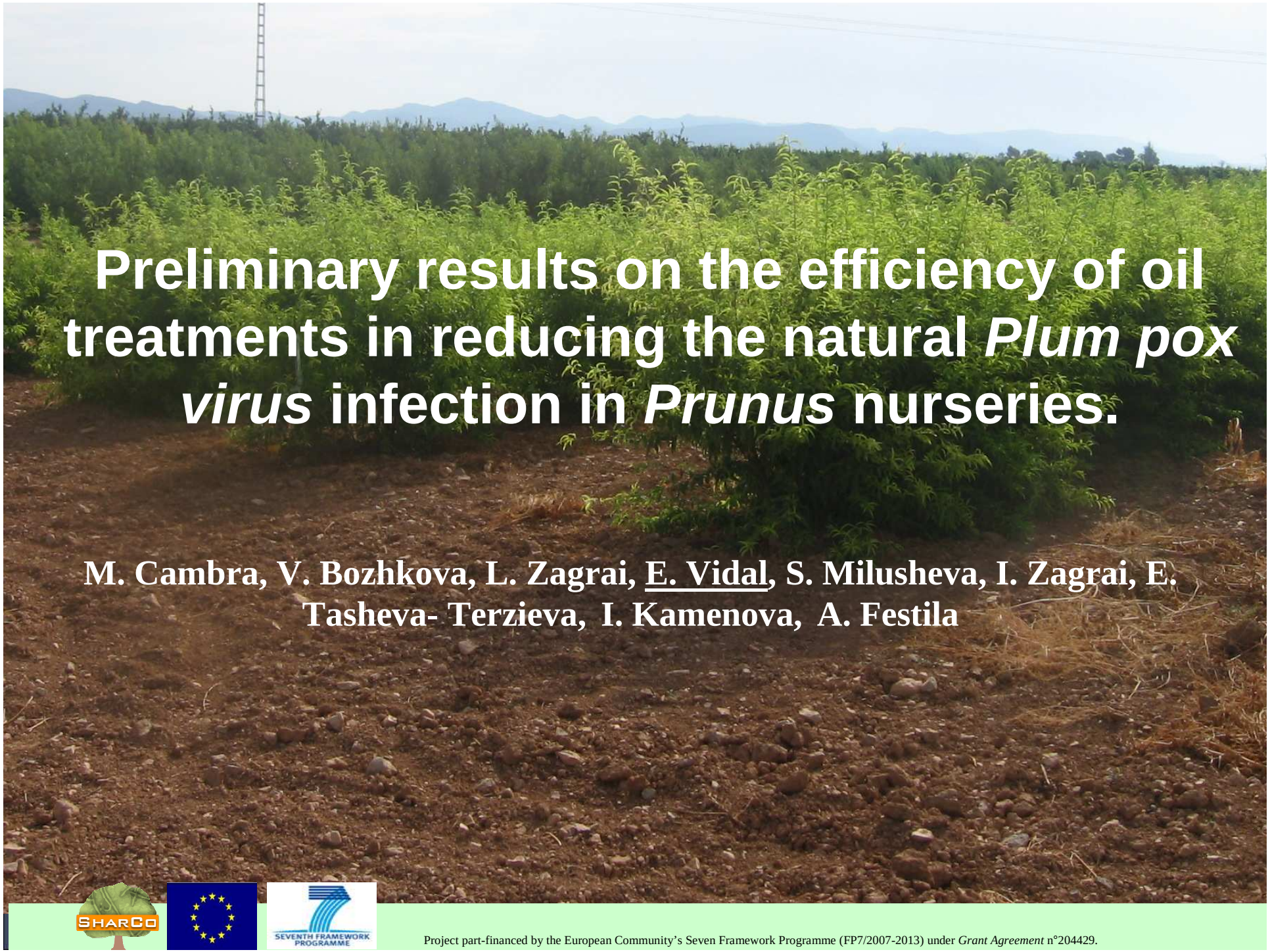

Preliminary results on the efficiency of oil treatments in reducing the natural *Plum pox virus* infection in *Prunus* nurseries.

M. Cambra, V. Bozhkova, L. Zagrai, E. Vidal, S. Milusheva, I. Zagrai, E. Tasheva- Terzieva, I. Kamenova, A. Festila

Project part-financed by the European Community's Seven Framework Programme (FP7/2007-2013) under *Grant Agreement* n°204429.

Sharka disease:

- **The most serious viral disease affecting Prunus species. Worldwide losses associated with sharka disease have been estimated in more than 10.000 million euros in the last 30 years**

