Current IPM strategies against *Drosophila suzukii* in Switzerland

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ABSTRACT

The Spotted Wing Drosophila (SWD) (*Drosophila suzukii*, Matsumura) is a concern to berry crops it is causing important economic losses. It was first recorded in Switzerland in 2011. The pest was found in all regions of the country, from low altitudes to the timberline. Switzerland has implemented a strategy at the national level by combining an effective monitoring system with hygiene measures and mass trapping. The survey with an efficient trap is a good tool. It will allow to decide at the right time to start the control measures like mass trapping, nets or treatment. The strategy relies on sanitation measures which is the most important parameter to reduce the SWD population. It is costly and time consuming for the producer but no other control measure can be effective without it. Mass trapping can only be effective with efficient traps which must be more attractive than the fruits for SWD. The Riga trap is a good tool in berries and the attractant is one of the best on the market today. Nets are a good solution for the crops where sanitary measures are difficult to apply. Insecticide applications, usually based on spinosyns, are only considered as a last resort. In addition to this already operative strategy, innovative alternatives are being considered, in particular the use of repellents or masking substances. Lime treatment might be an interesting alternative to chemical insecticides. The IPM (integrated pest management) tactics must be implemented from the beginning of the season with the aim to keep the population as low as possible. And it will only be possible with a combination of different techniques. Research must continue to develop and optimize this control program because this pest will never disappear from our country.

1 Introduction

The Spotted Wing Drosophila (SWD) (*Drosophila suzukii*, Matsumura) is a concern to berry growers since it is causing economic losses. It first invaded Switzerland in 2011 (Cini et al. 2014). The pest was found in all regions of the country, from low altitudes to the timberline. *D. suzukii* spread over the years and invaded completely the country in 2014. It is considered as a pest of stone and small fruit not only in Switzerland but in all the countries where it has been introduced (Asplen et al. 2015). In addition, more than 50 wild host plants have been determined in Europe and the USA, providing the pest a large reservoir of alternative hosts throughout the seasons (Lee et al. 2015, Kenis et al. 2016). Significant crop losses can result from *D. suzukii* invasion. In the future, increasing production costs and potential market losses might be expected. Most countries have established an integrated pest management strategy to fight against the pest. Switzerland has developed its approach based on a national survey and a combination of control methods including sanitary measures, mass trapping, nets and chemical or alternative treatments (Haye et al. 2016).

Switzerland launched its first survey in 2011 and then continued over the following years (Baroffio, et al. 2015). The aim of this survey was to complete the current situation of the distribution of the pest and to initiate a sustainable control strategy. Control measures are applied against SWD, like chemical, physical and biological control as well as cultural control (Asplén et al. 2015, Haye et al. 2016). Treatments with insecticides or alternatives (lime) are applied and evaluated. Current controls of SWD primarily rely on sanitation. To date, sanitation is the most important method to fight SWD. Although costly and time consuming, other control measures can only be effective when the crop is “clean” and SWD reservoirs are reduced as much as possible. In addition to this already operating strategy, innovative alternatives have been envisaged, in particular the use of repulsive or masking substances: the efficacy of treatments based on lime hydroxide in protection of berry crops will be presented.

2 Material and Methods

2.1 Monitoring
Monitoring was conducted all over the country with an average of 200 traps. The traps were checked on a weekly basis over the whole year (Kuonen and Baroffio 2017). The records of the population development, including crops affected, progression and location of spread, were published in an open access website (www.drosophilasuzukii.agroscope.ch).

2.2 Lime treatment

To measure the effect of a lime treatment on the SWD development, 14 blueberries plants with ripe fruits were used with 1 plant per cage. Lime at the concentration of 1.8 kg / ha was applied weekly on seven plants in cages with a Stihl® SR430 sprayer while seven plants were used as a control. One day after the treatment, 10 SWD adults (5 males and 5 females from our breeding) were released in each cage weekly. The trial began on the 22.07 till 22.08.2015. There were 40 adults released in each cage during the trial. To measure the efficacy of the treatment, 10 fruits were weekly analyzed per cage for eggs and larvae presence (Dorsaz 2016)

3 Results

3.1 Monitoring

Figure 1 shows the development of the SWD population between 2012 and 2017 (May). There was a winter pause in 2012 and 2013 when no catches were recorded during the first months of the year. Since 2014, continuous catches of the insect were recorded. The monitoring shows a global repartition in crops and in wild areas all over the country from low to high altitudes (to 1500 m a.s.l) with an increasing population. The highest number of adults was recorded in autumn months of each season (October, 2013 and November, 2012, 2014, 2015 and 2016). The population in March 2017 was very high but 5 nights with frost in April reduced the population.

![SWD catches 2012-2017](image)

Fig. 1 Population density of *D. suzukii* in Switzerland from 2012 to 2017 (based on adult catches in traps, set at altitudes up to 1500 m a.s.l.). The catches are per 100 traps and in a log scale.

3.2 Lime treatment

This semi-field trial shows an effect of the lime on SWD. The released drosophilae had no choice in the cages sprayed with lime. There was no other opportunity to lay eggs. In those conditions, the repellant effect of lime is proved.
Table 1  Number of SWD eggs and larvae (median) per modality and p-values (Kruskal-Wallis).

<table>
<thead>
<tr>
<th>Date</th>
<th>Lime</th>
<th>Control</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>07/29/2015</td>
<td>7</td>
<td>16</td>
<td>0.272</td>
</tr>
<tr>
<td>08/05/2015</td>
<td>8</td>
<td>12</td>
<td>0.275</td>
</tr>
<tr>
<td>08/13/2015</td>
<td>2</td>
<td>11</td>
<td>0.063</td>
</tr>
<tr>
<td>08/20/2015</td>
<td>0</td>
<td>9</td>
<td>0.034*</td>
</tr>
</tbody>
</table>

4 Conclusions

The Swiss IPM strategy relies on sanitation measures which is the most important parameter to reduce the SWD population. It is costly and time consuming for the producer but no other control measure can be effective if the crop is not clean. The survey with an efficient trap is a good tool. It will allow to decide at the right time to start the control measures like mass trapping, nets or treatment. Lime treatment might be an interesting alternative to chemical insecticides. The fight against SWD can be effective if the IPM tactics are implemented from the beginning of the season with the aim to keep the population as low as possible. And it will only be possible with a combination of different techniques. Research must continue to develop and optimize the control program.

References


