



### *Original Contribution*

## **BREED- AND GENDER-RELATED FEATURES OF BLOOD LYSOZYME ACTIVITY IN GOATS DEPENDING ON THE SEASON**

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### **ABSTRACT**

The investigations were performed in 2005-2006. Serum lysozyme concentrations were assayed in goats from the Bulgarian Dairy breed (BDB) reared in the Institute of Mountain Stockbreeding and Agriculture – Troyan and Experimental Farm of the Trakia University – Stara Zagora, BDB×Toggenburg and BDB×Anglo-Nubian crosses, as well as local crosses reared in Bogomilovo, region of Stara Zagora and Anevo, region of Karlovo. Six goats were studied from each group, as well as 6 purebred BDB, 6 Anglo-Nubian and 6 Toggenburg bucks or a total number of 163 goats and 72 bucks.

Blood samples were aseptically obtained in the morning prior to feeding from the jugular vein. The activity of lysozyme was assayed by the method of Lie (1).

During spring the lowest lysozyme activity was exhibited by local goats reared in Anevo ( $0.192 \pm 0.015$ ) and the highest mean values – by local goats reared in Bogomilovo ( $p < 0.01$ ).

In summer, the highest lysozyme concentrations were those of the BDB breed from Troyan with  $0.447 \pm 0.244$ , and the lowest – of local goats from Anevo with  $0.192 \pm 0.015$  and BDB from Stara Zagora:  $0.204 \pm 0.022$  ( $p < 0.01$ ). There was a tendency towards higher summer blood lysozyme activity in male animals as compared to females, with the exception of the BDB from Troyan.

In autumn, blood lysozyme activity was the highest in most studied goat breeds, both in males and females. During winter, all goats and bucks except for those reared in Anevo, showed a reduced lysozyme activity.

**Key words:** lysozyme, breeds, goats, bucks, seasons

### **INTRODUCTION**

Lysozyme is one of the primary factors of natural immunity in men, animals and birds (2, 3). Its bactericidal activity against Gram-positive and some Gram-negative microorganisms and some viruses is attributed to its lytic, cationic and hydrophobic properties.

Numerous investigators have proved that lysozyme and complement activities were different in the various animal species and were further influenced by breed. Considerable breed-related variations have been reported in pigs, birds, turkeys, sheep, horses (4-12) and cattle (13-16).

The purpose of the present investigation was to establish the seasonal, breed- and gender-related differences in serum lysozyme activity

in goats and bucks, reared in different regions in Bulgaria.

### **MATERIAL AND METHODS**

The investigations were performed in 2005-2006. Serum lysozyme concentrations were assayed in goats from the Bulgarian Dairy breed (BDB) reared in the Institute of Mountain Stockbreeding and Agriculture – Troyan and Experimental Farm of the Trakia University – Stara Zagora, BDB×Toggenburg and BDB×Anglo-Nubian crosses, as well as local crosses reared in Bogomilovo, region of Stara Zagora and Anevo, region of Karlovo. Six goats were studied from each group, as well as 6 purebred BDB, 6 Anglo-Nubian and 6 Toggenburg bucks or a total number of 163 goats and 72 bucks. Blood samples were aseptically obtained in the morning prior to feeding from the jugular vein. The activity of lysozyme was assayed by the method of Lie (1).

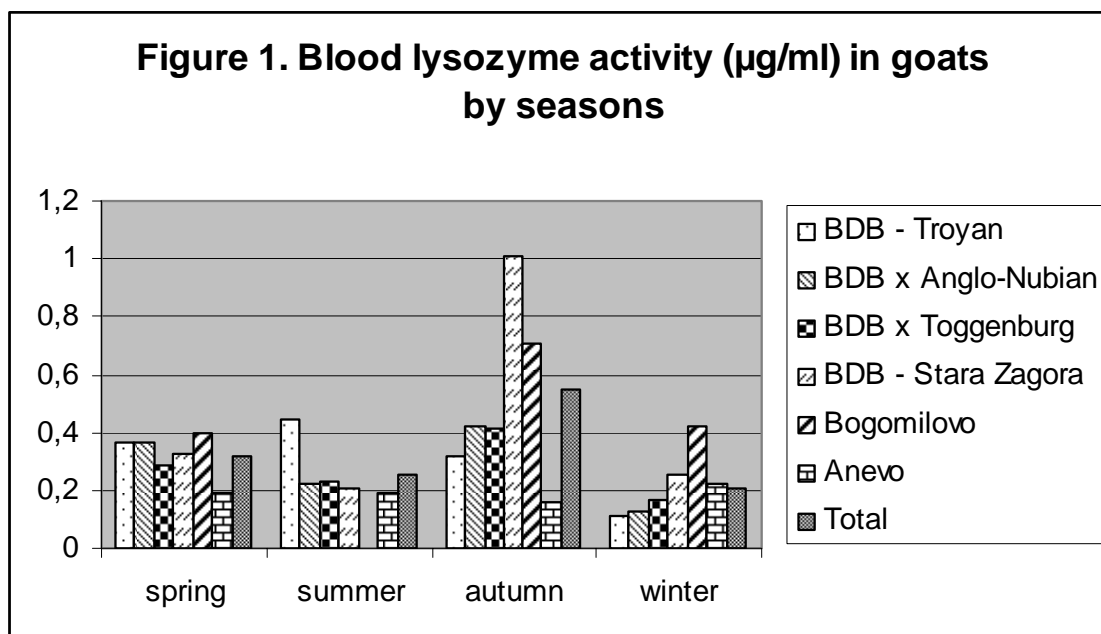
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**Table 1.** Blood lysozyme activity ( $\mu\text{g/ml}$ ) in goats and bucks by breeds and seasons