- **The causal agent of sharka disease is *Plum pox virus* (PPV)**

- **PPV is transmitted in the field by aphids in a non-persistent manner**

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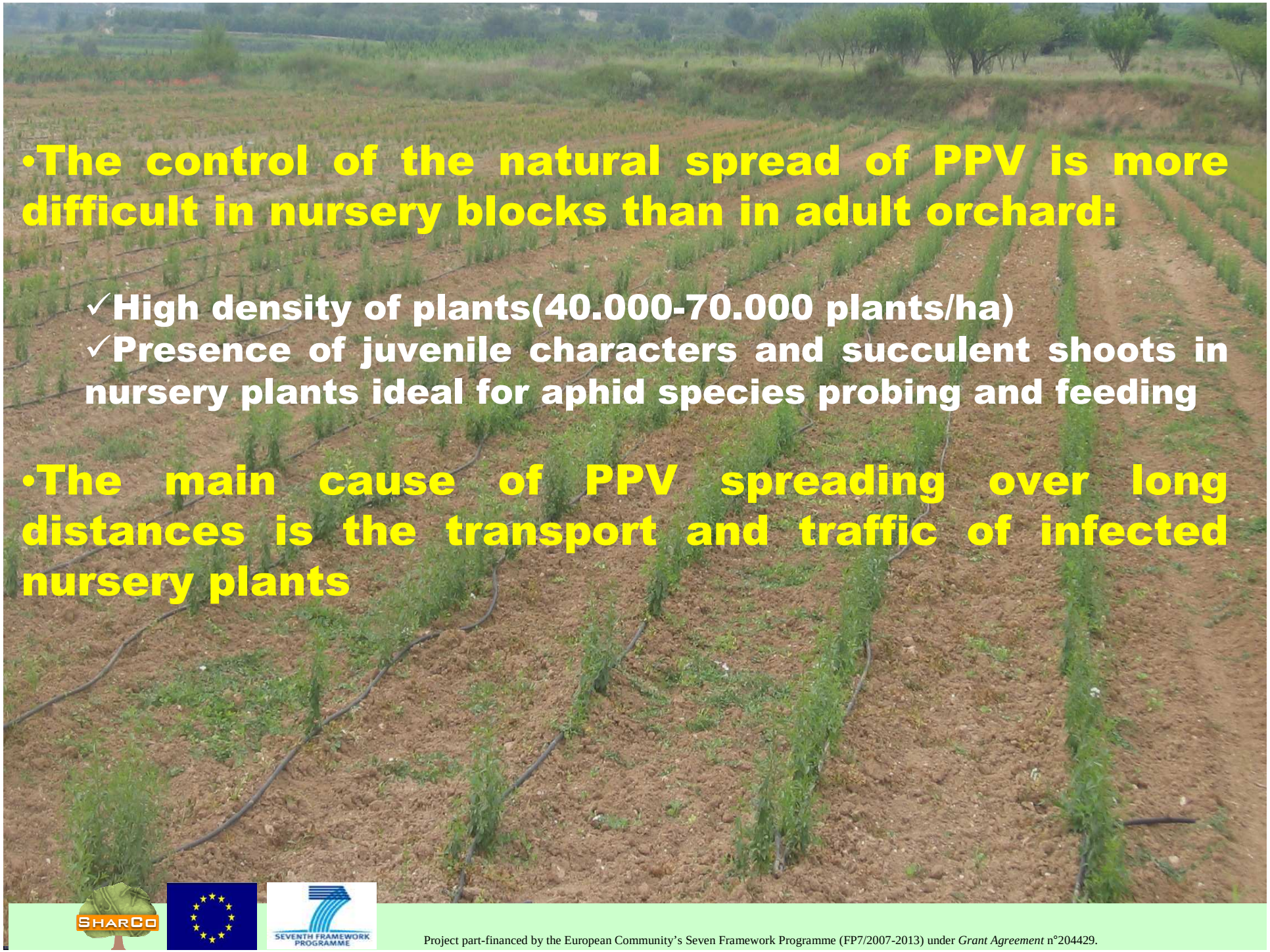

- **The control of the natural spread of PPV is more difficult in nursery blocks than in adult orchard:**
  - ✓**High density of plants(40.000-70.000 plants/ha)**
  - ✓**Presence of juvenile characters and succulent shoots in nursery plants ideal for aphid species probing and feeding**
- **The main cause of PPV spreading over long distances is the transport and traffic of infected nursery plants**

