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RESEARCH ARTICLE

Investigation of Schmallenberg Virus Seroprevalence in Honamlı Goats from Burdur Region

Kemal VAROL[1]*

[1] Burdur Mehmet Akif Ersoy University, Food, Agriculture and Livestock Vocational College of Burdur, Department of Veterinary, 15030, Burdur , Turkey

ABSTRACT

Schmallenberg virus (SBV) was first reported in cattle, in north-western Germany and east of the Netherlands in November 2011. SBV causes serious economic losses in domesticated ruminant animals. SBV is also seen in Turkey and there are few seroprevalence studies in cattle, sheep and goats. For this purpose, in this study, the prevalence of SBV was investigated in Honamlı goats in Burdur region. The study was carried out in 12 different herds that were breeding Honamlı goats in Burdur province. The animal material consisted of 186 Honamlı goats with 93 aborted and 93 normal healthy births which were aged between 2-5 years. In the findings; SBV specific antibodies were detected in only two (1.1 %) serum samples from the animals included in the study. In two goats (1.1 %), the test result was suspectable for antibody positivity. Consequently, it was determined that SBV infection has a low seroprevalence rate in Honamlı goats in Burdur province.

Keywords: ELISA, Goat, Honamlı Goat, Schmallenberg virus, Seroprevalence.

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Burdur Yöresi Honamlı Irkı Keçilerde Schmallenberg Virüs Seroprevalansının Araştırılması

ÖZ

Schmallenberg virüsü (SBV) ilk olarak Kasım 2011'de kuzeybatı Almanya'da ve Hollanda'nın doğusunda sığırlarda rapor edilmiştir. SBV evcil geviş getiren hayvanlarda ciddi ekonomik kayıplara yol açmaktadır. SBV ülkemizde de görülmektedir ve sığırlarda ve koyunlarda ve keçilerde az sayıda seroprevalans çalışmaları bulunmaktadır. Fakat Honamlı ırkı keçilerde yapılan seroprevalas çalışması yoktur. Bu amaçla bu çalışmada Burdur yöresinde Honamlı ırkı keçilerde SBV prevalansı araştırılmıştır. Bu çalışma Burdur ilinde Honamlı keçisi yetiştiren 12 farklı sürüde yürütülmüştür. Hayvan materyalini 2-5 yaşları arasında değişen 93 abortlu ve 93 normal sağlıklı doğum yapan 186 Honamlı keçi oluşturmuştur. Bulgularda; Çalışmaya dahil edilen hayvandan kan serumlarının yalnızca ikisinde (% 1.1) Schmallenberg virus spesifik antikor varlığı saptandı. iki keçide ise (% 1.1) test sonucu şüpheli antikor pozitiflik belirlenmiştir. Sonuç olarak; Burdur ilinde Honamlı ırkı keçilerde SBV enfeksiyonunun düşük seroprevalans oranına sahip olduğu belirlenmiştir.

Anahtar kelimeler: ELISA, Honamlı Keçisi, Keçi, Schmallenberg virus, Seroprevalans.

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ORCID ID; *KV: 0000-0002-3057-2865.*

*Corresponding author e-mail: kmlvrl@yahoo.com

INTRODUCTION

Schmallenberg virus (SBV) is a Shamonda /Sathuperilike RNA virus belonging to the serogroup Simbu, and located to the family Peribunyaviridae of the genus Orthobunyavirus (Elbers et al. 2012, Yilmaz et al. 2012, Wernike et al. 2018, Kauffold et al. 2021).

SBV predominantly infects domestic ruminants such as cattle, sheep, goats and, wild and exotic ruminants such as alpaca, llama, elk, water buffalo, bison, various species of deer, mouflon, chamois, wild boars and camelids. In addition, SBV antibodies have also been detected in dogs and wild boars (Brülisauer et al. 2017, Kęsik-Maliszewska et al. 2018, Kauffold et al. 2021).