Groups	n	Spring	n	Summer	n	Autumn	n	Winter
		$\bar{X} \pm Sx$		$\bar{X} \pm Sx$		$\bar{X} \pm Sx$		$\bar{X} \pm Sx$
<b>Goats</b>								
BDB – Troyan	6	0.364 $\pm$ 0.033 <sup>a</sup>	6	0.447 $\pm$ 0.244 <sup>a</sup>	6	0.321 $\pm$ 0.019	10	0.115 $\pm$ 0.014 <sup>a</sup>
BDB $\times$ Anglo-Nubian	6	0.364 $\pm$ 0.033 <sup>b</sup>	6	0.219 $\pm$ 0.024	6	0.418 $\pm$ 0.075	10	0.127 $\pm$ 0.016 <sup>c</sup>
BDB $\times$ Toggenburg	6	0.285 $\pm$ 0.033	6	0.228 $\pm$ 0.016	6	0.412 $\pm$ 0.045	10	0.166 $\pm$ 0.013 <sup>b</sup>
BDB-Stara Zagora	6	0.323 $\pm$ 0.039	9	0.204 $\pm$ 0.022 <sup>a</sup>	9	1.013 $\pm$ 0.420 <sup>a</sup>	10	0.251 $\pm$ 0.019
Bogomilovo	6	0.394 $\pm$ 0.027 <sup>cd</sup>	-		6	0.709 $\pm$ 0.275 <sup>b</sup>	8	0.418 $\pm$ 0.036 <sup>abc</sup>
Anevo	6	0.192 $\pm$ 0.015 <sup>abc</sup>	6	0.192 $\pm$ 0.015	6	0.161 $\pm$ 0.013 <sup>ab</sup>	7	0.223 $\pm$ 0.026
Total	36	0.321 $\pm$ 0.016	33	0.253 $\pm$ 0.042	39	0.545 $\pm$ 0.108	55	0.209 $\pm$ 0.016
<b>Bucks</b>								
BDB	6	0.228 $\pm$ 0.018 <sup>d</sup>	6	0.283 $\pm$ 0.031	6	0.489 $\pm$ 0.073	6	0.285 $\pm$ 0.050
Toggenburg	6	0.270 $\pm$ 0.036	6	0.263 $\pm$ 0.017	6	0.349 $\pm$ 0.014	6	0.226 $\pm$ 0.029
Anglo-Nubian	6	0.274 $\pm$ 0.029	6	0.250 $\pm$ 0.024	6	0.363 $\pm$ 0.029	6	0.311 $\pm$ 0.012
Total	18	0.257 $\pm$ 0.016	18	0.265 $\pm$ 0.013	18	0.400 $\pm$ 0.028	18	0.274 $\pm$ 0.019