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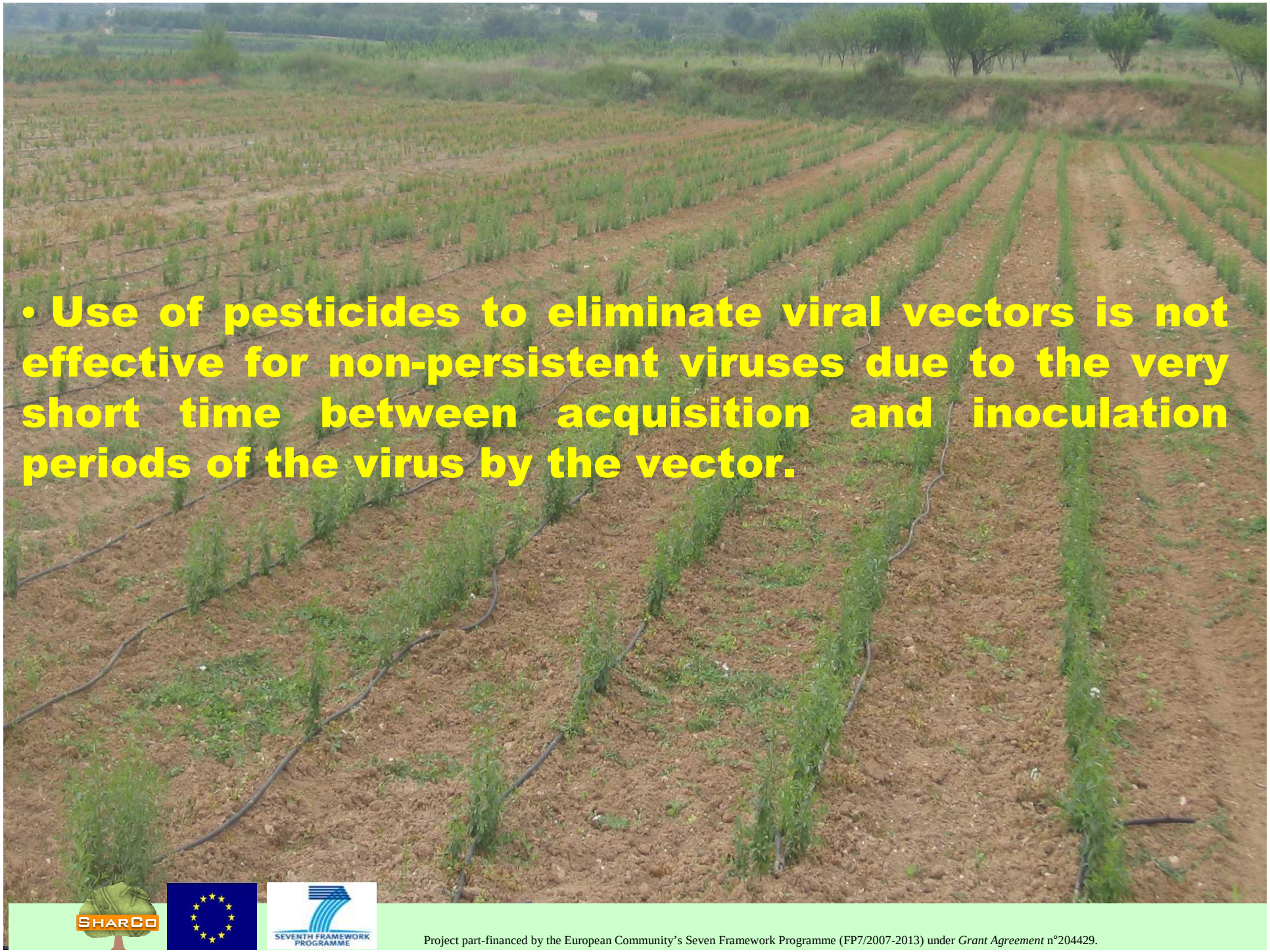

- **Use of pesticides to eliminate viral vectors is not effective for non-persistent viruses due to the very short time between acquisition and inoculation periods of the virus by the vector.**

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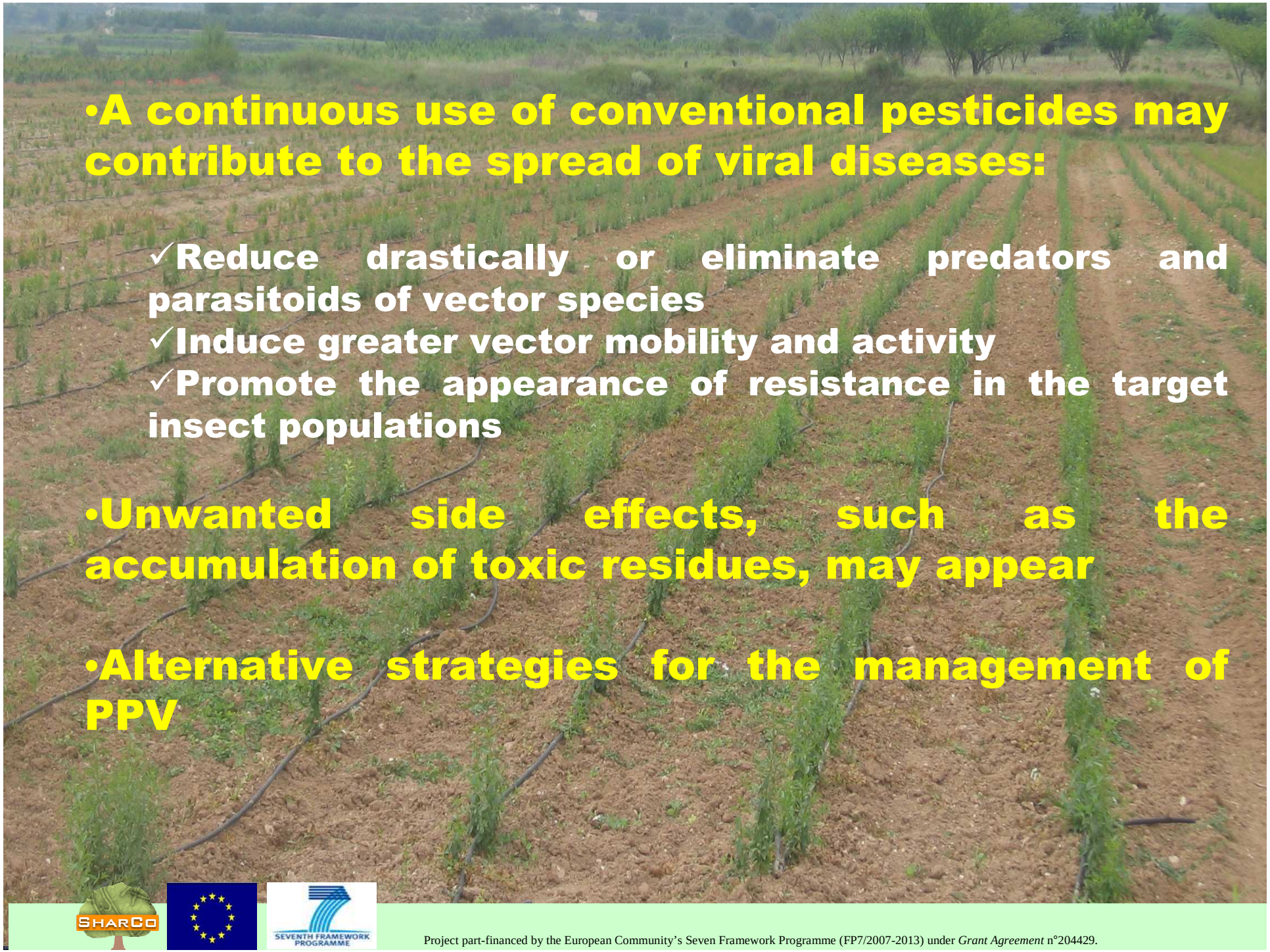

