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## Influence of some factors on body weight of Mis lambs at early stage of growth

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### SUMMARY

The lambs' body weight is not only for genetic purposes but also need for economic prognostics and evaluations. The study aim is to find important factors that affect the growth performances of lambs Mis at birth to 90 days.

The records of body weights from at birth (BWB), at 30 days (BW30), 60 days (BW60), and 90 days (BW90); birth type (bt) of 200 Mis lambs (male, female) born during summer (S) and winter (W) season had use in the investigation to find the effects of some factors on lamb's neonatal development.

Also, have considered in the study were the ages of dam's (da) at lambing classifying as 4-5 years and 6-7 years.

The lambs' body weight from birth to 90 days of age showed higher on male

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( 60), 90 ( 90).;  
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4-5 5-6  
90

4-5 ,  
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 (P<0.01)  
 60 90 ,  
 30 (P<0.5).  
 30 90 (P<0.05;  
 P<0.01).  
 :

lambs, the lambs born by dams' ages 4-5 years, lambs born single and the lambs born during summer.

The analysis of variance showed much effects (P<0.01) of lambs sex and the type of birth on body weights at birth to 90 days of age. Although the dam age not affected lambs' bodyweight at birth, at 60 days and 90 days, it has shown a significant effect on lambs body weight at 30 days (P<0.5).

The season of lambing have no effect on lambs' body weights at birth. However, it showed a significant effect at body weights of lambs at 30 days to 90 days (P<0.05; P<0.01).

**Key words:** lambs, bodyweight, sex, dam age, birth type, lambing season

(Bathaei and Leroy, 1998).

## INTRODUCTION

The trait of interest in domestic animals is growth and it has been described as the change in live weight per unit of time or as plotting body weight against age (Bathaei and Leroy, 1998). Traits such as birth weight and growth rate have great implications on flock productivity, management systems and breeding policies to be followed.

(Yiheiyis et al., 2012; Zidane et al., 2015).

While, an important character which determines the overall productivity of the flock and the economic return from sheep production enterprises with the main objective for meat production is the body weight and growth performance (Yiheiyis et al., 2012; Zidane et al., 2015).

(Suleiman et al., 1985).

Animals with high birth weight allows to starting well his career, grow rapidly before and after weaning predisposes, better resistance on diseases and quickly reach puberty and maturity (Suleiman et al., 1985).

Recording of weight is essential in meat

breeding, because these traits constitute important selection criteria in the improvement programs.

These data are not only useful in genetic purposes but also important to develop economic prognostics and evaluations, to make prevision on feeding, reproduction and other farming activities (Lupi et al., 2015). Mis breed of sheep is a new meaty breed introduced in Serbia (Petrovic, 2006).

The aim of our study is to determine some important factors affecting growth performances of lambs Mis breed at birth to 90 days of age.

**MATERIAL AND METHODS**

The research was performed at the Institute of Animal Husbandry Belgrade, Serbia in the population of Mis breed of sheep. The investigation was carried out for the determination of some factors effects on lambs' neonatal development, the records of body weights, birth type (bt) of 200 Mis lambs born during summer (S) and winter (W) season male and female are utilized in the study. These include the body weights at birth (BWB), at 30 days (BW30), 60 days (BW60), and 90 days of lambs' age (BW90). Also, have considered in the study are the dam' age (da) at lambing classified as 4-5 and 6-7 years. The animals are having managed thru the intensive rearing practices. Feeding management of dam was seasonally and intensive, that during winter supplied with alfalfa hay, silage and concentrate with 12% protein. In summer season the dams allowed in pasture and supplemented with concentrate with 12% protein 3 weeks before mating and after lambing. The lambs are also having supplemented with alfalfa hay and the concentrate mixtures for lambs with 18% protein. Their feeding has been ad libitum up to the age 90 days and nursed by their mother's from birth to 90 days of age. The

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General Linear Model  
SPSS, 20.

statistical analysis was performed using the General Linear Model of SPSS software package version 20.

## RESULTS AND DISCUSSION

As the results displayed in Table 1, the male lambs showed dominant on body weights at birth to 90 days of age than female lambs.

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1. , kg  
**Table 1. Mean values and standard error of means of lambs bodyweight according to sex, kg**

/Sex		/bwb	30/bw30	60/bw60	90/bw90
Female	/Mean	4.30	12.58	21.88	31.96
	N	100	100	100	100
	Std. error of mean	.06	.14	.40	.29
Male	/Mean	4.70	13.77	23.41	34.27
	N	100	100	100	100
	Std. error of mean	.05	.11	.30	.23

0.40 kg ; 1.19 kg 30;  
1.53kg 60 2.31 kg 90  
/ 8.28kg/9.07kg  
(1-30 ); 9.30kg/9.64kg (31-60 )  
10.08 kg/10.86kg (60-90 )  
27.66kg/29.57kg 1-90  
90  
.307kg  
.328kg.

(Shahroudi et al., 2002; Rashidi et al., 2008; Baneh and Hafezian, 2009),

The differences of body weights were 0.40kg at birth; 1.19kg at bw30; 1.53kg at 60 days and 2.31kg at 90 days of age. The total gain weights for female; male lambs were 8.28kg; 9.07kg (1-30 days); 9.30kg; 9.64kg (31-60 days) and 10.08 kg; 10.86kg (60-90 days) with a total gain of 27.66kg; 29.57kg from 1-90 days. The average daily gain at 90 days was .307kg for female lambs while .328kg for male lambs.

According to some authors (Shahroudi et al., 2002; Rashidi et al., 2008; Baneh and Hafezian, 2009), the type and measure of hormone secretion particularly sex hormones, lead to difference in animal growth. Also, emphasizing that the estrogen hormone having limited effect on the growth of long bones in females that possibly one reasons for which females having smaller and lighter weight than males.

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**Table 2. Effect of sex on lambs body weight at birth to 90 days of age**

		F	Sig.
* bwb * sex	Between groups ( Combined) /Within Groups	34.404	.000
30 * bw30 * sex	Between groups ( Combined) / Within Group	47.131	.000
60 * bw60 * sex	Between groups ( Combined) / Within Groups	38.500	.000
90 * bw90 * sex	Between groups ( Combined) / Within Groups	38.616	.000

2, (P<0.01) 90

The analysis of variance as seen in Table 2, showed that the sex of lambs much affected (P<0.01) the body weights at birth to 90 days of the early stages of growth.

3.

, kg

**Table 3. Mean values and standard error of means of lamb's body weight according to dam age at lambing, kg**

	/da	/bwb	30/bw30	60/bw60	90/bw90
4 -5	N	4.58	13.60	23.04	33.45
	Std. error of mean	.06	.14	.39	.28
6-7	N	4.41	13.15	22.26	32.76
	Std. error of mean	.06	.13	.37	.28

4-5 90- 5-6

The lambs born by dams' ages 4-5 years were slightly higher on body weights from birth to 90 days of age than lambs born by dams' age more than 5-6 years (Table 3). The differences of weights as follows: 0.17kg (bwb), 0.45kg (bw30), 0.78kg (bw60) and 0.69kg (bw90). The lambs of dams 4-5 years old have attained a total gain weight of 28.87kg while 28.35kg attained by lambs of dams age 6-7 years, with a difference of 0.52kg in favor of lambs born by 4-5 years old.

0.45kg ( 30), 0.78kg ( 60) 0.69kg ( 90).

28.87 kg, 6-7 28.35 kg, 4-5

0.52 kg

4.

