

Evaluation of management plans for almond leaf scorch disease in Alicante

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The plant pathogenic bacterium *Xylella fastidiosa* is a priority quarantine pathogen in the EU (Commission Implementing Regulation (EU) 2019/2072). In Alicante, Spain, the presence of *X. fastidiosa* was first reported in 2017, as the cause of almond leaf scorch disease (ALSD). Based on the legislation that establishes specific measures against this quarantine pathogen (Commission Implementing Regulation (EU) 2020/1201), under an outbreak situation a buffer zone around the infested zone is delimited, where intensive surveillance and control measures have to be implemented. From an individual-based epidemiological model, the ALS D spread in the affected area of Alicante was simulated, and different survey designs and control measures were implemented to compare their effectiveness on the outbreak management. In the disease spread model, the infection of susceptible individuals depends on the transmission rate of infected individuals and the spatial dependence between them through the Matérn correlation function. The survey design was based on the European Food Safety Authority (EFSA) guidelines for statistically sound and risk-based surveys of *X. fastidiosa*, where the survey effort, i.e. sample size, was estimated based on the hypergeometric distribution. One-step and two-step approaches to survey design were compared with different confidence levels for both approaches, including those set by the legislation. Different sizes of buffer zone and eradication radius were also evaluated, with a buffer zone of 2.5 and 5 km, and an eradication radius of 50 and 100 m, where the smaller of each is the minimum set by current legislation. In addition, the effect of vector control, including treatments and inoculum reduction, was considered. They were implemented assuming reductions of the transmission rate by 50% and 90% in the buffer zone, and were compared with the baseline scenario of no reduction. It was found that regardless of the survey design, size of the buffer zone and eradication radius, the reduction of the transmission rate had a strong effect in decreasing substantially the number of infected almond trees. Even when the eradication measures were applied, without this reduction of the transmission rate the resulting number of infected trees was similar to those obtained without any intervention. No major differences were observed with the combinations of buffer zone size and eradication radius. Regarding the different survey designs, a higher confidence level resulted in larger survey efforts and a higher efficiency in reducing the number of infected almond trees. Nevertheless, the survey effort had to be very high to remove all infected trees. Although the two-step approach resulted in a higher survey effort compared to the one-step approach with a similar number of hectares inspected, there were no major differences in the results related to the disease spread management.

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