- **A continuous use of conventional pesticides may contribute to the spread of viral diseases:**
  - ✓Reduce drastically or eliminate predators and parasitoids of vector species
  - ✓Induce greater vector mobility and activity
  - ✓Promote the appearance of resistance in the target insect populations
- **Unwanted side effects, such as the accumulation of toxic residues, may appear**
- **Alternative strategies for the management of PPV**

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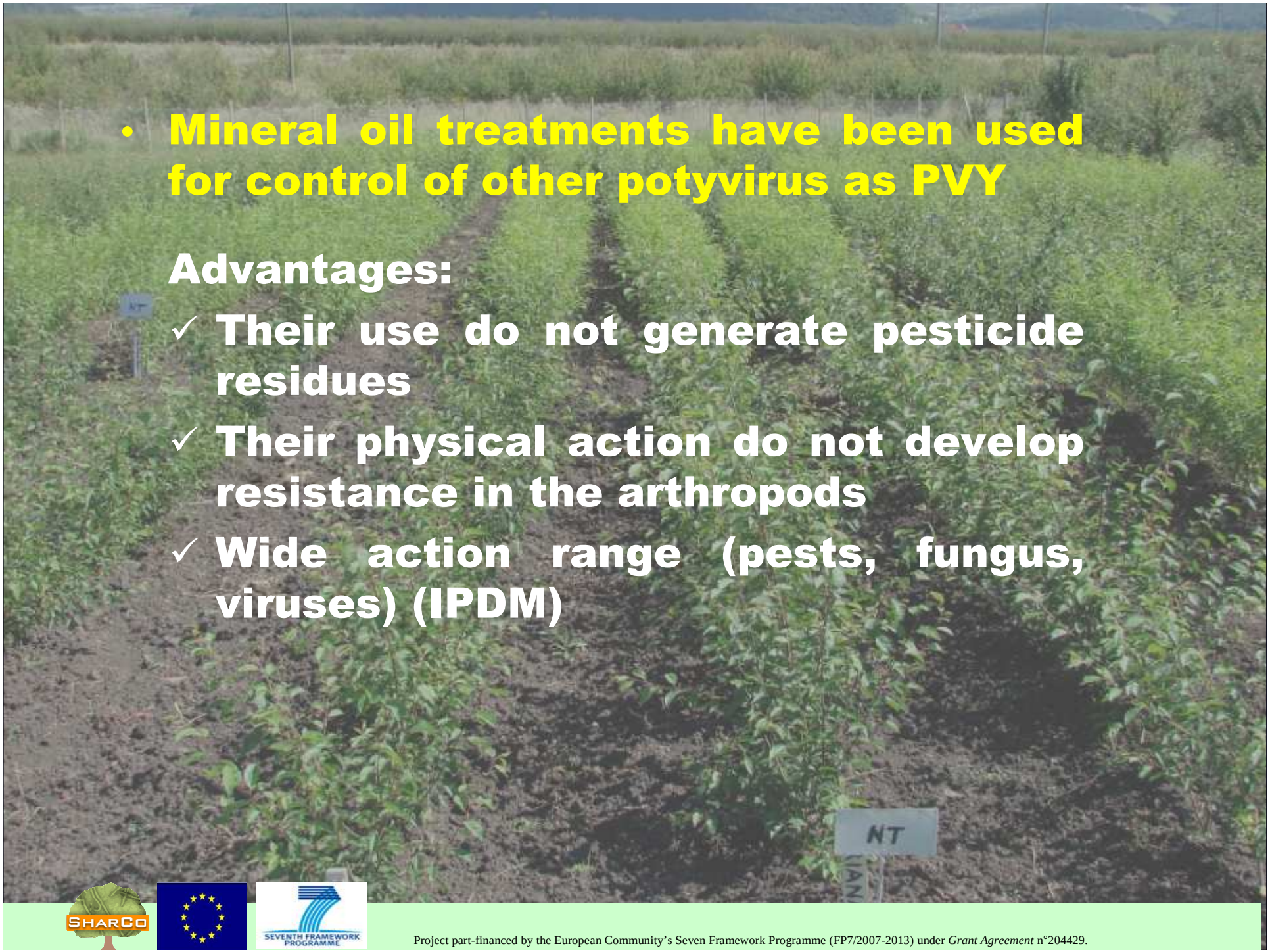