p &lt; 0.01

a, b, c, d



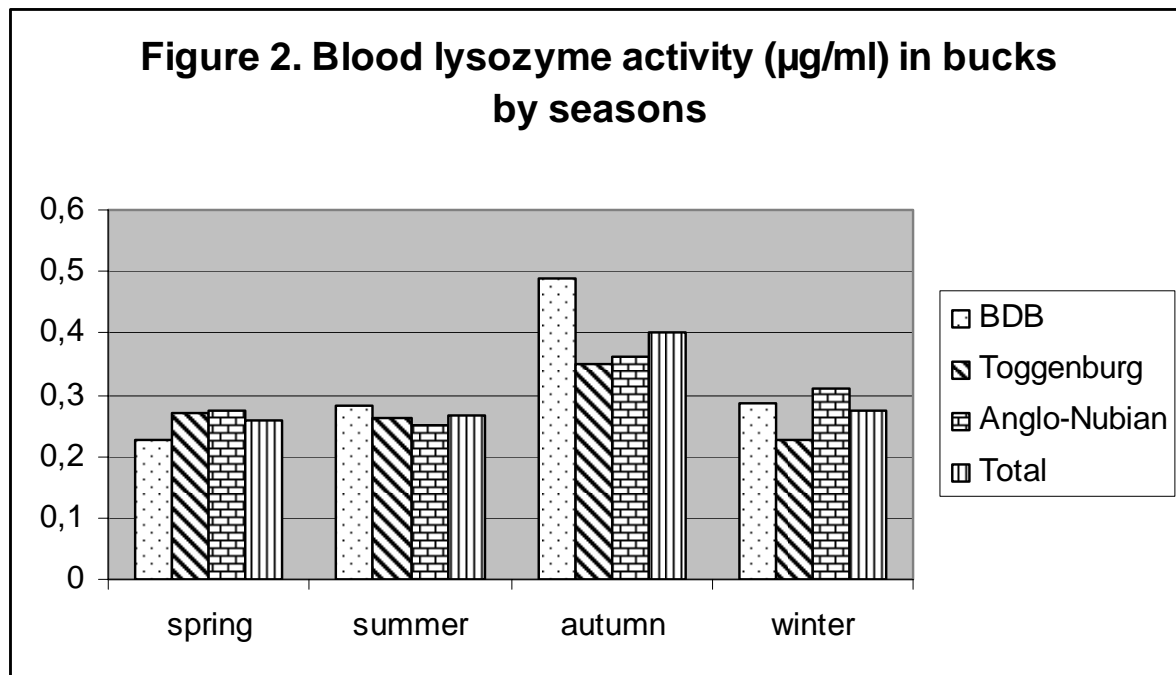
## RESULTS AND DISCUSSION

The blood lysozyme values in goats according to seasons are shown in **Table 1** and **Figure 1**. In spring, the lowest lysozyme activity was established in local goats from Anevo – 0.192  $\pm$  0.015, and the highest – in local goats from

Bogomilovo ( $p < 0.01$ ). The differences with the other breeds were not statistically significant for both goats and bucks. It should be noticed that in spring, blood lysozyme activity in males was lower as compared to females from the respective breeds.

In summer, the highest lysozyme concentrations were exhibited by BDB goats reared in Troyan ( $0.447 \pm 0.244$ ) and the lowest – by local goats from Anevo ( $0.192 \pm 0.015$ ) and BDB from Stara Zagora ( $0.204 \pm$

$0.022$ ) ( $p < 0.01$ ). During this season, the lysozyme activity in bucks tended to be higher as compared to female goats, with exception of the BDB reared in Troyan.



As seen from **Figure 1** and **Figure 2**, lysozyme concentrations in the autumn were the highest in most studied breeds, both for males and females. It should be emphasized that BDB goats reared in Stara Zagora ( $1.013 \pm 0.420$ ) and local goats from Bogomilovo ( $0.709 \pm 0.275$ ) showed activities, considerably higher vs the other breeds, whereas the values of local goats from Anevo were the lowest ( $0.161 \pm 0.013$ ), possibly due to environmental factors. In bucks, the autumn lysozyme activity was the highest in BDB ( $0.489 \pm 0.073$ ) and lowest in the Anglo-Nubian breed –  $0.363 \pm 0.029$ .

In winter, lysozyme activity decreased in all studied animals with the exception of local goats from Anevo (Figure 1 and 2). In the latter, the seasonal variations of blood lysozyme activity were the least and it remained at relatively low levels (about  $0.2 \mu\text{g/ml}$ ). In winter too, local goats from Bogomilovo had higher blood lysozyme concentrations:  $0.418 \pm 0.036$  ( $p < 0.01$ ). The goats from the Institute of Mountain Animal Breeding and Agriculture were with lower lysozyme concentrations. In bucks, breed-related differences were not statistically significant ( $p > 0.05$ ).

The differences between the both genders could be attributed to the respective hormonal profiles whereas differences between breeds – with breeding traits (pure breed or crossing) with further influence from the environment.

Breed- and age-related differences in sheep are reported by Sotirov et al. (5, 7), and explained with the different productive type of investigated breeds. Bivolarski et al (10) have demonstrated that in female lambs, winter lysozyme activity was higher as compared to that in summer. Bivolarski and Sotirov (11) showed that sheep also exhibited higher lysozyme levels in winter than in the summer. In cattle and other animals' species, breed-related differences in lysozyme were also reported (13, 14, 17, 18). According to some authors, lysozyme serves as indicator for the resistance of breeds against pathogenic agents and for increasing the resistance to Gram-positive bacteria and some viruses (19, 20, 21). In purebred German Landrace pigs and German×Belgian Landrace, Sotirov (4) has shown that both season and age had an impact on blood lysozyme concentrations. Some of age-related changes are explained by an altered expression of genes that control the synthesis of the enzyme, as well as with the different

penetrance in the expression of the gene. All investigations on this subject could add to the more complete elucidation of the effect of lysozyme on animal productivity and resistance, and could provide information for the genetic control of lysozyme activity and its phenotype expression under various factors from the environment.

## CONCLUSIONS

During spring, the lowest lysozyme activity was exhibited by local goats reared in Anevo ( $0.192 \pm 0.015$ ) and the highest mean values – by local goats reared in Bogomilovo ( $p < 0.01$ ).

In summer, the highest lysozyme concentrations were those of the BDB breed from Troyan with  $0.447 \pm 0.244$ , and the lowest – of local goats from Anevo with  $0.192 \pm 0.015$  and BDB from Stara Zagora:  $0.204 \pm 0.022$  ( $p < 0.01$ ). There was a tendency towards higher summer blood lysozyme activity in male animals as compared to females, with the exception of the BDB from Troyan.

In autumn, blood lysozyme activity was the highest in most studied goat breeds, both in males and females.

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