



**PSR** LOMBARDIA  
L'INNOVAZIONE  
METTE RADICI  
2014 2020



Regione  
Lombardia

**PRO.VIR.VE** (acronym of "Operational protocols of integrated and biological control for the containment of Tomato Spotted Wilt Virus and Thrips Vectors on salads of the fresh-cut salad chain) had as its main purpose to develop and evaluate a protocol to low environmental impact due to the containment of the virus in open field salads both with organic and integrated pest management methods.

Among the protocols with low environmental impact tested there was that of the "flower strip", consisting in sowing, at the edges of the plots, flowering strips on which the thrips predators *Amblyseius swirskii* and *Orius laevigatus* were distributed.

In the field, however, treatments were carried out with entomopathogenic nematodes *Steinernema feltiae* and with the predatory mite *Neoseiulus cucumeris*, both useful for containing TSWV vectors.

We also tested the use of a simple tool such as the lateral flow for the early detection of TSWV, applied both to the arrival of nursery seedlings but also in the field to immediately identify the presence of the virus.

The evaluation of the effectiveness of these protocols was carried out using the following techniques:

- Monitoring of thrips with blue and yellow color traps;
- Evaluation of the presence of the pathogen in the field by means of rapid lateral flow diagnostic tools;
- Serological and molecular analyzes (PCR and qPCR) conducted in the laboratory on samples of salad and wild plants collected in the field;
- NGS sequencing, using Illumina technology, of soil samples taken from farms to monitor their biodiversity.

The results obtained indicate an inconsistent effectiveness of the flowering bands in the control of thrips, to be attributed to the reduced presence of flowers in the warmer months and the consequent reduction in the vitality of predators due to the lack of pollen. Similarly, the distribution of *Amblyseius swirskii* and *Orius laevigatus* also gave mixed results.

The entomopathogenic nematodes *Steinernema feltiae* distributed to reduce the vector population, showed good persistence in the medium following treatment, however not sufficient for the control of thrips. Insignificant results were also observed in relation to the predatory mite *Neoseiulus cucumeris* distributed in the field in correspondence with the nematodes.

In addition to the factors previously indicated, a significant relationship was observed between the growth in the number of thrips and the increase in temperatures, also associated with the presence of TSWV in salads grown during the second cycle. In this period the serological and molecular analyzes carried out to identify TSWV have in fact made it possible to identify the virus in salad plants (*Cichorium intybus*) and soft rag (*Abutilon theophrasti*).

Although the "Illumina" analyzes carried out on soil samples did not allow to detect sequences attributable to the Thripidae family, it was possible to find OTUs related to Rhabditida: this order includes *S. feltiae* and, compared to total nematodes, represented 20% of the reads in the biological field and 57% in the integrated one. However, it should be emphasized that the sequences relating to nematodes represented 1% - of the total.

It should be emphasized that the use of a tool such as the lateral flow for the early detection of TSWV has proved to be very useful, allowing the presence of the virus to be identified, especially in the field, with methods that can also be applied by company technicians.

"Rural Development Program 2014-2020"

"European Agricultural Fund for Rural Development: Europe invests in rural areas"

"Publication realized with the co-financing of the EAFRD. Information manager: O.P. Sole e Rugiada S.A.C.p.A.  
Program Management Authority: Lombardy Region "