90-

**Table 4. Effect of dam age on lambs body weight at birth to 90 days of age**

		F	Sig.
* bwb * da	Between groups	3.422	.066
	( Combined) /Within groups		
30 * bw30 * d	Between groups	5.603	.019
	( Combined) /Within groups		
60 * bw60 * da	Between groups	2.012	.158
	( Combined) /Within groups		
90 * bw90 * da	Between groups	2.926	.089
	( Combined) /Within groups		

As displayed on Table 4, the analysis of data indicated that age of dam have no effect on lambs' bodyweight at birth, at 60 days and 90 days but showed significant influence only on lambs body weight at 30 days (P<0,5).  
Csizmar et al. (2013),

As displayed on Table 4, the analysis of data indicated that age of dam have no effect on lambs' bodyweight at birth, at 60 days and 90 days but showed significant influence only on lambs body weight at 30 days (P<0.5).

We do agree with Csizmar et al. (2013) as stating that mothers should have good mothering ability, easy lambing and able to produce milk of sufficient quantity and quality, to achieved good lamb growth. These notes defend the result we attained in this study.

5.

90

,kg

**Table 5. Mean values and standard error of means of lambs body weights at birth to 90 days according to birth type, kg**

	/Birth type	/bwb	/bw30	/bw60	90/bw90
Single	/Mean	4.79	14.00	24.00	34.43
	N	100	100	100	100
	Std. error of mean	.06	.13	.35	.27
Twin	/Mean	4.19	11.75	21.29	31.79
	N	100	100	100	100
	Std. error of mean	.05	.11	.35	.24

The lambs born single have higher bodyweights at birth to 90 days in comparison with lambs born twins (Table 5). The differences of body weights of

The lambs born single have higher bodyweights at birth to 90 days in comparison with lambs born twins (Table 5). The differences of body weights of

30 : 0.60kg  
 , 2.71kg 60 , 2.25kg  
 , 2.64kg 90  
 1 90 e :  
 29.64 kg  
 0.329 kg,  
 - 27.6 kg  
 .306 kg.

single born lambs and twin born were; 0.60kg at birth, 2.25kg at 30 days, 2.71kg at 60 days, 2.64kg at 90 days. The total weight gain of lambs' from 1-90 days, the single lambs had 29.64kg with an average daily gain of .329 kg while for twins obtained 27.6kg with an average daily gain of .306kg.

6. 90-

Table 6. Effect of birth type on lambs body weight at birth to 90 days of age

		F	Sig.
* Between Groups (Combined)		57.461	.000
bwb * bt / Within Groups			
30 * Between Groups (Combined)		52.621	.000
bw * bt / Within Groups			
60 * Between Groups (Combined)		43.487	.000
bw * bt / Within Groups			
90 * Between Groups (Combined)		53.846	.000
bw * bt / Within Groups			

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 90 (P <0,01).  
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 (Benyi et al., 2006).  
 (Benyi et al., 2006).

As seen in Table 6, the birth type significantly influence the lambs body weights at birth to 90 days (P<0.01).  
 - The superiority of single-born lambs in weight and part of its difference was the fact that  
 -  
 Singles are the sole user of their dam milk (Benyi et al., 2006).

7.

90

( ), kg

Table 7. Mean values and standard error of means of lambs body weights at birth to 90 days according to lambing season, kg

	/LS	/bwb	30/bw30	60/bw60	90/bw90
/Mean		4.57	13.58	23.36	33.72
N		100	100	100	100
/S		.06	.13	.35	.27
Std. error of mean					
/Mean		4.42	13.00	21.93	32.00
N		100	100	100	100
/S		.06	.14	.41	.30
Std. error of mean					

kg 0,15 kg 1,43 kg 0,58 kg 1,72 kg 90 (7).  
P<0.01) (8).  
P<0.05;

The lambs born during summer season have higher body weights over the early stages of growth from birth to 90 days with differences with lambs born in winter season of 0.15kg at birth, 0.58kg at bw30 days, 1.43kg at bw60days, and 1.72kg at bw90 days (Table 7).

The season of lambing have no effect on lambs' body weights at birth. However, it showed a significant effect at body weights of lambs at 30 days to 90 days (P<0.05; P<0.01) (Table 8).

8. ( )

**Table 8. Effect of lambing season on lambs body weight at birth to 90 days of age**

		F	Sig.
* bwb * LS	Between groups (Combined) /Within groups	2.637	.106
30* bw30* LS	Between groups (Combined) /Within groups	4.592	.033
60* bw60 * LS	Between groups (Combined) /Within groups	7.005	.009
90* bw90 * LS	Between groups (Combined) /Within groups	4.388	.037

Zidane et al. (2015),

Bharathidhasan et al. (2009)

. Yilmaz et al. (2007)

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The results of our study was compatible with other authors; Zidane et al. (2015), who informed that the influence of sex on growth performances of lambs showed superiority of males over females, as well as on the type of birth which showed superiority of singles over twins. Bharathidhasan et al. (2009) commented that male lambs had a faster growth than female also; sex and type of birth are the main factor on lambs' growth. Yilmaz et al. (2007) also attained that male lambs were heavier than female lambs at birth, 90 days, while the lambs born as single were heavier than lambs born as twins at birth, 90 respectively. Similar result also attained by Ghafouri-Kesbi and Notter, (2016) that



Ghafouri-Kesbi Notter (2016),

Yiheyis et al. (2012)

; Baneh et al. (2013)

Vatankhah Talebi (2008)

Rashidi et al. (2008)

al. (2011); Taye et al. (2010)

. Szwaczkowski et al. (2006)

al., 2004; Saghi et al., 2007).

Suši et al. (2005);  
Petrovic et al. (2015)

male lambs are heavier than female lambs.

Yiheyis et al. (2012) noted that the pre-weaning growth performance of lambs depends up on the inherent genetic potentiality and the mothering ability of ewes, we do agree in these statements.

Likewise other authors supported and agreeable in the results we obtained of such; Baneh et al. (2013) found that all traits of growth performance are influenced lamb sex, type of birth and dam age. Vatankhah and Talebi (2008) reported the significant effects of lamb's sex, birth type and age of dam on BW.

Rashidi et al. (2008) found that both birth weight and weaning weight were significantly affected by lamb's sex, birth type, and age of dam at lambing.

In support with our result, the findings of other authors like Abegaz et al. (2011); Taye et al. (2010) reported that single born lambs were significantly heavier than those born twins at one month of age. They also quoted that better pre-weaning growth of single born lambs is a common trend in many other breeds which is true in our results. Szwaczkowski et al. (2006) informed that single-born lambs had higher growth rate than twin-born lambs. The birth weight advantage of single-born lambs over the multiple-born lambs may be due to competition for nutrient and uterine space. The lambs born single grew faster than their multiple contemporaries between birth to 30 days of age and to weaning (Babar et al., 2004; Saghi et al., 2007).

According to Suši et al. (2005); Petrovic et al. (2015) the birth weight of lambs born in summer was higher by the fact that their mothers had a qualitatively and quantitatively better forage availability during the final two to three months of gestation period than those

al., 2015).

(Petrovic et

which have lambed in winter season. The difference of body weights on the lambing season can be interpreted as the factor of food, in other words, the effect of pasture grass and natural environment (Petrovic et al., 2015). All the above mentioned are absolutely reasons and served as support in our findings.

## CONCLUSIONS

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4-5  
30;  
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6-7  
0.40 kg ; 1.19 kg  
1.53 kg 60 2.31 kg 90-  
4-5  
90-  
0.17kg ( ), 0.45kg ( 30),  
0.78kg ( 60) 0.69kg ( 90).  
0.60kg  
2.25kg 30 , 2.71kg  
60 , 2.64kg 90  
0.15kg , 0.58 kg 30  
, 1.43 kg 60 , 1.72 kg 90

The superiority of lambs body weights from birth to 90 days have found from male lambs, the lambs born by dams ages 4-5 years, the single born lambs and the lambs born during summer season. The differences of body weights between male and female lambs were: 0.40kg at birth; 1.19kg at bw30; 1.53kg at 60 days and 2.31kg at 90 days of age. The lambs born by dams' ages 4-5 years were slightly higher on body weights from birth to 90 days of age than lambs born by dams' age more than 6-7 years. The differences of weights as follows; 0.17kg (bw), 0.45kg (bw30), 0.78kg (bw60) and 0.69kg (bw90).

