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SERO-ENTOMOLOGY APPROACH OF BLUETONGUE VIRUS (BTV) INFECTION IN SHEEP IN SOME PROVINCES OF NORTH-WEST ALGERIA

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ABSTRACT

This study aimed to estimate the sero-prevalence and associated with *Culicoides* trapping in study area in sheep and cattle bluetongue virus sero-positive from seven provinces in North Western Algeria, seven provinces were selected. A total of 255 sheep were used. Three times blood collection in season of autumn were randomly collected for detection of bluetongue virus group specific antibodies through competitive ELISA (c-ELISA) for assessment of situation epidemiological by prevalence and presence of *Culicoides* trapping in sites was revealed seropositive.

The prevalence of bluetongue virus in sheep was found higher (35,76%) than cattle (16,91), specie new were significantly associated with the occurrence of disease.

Keywords: Bluetongue virus; sheep; sero-entomology; North-West Algeria.

INTRODUCTION

Bluetongue (BT), caused by Bluetongue virus (BTV), is a vector-borne disease of small and large ruminants. Numerous species of *Culicoides* biting midges serve as a vector for transmission of virus from one susceptible host to another [1]. The susceptibility of animal, strain type, and environment are deciduous factors for severity of infection giving rise to 70% mortality in small ruminants [2] having clinical signs of fever, depression, salivation, dyspnea, and cyanosis of tongue. The highly susceptible animals like sheep depict additionally hyperemic muzzle, ears and lips [3,4].

The disease has resulted in huge economic losses in terms of death of greater than 1 million sheep in Europe until 1998. The losses other than death of animal may arise in the form of abortions, decrease body weight, poor milk production and decreased reproductive performance [5]. Other than aforementioned characteristic conditions of BTV are; infected animals and vector spread to other regions that usually call for ban on trade.

Algeria, by virtue of its size, geographical location and its frontiers with neighbouring countries of Grand Maghreb that makes it vulnerable to many diseases cross-border including blue tongue

which is widespread last decades and heightened by the factor global warming which contributed to its spread. Currently, an expansion of *C. imicola* and invasion other species suitable to spread the disease this fact that the bluetongue persist in Algeria, a species other than *C. imicola* regions when Cases of bluetongue have been identified. In Algeria 47 species of *Culicoides* has been identified those species could be caused occurred the disease [6].

For the purpose of detection for a possible circulation of virus of BT in some provinces in north-west of Algeria when a high outbreak of *Culicoides* has been discovered. We have undertaken a study epidemiological (sero-entomology) which the purpose is to know the health status against BT and estimate of the rate of prevalence in the provinces targeted in this study (study transversal), its consist to Blood samples were collected from sheep and cattle in each of the herds during a vector season of autumn, Blood samples were tested for antibody to BTV using a commercial competitive enzyme-linked immunoassay (c-ELISA). Competitive enzyme linked immunosorbent assay (c-ELISA) are highly recommended by OIE manual of diagnostic tests and vaccines [7] where, c-ELISA is mentioned as a rapid method that can detect antibody in serum samples as early as 6th day post infection [8].

Knowing neither campaign of vaccination against BT is not implementing in Algeria, at present fewer studies have been conducted with exploitation of the entomological data that it allows us to make a comparison between sero-prevalence and presence of certain vectors *Culicoides* can be detect species new can participate in the transmission of BT.

MATERIALS AND METHODS

The study focused in north-west Algeria in large region characterized by varied landscape compound 7 provinces (Mostaganem, Oran, Mascara, Rélizane, Chlef, Tiaret et Tissemsilt). For the estimation of BTV sero-prevalence, and their relation by a detect species new can participate in the transmission of BT. Random sampling was performed three times of blood collection per animal during autumn (from September to November) for three years 2017, 2018 and 2019 respectively. Samples were transported to the regional veterinary laboratory of Mostaganem using ice boxes. Serum was obtained through centrifugation at 1000 *g* for 5 min further stored at -20ºC till analysis for diagnosis crossing viral of BTV.

The collected sera were analysed individually through competitive-ELISA (cELISA) for detection of serogroup-specific antibodies (IgG) against the VP7 protein of bluetongue virus as per manufacturer's instruction (ID.vet Screen Bluetongue Competition, France).

The assay is based on competition between antibodies in test sera and anti-VP7-conjugated antibodies for binding to plates coated with VP7-antigen. The optical density (OD) values were recorded at 450 nm using an iMark TM Microplate Absorbance Reader (Multiskan). For each sample, signal-to-noise ratio (S/N %=ODSample/ODNC9100) greater than or equal to 40% was considered negative, while less than 40% was considered positive for any of the serotypes of BTV. From 2012 to 2019, between April and November, 236 representative sites were selected in study area farms so affected by BTV outbreaks or at risk as part of the BT surveillance programme.

The analysis was restricted to the abundance and distribution of *Culicoides* during this period corresponds with outbreaks of *Culicoides*-borne disease and the peak of abundance of different *Culicoides* species [9]. One-night catches per site using UV-light traps [10] were performed following the plan of the dates of trapping sites about 6 provinces (Mostaganem, Mascara, Rélizane, Chlef, Tiaret and Tissemsilt). Traps were located outdoors, within 25 m of livestock premises and suspended from the walls of buildings 1.5 to 2 m above ground level. Traps were set 1 h before sunset and collection was made at about 8 am the next morning. The insects were transported to the laboratory in a water-filled beaker and then covered and preserved in 90% ethanol. *Ceratopogonidae* were first separated from all other insects. *Culicoides* were identified based on wing patterns, and subsequently confirmed by mounting specimens on microscope slides [10].