SBV is mainly transmitted by biting midges of the genus Culicoides, as with other Simbu serogroup viruses. Furthermore, SBV is also transmitted by other blood-sucking vectors such as mosquitos and ticks. In addition, wind also plays a role in the spread of Culicoides midges over long distances (Kęsik-Maliszewska et al. 2018, Wernike et al. 2018, Wernike and Beer 2020).

According to the time of infection, the virus shows two different clinical courses. Especially, it produces a short-lived viremia in domestic ruminants of all age groups. Clinically, there is a history of mild transient disease with fever, diarrhea, and decreased milk yield. On the contrary, persistent infections in the fetuses of pregnant animals can cause abort, premature birth or severe congenital malformations (Endalew et al. 2019, Wernike et al. 2018).

Therefore, SBV causes serious economic losses in domesticated ruminant animals (Szeredi et al. 2020). SBV is also seen in Turkey and there are few seroprevalence studies in cattle, sheep and goats (Azkur et al. 2013, Tonbak et al. 2016, Macun et al. 2017, Elmas et al. 2018). But, there is no seroprevalence study in Honamlı goats. For this purpose, in this study, the prevalence of SBV was investigated in Honamlı goats with and without abortion in Burdur region.

MATERIALS and METHODS

This study was carried out with the permission of the Burdur Mehmet Akif Ersoy University Animal Experiments Local Ethics Committee, dated 13.05.2021 and numbered 88/751. The study was carried out in 12 different herds that were breeding Honamlı goats in Burdur province. The animal material consisted of 186 Honamlı goats with 93 aborted and 93 normal healthy births which were aged between 2-5 years. For analysis, 8 ml of blood was taken from the vena jugularis of goats into vacuum gel tubes. The blood samples were centrifuged at 3500 RPM for 15 minutes and their serums were extracted. Extracted serums were stored in a deep freezer at -20°C until analysis.

Serological Analysis

For the determination of specific antibodies to SBV; A commercial ELISA kit (IDEXX Schmallenberg Ab Test®, IDEXX, Switzerland) was used. Control and serum samples were analyzed according to IDEXX's guidelines. In the assays, optical density (OD) was determined relative to the negative and positive controls provided by IDEXX (S/P %). According to this; S/P % = 100 x sample (OD) - negative control (OD)/Positive control (OD) - negative control (OD). S/P percentages were evaluated as follows; S/P % < 30 % negative, ≤ 30 % S/P % ≥ 40 % suspectable and ≤ 40% positive. The specificity and sensitivity of this Test Kit are 99.5% and 98.1 %, respectively (Pejaković et al. 2018).

Statistical Analysis

The findings obtained from the study were evaluated using the IBM SPSS 26.0 for Windows package program. The compositional distribution of the variables was determined using crosstabs. Spearman Correlation analysis was used to determine the relationship between variables.

RESULTS

In the findings, SBV specific antibodies were detected in only two (1.1 %) serum samples from the animals included in the study. In 2 goats (1.1 %), the test result was suspectable for antibody positivity (Table 1 and Table 2).

When the aborted goats were examined in terms of the presence of SBV specific antibodies; 1 seropositive goat was detected in Bağsaray 1 and 1 suspectable goat was detected in Ovacık 2 (Table 1 and Table 2).

When the non-aborted goats were examined in terms of the presence of SBV specific antibodies; 1 positive goat was detected in Bağsaray 1 and 1 suspectable goat was detected in Kuzköy 2 (Table 1 and Table 2).

In correlation findings, no correlation was found between abortion and SBV (r=1.00; p=1.00) (Table 3).