The differences of body weights of single born lambs and twin born were; 0.60kg at birth, 2.25kg at 30 days, 2.71kg at 60 days, 2.64kg at 90 days. The differences of bodyweights between lambs born in summer with lambs born in winter were from 0.15kg at birth, 0.58kg at bw30 days, 1.43kg at bw60days, and 1.72kg at bw90 days. The result we obtained in this study can therefore ceased that sex of lambs, birth type; partly from dam age at lambing and lambing season have contribution on the lambs' body weight at birth and early stage of growth.

## ACKNOWLEDGEMENTS

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## Relevant factors affecting the fertility of rams

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### SUMMARY

The aim of this paper is to present a review of the most important points that are relevant to the successful use of rams in sheep reproduction. Rams play a big role and fertility in rams can be caused by many factors which can causes of infertility or reduced fertility.

Body temperatures produced in rams by high summer temperatures is a cause of poor quality semen. High temperatures can also affect mating with reduced sexual activity.

Sperm abnormalities are the morphological deviations from the normal sperm structure of that kind include abnormalities in head, mid-piece, tail, proximal cytoplasmic, droplets detached acrosomes, which increase in heat stressed ram semen.

Semen quality can also be affected by: poor nutrition; diseases including

reproductive tract, ovine brucellosis and other. Small testes in well grown young rams should be viewed with suspicion

scrotal circumference can be measured with a tape. Although a variety of organisms and trauma can cause inflammation of the epididymis, the cause of contagious ram epididymitis in mature rams of multi-sire breeding systems is the bacterium *Brucella ovis*.

Selection of ram on the basis of their ability to produce offspring and suited to the environment.

**Key words:** sheep, reproduction, ram, fertility, health

Success in sheep production regard to fertility greatly depends on genetic variability of reproductive components (Petrovi et al., 2001; 2002; 2007). Heritability for onset of puberty is low and within the interval of 0,1 to 0,26 (Petrovi , 2000; Petrovi et al., 2012). In system of sheep reproduction rams play a big role and fertility in rams can be caused by many factors.

In other words, can be causes of infertility or reduced fertility, e.g. poor semen quality, poor libido, physical defects, disease, poor nutrition, injury, heat stress, body condition, and age (Simitzis et al., 2006). In addition the, malnutrition and internal parasites, can cause sterility or depress the ram's desire to mate.

Some diseases, such as those affecting the feet or any of the external breeding organs, can make it impossible for a ram to breed ewes. Ram's fertility may be retained throughout the whole year, but in many instances, fertility is depressed when mating occurs during the hot months of the year (Hafez, 1987).

reproductive tract, ovine brucellosis and other. Small testes in well grown young rams should be viewed with suspicion

scrotal circumference can be measured with a tape. Although a variety of organisms and trauma can cause inflammation of the epididymis, the cause of contagious ram epididymitis in mature rams of multi-sire breeding systems is the bacterium *Brucella ovis*.

Selection of ram on the basis of their ability to produce offspring and suited to the environment.

**Key words:** sheep, reproduction, ram, fertility, health

## INTRODUCTION

Success in sheep production regard to fertility greatly depends on genetic variability of reproductive components (Petrovi et al., 2001; 2002; 2007). Heritability for onset of puberty is low and within the interval of 0,1 to 0,26 (Petrovi , 2000; Petrovi et al., 2012). In system of sheep reproduction rams play a big role and fertility in rams can be caused by many factors.

In other words, can be causes of infertility or reduced fertility, e.g. poor semen quality, poor libido, physical defects, disease, poor nutrition, injury, heat stress, body condition, and age (Simitzis et al., 2006). In addition the, malnutrition and internal parasites, can cause sterility or depress the ram's desire to mate.

Some diseases, such as those affecting the feet or any of the external breeding organs, can make it impossible for a ram to breed ewes. Ram's fertility may be retained throughout the whole year, but in many instances, fertility is depressed when mating occurs during the hot months of the year (Hafez, 1987).

Shelton (2000)	(Casu et al., 1991).	The greatest effect is expressed during the 1st stage of spermatogenesis (Casu et al., 1991). Shelton (2000) stated that under extreme conditions, the interference with sperm production can be acute, resulting in destruction of the sperm in the epididymitis and destruction of the germinal epithelium.
al. (1985)	Ortavant et	Ortavant et al. (1985) reported that the increase of ambient temperatures up to 30°C that often occurs during summer in hot climate areas is known to adversely affect libido and semen quality).
30 °C,		Pinto et al. (2001) reported that heat stress caused temporary interruption of sperm production and sperm motility.
(2001)	Pinto et al.	
14	16	A high percentage of rams could be sterile during the summer time, especially under conditions of high humidity. Exposure of the ram scrotum to approximately 40°C for 1.30 to 2.00 h caused a sharp increase in the proportion of morphologically abnormal spermatozoa 14 to 16 days later. Damage to spermatozoa (e.g. tail abnormalities and dead spermatozoa) and abnormalities (pyriform cells, midpiece abnormality and acrosomal abnormality) increased and fertility decreased (Curtis, 1983).
1.30	2.00	
40°		
(Curtis, 1983).		Conception failure in ewes mated to heat-stressed ram was related to a failure to fertilize than to embryonic mortality (Curtis, 1983). Shelton (2000) claimed that 6 weeks are required for the ram recovery after environmental conditions return to normal.
(Curtis, 1983). Shelton (2000)	6	
Hafez (1987)		Hafez (1987) stated that fertility of the rams is related to several phenomena: the ability to mate, sexual desire, sperm production and viability and fertilizing capacity of ejaculated sperm, which are influenced by elevated ambient temperatures, as well as nutritional level (Johnson, 1987; Petrovic et al., 2012).
(Hafez, 1987; Petrovic et		

al., 2012).

Such changes are mostly due to the quality of the available nutrients than due to the climate, in the different seasons, since there are a lot of farms in the tropics with good reproductive level. In tropical and sub-tropical areas, the variation in daylight length is less, and indigenous ewes tend to breed throughout the year.

(Petrovic et al., 2012).

The sexual activity may be restricted to a certain extent during summer months due to adverse effects of the high environmental temperature and lack of feed (Petrovic et al., 2012).

The aim of this paper is to present a review of the most important points that are relevant to the successful use of rams in sheep reproduction.

#### **Heat stress**

High body temperatures produced in rams by high summer temperatures is a cause of poor quality semen. High temperatures can also affect mating with reduced sexual activity. Conception rate is also reduced. This affects the number of offspring born (Petrovic et al., 2012).

(Petrovic et al., 2012).

Exposure of sheep to heat stress evokes a series of drastic changes in the biological functions which include decrease in feed intake efficiency and utilization, live body weight and impaired reproduction. Some authors informed that the local sheep show restricted sexual activity in the summer months (Marai et al., 2004).

(Marai et al., 2004).

Interesting is how exposure to high ambient temperature causes impairment of reproductive functions in sheep. According to Marai et al. (2000; 2004; 2006; 2007) the effect of heat is aggravated when heat stress is accompanied with high ambient humidity.

(2000, 2004, 2006, 2007)

Marai et al.

