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S11.042 Light Reduction as Environmental Sustainable Thinning Agent in Apple: A Modelistic Approach

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The environmental sustainability of fruit production is an important issue to deal with. Findings from previous studies showed that a strong but temporary light reduction could be used as a thinning method to induce fruit drop without chemical thinners. Following the hypothesis that C-starvation may induce fruit abscission, shade is a possible way to thin apple trees. However, a method is needed to determine the length of shade because the strong reduction of incoming light for a very long time causes all the fruit to drop. Thirty days after full bloom (DAFB), six ‘Imperial Gala’ apple (Malus x domestica Borkh.) trees were covered with a 90% shading net. Trees were uncovered in different days, leading to six different shading durations (10, 7, 6, 5, 4, 3 days). During the experiment tree gas exchanges were continuously monitored using a whole canopy enclosure method and the daily carbon gain per tree was determined. The “Malusim” dry matter production and partitioning model developed by Prof. Alan Lakso using Stella modelling software was applied in order to simulate the six trees daily carbon balance. Apple trees carbon gain and fruit drop were affected by shading duration. During the 10 days of whole canopy gas exchange trial the total net carbon uptake ranged from -50 to 500 g per tree corresponding to a percentage fruit drop of 90 and 60, respectively. A goodness-of-fit analysis between observed and predicted daily carbon balance yielded a range of values between 0.76 and 0.95. Nevertheless, in some cases a consistent overestimation of daily carbon balance was observed. This variability and lack of accuracy can probably be ascribed to the fact that several of the model parameters have not been optimised yet for the environmental conditions of Bologna, as well as some of the tree responses to these conditions.