oestrus after two estrous cycles of 92%, a fecundity of 88% and a prolificacy of 168.2%.

#### 5. ACKNOWLEDGEMENTS

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