Heat stress also evokes a series of drastic changes in animal biological functions,



(Shelton, 2000; Marai et al., 2006)  
(Shelton, 2000; Marai et al., 2006).

. El-Darawany (1999)

Marai et al. (2004; 2007),

. Shelton (2000); Marai et al. (2006)

(El-Darawany, 1999; Oyeyemi et al., 2009),

( 1).

which include a decrease in feed intake efficiency and use, disturbances in the metabolism of water, protein, energy and mineral balances and enzymatic reactions, and blood metabolites (Shelton, 2000; Marai et al., 2006).

If the temperature in the testes cannot be kept low, the production of viable sperm may be affected.

Fully developed sperm are less affected by heat stress than sperm in the developing stages. El-Darawany (1999) reported that the sperm cell concentration was significantly lower under heat stress than in thermoneutral conditions.

Marai et al. (2004; 2007) reported that in tropical and sub-tropical areas the local sheep show restricted sexual activity in the summer months and reviewed how exposure to high ambient temperature causes impairment of reproductive functions in sheep.

The heat effect is aggravated when heat stress is accompanied with high ambient humidity. Shelton (2000); Marai et al. (2006) informed that heat stress evokes a series of drastic changes in animal biological functions, which include a decrease in feed intake efficiency and use, disturbances in the metabolism of water, protein, energy and mineral balances, enzymatic reactions, hormonal secretions and blood metabolites.

### **Abnormalities in sperm**

Sperm abnormalities are the morphological deviations from the normal sperm structure of that kind include abnormalities in head, mid-piece, tail, proximal cytoplasmic droplets detached acrosomes (El-Darawany, 1999; Oyeyemi et al., 2009), which increase in heat stressed ram semen (Table 1).

(64.42%,  
(15.53%,  
Merino  
(Naves et  
al., 1980).  
17.0, 16.5, 18.4  
17.9  
(Gamcik et al., 1979) 25.17, 18.42 14.47  
Ossimi x Suffolk (Abdel-Hafez,  
2002),  
(Abi-Saab and Hamada, 1984).  
(Aboul-Ela Chemineau, 1988),  
al., 1985).  
30%

The incidence of abnormal sperm was found to be higher in summer (64.42 %; June and July) compared to winter (15.53 %; December and January) in Mutton Merino rams in a temperate environment (Naves et al., 1980). The sperm abnormality percentages were 17.0, 16.5, 18.4 and 17.9 during summer, autumn, winter and spring, respectively, in Slovakian rams (Gamcik et al., 1979) and 25.17, 18.42, and 14.47 during summer, winter and autumn, respectively, in Ossimi x Suffolk rams (Abdel-Hafez, 2002), indicating that the lowest incidence of abnormal sperms was in autumn. The highest semen quality was detected during the two periods of changing daylight, i.e. during the autumn and spring equinoxes (Abi-Saab and Hamadah, 1984). However, the seasonal differences in semen quality seemed to be attributed to both meteorological and nutritional factors (Aboul-Ela and Chemineau, 1988), as well as the sperm output and semen characteristics are adversely affected following exposure to long daylights (Ortavant et al., 1985). Those rams with questionable semen quality will have more than 30 percent abnormal sperm.

## 1.

**Table 1. Effect of season on rams semen characteristics**

Genotype	Seasons	Volume (cc)	Motility (%)	Sperm-cell concentration (x109/ml)	Live sperm (%)	Abnormal sperm (%)	References
Rahmani x Finn.Landrace	/Summer	1.17	33.00	2.35±3.50	77.4	77.4	Daader et al. (1985)
	/Autumn	1.28	85.0	2.59±3.59	83.36	12.7	
	/Winter	1.27	85.2	3.30±4.41	77.97	16.2	
	/Spring	1.13	88.2	3.39±0.33	83.57	11.93	
Ossimi	/Spring	1.20	55.30	0.03±0.01	73.4.0	19.30	EIDarawany (1999)
	/Summer	1.30	75.30	1.62±0.01	96.20	11.90	
	/Autumn	1.06	73.00	3.94 (106 ul)	70.84	9.23	
	/Winter	0.92	67.00	3.23 (106 ul)	55.85	21.52	
Rahmani	/Spring	1.13	62.00	3.37 (106 ul)	64.67	9.78	Abdel Hafez (2002)
	/Summer	1.10	60.00	3.61 (106 ul)	51.85	23.92	
	/Autumn	1.29	67.00	3.38 (106 ul)	59.92	13.18	
	/Winter	1.17	54.00	2.96 (106 ul)	54.74	17.39	
Ossimi x Suffolk	/Summer	0.95	67.92	0.83±0.11	84.83	19.54	Abdel Hafez (2002)
	/Winter	0.93	72.29	1.26±0.11	81.58	14.04	
	/Autumn	0.93	73.50	1.24±1.13	87.27	12.73	

);

*Actinobacillus seminis*;

2

3

30%

70%

( )

### Quality of semen

Semen quality can be affected by: heat stress; poor nutrition; over feeding (often evident in show rams); diseases including foot abscess and foot rot; diseases of the reproductive tract, including ovine brucellosis and *Actinobacillus seminis* infections; and any other condition causing overheating.

In Table 2 are shown semen standards for rams and in Table 3 shown effect of feeding on volume ejaculate.

Samples for semen can be collected using electro-ejaculation or via an artificial vagina. Semen should be evaluated for sperm motility, morphology, and white blood cells. The minimum acceptable standards are fair gross motility or 30 percent individual motility and 70 percent normal morphology. White blood cells in the semen are an indication of infection (e.g. epididymitis).

2. Cornell University, 2002)

**Table 2. Rams semen standards (Sheep Production Handbook. Cornell**

	/ Percent motility	30-70
%	/ % Normal mophology	30-50
	/ White blood cells	> 5
<i>Brucella ovis</i>		/ Negative

3. Abdalla, 2010)

(Suhair and

**Table 3. Effect of feeding on volume ejaculate (Suhair and Abdalla, 2010)**

Level of feeding	/ Season		Significance level
	/ Winter	/ Summer	
/ High	1.96±0.09	1.66±0.09	**
/ Medium	1.98±0.10	1.58±0.09	**
/ Low	1,58±0.08	1.33±0.07	*
	/ Sig. level	**	**

In all level of feeding, the significantly higher ejaculate volume observed during winter than summer values, and could be related to the effects of endocrine activation on exposure of rams to cold and stimulatory effects of

(Suhair and Abdalla, 2010) ,

testosterone on accessory genital glands ( Suhair and Abdalla, 2010).

**Scrotal measurement**

In the reproduction already known that there is a close relationship between testicular size and sperm production (Petrovic et al., 2007). Rams with small testes may not produce enough sperm throughout the joining period to maintain good fertilization rates.

(Petrovic et al., 2007).

**Scrotal circumference:**

Small scrotal circumference can have a number of causes, including immaturity, poor nutrition and developmental defects. Small testes in well grown young rams should be viewed with suspicion Scrotal circumference can be measured with a tape. Ram lambs with a scrotal circumference of less than 30 centimeters and adult rams with a scrotal circumference of less than 32 centimeters should probably not be used for breeding. There is some evidence to suggest that rams with larger testicles will sire more prolific ewes.

Some rams in good condition may have scrotal circumferences of up to 40 cm. Scrotal circumference increases with age (Table 4).

40 cm.

( 4).

