

## ABSTRACT

*Ixodes ricinus* and *Dermacentor reticulatus* both belong to ectoparasites with the most important veterinary and medical significance in Europe and Asia. It is directly due to their ability to transmit a lot of pathogens such as protozoa, bacteria or viruses and vast adaptation abilities to new or changing environmental conditions.

The aim of the work was to estimate the quantity and demographic structure of *I. ricinus* and *D. reticulatus* tick population in the Protected Landscape area of the Bug and Nurzec Valley in the commune of Ciechanowiec.

Another aim was to estimate seasonal activity of *D. reticulatus* and *I. ricinus* and to describe their habitat preferences and influence of biotic and abiotic factors on the occurrence of investigated species of ticks. The final and important from a medical point of view aim of the research was to determine the main infectious agents transmitted via ticks in the area of the Protected Landscape area of the Bug and Nurzec Valley.

The survey was divided into two parts: terrain and laboratory. The terrain part was carried out between 2016-2018. It consisted of catching ticks in their natural environment, estimating quantitative composition and demographic structure of these parasites.

Ticks were collected by flagging method for one hour in the afternoon. The temperature and air humidity were taken during the collection. The survey was conducted in several connected but environmentally different areas between which transect along which ticks were collected were designated.

The collected ticks were accordingly marked and transported to a laboratory where they were subjected to morphological analysis and further research. The laboratory part in its initial phase consisted of preparing DNA isolate samples for further molecular analysis. Then in the proper phase of the study, using PCR technique, types of pathogens which ticks are able to transmit in the researched area were detected. The research was conducted testing the ticks for presence of pathogens such as: *B. burgdorferi* s.l., *Babesia* spp., *A. phagocytophilum*, *Rickettsia* spp., *Bartonella* spp. i *Coxiella burnetii*.

Ticks ecology research analysis proved predomination of *D. reticulatus* occurrence whose participation in the research area is 64,86%. The meadow tick occurred more often in

the largest number (201/811) of specimens in the zone between sunlit part of the meadow and the forest. *I. ricinus* predominant in rich flora composition ecotone between darkened part of the forest and the meadow. In three years of research 115 ticks were collected from this area.

Analyzing the research results it was determined that through the main part of the year female *D. reticulatus* and *I. ricinus* were predominant. The ratio of meadow tick females was 54.56% and castor bean tick – 54.04%. Moreover, essential differences in annual activity of tested parasites were demonstrated. *D. reticulatus* showed two distinct periods of activity, the first one in the spring with the peak in April and the other one in the autumn with the peak at the turn of September and October. On the other hand, *I. ricinus* had one distinct spring period of activity with the peak in May. The other peak was minor. *I. ricinus* ticks appear in the autumn in negligible vast minority.

According to the statistical analysis all the examined factors such as temperature, humidity and the length of day had an influence on ticks occurrence. The research species differed as far as climatic preferences go. *D. reticulatus* was found more often in lower temperature and more humid (71-72%). It was most often collected on short and medium length days. *I. ricinus* was collected in higher temperatures (21°C) and lower humidity (67-68%) than *D. reticulatus*. Common tick were collected more often on long days (on average from 910 to 920 minutes).

It was typical of *D. reticulatus* to occurs in wider range of climatic conditions. The temperature and humidity range in which it was found was respectively from 4°C to 33°C and from 20% to 100%. *D. reticulatus* was collected during days lasting between 8h 54'-16h 52'. It was typical of *I. ricinus* occurs in narrower range of climatic conditions. The temperature and humidity range in which it was found was respectively from 11°C to 33.6°C and from 29.5% to 99%. *I. ricinus* was collected during days lasting between 10h 16'- 16h 52'. A correlation between occurrence of nymphs and the length of the day was proven, however they was known such correlation in the case of adults.

*D. reticulatus* and *I. ricinus* are species with significant importance in transmission of pathogens. The research demonstrated that 24.91% of all collected ticks were infected with one or several pathogenic agents. The most often detected pathogen was *B. burgdorferi* sl in the castor bean tick and in the case of the meadow tick it was *Babesia* spp.. Three coinfections were also detected. However, *Rickettsia* spp. *Bartonella* spp. i *Coxiella burnetii* were not present.

Infected *D. reticulatus* ticks accounted for 18.82%, while 17.11% of which were infected with a single pathogen and 1.71% were coinfections. In case of *I. ricinus* the share of single pathogen infected ticks was 35.44%, whereas coinfections were 0.7%.

More accurate molecular research showed the presence a lot of genospecies belonging to *B. burgdorferi* sl and 3 genospecies belonging to *Babesia* spp.. *B. burgdorferi* sl spirochetes were found more often in *I. ricinus* whereas *Babesia* spp. protozoa were found more often in *D. reticulatus*. *B. afzelii*, *B. garinii* and *B. burgdorferi* ss were the most often appearing genospecies in the case of *B. burgdorferi* sl. In the case of common ticks their present was 17.54%, 5.26%, 5.61% respectively and was higher than in the case of *D. reticulatus* where the participation was 4.56%, 0.95%, 0.38% respectively. *Babesia canis*, whose presence was most often found in *D. reticulatus*, was the most frequently appearing genospecies belonging to *Babesia* spp. 11.03 % of *D. reticulatus* and 1.40% of *I. ricinus* were infected with *B. canis*. The research also showed the presence of coinfection within the genospecies: *B. afzelii* and *B. canis*, *B. afzelii* and *B. venatorum*, *B. garinii* and *B. canis*, *B. yangtzensis* and *A. phagocytophilum*, *A. phagocytophilum* and *B. canis*.

The biological and laboratory studies conducted in this dissertations proved the necessity of further deepening of knowledge on biology of ticks and their relevance to health of people and animals. The research shows the complexity of all the processes and networking on the line: pathogen, tick, environment and host both on molecular as well as ecosystem levels.