Beta regression model zero-inflated to measure the incidence of disease in tomato plants

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In experiments in fields such as Agronomy and Biology, especially in the area of phytopathology, the incidence of disease in some crops is usually studied with repeated measurements presenting correlations between observations. Furthermore, this incidence is in the interval [0, 1) and often with too many zeros. In this work, a Beta regression model with random effects is fitted for an experimental design in blocks that was carried out in the municipality of Fomeque (Cundinamarca department, Colombia). This model is carried out to see the association between the incidence of botrytis in tomato plants using the independent variables: two fertilization plans of 6 and 8 kg per plant or treatments, in two locations Susa and Tablón, two axes of the plant and several flowering floors.

The model used includes two parts: a logistic regression component to model the presence and absence of the disease in plants, and a Beta regression component to model non-zero incidences. Each component includes a random effect to account for correlations among measurements made on the same plant. From the statistical analysis made with the model, no differences appeared between the fertility treatments, there are differences between the main and secondary axes for the variable incidence of botrytis cinerea in tomato flowers. Furthermore, it was found that axis two has a lower risk of presenting the disease and significant differences found between flowering floors. There are an increase in incidence over time between 84 and 140 days after transplantation with maximum between the floors 6 to 8.

Keywords: longitudinal Beta regression, zero inflated, incidence, random effect.