**4. (cm) ( Cornell University, 2002)**  
**Table 4. Scrotal circumference (cm) (Sheep Production Handbook . Cornell University (2002)**

Age of ram	Questionable	Satisfactory	Exceptional
, 8-14	< 30	30-36	>36
Ram lambs, 8-14 months			
, > 14	< 32	32-40	>40
Mature rams, > 14 months			

**Causative agent**

Epididymitis of ram is a reproductive disease that causes inflammation of the epididymis in the reproductive tract. The epididymis is the

1  
40%  
(Lupton, 2008; Fitch, 2012).

tubular portion of the testicle that collects the spermatozoa produced by the testicular tissues and stores it until transport when it is mixed with the seminal fluid to produce an ejaculate. Inflammation of the epididymis causes varying degrees of damage that can result in infertility and a reduced capacity to produce viable spermatozoa. Ram epididymitis is usually a condition of mature, sexually experienced rams. Ram epididymitis is the number 1 ram fertility problem seen in the sheep industry today. This disease has caused the culling of up to 40 percent of the commercial rams in many flocks in Colorado, Wyoming, Montana, and many other western states (Lupton, 2008; Fitch, 2012). These inflammatory changes of the epididymis and reproductive tract usually reduce the quality of semen and may completely prevent the transport of semen from the infected testicle. Most rams are still able to produce some semen from at least one testicle, so only a small percent are sterile. However, the majority of affected rams do have reduced semen quality and lowered breeding capacity.

Healey (1997), Bagley and 1,

The findings of Bagley and Healey (1997), as seen in Figure 1, was the comparison of the normal testicle and epididymis which is on the left side and the infected testicles and epididymis seen on the right side.

ovis. Brucella 30%

Although a variety of organisms and trauma can cause inflammation of the epididymis, the cause of contagious ram epididymitis in mature rams of multi-sire breeding systems is the bacterium *Brucella ovis* (*B. ovis*). The poor or questionable ram will have poor motility, and more than 30 percent abnormal sperm. Any ram that has white blood cells present would be considered of questionable fertility. The acceptable or satisfactory ram would fall between these two categories.



1 ( ) ( )

(Bagley and Healey,

1997).

**Fig 1. Comparison of a normal (left) and infected (right) testicle and epididymis. Note the presence of scar tissue and the adhesions of the tunic on the right testicle and epididymis (Bagley and Healey, 1997).**

Corynebacterium renale ( )  
(>16 )  
)

- Pizzle (or sheath) rot is an infection
- in the sheath area and could affect
- breeding activity. Pizzle rot is caused a
- bacteria, Corynebacterium renale (or one
- from that group). The other factor is high
- protein diets (>16 percent crude protein).

- Ammonia, produced by excess urea in
- the ram's urine can cause severe irritation
- and ulceration of the skin around the
- preputial opening. The debris from the
- ulcer form a crust which may block the
- opening to the prepuce.

### **Cryptorchidism**

1)

; 2)

- Rams with one or both testicles
- retained in the abdomen, or not
- descended fully into the scrotum are
- cryptorchids. Cryptorchidism presents
- : itself in one of two forms: 1) unilateral
- cryptorchidism - normal descent of only
- one testicle, 2) bilateral cryptorchidism -
- retention of both testicles. Unilateral
- cryptorchid lambs are usually capable of

- breeding, whereas bilateral cryptorchids are sterile. The condition usually is inherited as a simple recessive trait.

- There seems to be some association between this condition and the polled characteristic found in some fine-wool rams.

- Purebred breeders should make every effort to eliminate this condition. In spite of the fact that bilateral cryptorchid lambs are sterile, both bilateral and unilateral cryptorchids should be castrated, to reduce the risk of possible future complications.

- Unilateral cryptorchids should never be used in a breeding program. Cryptorchidism is the failure of one or both testes to descend into the scrotum.

- Cryptorchids are undesirable breeding animals. If both testicles are affected, the ram is infertile. If only one testical is affected, the ram may be fertile, but he will pass the trait onto his offspring.

- Cryptorchidism usually is unilateral; scrotal testes in unilateral cryptorchid males often produce fewer than normal numbers of sperm, with an increased percentage of abnormal sperm (Amann and Veeramachaneni, 2006).

(Amann and Veeramachaneni, 2006).

### **Management and control**

- A diligent amount of time spent studying performance information, pedigrees and other pertinent information is warranted as ram selection is the most important tool for making genetic progress in the flock (Petrovic et al., 2001). Of equal importance is the care and management of the newly acquired ram. Proper management and nutrition are essential for the ram to perform satisfactorily during the breeding season (Greiner, 2005).

(Petrovic et al., 2001).

(Greiner, 2005).

- The degree of infertility in rams can vary from mild through to complete

sterility. A simple check for possible causes of infertility can be done by running the rams into a race and checking their teeth, toes and testicles. Ideally this should be done 8-12 weeks prior to joining, so that steps can be taken to ensure fertility levels are improved ready for mating.

8-12

(Silanikove, 2000).  
6 8

The prevent heat stress; rams should not have a full fleece during the breeding season (Silanikove, 2000). They should be sheared 6 to 8 weeks prior to breeding. The scrotal sack should be free from wool. Adequate shade and water should be provided during the breeding season. In extreme circumstances, rams can be housed during the hottest part of the day and put out for breeding during the cooler parts of the day.

(Petrovic, 2000; Aguirre et al., 2007).

Semen testing is important for fertility of rams (Petrovic, 2000; Aguirre et al., 2007). A complete semen evaluation should be conducted to indicate rams of poor fertility. Semen is normally collected with the use of an electro-ejaculator. This procedure allows the veterinarian to easily collect a ram.

*Brucella ovis*. *B. ovis*

(Abdel Hafez, 2002).

The semen is then evaluated under the microscope for motility and morphology. This semen evaluation allows the veterinarian to estimate forward progressive motility. As motility is influenced by a number of factors, rams should not be disqualified on the basis of motility alone. White blood cells in the collection are an indication of infection. The majority of this infection in mature rams stem from *Brucella ovis* infection. *B. ovis* is the cause of epididymitis. The second half of the semen evaluation is morphology (Abdel Hafez, 2002).

30%

A veterinarian then checks the collection for sperm abnormalities. Those rams with questionable semen quality will have more than 30 percent abnormal sperm.



30

30%  
70%

Scrotal circumference (width of the testicles at the widest point) should be measured as it gives a good indication of a ram's breeding ability. Sperm production is directly correlated to testicular width.

Scrotal circumference will vary with season and body condition, but should be at its maximum peak during the fall breeding season. The scrotal circumference preferably 30 cm at the time the ram is to be used.

Semen samples can be collected using electro-ejaculation or via an artificial vagina. Usually veterinary assistance is required to collect semen. Semen should be evaluated for sperm motility, morphology, and white blood cells. The minimum acceptable standards are fair gross motility or 30 percent individual motility and 70 percent normal morphology.

## CONCLUSIONS

Based on the above causes of infertility on rams, in sheep reproduction, need to control all of the mentioned above factors through:

- Selection of ram on the basis of their ability to produce offspring and suited to the environment;
- Ensure right nutrition during the production cycle;
- Regular check up of rams health;
- A suitable vaccination program.

Generally, it can be concluded that health status of ram play an utmost role in the success of sheep production.

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## Study on the relation among some economic and biochemical indicators with the qualitative composition of grazing in beef cattle

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### SUMMARY

36

The study was carried out on 36 cows of meat breeds, such as Hereford, Aberdeen-Angus and Limousine in the Experimental Base of RIMSA in the town of Troyan. An assessment of the general body condition was determined (GBC). Blood samples from these animals were gathered and analyzed. Grass samples were subjected to laboratory testing through a classic Weende method in order to determine nutrients and chemical composition.

It has been found that the general body condition is directly related to the protein content of grass for beef cattle in the conditions of free pasture farming. The calcium and phosphorus content in blood serum is dependent on the content of the elements in the grass. The

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 odorov (2003)  
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 5-8  
 150-200kg  
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 slev et al.  
 (2011)  
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 Renquist et al. (2007)  
 .  
 (Llewelyn et al.,  
 2006; Gunn et al., 2014; Matthews et al.,  
 2015)  
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Aberdeen-Angus breed showed the best metabolic activities in the pastures used.

