FEASIBILITY STUDY FOR TRAPPING OF THE SEA BUCKTHORN FLIES AND BIOLOGICAL CONTROL OF WILT

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Abstract

Sea buckthorn growers currently face two plant protection problems – extensive fruit damage by the sea buckthorn fly *Rhagoletis batava* and drying of shrubs caused by vascular mycosis wilt.

This study aims to answer two questions: 1) Can *Rhagoletis batava* be caught by readily available organic low cost feeding attractants? 2) Does the organic preparation HIPPOVITA reduce the infection of sea buckthorn with vascular mycosis in the already infected soil?

Conclusions:

• Molasses can be used as a lure for sea buckthorn flies *Rhagoletis batava*

• Holes and openings through which flies enter the trap can be crucial.

• HIPPOVITA does not protect sea buckthorn from wilt in already infected soil.

Key words: Sea buckthorn, *Rhagoletis batava*, wilt, organic control.

Assessment of the situation

The sea buckthorn fruit fly *Rhagoletis batava* is the most important pest of sea buckthorn causing big losses of fruit yield. Recently, the fly has been rapidly spreading in European sea buckthorn plantations. As the area of sea buckthorn plantations in Latvia increases, the sea buckthorn fly causes significant crop losses (even up to 100%) in both integrated and organic sea buckthorn plantations. This problem needs to be addressed very urgently, as the infestation of sea buckthorn flies in sea buckthorn plantations has reached a level where not only is the establishment of new plantations declining, but the destruction of existing ones starts to take place as well.

Verticillium sp. and *Fusarium sp.* wilt is widespread disease in sea buckthorn plantations and causes significant damage to growers. Here are just some representative records of the devastating effects of the sea buckthorn wilt.

About 20% of cultivated sea buckthorn plants die from wilt during first 7 years in the continental part of Russia. This is one of the main cause of the short life span of the plantations, they last only 7-10 years.

High mortality (over 70%) from *Fusarium* caused wilt of the twelve Russian and Chinese sea buckthorn five year old cultivars has been recently (June 2021) reported from Gansu province in northwest China.

In Romania, Timis county, 94% of the variety Clara has been infected by various soilborn fungi of *Verticillium sp*. and/or *Fusarium sp.*

The nature and objectives of the study

This is a piece of research done before the main study, it can be used to estimate important parameters that are needed to design the basic investigation.

Key questions that need to be answered:

• Can *Rhagoletis batava* be caught by organic low cost feeding attractants?

• Does the biological preparation HIPPOVITA reduce the infection of sea buckthorn with vascular mycosis in the already infected soil?

• Should we proceed with them?

If so, how?

Rhagoletis trapping trial

The aim of the study was to find out whether it is possible to attract sea buckthorn flies *Rhagoletis batava* by feeding attractants, meeting the following requirements:

1. Attractants are easy accessible and effective enough to significantly reduce the number of flies.
2. They can be used in organic farming.

3. Their cost does not make sea buckthorn cultivation unprofitable.

Currently, the only one insecticide GF – 120, allowed in organic farming, which contains a feeding attractant, is available in Latvia, though its price is far from acceptable for commercial use on plantations. Besides, the progress of the European Green Course suggests that the use of this product in organic farming would soon be banned as well.

The first attempts to test sea buckthorn fly low cost feeding attractants were performed in the summer of 2020, using the following substances: molasses, honey, malt extract, beer, apple cider vinegar, methyl eugenol. Methyl eugenol is a component of floral fragrance, attracting insects, it is found in more than 350 plant species. The choice of these substances was determined by the collection of international information on the substances used to attract fruit flies. These substances were filled in appropriate dilutions in 1 liter yellow plastic cans, covered by waterproof lid. 30 holes each 5 mm in diameter were drilled in side walls of the can under the lid overhang to protect the contents of the cans from rain. These boxes were placed among the productive sea buckthorn bushes at a height of 130 cm at the site where sea buckthorn flies had been found in previous years. The boxes were exposed from June 20th to July 31st. The presence of flies was recorded on adhesive patches affixed to the inner walls of the cans. In the variants with honey, malt extract and molasses it was not necessary, because the substances themselves are sticky.

