NIAB Fruit

CONFERENCE REPORT

# 12th IOBC-WPRS workshop on Pome Fruit Diseases

## Plovdiv, Bulgaria, June 2022

### Background and purpose of this report

NIAB scientists regularly attend international conferences, symposia and workshops to present research results and share new technical information gathered from across the world. The cost of travel and attendance at these events can be borne by NIAB, but also in some cases, through the generosity of other industry bodies and organisations.

This is a report on the 12th Workshop on Pome Fruit Diseases organised by the International Organisation for Biological and Integrated Control – West Palaearctic Regional Section (IOBC-WPRS), held in Plovdiv, Bulgaria in June 2022. The workshop was attended by NIAB plant pathology research leader Matevz Papp-Rupar whose costs were co-funded by NIAB and The Worshipful Company of Fruiterers.

The aim of this report is to condense five days of talks and discussions into a few highlights of industry relevant information. It has been written and produced by Matevz Papp-Rupar.

### Introduction and attendance

The workshop was organized by Zvezdomir Jelev and Martin Marinov of Plovdiv University, Bulgaria. The workshop brought together the latest knowledge and advances in apple and pear disease from across the world. It was attended by delegates from 19 countries including New Zealand, USA, Canada, Chile, Israel, Tunisia, and most European countries. Discussions revolved around the latest developments on perennial diseases such as apple scab, apple canker and post-harvest diseases. Researchers and fruit industry advisors also reported on some potential new emerging plant pathogens of concern to the pome fruit industry.

### Breeding for disease resistance

The opening session of the workshop focused on breeding for disease resistance. Awais Khan (Cornell University, USA) and Elias Dorfman (Agoscope, Switzerland) presented the latest in the breeding for disease resistance in apple scion varieties. In the USA, scientists have started using transgenic early flowering apple lines to decrease the time taken from seed germination to reach first flower and fruit production, from the previous three to five years to just three to nine months. This has enabled rapid stacking of multiple resistance genes from wild apple relatives, and back crossing with commercial varieties, to maintain relevant fruit and storage traits. The transgenes are removed before commercial release resulting in disease resistant, non-GMO, high quality commercial varieties.

The colleagues in Switzerland reported good progress of genetic marker assisted conventional breeding, to incorporate multiple resistance genes against fireblight, scab and powdery mildew, into commercially relevant varieties. Rootstock breeding was also discussed. Interestingly, fireblight resistance was shown to be affected by rootstock traits such as root mass and root surface area. The fact that breeding rootstocks for disease resistance has been neglected so far was discussed. Watch this highly interesting and fast moving space in the future.

### Apple scab (*Venturia inaequalis*)

The highlight of the apple scab (*Venturia inaequalis*) session included the report by An Ceustermans (Research Station for Fruit Cultivation, Belgium) on the development of an artificial ascospore release protocol combined with quantitative PCR methodology, to predict the amount of primary scab inoculum in the leaf litter prior to the start of the season. The PCR method was also able to predict the number of post-harvest scab lesions based on the washings taken from healthy looking fruit at harvest. The methodology can be used to design orchard specific spray programmes based on disease pressure every year.

Daniele Produrotti (Fonadazione Edmont Mach, Italy) reported that application of water by sprinkler irrigation directly to the leaf litter during dry and sunny spring days, can release up to 50% of primary ascospores, which then fail to infect due to the absence of leaf wetness. This method reduced the inoculum and resulting scab problem later in the season. For this method to work best, the time between sprinkler application and a subsequent rain event should be approximately two days. Daniele also reported a new species of scab on apple in Italy, *Venturia asperata*, with symptoms similar to *V. inaequalis* but developing later in the season. The research on epidemiology and impact of this new pathogen is ongoing in Italy. Look out for this new pathogen, especially on scab resistant varieties under low fungicide application regimes.

Vincent Philion (IRDA Canada) updated delegates on efficacy profiles of all available fungicide FRAC groups against apple scab.

He compared the efficacy of single applications at different rates and at different timings: 24h before a rain event or approximately 6, 24 and 48 hours after the start of the rain event. Almost all fungicides tested were most effective when applied within 6 hours following the start of the rain (even if sprayed during the rain). Preventative (24 hours before the rain) or curative application within 24 hours were equally effective for most fungicides, while application at 48 hours post rain event showed significantly reduced efficacy. Vincent's conclusion was that kick-back applications beyond 48 hours are not effective, can contribute to development of fungicide resistance, and should be avoided.

Scientists from many countries reported their finding that maintaining strict orchard hygiene through the complete removal of leaf litter in the autumn was an effective way of reducing scab incidence by more than 90%.

Peter Triloff form Germany reminded delegates that effective sprayer operation is crucial for disease control. He tested more than 20 different sprayers operated by commercial growers on their farms and found that the majority are still using old and ineffective sprayers that result in the majority of fungicide ending above or below the canopy, or in the alleyway. He stressed how a well calibrated tower sprayer operated at the right speed and pressure, can increase fungicide deposition on the trees and decrease the total required fungicide use by at least 50%. He appealed to growers to modernize and calibrate their spray equipment for specific orchards (tree density, height, age) to ensure accurate application, and prevent unnecessary release of product into the environment. Workshop delegates are becoming increasingly aware that the use of plant protection products are being restricted or banned due to their detection in ground water. More precise application would reduce the use and cost of products, prevent loss of products into the environment and lengthen their lifetime.