RESULTS

The study found was not BTV positive cases of 92 sheep analysed for the first place in 2017 as a whole province, however on 272 serums cattle analysed in study area, 46 have revealed the presence antibodies, so sero-prevalence was found 16,91% BTV positive cases as a whole province in 2018.

The highest prevalence of BTV was recorded in province Oran followed by Mostaganem, Relizane, Mascara, Tiaret, Chlef. Whereas, the same thing for sites of sheep BTV positive, *Culicoides* imicola was present at all the sites, exeption sites of provinces of Relizane and Mostaganem, however will be other *Culicoides* species being present; *C. newstidie C. circumpscriptus C. kingui-C. puncticolis, C. longepennis, C. sahariensis C. pulicaris, C. pictepennis, C. obsoletus* was found in seven sites recorded BTV positive of province of Tiaret, concerning the provinces of Tissemsilt, Chlef, Relizane, Mostaganem, Mascara presenting *C. newstidie, C.circumpscriptus* in three sites, *C. newstidie* in one sites, *C. newstidie, C. circumpscriptus, C. kingui, C. obsoletus, C. pictepennis* in tow sites, *C.newstidie* in tow sites, *C. newstidie, C. kingui, C. circumpscriptus, C. obsoletus, C. puncticolis, C. pulicaris* in five sites respectively.

Table 1. Prevalence of blue tongue virus in sheep

Area	Tested	Positive	Prevalence (%)	p-value
Tiaret	42	19	45,23	
Tissemsilt	31	07	22,58	
Chlef	09	01	11,11	0,027972
Relizane	13	04	30,76	
Mostaganem	11	03	27,27	
Oran	09	02	22,22	
Mascara	48	06	12,5	
Total	**163**	**42**	**35,76**	

Table 2. *Culicoides* trapping in sites in BTV sero-positive sheep

Province	Sites of sheep BTV sero positive	*C. imicola*	Other culicoides species
Tiaret	07	242	*C. newstidie-C. circumpscriptus-C. kingui-C. puncticolis-C.longepennis-C. sahariensis- C. pulicaris- C. pictepennis- C. obsoletus*
Tissemsilt	03	6	*C. newstidie-C. circumpscriptus*
Chlef	1	168	*C. newstidie*
Relizane	02	/	*C. newstidie- C. circumpscriptus-C. kingui- C. obsoletus- C. pictepennis*
Mostaganem	02	/	*C. newstidie*
Mascara	05	4	*C. newstidie-C. kingui- C. circumpscriptus-C. obsoletus-C. puncticolis- C. pulicaris*

DISCUSSION

For years the incursion of BTV, require the survey for seeing an idea on the situation epidemiological, we are opted to do a screening serological for serum sheep autumn; We used cELISA that is highly sensitive, specific and has previously been validated by OIE [7] cELISA provides rapid, accurate and precise assessment of exposure to BTV [11].

However, vaccination for BT is not being practiced in Algeria, the results presented in this study clearly indicate the presence of either current BTV infection or natural exposure in the past. The serological marker (VP7) is considered serogroup-specific for all BTV serotypes, as it involves a competition between test serum and monoclonal antibodies, potential serogroup level cross-reactivity by other arboviruses is excluded [11,12].

In the first instance for 92 sheep aged more than two years shared on seven sites in study area were sampled for *Culicoides*, knowing full well that it's more susceptible to BTV, has been revealed negative, which reflecting to no clinical declaration by veterinarians of sites study, during last spring and summer of year 2017.

In the studied area a prevalence of 16,91% was recorded. BTV occurrence is considered to be subclinical in cattle [13], however it could serve as a source of infection through virus transmission to and from vectors to susceptible animals [14].

Duration of viremia is particularly important, with regard to the cattle; among the hypothesis advanced for explain that persistence of the virus in cattle, the most likely be based on the fact that of BTV is being adsorbed on the erythrocytes which protect it from antibodies and disappeared all the way of 130-150 days [15].

Additional serological survey, when positive cattle were detected during period of vectors activity, is factor of pronounced prevalence includes ability of biting midges to actively fly (maximum of 2 Km), and being smaller in size (1-3 mm) makes winds to take them passively up to 700 km [16]. A fuller examination of the relative role of different vectors would require data on

species abundance, collected regularly before, during and after outbreak periods across the entire region. Currently, such data have been routinely collected.

It is suggested here that, during 2000 and 2006 out-breaks, BTV transmission was carried out primarily by *C. imicola*. We observed a low activity (and sometimes absence of the *Culicoides* imicola) in some provinces whereas cases of bluetongue occurred in these regions, Other species of *Culicoides* are potential vectors of the transmission of the bluetongue virus [6].

In the province of Relizane *C. newstidie, C. circumpscriptus, C. pictepennis* and *C. obsoletus* have been suspected to be less susceptible for BTV seropositive sheep In the provinces of Relizane and Mostaganem, *Culicoides imicola* was not found in currently survey, BTV transmission was carried primarily by *C. newstidie, C. circumpscriptus, C.kingui, C. obsoletus, C. pictepennis* and only by *C. newstidie* and sero-prevalence was 30,76% and 27,27% respectively.

As well as determining the relationship between particular vectors and the probability of virus transmission, it is important, therefore except tow provinces Tiaret and Chlef when *C. imicola* was frequently detected, in this study, other provinces were detected positive to *C. newstidie, C. circumpscriptus, C. kingui, C. obsoletus, C. puncticolis, C. pulicaris*.

CONCLUSION

The current study found the presence of BTV infection in cattle and sheep of the study area, and detect species new can participate in the transmission of BTV, but rest to confirm by other profound study. There is a need for further extensive exploration of the disease in other parts of the country.

ETHICAL APPROVAL

Animal Ethic committee approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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