Comparing the number of flies caught in different variants, it was significantly higher in cans with molasses. If in the other variants only 2-15 flies adhered to the glue tapes during the

exposure, then in the cans with molasses this number was about 300. Beer, apple cider vinegars and methyl eugenol were subjected to drying, their contents had to be refilled several times during the exposure. In cans with molasses, honey and malt extract it was not necessary, they did not dry out and acted as glue traps themselves.

Based on these results, in 2021 I carried out the next experiment using three variants - molasses, molasses with added sea buckthorn juice and a fruit fly attractant Combi-Protec, manufactured by the German company BELCHIM. This time instead of 1 liter cans I used 23 x 23 x 23 cm yellow plastic triangle shaped traps, the ends of which were closed with a yellow plastic sieve, mesh size 4 mm. The purpose of the sieve was to limit the entry of unwanted insects into the traps. The traps of all three variants were placed in three sea buckthorn gardens in Tume parish, Tukums district, Latvia. In two of the three gardens, sea buckthorn is grown organically. The attracting liquids were filled in aluminum foil baths, placed inside the housing of traps. To control the presence of flies, special insect glue tapes were attached to the inner walls of the traps. This was especially necessary in traps with Combi-Protec, as this liquid is not sticky in itself. The placement density was 1 trap per 100 square meters. The results differed sharply from 2020. Sea buckthorn flies were not detected at all in any of the three variants. The only species caught in traps were hoverflies *Syrphus ribesii.* At the end of the season, medium-intensity sea buckthorn fruit damage was found in the bushes between the traps, so flies were present, though did not enter traps. It can be concluded that chosen trap design was not successful, because in the previous experiment a significant number of sea buckthorn flies were caught in other forms of traps filled with molasses.
Possible reasons why the flies did not enter traps are:

• Mesh material used on the sides of the traps repelled flies. The size of the mesh holes 4 mm could not be too small, as evidenced by the presence of significantly larger hoverflies *Syrphus ribesii* in the traps.

• Too large area of the openings at both ends of the traps, which created a strong air circulation, thus significantly reducing the odor concentration.

Simultaneously with these experiments, in the summer of 2020, the *R. batava* feed attractant of the Hungarian company CSALOMON was tested in Latvia. Compared to controls, its efficacy was only 31%, which is not enough to make it useful in the mass capture of flies.

Conclusion: Experiments should be continued, trying to use as many different trap designs as possible, as both the concentration of the odor produced and the openings through which the flies must enter the traps can be crucial. Molasses should be included in the list of potential food attractants for the *Rhagoletis batava*.

IPPOVITA trial

In Latvia the vascular mycosis wilt is not as devastating as in the other countries mentioned above, because

• over the years we have selected and grown only the most resistant varieties,

• we avoid soils that have had previously grown plants that are susceptible to wilt,

• we avoid soils with high pH value, where the infection has a higher chance of developing, we plant sea buckthorn in soils with acidity pH 5.5-6.5

In our plantations the wilt takes about 10% of the sea buckthorn plants during the first 10 years. Not very much, nevertheless that is sufficient reason to try to control it, therefore I performed a trial of the biological remedy HIPPOVITA used to prevent wilting in sea buckthorn plantations in Romania. The experiment was set up in a plot where the soil is infected with wilting agents. The disease resistance of sea buckthorn varieties grown in Latvia has been tested in this specially infected sample plot since many years. Male variety 'Tarmo' was used for the experiment. 125 five-year-old shrubs were treated with HIPPOVITA aqueous solution. According to the instructions, the preparation was added to the water at some of the waterings. During the season, three treatments were performed, each time 5 ml of the HPPOVITA in 0,15% solution was applied to the soil for each shrub. The same number of untreated shrubs was observed for control. A proper regular watering, fertilizing and weed control has been applied to all plants.

In the case of both treated and untreated shrubs, 21% of the shrubs withered.

Conclusion: The result clearly indicates that treatment with HIPPOVITA does not reduce the dying of sea buckthorn bushes from *Verticillium sp.* and *Fusarium sp.* in the already contaminated soil. However, this does not exclude the possibility of successful use of this preparation prophylactically in uninfected soils.

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