UNAPera consortium: the research program to solve the problems of the pear cultivation in Italy

Stefano Foschi

FRUIT GROWERS VICTORIA CONFERENCE

«Improving on-farm efficiency through innivation»

The company UNAPera

UNAPera is a consortium founded in 2021 and made up of **25 companies**, of which 13 are Producer Organizations;

All the structures manage pears along the supply chain, from field to point of sale;

UNAPera is **recognized as an Association of Producer Organizations** from the European Union.

UNAPera


AFE
ASSOCIAZIONE
FRUTTICOLTORI
ESTENSE
Soc. Coop. Agricola


SALVI
UNACOA
S.p.a.


apo conerpo


APOFRUIT


BERGONZONI
Frutta


BIOP


CICO
Mazzoni


Cipof
COOP. INTERCOMUNALE
PRODUTTORI
ORTOFRUTTICOLI S.C.A.

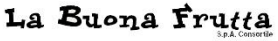

Il Frutteto
Consorzio Frutteto S.p.A. Consortile


ceor
COOPERATIVA ESPORTATORI
ORTOFRUTTICOLI ROMAGNOLI


EUROPFRUIT
Associazione Produttori


Gobbi Dino s.r.l.


O.P. GRANFRUTTA
ZANI


La Buona Frutta


La Buona Frutta


OrtolaniCofri


Minguzzi Spa Consortile


costea
organizzazione produttori - servizi agrotecnici


COFERASTA
La frutta appena raccolta


OP
kiwiSole


SPREAFICO


origine
GROUP


OROGEL


alegra
THE ITALIAN FRUIT COMPANY


Naturitalia
THE FLAVOURS OF NATURE


Opera
LA PERA!


Patfrut


agrintesa
Insieme più grandi


fruit modena group


PerArte


Ital-frutta s.a.c.
P.O.V.
Produttori
Ortofrutticoli
Voltana


OrtolaniCofri

The background

Italy is the EU main producer of pears.

Despite this, the Italian pear cultivation is experiencing a loss of competitiveness of a structural nature, with a reduction in cultivated area and productivity due to the following factors:

- excessive fragmentation of agricultural enterprises;
- Heterogeneous - and often unsatisfactory - quality of production;
- lack of recognized brands on the market;
- consumer disaffection;
- extreme climatic events (spring frost, hail, heat waves);
- emerging pathologies, such as brown spots and brown marmorated stink bugs, in addition to the resurgence of existing diseases due to climate change;
- lack of innovation along the supply chain;

Mission

Increase the competitiveness of the Italian pear sector through the implementation and sharing of rewarding initiatives:

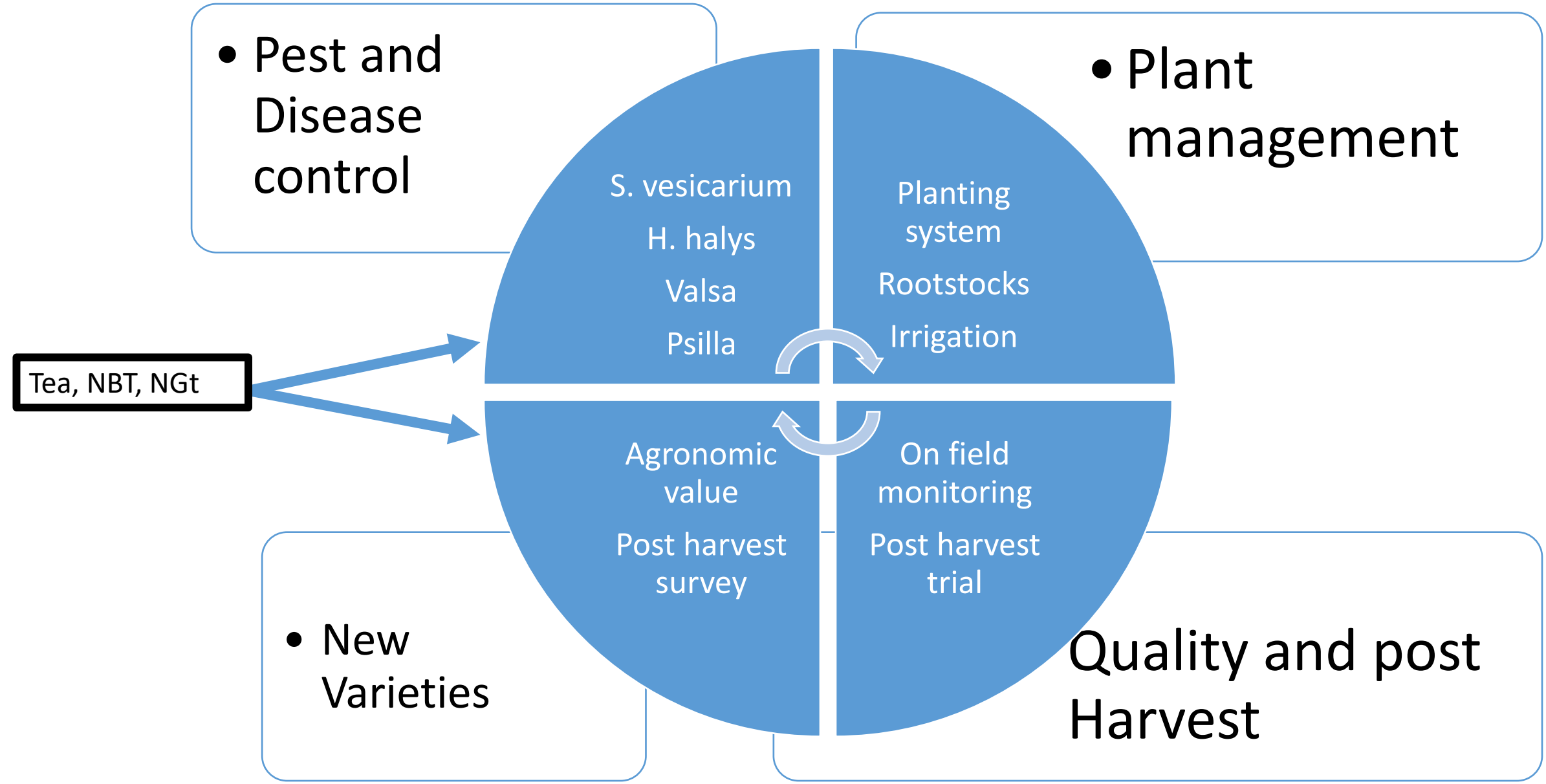
1. Improvement and standardization of production quality;
2. Unified commercial strategy and enhancement of production, also on the basis of the PGI (Protected Geographical Indication);
3. Research and development;

CONSORZIO DI TUTELA
PERA DELL'EMILIA ROMAGNA IGP

Research and Development

UNAPERA operates through technical and scientific committees with the following objectives:

1. Identify the needs of producers;
2. Organize and manage research activities;
3. Cooperate with national and international research centers;
4. MAIN FOCUS: Pest and Disease control, NBT, Genetic improvement, Crop management, Planting systems, Environmental sustainability, Post Harvest;


• Pest and Disease control
• Plant management
S. vesicarium
H. halys
Valsa
Psilla
Planting system
Rootstocks
Irrigation
Tea, NBT, NGt
Agronomic value
Post harvest survey
On field monitoring
Post harvest trial
• New Varieties
Quality and post Harvest

