



Magdalena Peterlin and Christian Andergassen

Research center Laimburg, South Tyrol, Italy
Christian.Andergassen@laimburg.it

EUFRIN meeting in the Czech Republic

News on the topic of thinning

As every year, the EUFRIN (European Fruit Research Institutes Network) fruit thinning working group met with scientists from all over Europe and beyond at the end of February. This year's event was hosted by the Holovousy Experimental and Breeding Centre in the Czech Republic. For three days, experiences were exchanged, discussed and debated.

The meeting was opened on 29 February 2024 by the chairman of the working group, Guglielmo Costa from the University of Bologna (Italy), and the participants were welcomed by host Luděk Laňar from the Holovousy Experimental and Breeding Centre.

Hierarchy in the fruit cluster

Guglielmo Costa kicked off the lecture series with his presentation on chemical thinning in connection with the hierarchy of fruits within a fruit cluster. The hierarchy within a fruit cluster is determined by the size of the king fruit and that of the laterals. It can influence the fruit drop of the laterals and thus also the thinning effect. If the fruits of a cluster differ greatly from one another, it is more likely that the smaller ones will fall off. In contrast, fruits are more likely to remain on the tree if they are the same size within a cluster. In his experiment, the thinning effect of Brevis and 6-BA was measured on Golden Delicious and Fuji fruit clusters with a barely pronounced hierarchy. Compared to the untreated control, the variants with 6-BA and Brevis achieved a high fruit drop. The more pronounced the hierarchy, the better the thinning effect. In the untreated control, three to four fruits remained per cluster, while in the variants with Brevis and 6-BA all but one or two fruits fell off.

Use hierarchy for fruit fall prediction?

Can the hierarchy within a fruit cluster be used for fruit drop prediction? This is the question posed by Alessandro Botton, Professor at the University of Padua (Italy). In 2019, Botton's hierarchy model was developed and a hierarchy index was created. With 100 fruit clusters, all fruits are measured and fed into the algorithm. The model uses this information to calculate the expected thinning effect at a predefined dosage. This makes it possible to change the dose or even wait with the application in order to achieve the best possible thinning result. At present, the model is still dependent on additional information calculated by other models and is limited to the use of Metamitron (Brevis). In the future, the model will also be adapted for other thinning strategies. However, one thing seems certain: the hierarchy in the fruit cluster appears to be a very interesting indicator of the expected thinning effect. This has already been proven in the past by various scientists using other approaches (e.g. Handschack and Greene). Many factors influence the hierarchy, the most likely being the weather. If the weather is unstable and cool during the thinning window, the carbohydrate supply to the fruits is not ideal, they do not grow and the hierarchy is not pronounced. In good weather, the king fruit develops well due to morphological and physiological advantages compared to the laterals, which is why internal competition occurs and heavy fruit drop prevails.

Models as decision-making aids

Konni Biegert from the *Kompetenzzentrum Obstbau Bodensee (KOB)* in Germany spoke about

Info

Shading

As in other countries, the installation of solar panels in apple orchards has been the subject of discussion in Germany for several years. How shading affects the physiological behaviour of the trees has not yet been sufficiently researched. At the Esteburg research station in Jork (Germany), Michael Clever investigated when shading starts to have a thinning effect. For this purpose, a shading net was used that reduced light by up to 71 %. Michael Clever found that shading for 72-120 hours significantly reduced fruit set, but that the thinning effect was only significantly increased from 168 hours. Shading in the period between 14 and 21 days after full bloom gave the strongest thinning.



Fruit drop prediction based on spectral VISNIR scanning at the research sites KOB (D) and Laimburg Research Centre (I) VZ Laimburg

Polysorbates

Nika Hillmayr from the Agricultural Institute of Slovenia (Slovenia) reported on polysorbates as alternative thinning agents.

Polysorbates are emulsifiers that can be found in the food industry, e.g. in ice cream, baked goods or in the pharmaceutical industry. They can have a thinning effect on fruit.

a new prediction model for blossom thinning. The so-called Bodata model was developed by Adrie Boshuizen (Bodata) to determine the ideal thinning time for ATS or lime-sulphur in relation to the weather during flowering and pollen tube growth. The model works with the following data: weather during flowering - temperature, precipitation, wind and leaf wetness - and pollen tube growth. The growth rate depends on the temperature, with an optimum above 15 °C, and the countdown day. This is the day on which enough flowers are open for an optimal yield and enough insects are present in the apple orchard to ensure sufficient fertilisation. This model was validated on the Nicoter and Braeburn varieties at the KOB. The model made it possible to better determine the timing, although the countdown day must be defined independently for each location and orchard. An earlier treatment according to the model compared to the strategy usually chosen by the fruit grower did not have a negative effect on over-thinning and fruit size. As the Bodata model was developed for Golden Delicious, an adaptation to other varieties is certainly advantageous for the future.