## Apple canker (*Neonectria ditissima*)

Dalphy Harteveld (Wageningen University and Research) presented a new highly sensitive molecular method (qPCR) that could be used to detect latent infections of *Neonectria ditissima* in nursery production. She found that the method detected artificially created latent infections with a high degree of accuracy, and correlated well with symptom expression in the field. In the next stage of this work, a sampling strategy is being devised that could be used to screen and certify batches of trees produced by the Dutch nurseries who have funded this research, and are actively seeking to eliminate canker from the nurseries.

Similarly, Jorunn Borve (Norwegian Institute of Bioeconomy Research) investigated latent apple canker infections originating from both wood cracks (bending) and the process of 'heading back' in the second year of nursery propagation. Inoculation of cracks made by bending resulted in much higher canker incidence in the first two years after planting in a commercial orchard than 'heading back' cut wounds. This information highlighted the need to protect the trees after bending.

The impact of nitrogen fertilisation on canker severity was also emphasised by Dalphy Harteveld. Her team potted trees using soils supplemented with the equivalent of 0, 50, 150 and 300 kg of nitrogen (urea) per hectare over a single growing season. The results clearly showed that the addition of nitrogen (in soil) of over 50 kg/ha/season doubled the canker incidence and canker lesion size.

Working with his PhD student Hamish McLean, NIAB's Matevz Papp-Rupar showcased NIAB's recent research on biocontrol of apple canker using the endophytic fungal strain *Epicoccum nigrum* and the effect of site (soil and microbiome) on canker development post planting. Subsequent general discussion highlighted the efficacy of good orchard hygiene, particularly removing wood with both young and especially old cankers from the orchards.

During the pruning process in New Zealand, pruners remove all canker infected wood from the orchard and only use healthy prunings as a mulch in the alleyways. The best timing for canker removal given current labour limitations was discussed. The consensus was that ideally, pre-bloom and pre-harvest canker pruning should be carried out, but pre-harvest is more important and effective in reducing inoculum load over the harvest and leaf fall period, especially in young, newly planted orchards.

## Fireblight (*Erwinia amylovora*)

Successful control of shoot blight (*Erwinia amylovora*) with Regaila (knot weed extract) was reported by Srdan Acimovic from Virginia Tech, USA.

Efficacy of a novel quorum sensing inhibitor on fireblight was presented by Mery Dafny-Yelin (Northern Agriculture Research and Development Israel). This novel approach does not kill the bacteria but rather prevents them from transitioning into a virulent stage, thus reducing disease severity with minimal or no environmental impact.

## New crop protection techniques

Two new crop protection technologies were presented. Marcel Wenneker (Wageningen University and Research) talked about the advantages and shortcomings of convertible rain covers in apple production. This system is equipped with sensors which close rain covers only during the rain, significantly reducing apple scab and apple canker issues. The water is collected and used for irrigation in the dry part of the year using buried drip irrigation pipes that minimise evaporation and maximize nutrient availability. A significant increase in powdery mildew, apple sawfly and apple blossom weevil was observed under cabrio covers. The sawfly and weevil issues were eliminated using mass trapping with white sticky discs (apple sawfly) and bundles of plastic tubing (apple blossom weevil). Ultra-violet translucent covers and timed water application are being investigated to reduce the powdery mildew issue. The most difficult pests to control in the cabrio systems appear to be rosy apple aphid and woolly apple aphid, with the performance of natural enemies now being assessed.

Ultra-violet (UV) treatments to control horticultural pests and diseases were presented by David Gadoury, Cornell University, USA. He presented more than 20 years of research on UV, mainly to control powdery mildew and mites on a wide range of crops including grapevine, hops, strawberry, cucurbits and apple. The UV technology is considered to be easy to adopt, is much safer than conventional spray products for the environment and the operators, offers residue free produce, and is unlikely to induce resistance in pests and pathogens. Several different options are open to growers, from simple self-build tractor attachments to autonomous UV treatment robots. Discussions centred on the need to apply UV at night, method throughput, use of proper protective clothing and dosing based on crop stage and disease pressure. The development and uptake of fruit wall growing systems have now opened the possibility to apply UV in apple production, and the first successful control of fireblight in apple and pear has been reported from the USA. There is huge potential for UV technology to become an integral part of tree fruit IPM in the future.

## Emerging pathogens

New and old post-harvest pathogens are reported to be increasing in prevalence due to a reduction in the use of crop protection products across the EU. One that UK growers should particularly look out for in the near future is sooty blotch, which is caused by a variety of fungal species that have been kept at bay in the past through regular fungicide use. The increase of sooty blotch has been reported in Austria, Italy, France and Germany, both in organic and reduced spray IPM orchards.

Apple blotch (*Diplocarpon coronariae*) is a major disease of apple in Asia and has recently emerged in Europe and the USA. It leads to severe defoliation, and in late summer reduces fruit yield and quality. The pathogen is spreading slowly in Europe and has not been reported in the UK so far. It thrives in warm, humid conditions after long periods of rain during the summer. UK growers should be vigilant for this pathogen in newly planted orchards where trees originate from central Europe, in particular from countries where the disease has been reported already (Austria, Croatia, Czech Republic, Germany, Italy, Romania, Slovenia and Switzerland).

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