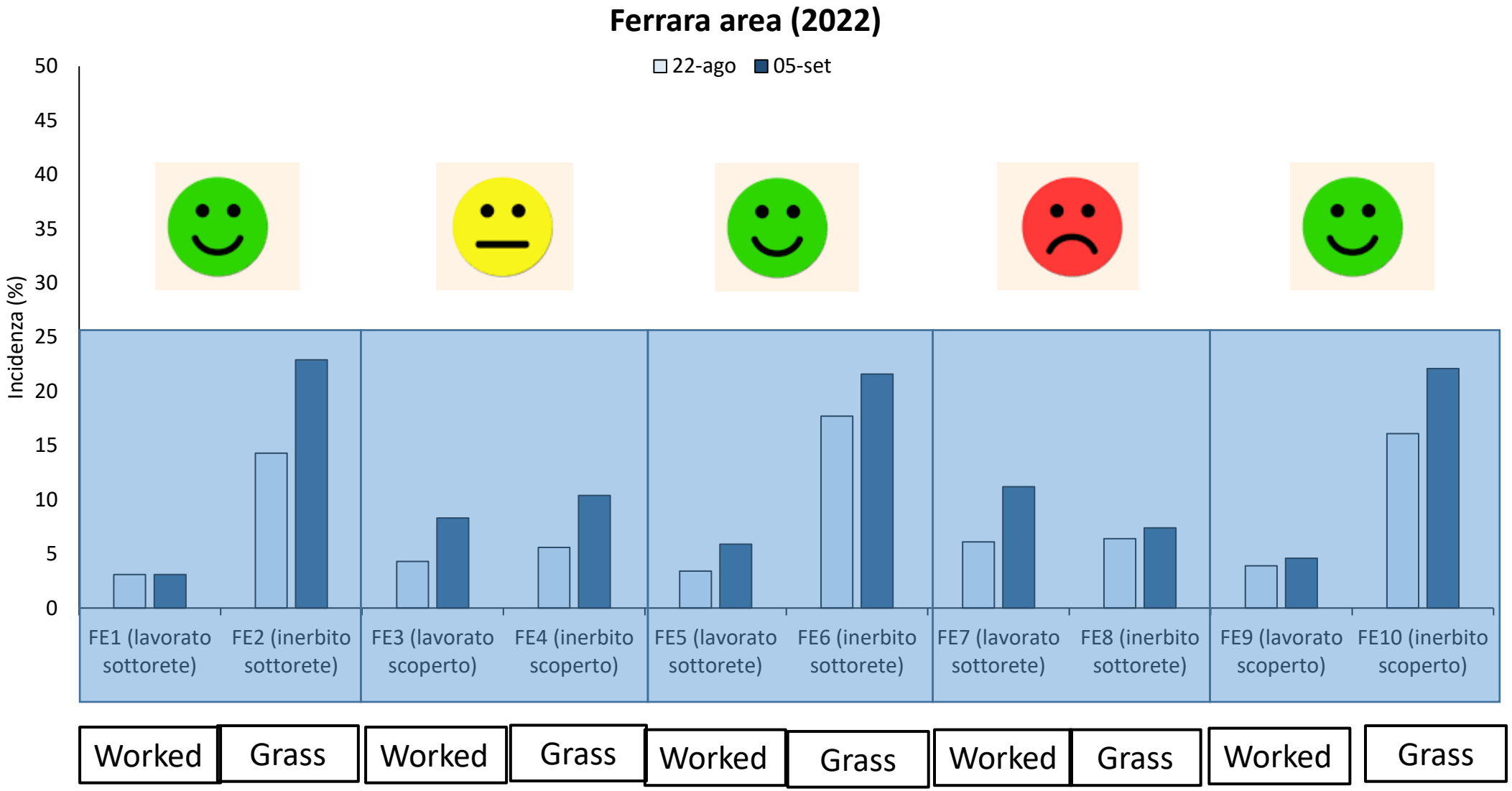
Sthemphylium Vesicarium trials-Working the grass

Field of cv Abate Fetel with:

- Grass not worked
- Grass worked into the soil (buried at 10-15 cm deep)

