New Strawberry Powdery Mildew control strategy

writes Malcolm Withnall

In a unique collaboration that could be an example for all growers, berry growers Harriet and Henry Duncaife have created a synergy between themselves and a research scientist. They have been collaborating with plant pathologist, Dr Avice Hall from the School of Life and Medical Sciences at the University of Hertfordshire at Hatfield, to address the ever-present problem of strawberry mildew, a plant disease of major economic importance to growers of berry crops.

Based at Maltmas Farm, Friday Bridge near Wisbech, the Duncaifles built up a substantial berry-growing business on a Cambridgeshire County Council holding, starting in 1988, and later arriving at the 120ha unit at nearby Maltmas Farm. "Although we now have 300 acres, we have concentrated on soft fruit, and grow long season crops intensively on 60 acres using protected growing systems", explained Harriet. "We are split roughly equally between strawberries and raspberries. The remaining land is used for spring barley, wheat and oilseed rape."

Maltmas Farm is a member of Berry Gardens, and Driscoll varieties feature strongly in its production. "We are growing varieties that we have found from experience particularly suited to our growing location, including Driscoll Jubilee, Sonata, Vibrant and Fenella, and also Driscoll Amesti, to achieve the longest season possible," she added. "We grow both floricae and primocane raspberries, using Octavia, Driscoll Maravilla and Driscoll Cardinal in our long-season supply programme."

Harriet was quick to reveal the devastating consequences of Strawberry Powdery Mildew (Podosphaera aphanis), explaining that annual losses can range from 20% to 70%, and Harriet has heard of 100% crop losses from this pernicious disease. At 20%, as it was estimated to be in 2008, the loss was equivalent to 12,800 tonnes of berries valued at £2.8m.

Harriet began her collaboration with Dr Avice Hall ten years ago with an HDC project initially looking at the source of the epidemic, and in 2008 looking at the effectiveness of a potassium bicarbonate and a silicon-based product as part of a postgraduate/grower trial. Additionally, a prediction system for Strawberry Powdery Mildew was developed to control the disease with reduced fungicide use. "Conducting field trials with

An infected leaf shows the devastating impact of Strawberry Powdery Mildew on plant performance. growers on their holdings heightens the relevance of scientific research," said Dr Avice Hall. "This decade of unique collaboration has generated a special synergy within us all by facilitating new solutions to a serious commercial problem."

By combining an acutely inquisitive mind, and enthusing young postgraduates at the University, Avice Hall has brought together, with her grower host, a greater understanding of the fungus, its mode of activity, and strategies to ameliorate its commercial impact. This collaboration has brought together scientists from different disciplines and commercial crop management to create genuine applied research.

The real benefits of having Dr Hall’s plant pathology team addressing the problem is that the fungus is now far better understood than before. "At the onset we incorporated predictive

The lifecycle of Podosphaera aphanis on strawberry. Source: Xiaolei Jin of the University of Hertfordshire.
quickly recognised that the two compounds enhanced one another. This was the hypothesis behind the first trial. Academic literature established that the element Silicon is omnipresent in plants, though some species have enhanced levels of silicon. Rice is a high accumulator of silicon whereas strawberry is listed as a non-accumulator. However, this investigation by researchers at the University of Hertfordshire has shown that when strawberries are given silicon, the plants absorb additional silicon, and this is associated with morphological changes in the plant, including an increase in the number and length of leaf hairs, a thicker cuticle and a modification of the wax layer of the leaf. Silicon also appears to be located in the vascular system of the plant, namely the xylem and phloem tissues.

Additionally, the use of the silicon nutrient delays the build-up of an epidemic of Strawberry Powdery Mildew. It is perfectly feasible that a silicon-strengthened epidemic will present a barrier to fungal infection, and when silicon is combined with the eradicant properties of potassium bicarbonate, experiments show that disease levels are reduced," observed Dr Hall.

In addition, the researchers identified that powdery mildew had an overwintering stage (ascospores) which became active as chlamydospores, releasing infective spores whenever present, and peaking at times when the climatic conditions favoured the fungus. These conducive conditions are prevalent in current growing systems, placing modern varieties under enormous pressure to remain free from disease.

From the established development stages of the crop, and directly from experience, the Duncaifes programmed their regular fungicial applications using the Strawberry Powdery Mildew period prediction system to ameliorate powdery mildew infection. "A combination of fungicial treatments and Siron, a silicon-based product from Orion, in a mix, and following the prediction system, gave improved disease control," said Harriet.

Dr Hall described the management of the disease as a ‘holistic approach’, encouraging growers to view this pathogen as a year-round foe that should never drop from their sights. Regular use of the silicon nutrient through the fertigation system delayed the build-up of the epidemic by 8-10 days.

“We have also concluded from our 2013 trials that early applications of silicon via the fertigation systems are desirable, as the growing plant requires a regular supply,” she said. “But I have to emphasise that the Strawberry Powdery Mildew period predication system is a rule-based system, not a model, and requires further software updates to make it truly grower-friendly. All methods of disease reduction and control require constant year-round vigilance to enable satisfactory control.”

The work undertaken by the team from the School of Life Sciences is well documented in the Aspects of Applied Biology in 2011, 2012 and 2013 and in HDC Factsheet 17/2008. The results of the 2014 work will be published and the programme will continue in 2015.

In memory of
Koen Carolus
CEO of Carolus C. BVBA
Loving husband of Christine Somers
Father of Ruben and Arne
* May 22, 1967 in St-Truiden
† October 12, 2014 in Nieuwerkerken
The families Carolus, Kinnaert, Somers and Mans thank you for your sympathy and support in their loss.

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