Fruit drop prediction

In her second presentation, Konni Biegert showed the first results of a fruit drop prediction based on spectral VIS/NIR scanning at the KOB and Laimburg research centre. She focussed on the question of whether it is possible to predict fruit drop using a non-destructive sensor. The F-750 spectrometer used for this purpose can measure green, yellow and red pigments, hydrogen-oxygen compounds and wavelengths of 420-1,100 nm. The experiment was carried out on Gala and Braeburn. Within a fruit cluster, the king fruit and the second lateral fruit were always measured before and every second day after thinning. After the treatments, the fruit drop was visually monitored to check which fruits were falling off. The spectrometer shows the development in the fruit on the tree after a treatment. Before the treatment and one day afterwards, the wavelength of the fruit is the same. In the case of the lateral fruits, you can see immediately afterwards which fruits may fall off, while in the case of the king fruits you can recognise an initial tendency from the 8th day after treatment. It was also possible to recognise the first natural fruit drop if measurements were taken before the first treatment.



Measuring the pistil length for the pollen tube growth model VZ Laimburg

Pollen tube growth model

Christian Andergassen from the Laimburg Research Centre (Italy) spoke about three years of experience with the pollen tube growth model for apple at the Laimburg Research Centre. This model makes it possible to find the best possible treatment time based on the speed of pollen tube growth. It is important to monitor the number of open flowers and to start the model when the desired quantity is reached. The model is run and as soon as the pollen tube has grown through the style, it is assumed that the flowers have been fertilised. As no additional fruits are required, the treatments must now be started. In the trials, the standard programme without a model achieved the better thinning effect. In general, it can be said that the model works worse with a high fruit set and better with a naturally low fruit set.

BreviSmart combined with fruit growth model

Dragan Radivojevic from the University of Belgrade (Serbia) investigated the combination of the 'BreviSmart' and 'Fruit Growth Model' models for chemical fruit thinning in Golden Delicious and Fuji. Firstly, the open flowers were counted and the thinning time was determined at a desired number using BreviSmart. The fruit growth model was used in the second step to see how many fruits remained on the tree. This is used to decide whether to thin again or not. The fruit growth model is based on the principle that any fruit on the tree whose growth rate is half that of the fastest growing fruit will fall off. Radivojevic found that BreviSmart works better with Golden Delicious than with Fuji.

Pometa app

Luiz Gonzalez Nieto from IRTA (Spain) presented a trial of the Pometa decision support system. Pometa is an app that can be used with a standard smartphone. Fruit clusters can be filmed with the mobile phone camera and then the diameter of the individual fruits can be determined. This data is then combined with Greene's fruit drop prediction model, allowing the expected fruit drop to be predicted. This gives the user the opportunity to decide whether to carry out a further thinning treatment or whether the expected fruit drop is sufficient. Nieto also presented trials on the effectiveness of Metamitron in thinning apples in the United States using the Gala variety. He achieved the best thinning effect with a fruit



The EUFRIN fruit thinning working group in the Czech Republic

Alessandro Botton

size of 10-12 mm, and the weather also has a significant influence on the effectiveness. He found that the efficiency was lower with higher global radiation and higher at temperatures above 14 °C.

Precision thinning

Serge Remy from the pcfuit research station in Belgium reported on his experience with precision thinning. The aim here is to thin individual trees using variable application rates. To achieve this, aerial photographs of an orchard were taken using drones to create a flower map. This serves as the basis for determining the exact dosage per tree. The results showed that there was not significantly less fruit per tree on the precision-thinned trees than on the trees treated as usual. This means that the technology for more precise thinning with variable application rates is not yet fully developed.

Ségolène Dandin from CTIFL (France) also spoke about the automatic detection of flowering intensity within an orchard and its possible use for precision thinning in apple trees. The systems of CCLAIR, Outfield and TCSD are to be compared with a standard strategy. To do this, a map of the orchard is first created using GPS and fed with images of the apple trees. This allows each system to analyse which trees need to be thinned. The map is transferred to the tractor so that each tree can be thinned individually. The aim is to use these systems to rebalance inhomogeneous blocks over the next few years.

Potassium hydrogen carbonate

Thomas Kuster from Agroscope (Switzerland) reported on his experiences with thinning with potassium hydrogen carbonate. In the trial for

the Golden Delicious variety, Armicarb was applied at flowering and at different fruit sizes as well as a combination of flowering and different fruit sizes. Only the treatment at 20 mm in combination with two treatments during flowering showed a significant difference to the control. However, the use of Armicarb caused severe russetting. Michael Zoth from the University of Weihenstephan Triesdorf (Germany) also tested potassium hydrogen carbonate (trade name: Kumar) as an alternative to conventional thinning agents on Gala. In his trials, he was unable to detect any thinning effect with a single application at 12 or 17 mm fruit size.

Mechanical fruit thinning

Luca Nari from Agrion spoke about thinning in Piedmont (Italy). He presented his trials with the new mechanical fruit thinning machine from BMV (THF800). The thinning machine showed a good thinning effect, but it also caused a lot of damage to the fruit. In some cases, up to 40% damage to the remaining fruit on the tree was observed. According to Nari, the technology is interesting, but we still need to learn to understand it better.



Mechanical fruit thinning machine from BMV (THF800)

VZ Laimburg