- **Mineral oil treatments have been used for control of other potyvirus as PVY**

Advantages:

- ✓ **Their use do not generate pesticide residues**
- ✓ **Their physical action do not develop resistance in the arthropods**
- ✓ **Wide action range (pests, fungus, viruses) (IPDM)**

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- **Vidal et al. 2010. (*Ann. Appl. Biol.*, in press) shown that the use of mineral oil treatments significantly reduced PPV-D infection in treated blocks of the rootstock Mariana GF8-1 in Spain**

	DASI-ELISA			
	October 2006		May 2007	
	Mariana GF8-1	Nemaguard	Mariana GF8-1	Nemaguard
Control plants	24 / 222 (10.8%) a	13 / 225 (5.8%) a	148 / 223 (66.4%) a	63 / 236 (26.7%) a
Treated plants	20 / 255 (7.8%) a	9 / 257 (3.5%) a	123 / 252 (48.8%) b	66 / 258 (25.6%) a

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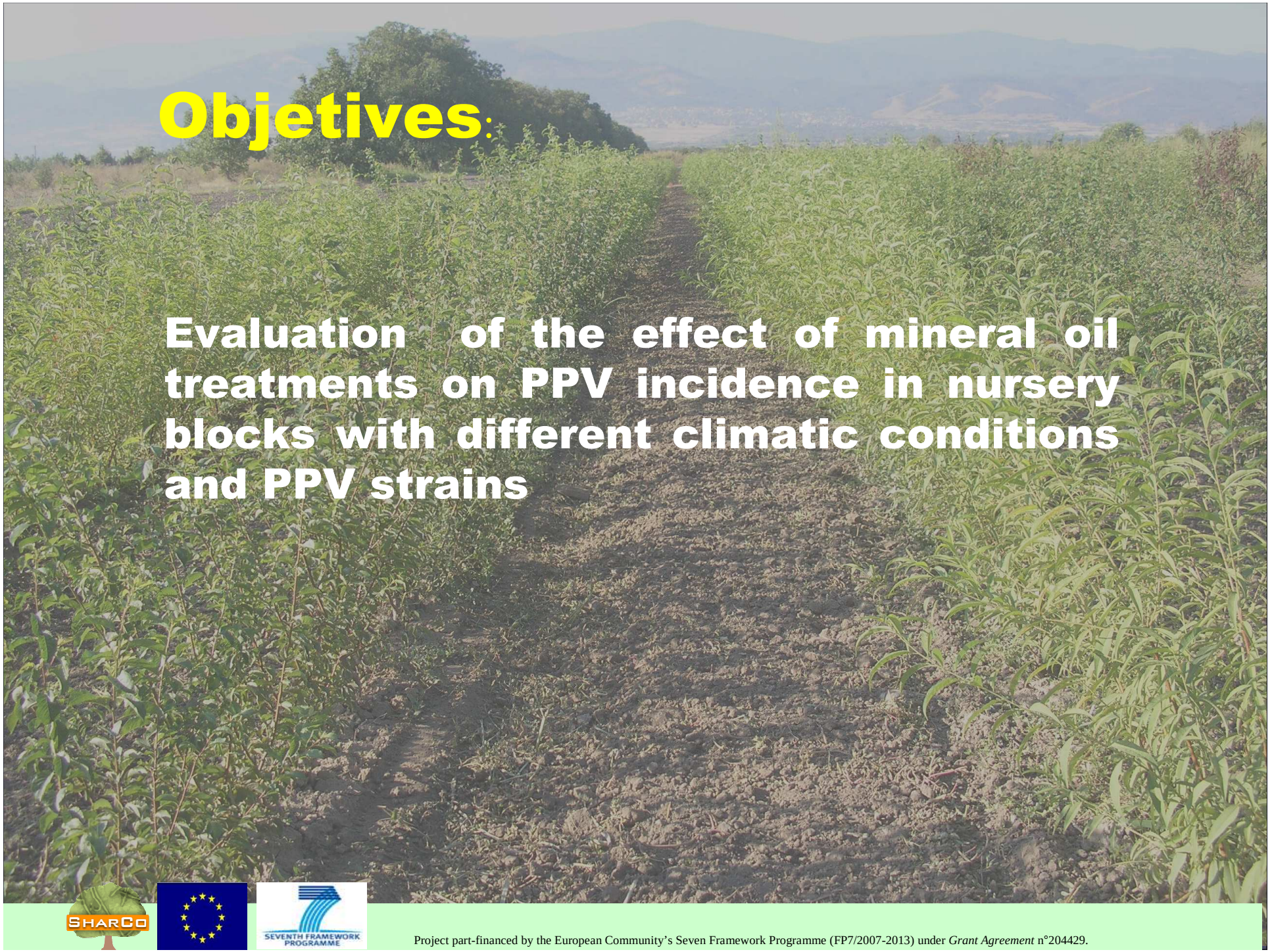