30 pairs of orchards in different areas

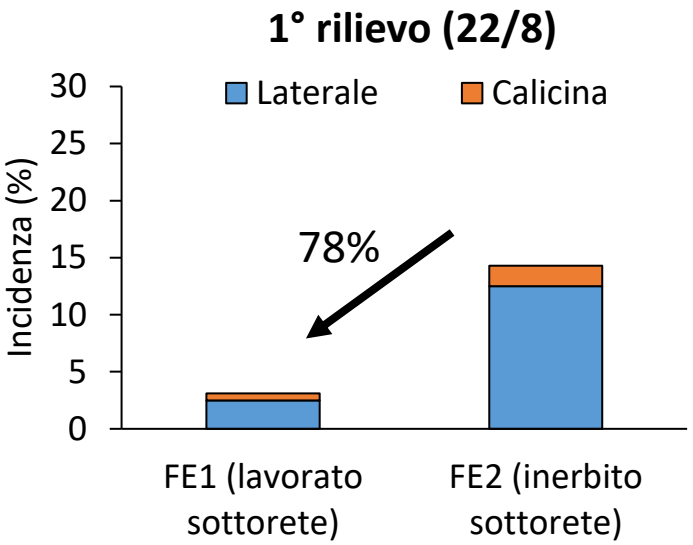
Fruit damage assessment

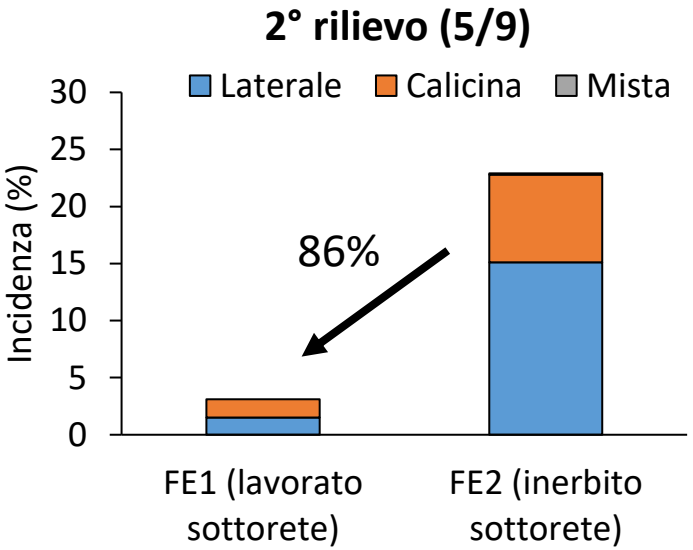

Ferrara area (2022)
22-ago
05-set
Incidenza (%)
50
45
40
35
30
25
20
15
10
5
0
FE1 (lavorato sottorete)
FE2 (inerbito sottorete)
FE3 (lavorato scoperto)
FE4 (inerbito scoperto)
FE5 (lavorato sottorete)
FE6 (inerbito sottorete)
FE7 (lavorato sottorete)
FE8 (inerbito sottorete)
FE9 (lavorato scoperto)
FE10 (inerbito scoperto)
Worked
Grass
Worked
Grass
Worked
Grass
Worked
Grass
Worked
Grass

FE1 (worked)

FE2 (grass)

Two different fields in the same farms, FE1 worked since 2021





Effect of working grass respect past damage

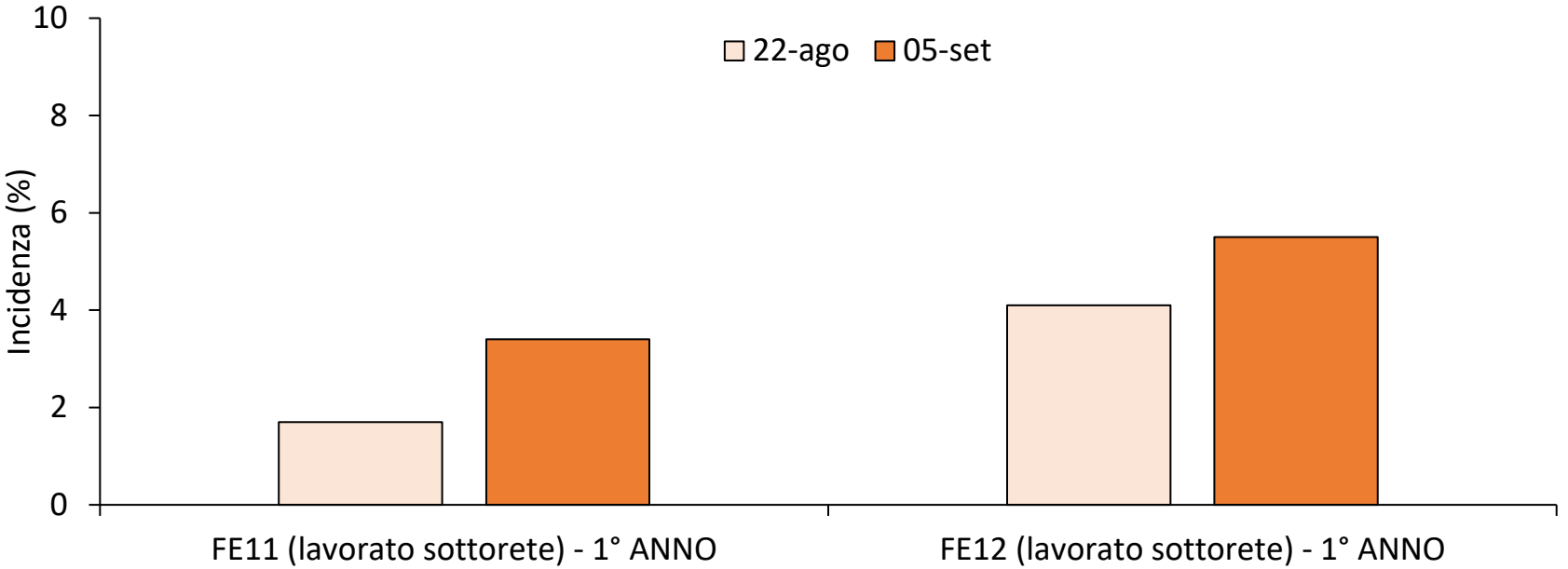
Damage FE11:

