

## **Mating disruption in Switzerland**

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**Abstract:** Since registration of RAK 2 (against *Lobesia botrana*) and RAK 1+2 (against *Eupoecilia ambiguella* and *L. botrana*) in 1996, mating disruption has become an important technique for controlling the main pests in viticulture. The three products RAK 1+2, RAK 2 and Bocep Viti (against *E. ambiguella*) were applied in 1999 on 4500 ha or 30 % of the total vineyard surface in Switzerland. The success of mating disruption in vineyards is mainly based on the efficacy of the technique and the ecology trend in agriculture. The main problem we had in getting the technique established was the large number of vineyard owners that had to be convinced. Precise instructions for application and control of the two generations during the season are very important and help give the users confidence in the technique. Isomate-C Plus is registered since 1996 for orchard use against *Cydia pomonella*. The surface treated with mating disruption has since grown to over 400 ha, which amounts to about 10 % of the Swiss orchard surface. The main factors hindering its spread are the relatively high price as compared to chemical treatments, and additional pests such as *Grapholita lobarzewskii* and *Adoxophyes orana* that are partially controlled by chemical treatments against *C. pomonella* but not by Isomate-C Plus. Isomate-M Plus or Isomate-OFM Rosso are mating disruption products normally used against *Cydia molesta*. In Switzerland they are used against *G. lobarzewskii* as a complement to Isomate-C Plus in apples or against *Grapholita funebrana* in plums. The efficacy on plums is rather limited due to little surfaces and high populations of *G. funebrana*. It is only used in organic farming.

**Key words:** *Eupoecilia ambiguella*, *Lobesia botrana*, *Cydia pomonella*, *Grapholita lobarzewskii*, *Adoxophyes orana*, *Grapholita funebrana*, mating disruption, pheromones, dispensers

### **Introduction**

In Switzerland the mating disruption technique is being applied on 4500 ha in vineyards and on 400 ha in orchards. The surface treated with pheromone dispensers has increased rapidly within the last 4 years and the technique has become – especially in vineyards - one of the most important instruments for controlling the main pest. The following presentation shall give an overview of the development and success of mating disruption in Switzerland.

### **Mating disruption in vineyards**

The grape berry moths *Eupoecilia ambiguella* and *Lobesia botrana* are the main pests in Swiss vineyards. In the southern part of the country *Lobesia*, is especially abundant, whereas in the eastern part there is mainly *Eupoecilia*. In most of the vineyards, though, both species are present.

There are only few places where no treatment against the grape berry moths is necessary. In most vineyards insecticide treatments had been carried out once or twice a year before the mating disruption technique was applied.

### **Development**

In the seventies first trials were made in Switzerland with the *Eupoecilia* Pheromone. A double chamber dispenser was developed and registered in 1986 by BASF containing 340 mg pheromone. This modern technique of grape moth control was subsidised in the following years. The treated area did not increase very much, though, because *Lobesia* spread especially over the warmer parts in the west and south of Switzerland but also north of the Swiss Alps. With the registration of RAK 2 against *Lobesia* and RAK 1+2 against both species in 1996 the products needed to control both grape berry moth species became available. The mating disruption surface grew from 500 ha in 1996 to 4500 ha in 1999. This represents about 30 % of the whole Swiss vineyard area. Nowadays about 60 % of this surface is being treated with RAK 1+2 and about 20 % each with one of the other two products.

### **Efficacy in 1999**

Under our conditions, the mating disruption technique is applied in the last week of April. This protects the crop throughout the season against both generations of the two grape berry moths.

This year we had very special weather conditions that favoured grape berry moth development. The flight period lasted very long, until mid August, and especially the population of the second generation was very strong compared to previous years. In extreme situations the flight was up to 6 times stronger than in the past year.

Three percent of the surface treated with the mating disruption technique reached an infestation rate in the first grape berry moth generation of over 10 % for *Eupoecilia* or over 5 % for *Lobesia*. These are considered threshold infestation rates for the two species. A supplementary insecticide treatment in the second generation becomes necessary to bring down the grape berry moth population sufficiently to be able to successfully continue with mating disruption.

During the second generation, though, about 13 % or 600 ha of the mating disruption surface had an infestation rate of over 5 %. This is much more than in previous years in which only very few vineyards had an infestation rate surpassing the 5 % threshold. The 5 % infestation threshold of the second generation is the upper limit for a successful use of the mating disruption technique in the following year. Higher infestation rates require a preventive insecticide treatment to reduce population size. Normally the infestation of the second generation is not a problem, because the intervention threshold for the first generation sufficiently reduces the population. Under normal conditions, there is a reduction in population size from the first to the second generation of grape berry moths in pheromone treated surfaces. This was not the case this year. This was probably due to the long flight period of the second moth generation and to varying warm weather conditions with no temperature peaks over 30 ° C. Consequently, the conditions for flight were good and egg and young larvae mortality was low.

Vineyards that had been treated with pheromones for years did not have any problems, but newly treated vineyards with high initial populations or small and unfavourable surfaces were severely hit in 1999.