Objetives:

Evaluation of the effect of mineral oil treatments on PPV incidence in nursery blocks with different climatic conditions and PPV strains

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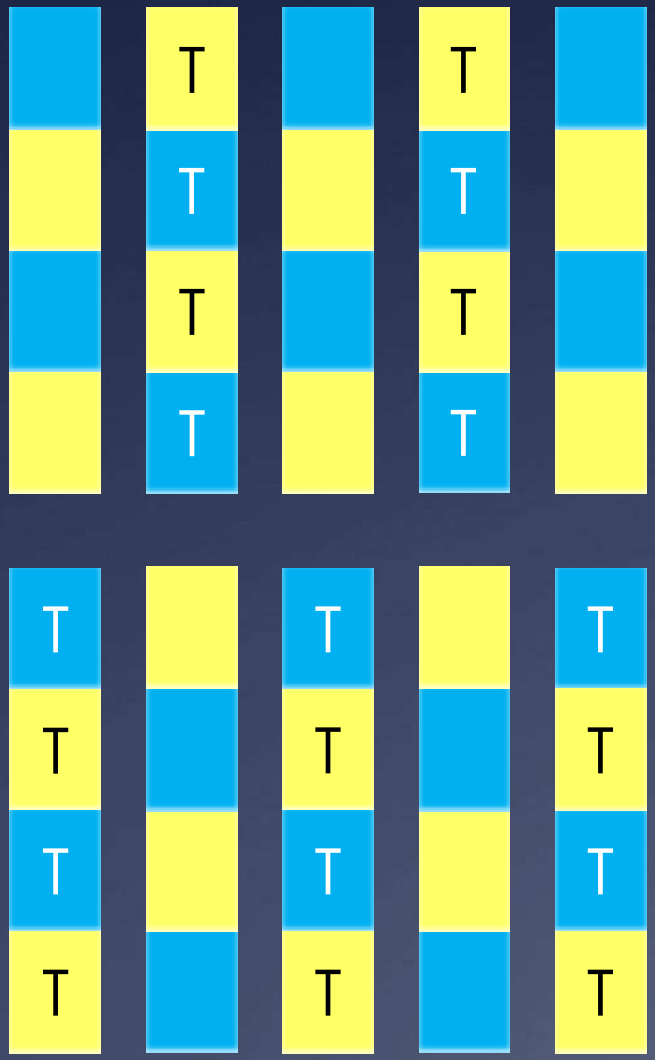
EXPERIMENTAL DESINGS

Bulgaria (Nemaguard and Mariana GF8.1)



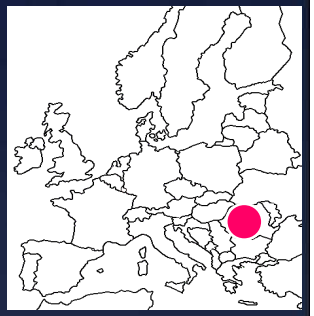
PPV-M

Continental climate

The plot was situated in Plovdiv. It was constituted by 2 blocks, Block 1 and Block 2, of 5 row. Each row will have 4 groups of 100 plants (400 plants/row; 2000 plants/ Block)