**Key words:** beef cattle, pasture, grass, blood samples, general body condition

## INTRODUCTION

The beef cattle farming is a major subsector of cattle breeding, providing quality meat and biologically valuable protein to feed the population. Its production cycles are based on the biological characteristics of cattle of specialized meat breeds.

Todorov (2003) considers that the breeding of cows, whose only production is the birth and breeding of a calf, which is weaned at 5-8 months of age and weighs 150-200kg, is relatively uncommon in our country. In the study of dynamics of progesterone and luteinizing hormone in meat cows, Maslev et al. (2011) draw attention to the qualities of the Aberdeen-Angus breed as the most viable and retaining GBC in the winter.

Renquist et al. (2007) conducted a study on the general body condition and its relationship to reproductive characteristics in meat cows.

A number of authors (Llewelyn et al., 2006; Gunn et al., 2014; Matthews et al., 2015) assume that with regard to protein, the animal is dependent on the metabolic processes in the proventriculus and the synthesis of microbial protein from the ration.

The purpose of present study is to measure and analyze some biochemical indicators of cattle and to compare them with the chemical and nutritional composition of the pasture.

## MATERIAL AND METHODS

The study was carried out on 36 cows of meat breed, such as Hereford

(n=7)	(n=14), (n=14) –	-	(n=14), Aberdeen-Angus (n=7) and Limousine (n=14) in the experimental base of the RIMSA - Troyan.
	( ) 1 5 Todorov (2003).	-	The assessment of the body condition was determined from 1 to 5 according to Todorov method (2003). It was carried out twice – in spring (April 2016) and at the end of summer (August 2016).
	( 2016) ( 2016).	-	Blood samples were gathered in vacutainer with a blood-clotting agent (KRUUSE – The Netherlands), as the venipuncture was performed after aseptic preparation of the tail vein by a two-pointed disposable needle.
	(KRUUSE – ),	-	Blood sera were separated within 2 hours and tested within 24 hours for the following indicators: total protein, calcium, phosphorus, magnesium
	2 24	-	In parallel with the above mentioned tests, grassland samples were analyzed as follows:
	:	-	The samples from 1-6 were taken from Boyadzhievo locality on 18.04.2016. The analyzed grassland was grazed by cattle of Hereford and Limousine breeds. Samples 7-12 were taken from the area of RIMSA-Troyan on 19.04.2016, where we observed representatives of Aberdeen-Angus that were included in the experiment. Sample No. 13 was straw that fed the animals during the winter.
	1-6 18.04.2016 .	-	Grass samples were tested at the laboratory using the classic Weende method – to determine nutrients and chemical composition. Results of GBC and laboratory blood serum samples were processed using the specialized panel Data Analysis of MS Office Excel.
	– 7-12 19.04.2016 .,	-	
	13	-	
	–	-	
Analysis	Data MS Office Ex el.		

## RESULTS AND DISCUSSION

The presented results summarize in a table the values of the studied parameters.

The results of laboratory grass test carried out during the spring study of animals showed satisfactory values for

protein, calcium and phosphorus – Table 1.

At the same time, there is no method available to determine accurately the consumption of grass in the pastures. The difficulty comes also from the fact that pastures themselves are inhomogeneous in terms of grass composition and grassland during the vegetation season.

1.

**Table 1. Results of crude protein, calcium and phosphorus in grass samples**

Sample No	Crude protein %	Calcium %	Phosphorus %
1	18.56	3.13	0.323
2	25.36	3.37	0.337
3	21.46	1.86	0.277
4	20.27	2.35	0.482
5	16.86	1.77	0.215
6	20.8	1.66	0.212
7	10.42	2.38	0.262
8	16.42	2.53	0.266
9	9.69	2.04	0.219
10	13.22	2.27	0.159
11	14.61	2.73	0.233
12	11.6	2.42	0.154
13	3.49	2.24	0.12
<b>/Mean</b>	<b>15.60</b>	<b>2.37</b>	<b>0.25</b>
<b>/SD</b>	<b>4.70</b>	<b>0.36</b>	<b>0.07</b>

(Renquist et al. 2007; Murrieta et. al., 2010).

(Galindo-Gonzalez et al., 2007; Thrall et.al., 2012).

(Reis et al.,2015).

– 2,13±0,44;

2, With regard to GBC – Table 2, it should be noted that the values are lower than the optimum for beef cattle (Renquist et al., 2007; Murrieta et al., 2010). However, the time of their determination should also be taken into account – spring, since the intake of grass is important for the course of all physiological processes (Galindo-Gonzalez et al., 2007; Thrall et al., 2012). Furthermore, the composition of the herb mixture is related to the distribution of nutrients and their absorption in the digestive system (Reis et al., 2015). The animals have largely depleted their reserves as they have decreased GBC as follows: Hereford – 2.13 ± 0.44;

2,27±0,4;  
 – 2,41±0,41.  
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 .  
 (Maslev et al., 2011; 2013).

Limousine – 2.27 ± 0.4; Aberdeen-Angus– 2.41 ± 0.41. The mathematical analysis of data gives reason to assume that Aberdeen-Angus breed retains GBC most efficiently during the winter period. The measured assessment is statistically significant higher in comparison with that of the other two breeds under the conditions of our study. This result was also reported by other authors for the same breed (Maslev et al., 2011; 2013).

**2.**  
**Table 2. Assessment of the body condition in three beef cattle breeds**

No in order	/Breed		
	Hereford	Limousine	Aberdeen-Angus
1	1.60	2.70	2.50
2	2.20	1.70	2.50
3	2.30	1.60	2.50
4	1.70	2.50	2.80
5	2.70	2.90	3.20
6	2.70	1.80	1.70
7	2.80	2.80	1.70
8	1.60	1.80	
9	2.50	2.20	
10	1.70	2.80	
11	1.70	2.40	
12	1.70	1.70	
13	2.80	2.50	
14	1.80	2.40	
<b>/Mean</b>	<b>2.13</b>	<b>2.27</b>	<b>2.41</b>
<b>/SD</b>	<b>±0.44</b>	<b>±0.40</b>	<b>±0.41</b>

With regard to blood biochemical indicators, interesting findings can also be made. The presented results – Table 3 are common to all animals, as there are no statistically significant differences between the breeds – at least as regards the indicators surveyed



## 3.

**Table 3. Blood biochemical indicators in beef cattle**

Sample No	Protein	Calcium	Phosphorus
1	110.8	2	3.2
2	107.9	1.8	1.9
3	101.2	1.9	2.4
4	113.7	1.8	2
5	113.3	1.8	1.4
6	113.9	2	2.4
7	125.1	1.7	2.2
8	103.1	1.8	2
9	112.3	1.9	2.6
10	118.2	1.9	0.164
11	110.8	1.8	1.8
12	114.5	1.8	2.5
13	113	1.8	2
14	121.9	2	1.8
15	115.2	2	2.2
16	113.1	2	1.8
17	122	1.8	2.7
18	113.7	1.8	1.7
19	121.8	1.7	2.2
20	108.3	1.6	1.8
21	117.4	2	1.7
22	115.8	1.9	2.2
23	121.9	1.8	1.9
24	108.9	1.8	2.5
25	110	1.6	1.7
26	124.3	1.8	1.8
27	113.3	1.9	2.3
28	113.4	1.8	1.7
29	122.9	1.8	1.8
30	112.2	1.8	1.5
<b>/Mean</b>	<b>114.4633</b>	<b>1.836667</b>	<b>1.995467</b>
<b>/SD</b>	<b>±4.350968</b>	<b>±0.083656</b>	<b>±0.352774</b>

114,46±4.35g/l.