Table 1. Distribution of Schmallenberg Virus' in aborted goats by herds

Aborted goats		Schmallenberg Virus			
Village		Negative	Suspectable	Pozitive	Total
Kuzköy 1	Count	5	0	0	5
	%	5,4 %	0,0 %	0,0 %	5,4 %
Kuzköy 2	Count	10	0	0	10
	%	10,8 %	0,0 %	0,0 %	10,8 %
Kuzköy 3	Count	10	0	0	10
	%	10,8 %	0,0 %	0,0 %	10,8 %
Ovacık 1	Count	10	0	0	10
	%	10,8 %	0,0 %	0,0 %	10,8 %
Ovacık 2	Count	9	1	0	10
	%	9,7 %	1,1 %	0,0 %	10,8%
Çeltikçi 1	Count	5	0	0	5
	%	5,4 %	0,0 %	0,0 %	5,4 %
Çeltikçi 2	Count	9	0	0	9
	%	9,7 %	0,0 %	0,0 %	9,7 %
Bağsaray 1	Count	4	0	1	5
	%	4,3 %	0,0 %	1,1 %	5,4 %
Bağsaray 2	Count	7	0	0	7
	%	7,5 %	0,0 %	0,0 %	7,5 %
Bağsaray 3	Count	7	0	0	7
	%	7,5 %	0,0 %	0,0 %	7,5 %
Bağsaray 4	Count	7	0	0	7
	%	7,5 %	0,0 %	0,0 %	7,5 %
Bağsaray 5	Count	8	0	0	8
	%	8,6 %	0,0 %	0,0 %	8,6 %
Total	Count	91	1	1	93
	%	97,8 %	1,1 %	1,1 %	100,0 %

Table 2. Distribution of Schmallenberg Virus' in non-aborted goats by herds

Non-aborted goats		Schmallenberg Virus			
Village		Negative	Suspectable	Pozitive	Total
Kuzköy 1	Count	5	0	0	5
	%	5,4 %	0,0 %	0,0 %	5,4 %
Kuzköy 2	Count	9	1	0	10
	%	9,7 %	1,1 %	0,0 %	10,8 %
Kuzköy 3	Count	10	0	0	10
	%	10,8 %	0,0 %	0,0 %	10,8 %
Ovacık 1	Count	10	0	0	10
	%	10,8 %	0,0 %	0,0 %	10,8 %
Ovacık 2	Count	10	0	0	10
	%	10,8 %	0,0 %	0,0 %	10,8 %
Çeltikçi 1	Count	5	0	0	5
	%	5,4 %	0,0 %	0,0 %	5,4 %
Çeltikçi 2	Count	9	0	0	9
	%	9,7 %	0,0 %	0,0 %	9,7 %
Bağsaray 1	Count	4	0	1	5
	%	4,3 %	0,0 %	1,1 %	5,4 %
Bağsaray 2	Count	7	0	0	7
	%	7,5 %	0,0 %	0,0 %	7,5 %
Bağsaray 3	Count	7	0	0	7
	%	7,5 %	0,0 %	0,0 %	7,5 %
Bağsaray 4	Count	7	0	0	7
	%	7,5 %	0,0 %	0,0 %	7,5 %
Bağsaray 5	Count	8	0	0	8
	%	8,6 %	0,0 %	0,0 %	8,6 %
Total	Count	91	1	1	93
	%	97,8 %	1,1 %	1,1 %	100,0 %

Table 3. Correlation findings between Schmallenberg Virus and abortion

Spearman's rho		Schmallenberg Virus	Abortion
Schmallenberg Virus	**Correlation Coefficient**	1	,000
	Sig. (2-tailed)		1,000
	N	186	186
Abortion	**Correlation Coefficient**	,000	1
	Sig. (2-tailed)	1,000	
	N	186	186

DISCUSSION

SBV was first reported in cattle, in north-western Germany and east of the Netherlands in November 2011(Azkur et al. 2020, Szeredi et al. 2020). Within two years of being first reported, SBV spread rapidly across the European Continent and more than 8,000 outbreaks were seen in 22 European countries (Jiménez-Martín et al. 2021). Later, SBV spread to Turkey, Russia, Azerbaijan, Iran, Lebanon and China, and then to African countries including Mozambique, Namibia and Ethiopia (Kauffold et al. 2021)

