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Spatial analysis of bulk tank milk somatic cell counts from dairy herds located in Brazil Southeast Region, 2011

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Abstract: Somatic cell counts reflect mastitis incidence and lesser milk quality which are responsible for many economic losses in all segments of milk production. The aim of the study was to evaluate the spatial distribution of bulk tank somatic cell count from dairy herds located in the southeastern region of Brazil. The geographic coordinates and the average annual of somatic cell count from 860 dairy herds were used for the study. The spatial dependence was evaluated by semivariogram. The kriging method for interpolation data was applied to not sampled areas according to positive semivariogram. The bulk tank somatic cell count showed moderate spatial dependence at the analysed region. This study open access to a geographical map the distribution of mastitis incidence through the identification of areas with medium and high somatic cell counts providing a helpful tool to define strategies for prevention and control of mastitis in dairy cows.

Keywords: spatial analysis, bulk tank somatic cell counts, kriging

Análise espacial da contagem de células somáticas de rebanhos localizados na Região Sudeste do Brasil, 2011

Resumo: A contagem de células somáticas no leite é um reflexo da incidência de mastite e diminuição da qualidade do leite que são responsáveis por grandes perdas econômicas em todos os segmentos da produção leiteira. O objetivo do estudo foi avaliar a distribuição espacial da contagem de células somáticas de rebanhos bovinos leiteiros localizados na Região Sudeste do Brasil. As coordenadas geográficas e a média anual da contagem de células somáticas de 860 rebanhos foram usadas para a realização do estudo. A dependência espacial foi avaliada por meio de semivariograma. O método de Krigagem para interpolação de dados foi aplicado em áreas não amostradas de acordo com o semivariograma positivo. A contagem de células somáticas do rebanho apresentou dependência espacial moderada na região analisada. Esse estudo abre a possibilidade acesso à mapas geográficos que refletem a distribuição da mastite através da identificação de áreas com média e alta contagem de células somáticas constituindo uma ferramenta importante para definir estratégias para controle e prevenção da mastite em vacas leiteiras.

Keywords: análise espacial, contagem de célula somática do rebanho, krigagem

Introduction

Regional differences such as climatic and landscape conditions, agricultural activities, local health animal policy and cow racial heterogeneity have a great influence on mastitis spread and control

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(Gay et al., 2007). The tools available to explore spatial patterns of diseases and cluster detection are of interest for dairy plant and government policies. For mastitis cases the intervention should be based on economic features at region, herd and animal levels (Halasa et al., 2007). Spatial analysis of udder health, which is reflected by somatic cell counts, provide useful information for making decision at region level (Ely et al., 2003). The aim of study was to identify areas with high bulk tank somatic cell counts (BTSCC) from dairy herds located at Brazil southeast region of generating a map of geographical distribution of this disease. The results will be helpful for strategic intervention and control of mastitis at Brazil southeast region.

Material and Methods

The work was developed with information of geographical coordinates and annual geometric mean of BTSCC from 860 dairy herds located at Brazil southeast region . The area considered for this study was 3,633 km^2 located at Brazil´s Southeast Region. The spatial dependence for BTSCC was evaluated using semivariogram. In case of spatial dependence, the values of BTSCC at non-sampled locations were estimated with minimum bias and variance by Kriging method for interpolation data. The exponential model was used to adjust the semivariogram. The determination coefficient (R^2) and spatial dependence degree (SDD) were calculated in function of exponential model parameters.

Result and Discussion

The results demonstrated a moderate spatial dependence (SDD=28.9 and R^2=0.308) at the evaluated area. The geographical distribution showed areas with low (less than 250,000 cells/mL), medium (between 250,000 and 400,000 cells/mL) and high (more than 400,000 cells/mL) BTSCC at the evaluated region. The spatial analysis identified six areas with medium and high BTSCC (Figure 1). It is important to mention that areas located at south and southwest had greater number of herds per square kilometer in relation the areas located at central and northeast of evaluated region (Figure 1). Taken together these results suggest that mastitis may be more prevalent at central and northeast of Espirito Santo state pointing for an intervention priority in local health animal policy besides of lesser number of herds per square kilometer. The microbiological diagnosis of mastitis in aleatory animals of the herd analyzed might be helpful to establish efficient methods to control the disease and prevent economic losses. The geographical distribution of dairy cattle is also an important information for epidemiological control of another infection diseases at Brazil southest region since high animal density may be a dangerous for infection propagation among bovine herd. The geographical distribution of dairy cows at national territory and interpolation of other important data such as milk quality, economic losses and other disease prevalence might constituted an essential tool for a more efficient intervention in public and animal health policies.

Conclusion

The map of BTSCC might be useful for a decision-making police at regional level for mastitis control by government and private dairy sector located at Espirito Santo state.
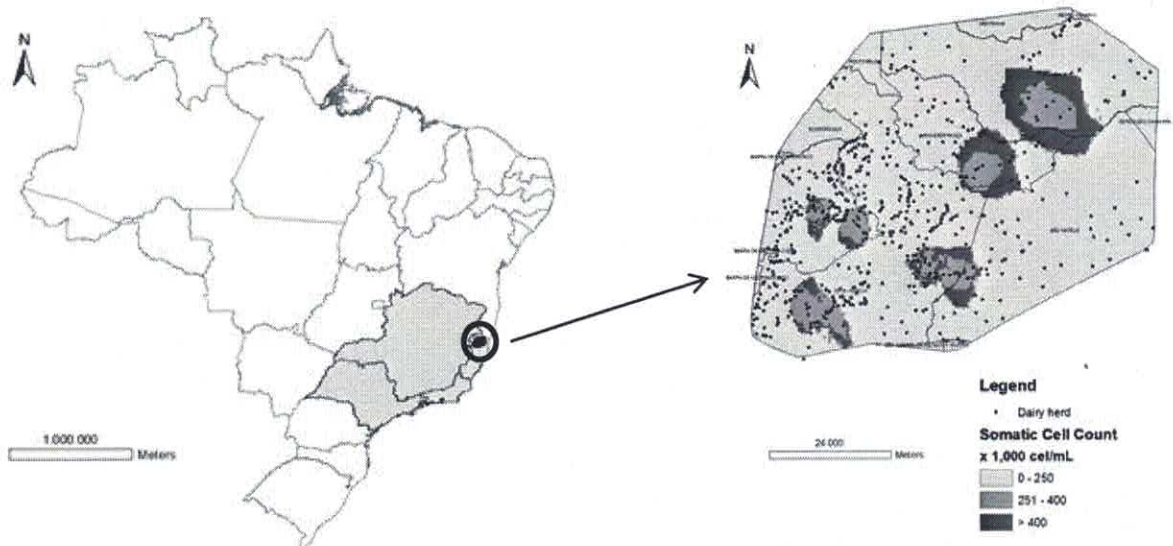
Figure 1 – Map of Brazil and its Southeast Region (left map, gray scale). Circumscribed region indentify the dairy herd location at Espirito Santo state used for milk sample collection and somatic cell counts. The cluster of medium and high bulk tank somatic cell counts in evaluated region is represented on theright map according to the legend.

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