EXPERIMENTAL DESINGS

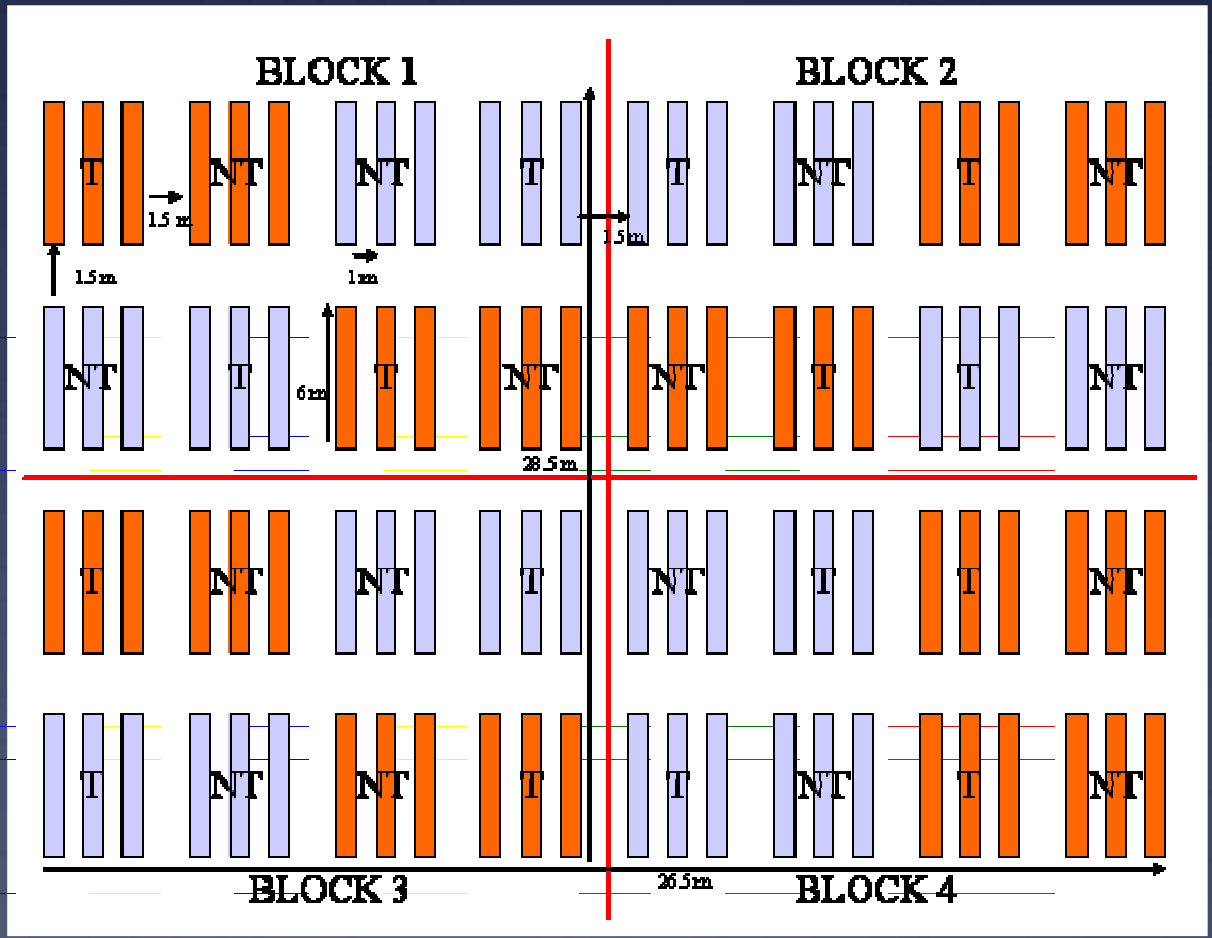
Romania (Nemaguard and Mariana GF8.1



PPV-D

Continental climate

The plot was situated in Bistrita (Romania). It was situated near two inoculum PPV-D inoculum source. The plot was divided in 4 blocks following a statistical split-plot design with two variables (rootstock and treatment).



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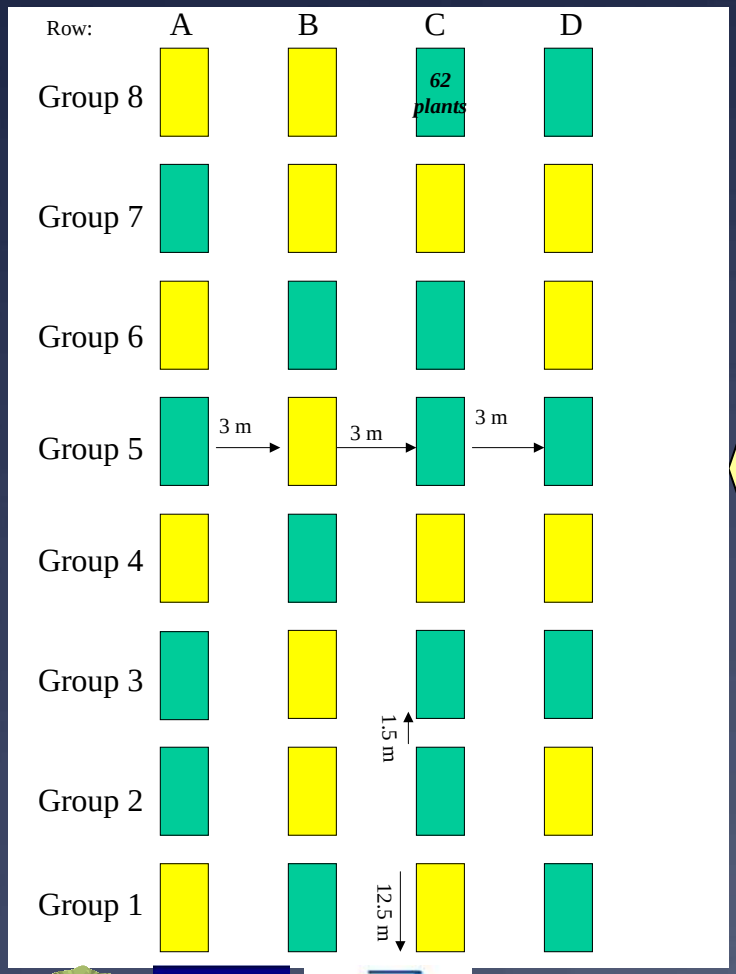
EXPERIMENTAL DESINGS

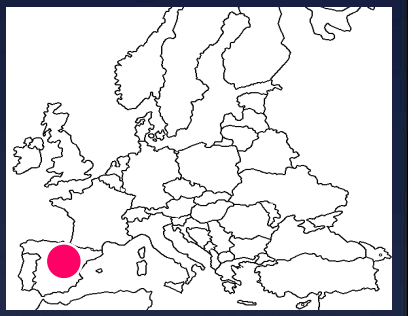
Spain (Nemaguard)



Non-treated

Treated

Apricot orchard with 45% PPV-D infection



PPV-D
Continental moderate climate

The plot was situated in Llíria (Spain). It was planted in 4 rows, each row was formed by 8 groups of rootstocks. Each group was formed by 62 plants each other. The treatment was assigned randomly between the 32 groups.