To check the efficacy of mating disruption, Dr. P.-J. Charmillot of the Federal Research Institute in Changins compared the technique with insecticide treatments in the field. In nearly all cases the pheromone method showed a better efficacy than the insecticide treatments. There are several reasons for this. First of all, the long flight period made it difficult to time an insecticide treatment. Secondly, the warm and wet weather favoured berry and foliage in-

crease. This led to a dilution of the insecticide on the grapes. The foliage covering the grapes hindered the insecticide application.

Please note, though, that the diagram does not show an insufficient efficacy of the insecticide treatments, simply a higher efficacy of the mating disruption technique!

### ***Surface composition and organisation***

The composition of the surfaces on which the pheromone technique is being used is very variable. The smallest vineyards are only 0.5 ha, whereas the biggest connected areas are around 450 ha. The surface per owner is also very variable. In the Wallis in the south of Switzerland, we have an average surface of 0.2 ha per owner, whereas in the canton of Geneva you can find owners with up to 50 ha and the average is around 5 ha.

Especially for big vineyards with different producers a well organised concept is needed to get the mating disruption technique established. One possibility is dividing the whole area into sectors of 10-15 ha, with one person in each sector responsible for applying the technique together with the different producers in that sector. This organisation group can also control the infestation of the first and second generation. For the application of the dispensers 1.5 – 3 hours are normally needed, depending on the topography.

For the promotion of the mating disruption technique about 30 % of the surface treated is subsidised (50 % of the costs). Furthermore, the official viticulture technicians support the technique by organising application of the dispensers and the control of infestation. Our aim is to provide as much information on the technique as possible. We therefore organise meetings to present technical information and results. The controls of the first and second generation infestation that we carry out in as many vineyards as possible are very much appreciated by the producers. These results are published once a year in viticulture journals.

### ***Mating disruption – pro and contra***

Many people are surprised by the how important mating disruption has become in Switzerland, especially as the price is higher than for insecticides.

One of the most important reasons for the success of the technique is the difficulty in timing an insecticide treatment, whereas with mating disruption – once installed – there is no timing problem. It is the application date is even more difficult to determine the right application date when both species of grape berry moths are around, or when big differences in exposition and altitude exist.

Changing consumer demands make alternatives to insecticide applications economical. Several regions made good publicity for their wine by cultivating their vineyards without the use of insecticides and by emphasising this fact. This then led to an expansion of mating disruption to nearby vineyards, because the latter realised that wine sales were more difficult without.

To cut prices many producers reduce the number of dispensers per ha from 500 to 300 after one or two years of successful introduction of the mating disruption technique. Resistance of grape berry moths against insecticides is not yet a real argument.

The organisation needed for mating disruption is sometimes considered a negative aspect, especially if you have people voting against the technique. There is e.g. an area in the Wallis with 387 different producers on 16 ha. It is a real challenge to get all these producers to use the pheromone technique!

## Mating disruption in orchards

The situation for mating disruption in orchards is very different from that in vineyards. There are some large coherent orchard areas, especially in the western part of Switzerland, but more often the orchards are small and isolated with a single producer. The mating disruption technique can thus be established by a producer even if his neighbour does not participate.

Yet orchard areas have their own particular problems: There are often old tall trees near the orchards that are an infestation source for the codling moth and on which no plant protection is undertaken. In mating disruption supplementary treatments against additional pests are often needed whereas the unspecific insecticide treatments eliminate these pests at the same time. Furthermore, insecticides are cheaper than the mating disruption technique.

To date only few cases of codling moth resistance to insecticides exist in Switzerland. As long as insecticides guarantee a sufficient efficacy many fruit growers will not change to the more expensive technique.

### *Efficacy of Isomate-C Plus against the codling moth*

In orchards with a low initial codling moth population there was no pest control problem with Isomate-C Plus. Only about 20 ha or 5 % of the surface had an infestation rate over 2 %. Many orchards have hale protection nets which are favourable to codling moth control with pheromones as there is less migration and the pheromone cloud is more stable.

The pheromone components in Isomate-M Plus/OFM Rosso dispensers are normally used to control the oriental fruit moth, but the pheromones are also effective against *Grapholita lobarzewskii* and the plum fruit moth.

*Grapholita lobarzewskii* has become an important pest in orchards in which mating disruption against the codling moth is being carried out. This year's results show a good efficacy with infestations below 2 %.

For the plum fruit moth the trials carried out, showed that the efficacy of the technique is limited by high populations and small surfaces. In Switzerland most plum orchards are less than 1 ha. The contradicting results this year for the different pests show the limits of the application. Isomate-M Plus/OFM Rosso is consequently only used in organic farming and here only due to lack of an alternative.

Sale of the combined product Isomate-C Special against the codling moth and the summer fruit tortrix has been stopped because of its rather limited efficacy against the summer fruit tortrix. Trials will be carried out next year with Isomate-C Super. These pheromone compounds should be more effective against the summer fruit tortrix, *Adoxophyes orana*.

A summary of all the results made with mating disruption in Switzerland shows a very positive balance. The efficacy is normally very good and the method is appreciated by the producers as well as by the consumers. A critical point is always the relatively high price. New alternatives like sprayable pheromones or cheaper pheromone dispensers are needed to make the mating disruption technique even more attractive in the future.

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