The average total blood protein result in the particular study is acceptable as a value of  $114.46 \pm 4.35$ g/l. It should be noted that the small value of the standard deviation also explains the lack of difference between the breeds. With respect to protein, the animal is dependent on the metabolic processes in the proventriculus and the ability to synthesize an adequate amount of microbial protein with a positive protein balance in the rumen. It becomes obvious from the above analysis that the protein in the diet is the main nutrient that provides an adequate amount of protein in the blood, which is dependent on the adequate development of muscle tissue in beef cattle. The result obtained is consistent with data obtained from other authors under similar conditions (Llewellyn et al., 2006; Gunn et al., 2014; Matthews et al., 2015).

(Llewellyn et al., 2006; Gunn et al., 2014; Matthews et al., 2015).

As mutually related metabolites in animal physiology, calcium and phosphorus should be considered together - especially in productive animals. Under the conditions of our study, the low value of both elements in the blood makes an impression - unlike the total protein. Somewhat this result is explained by the low amount of these metabolites in grazing, as well as the progressive deterioration in grassland quality as the summer progresses. The most impressive result in relation to calcium and phosphorus is the ratio Ca/P - 0.92. The results show that in some animals phosphorus significantly exceeds calcium - due to the inverse ratio (Matthews et al., 2015).

(Matthews et al., 2015).

Interrelations among indicators.

The numerical determination of the relationships between the studied indicators should be determined by a polynomial model, but due to the small number of samples and animals - in our

0,41

(Samadia et al., 2013; Samadia, 2014).

et al., 2015; Diskin et al., 2016).

case, it was more appropriate to use the correlation coefficient among the surveyed indicators. The correlation coefficients were calculated by a specialized software as follows:

Protein, calcium, phosphorus - in grass and in blood serum; -0.13; 0.85; 0.41 respectively

The GBC results in Table 4 show a positive correlation for the three breeds in terms of protein while at the same time this factor is significantly higher in the Hereford breed and less significant in Aberdeen-Angus. These results are also discussed in other countries, with the negative effect of bad grazing being recognized as the most significant in both the northern and southern hemispheres (Samadia et al., 2013, Samadia, 2014).

For calcium and phosphorus, the positive value of the coefficients is only for Aberdeen-Angus, which is slightly significant in calcium and insignificant in phosphorus. An explanation of this fact should be sought in the smaller live weight of the breed and the lower energy and metabolic needs. At the same time, the reading of this coefficient is important also from the point of view of the next fertilization in such heavy pasture conditions (Nasca et al., 2015; Diskin et al., 2016).

4.

**Table 4. Correlation coefficient among GBC for each of the breeds studied and calcium, phosphorus, and protein content in the grass**

		Protein	Calcium	Phosphorus
R	/Hereford	0.59	-0.42	-0.01
R	/Limousine	0.06	-0.81	-0.41
R	/Aberdeen-Angus	0.31	0.34	0.01

**CONCLUSIONS**

GBC is directly related to the protein content of grass in beef cattle in free pasture farming.

- The calcium and phosphorus content of the blood serum is directly related to the content of the elements in the grass.
- Aberdeen-Angus breed has the best metabolic potential under the conditions of the present study compared to the other breeds mentioned – In non-homogeneous pastures.

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## Development of the family structure on the Orlov trotter breed in Bulgaria

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### SUMMARY

- The family structure of the Orlov trotter mares in Bulgaria was traced. The family of Zakrasa, Kadetka, Itka and etc. was development to 2-3 generations.
- Today the family of Bayaderka is present of 4 mares.

Examined 4 exterior measurements on Orlov mares and halfbred mares were values via statistic analysis – height at withers, body length, chest circumference and cannon bone.

The purpose of the study was to trace back and establish the influence of Orlov mares in Bulgarian horse breeding.

**Key words:** Orlov trotter, mare, family structure, damlines

### INTRODUCTION

- The development of trotter horse breeding in Bulgaria is related with import of horses from abroad.
- Influence to Orlov trotter on improvement in Bulgarian horse breeds has not been studied yet.
- Following the resuscitation of stud farms

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1883-1887 . Petrov (1927)

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15

1924 . " "

(Petrov, 1927).

1954 .

(

- in Bulgaria at the end of XIX century
- Bulgarian horse breeders began to use Orlov breed in order to improve local horses exterior and their trod ability.
- That is why they had a preference for the Orlov trotter breed which was popular in Russia and countries with advanced horse breeding where harness racing was popular. According to Petrov (1927), during the period 1883-1887 there were 108 stallions and 550 mares at stud farm „Kabiuk“-Shumen. 8 of them were stallion by region farms and 15 Orlov trotter mares. Among them were 17 mares of unknown pedigree that had been considered as having Orlov trotter origin.
- In 1924 the breeding purpose was changed into two directions – the first one was to breed horses for riding and middle draft horses and the second purpose was to breed middle heavy horses for a agriculture. For this purpose at stud farm „Kabiuk“-Shumen started work with Arabian, Anglo-Arab and Anglo-Normand (Nonius) horses.
- The other horse breeds – Ardenian, Percheron, Thoroughbred and trotter are not suited for horse breeding and improvement to height to local horses and they will be closed.
- They are used to breeding in local stud farm (Petrov, 1927).
- This is the end of the first period of Orlov trotter in Bulgaria.
- In 1954 Orlov trotters were again imported. The breeding purpose was improvement to Bulgarian horse and development to a harness racing. Three stallions (Vorobishek, Perlamutr and Guslyar) and eight mares (Bayaderka, Victoria, Viskoza, Deviatsia, Lihodeyka, Orbita, Plamennaya and Seria) were bought from Russia.

Kalinkova (2009)

4

2. (61.43%)

- According Kalinkova the first mares of damlines in Orlov trotter are „khrenovsky” and „no khrenovsky” which were born in Khrenovsky studfarm and other farm. The „khrenovsky” families were 4 groups and „no khrenovsky” – 2. A part of mares (61.43 %) were „khrenovsky” – to group „old khrenovsky mares”. Contemporary families have originated from those groups, as part of them are closed.

The purpose of the study is to trace back and establish the influence of the Orlov mares in Bulgarian horse breeding.

### MATERIAL AND METHODS

As sources of information for the survey are used lists of annual zootechnical examinations of the Stefan Karadzha stud farm - Balchik, the original studbooks of mares and other literary information.

- Data for body measurements - height at withers, body length, chest circumference and cannon bone and breeding produce on Orlov trotter are used.

The data for racing result are taken from the test committee’s records. The variance analysis method is used to process the body measurements.

The present study covers the second period of the development of trotter horse breeding in Bulgaria.

### RESULTS AND DISCUSSION

- The results for the genealogic structure of the Orlov trotter breed have been traced in previous studies (Lukanova, 2016)

Strongly developed families of the Orlov trotter are those of the mares Bulatnaya, Beznadezdnyaya laska (47

(Lukanova, 2016).



(47), (24)  
 (Rozdestvenskaya, 1978).  
 20.01.1950  
 1954  
 154/158/179/19.  
 (17)  
 16  
 (Barzev et al., 2012).  
 3  
 1.

mares), Volga (24 mares) and others that are not present in Bulgaria (Rozdestvenskaya, 1978). Representative of the mare's family Zakrasa is the mare named Bayaderka (Scheme 1), born on January 20, 1950, in the Shahov stud farm. She was imported in 1954 from USSR, 154/158/179/19 body measurement – height at withers, body length, chest circumference and cannon bone. For her reproduction period (17 seasons), she has given 16 foals, of which 6 were mare. Of these, only the mare Pavlova is important for the development of the family in Bulgaria (Barzev et al., 2012). Her other daughter, called Pobeda has three second places (Table 1).