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Monitoring of aphid species

a) Moericke yellow trap

b) Sticky plant method

a) Moericke yellow traps were collected every 7 days (from May 2008 to October 2009) in Spain

b) Sticky shoot method: 18 shoots / week were sprayed with glue (Souverode, Scotts, France) in Bulgaria, Romania and Spain.

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The dynamic of aphids landing in nursery plots showed a maximum peak of aphid populations:

Bulgaria: beginning of June and at the end of October (2009).

Romania: beginning of June (2008) and mid-June (2009).

Spain: mid May (2008-2009).

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Mineral oil treatments

- **Mineral oil:** SunSpray Ultrafine EC (85% p/v) at 1%

- **Frequency:** Treatments started in Spring when the plants sprouted and were performed weekly until the leaves fall in Autumn. No treatments were done during the Summer time

- **Material:** Pull type sprayer with an agitation system

  Spray gun with manometer (10 bar)

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Monitoring of *Plum pox virus* spread

- It was performed by individual analysis of the nursery plants by DASI-ELISA 5B-IVIA in different periods

Experimental plot situated in Bulgaria was analyzed in February 2009 and February 2010

Experimental plot situated in Romania was analyzed in May 2009

Experimental plot situated in Spain was analyzed in October 2008 and April 2009

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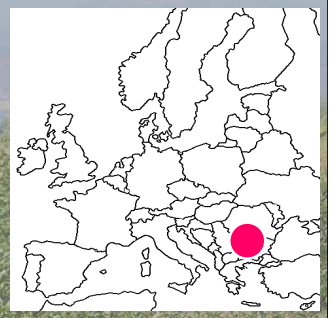
- **Effect of mineral oil treatments on PPV-M spread determined by DASI-ELISA in Plovdiv (Bulgaria)**



	Bulgaria			
	February 2009		February 2010	
	Mariana GF8-1	Nemaguard	Mariana GF8-1	Nemaguard
Control plants	18 / 696 (2.6%) a	27 / 931 (2.9%) a	151 / 709 (21.3%) a	186 / 924 (20.1%) a
Treated plants	14 / 795 (1.8%) a	18 / 890 (2.0%) a	109 / 809 (13.47%) b	135 / 908 (14.9%) a

Data in the same column followed by different letter are significantly different according to generalized linear model in a binomial distribution (overall p-value < 0.05.)

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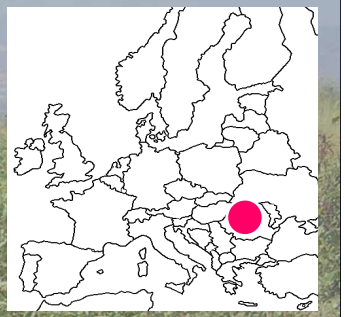
- **Effect of mineral oil treatments on PPV-D spread determined by DASI-ELISA in Bistrita (Romania)**



	Romania	
	May 2009	
	Mariana GF8-1	Nemaguard
Control plants	13 / 693 (1.9%) a	31 / 691 (4.5%) a
Treated plants	9 / 703 (1.3%) b	16 / 709 (2.3%) b

Data in the same column followed by different letter are significantly different according to generalized linear mixed model in a binomial distribution (overall p-value < 0.05.)

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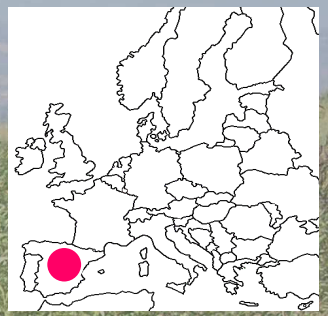
- **Effect of mineral oil treatments on PPV-D spread determined by DASI-ELISA in Llíria (Spain) in the Nemaguard rootstock plants**



	Spain	
	October 2008	April 2009
Control plants	0 / 900 (0.0%)	7 / 863 (0.8%)
Treated plants	0 / 894 (0.0%)	3 / 856 (0.3%)

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Conclusions:

- The peak of aphid population has been different in each assayed country depending of their climatic conditions. In areas with a continental moderate climate occurs before than in areas with a continental climate

- The oil treatments did not prevent PPV infection but always reduced the number of infected plants in all the experimental plots. Significant differences in PPV incidence were found between Mariana GF8-1 and Nemaguard treated and non-treated plants in the plots of Bulgaria and Romania in February 2010 and April 2009, respectively

- Due to their physical action, the mineral oil treatments has been effective against D and M strains

- The use of mineral oil treatments combined with other methods for control of PPV in nursery blocks, as use of resistant or less susceptible rootstocks or adequate localisation of the nursery, could be constitute an integrated strategy to reduce PPV spread in the nursery industry.

Recommendations and current situation:

- To apply a control based on mineral oil treatments, the peak of aphids populations have to be established
- The treatments must be done at least during the peak of aphid population
- Mineral-oil treatment should also be evaluated under different climatic conditions and PPV inoculum pressures, using different rootstocks genotypes, challenging the plants with different PPV strains and using different technologies for mineral oil application before it is applied on large scale (SharCo project)
- Assays are conducted to evaluate the efficiency of mineral oil treatments in young plantations (the most sensitive period for natural PPV infection)

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