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## Classifying health issues in *Eucalyptus* miniclinal gardens in Uruguay

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Clonal propagation is extensively used in the *Eucalyptus* pulp industry in Uruguay. Mother plants are maintained in clonal minigardens and they constitute the source of cuttings that are harvested continuously and sent to shaded greenhouses for rooting. Environmental conditions within the minigarden are optimized for plant growth, but such conditions can also promote the emergence of pests and diseases which can affect the mother plants and impair cutting production. However, comprehensive studies on health status within minigardens are scarce in the country. We carried out a seasonal survey on three clonal minigardens along the country to check for epidemiological patterns connected to the time of the year, the conditions within the clonal garden and the genetic material in propagation. We visited each minigarden at least once per season during 2019 and the beginning of 2020. During each visit, we inspected all the mother plants along three transects (two on the edges and one in the centre of the minigarden). We counted the number of plants with symptoms of disease and of insect attacks, and collected samples of affected plants for further identification in the laboratory, if necessary. We looked for a way to classify nurseries and species all together, according to the incidence of the different health issues surveyed. Thus, the dataset obtained from the surveys was assessed under different classification algorithms based on machine learning: neural networks, discriminant analysis models, classification regression tree, support vector machine, and random forest. We observed attack by arthropods such as mites, whiteflies, scales and aphids and caterpillars. We also recorded powdery mildew and disease symptoms such as dead plants and dry shoots. The different materials assessed during the survey belonged to *E. grandis*, *E. dunnii*, and *E. grandis* × *E. globulus* hybrids. The most common symptoms observed in all the minigardens and throughout the entire survey period were powdery mildew and damage from mites. The support vector machine model performed best, being able to classify the dataset with an accuracy of 76%. We discuss the relevance of these findings within the context of miniclinal garden health management.

**Keywords:** forest entomology, forest pathology, machine learning, clonal forestry