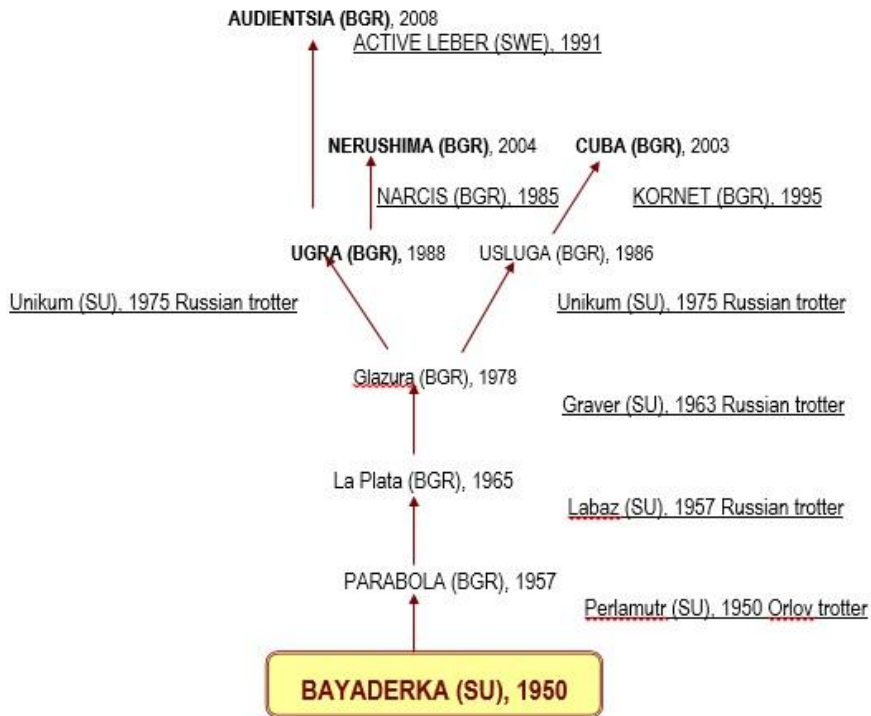
1 600 .

**Table 1. Result of trotter races on Orlov mares / 1 600 meters in National hippodrome Bankya**

Name	Year of start	sire	mare	place/time (min/sek)
Pobeda	1962	Perlamutr	Bayaderka	II / 2,30
Povelial	1962	Perlamutr	Viktoria	III
Plamenna	1963	Perlamutr	Lihodeyka	I / 2,54
Alpaka	1965	Vorobishek	Parabola	II / 2,50,2
Povelial II	1965	Parvenets	Viktoria	I / 2,49
Amperia	1967	Perlamutr	Paloma II	I / 2,47,6
Penelopa	1967	Povelitel	Lihodeyka	I / 2,48,2
Paluba	1967	Povelitel	Bayaderka	III

1,

As it can be seen from Scheme 1, the further development the family of Bayaderka is conditioned by the replacement of the Orlov stallions with Russian trotter stallions. Later the progeny of other mares of the Orlov breed were covered with the imported Russian trotter stallions.



1.  
**Scheme 1. Family structure on mare Bayaderka**

05.02.1949 .	14	Mare Victoria, born 05.02.1949, has been used for 14 breeding seasons and has 8 born foals and has remained 6 barren. She is representative of the family of the mare Kadetka – 30 mares to 1976 (Rozdestvenskaya, 1978).
8	6	
1976 .	– 30	
1978).	II	
( 1).	1965 .	Her daughter, mare Povelia II, won the Derby race in 1965 (Table 1). Her son – stallion Povelitel was used for a sire in a Stefan Karadzha stud farm.
”	“	
”	23.05.1950 .	
14	13	Mare Viskoza, born on 23.05.1950, has also been used 14 breeding seasons and has 13 foals. Mare Deviatsia is representative of the family Itra. She was born on 10.04.1950. She was used for breeding only 4 years – from 1954 to 1958 and 4 foals were born. Mare Lihodeyka, born on 01.03.1950, in the Chestmenski stud farm was used for
10.04.1950 .	4	
1954 1958 .	4	
01.03.1950 .	-	

ú 1954 .  
 1965 . 11  
 6 5 .  
 1962 .,  
 1 . 2  
 “ . ”  
 28.03.1950 .  
 12 9  
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 05.03.1950 .  
 4 2  
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 - 163/170/182/19  
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breeding from her import in 1954 until her death in 1965. She has born 11 horses, of which 6 colt and 5 filly. Her son, stallion Plamak, in 1962 at the Central Hippodrome, has three appearances, including 2 first places and 1 third.

After the end of the racing career he was used as a sire in the Stefan Karadzha stud farm. The mares Lihodeyka and Deviatsia were origin from line of stallion Koreshok.

Mare Orbita, born on 28.03.1950 in Antonov's stud farm, USSR, has been used for breeding for 12 years and has 9 born foals (5 colt and 4 filly). Her son, stallion Alegro, was used as a sire. Mare Plamennaya, born on 05.03.1950, has been used for breeding for 4 years and has 2 registered born foals and 2 barren. Both mares – Orbita and Plamennaya were origin from line of stallion Voin.

Mare Seria, born on 13.04.1949, with body measurements – height at withers, body length, chest circumference and cannon bone – 163/170/182/19, has been used for 7 years for breeding, 1 barren and has 6 foals.

She is the representative of line stallion Lovchii.

Her son, stallion Polys, was used as a sire at Tolbukhin stud farm.

The performance of mares (Table 1) shows satisfactory results, having in mind the initial stage of training, the skills of drivers and trainers and equipping of horses.

The body measurements of the Orlov trotter mares, as well as of the mares crossed between Orlov trotter and half bred horses were subjected to statistical processing. The analysis of the data shows a low variation of the chest circumference in the Orlov mares – 4.41.

– 4.41.  
 ( 2).  
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 ,  
 ,  
 Barmintsev (1972)  
 160.6; 162.5; 184.3; 20.0.  
 2  
 . 2

By the parameter cannon bone, variation is also low (Table 2).

The results obtained by us show that regarding the exterior measurements - height at withers, body length and chest circumference the mares bred in the country are below the average for the breed indicated by Barmintsev (1972) – 160.6; 162.5; 184.3; 20.0, respectively.

It can be seen from Table 2 that the differences between the main body measurements of Orlov trotter mares and the half-bred mares are insignificant, indicating that the selection of mares has been used to select for their height.

**Table 2. Body measurements of Orlov mares and halfbred Orlov**

Traits	Orlov mares				Halfbred Orlov mares			
	n	x	Sx	SD	n	x	Sx	SD
/ Height at withers	26	158,23	0,49	2,49	15	158,00	1,03	4
/ Body length	26	159,69	0,79	4,01	15	156,93	1,05	4,08
/ Chest circumference	26	180,81	0,86	4,41	15	181,13	1,09	4,21
/ Cannon bone	26	19,85	0,14	0,74	15	19,85	0,14	0,54

## CONCLUSIONS

1.

- Horses of the Orlov trotter have participated in the start of the breeding of Bulgarian breeds. The beginning of trotter horse breeding and harness racing of their offspring. The Orlov trotter mares and the half bred mares – crosses with Orlov stallions in our country were less in regard to the body measurements in the 60s of the last century of the average for the breed in Russia.

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4

2. Eight mares of different damlines are included in the family structure of the Orlov trotter breed in Bulgaria. The family of mare Bayaderka is preserved, which today is represented with 4 mares.

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