A few number of seroprevalence studies have been published since the SBV infection was detected in Turkey. (Azkur et al. 2013, Yilmaz et al. 2014, Tonbak et al. 2016, Macun et al. 2017, Elmas et al. 2018, Azkur et al. 2020). The most comprehensive study in our country was carried out by Azkur et al. (2013). According to this study, they reported that the SBV seroprevalence in Turkey was 39.8 % in cattle, 1.6 % in sheep, 2.8 % in goats and 1.5 % in buffaloes. In addition, Azkur et al. (2013) also determined the prevalence of SBV in goats by province. They reported that the prevalence of SBV by provinces was 7.1 % in Sinop and 2.1 % in Samsun.. Macun et al. (2017) reported that SBV seroprevalence was 0.38 % in sheep in Kırıkkale province. Elmas et al. (2018) reported that SBV seroprevalence was 0.27 % in Akkaraman sheep in Sivas province. In parallel with this information, in our study, the prevalence of SBV in Honamlı goats in Burdur province was determined as 1.1 % (Table 1 and Table 2).

Schmallenberg virus is transmitted by blood-sucking flies (especially Culicoides spp), which is found in large numbers near rivers, waterfalls and lakes. It is also reported that the flight activities of Culicoides can be affected by many factors such as light, temperature, wind and humidity (Pawaiya and Gupta 2013, Macun et al. 2013, Lievaart-Peterson et al. 2015). Elmas et al. (2018) associated the low prevalence of SBV in Akkaraman sheep in Sivas province with the harsh continental climate of Sivas province. Because the density of blood-sucking stinging flies, Culicoides species that transmits the infection, decreases in harsh climates. Our study also strengthened the opinion that the SBV prevalence may have been low due to the grazing of goats on mountains far from the water's edge. This is supported by the high prevalence of SBV in goats in Sinop and Samsun provinces climate (Azkur et al. 2013), which are rainier and more humidity Black Sea climate.

Antibodies are formed approximately 12 to 14 days following SBV infection. The presence of the specific antibody in the serum of naturally infected adult cattle with SBV continues for at least 2 years (Conraths et al. 2013, Elbers et al. 2014, Elmas et al. 2018). However, there is any literature on the persistence of antibodies formed in natural infection with SBV in goats. In addition, Elmas et al. (2018) reported that the low SBV positive seroprevalence and the presence of three suspected seropositive samples may be due to the decrease in the titer of existing antibodies over time. In our study, the low SBV positive seroprevalence in goats and the detection of 1.1 % of goats as suspectable for SBV specific antibodies may be related to the decrease in the titer of the existing antibodies (Table 1 and Table 2).

Small ruminants show maximum sensitivity to SBV between 28-50 days of pregnancy. Abortions, stillbirths and congenital malformations are seen in infected animals during this period of pregnancy. Adult animals naturally infected with SBV have effective immunity when they subsequently recover from the infection. The level of neutralizing antibodies after immunization is effective to prevent transmission of SBV to other susceptible animals (Jiménez-Martín et al. 2021). Macun et al. (2017) reported that widespread abortion in sheep is not due to SBV. In our study, 1 goat with abortion and 1 goat without abortion were determined as SBV seropositive, and 1 goat with abortion and 1 goat without abortion were determined as suspicious in terms of SBV specific antibodies. Furtermore, statistically, there was no relationship between abortion and SBV (r=1.00; p=1.00) (Table 1, Table 2 and Table 3). These findings showed that common abortion in goats was not related to SBV.

CONCLUSIONS

Consequently, it was determined that SBV infection has a low seroprevalence rate in Honamlı goats in

Burdur province. In addition, future large-scale epidemiological studies in terms of SBV, and investigation of the presence/distribution of vectors that play a role in the transmission of infection will be beneficial for the prevention of SBV infection.

Conflict of interest: The authors declared that there is no conflict of interest.

Ethical Approval: This study has received permission with, Mehmet Akif Ersoy University HADYEK number 88/751 and 14.04.2021 date. In addition, the authors declared that they comply with the Research and Publication Ethics.

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