2019 – 0%

2020 > 70%

2021 > 70%

2022 < 5%



Damage FE12:

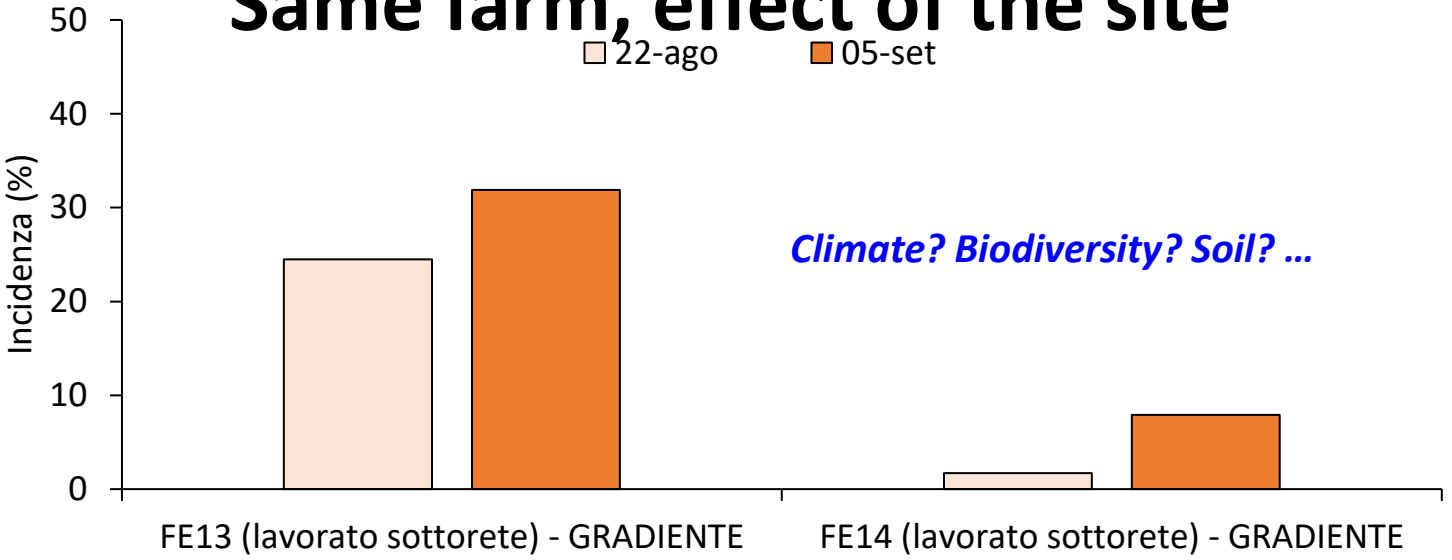
2019 < 5%

2020 ~ 30-40%

2021 = 100%

2022 ~ 5%

Same farm, effect of the site



Climate? Biodiversity? Soil? …

Where the damage is serious, bury the grass, IF DONE IN A PROPER WAY, seems to bring about a visible and concrete improvement.

When carried out late and in isolated form it does not appear to make a significant contribution to damage control.

It is important to carefully consider all the negative consequences of this technique (including returning to the field).

SCENARIO 2030 TRIAL

Started since october-november 2023

Scenario 2030-Abate and William

Agronomic and economic evaluation of a new pest and disease strategy

Evaluate the impact that disease control can have on production with the exclusion of molecules that will be revoked in the next 5 years.

- Evaluate the effectiveness of future disease control strategy vs current integrated pest management programme
- Economic analysis about impact on production
- Introduce new technical lines of defense which must be adopted from 2028

INSECTICIDE	SCADENZA AUTOR. DATA REVOCA	DATA UTILIZZO
ABAMECTINA	01/04/2023 01/07/2023	31/08/2024 30/12/2024
SPINETORAM	30/05/2024	30/12/2025
SPIROTERAMAT	30/04/2024	30/10/2025

FUNGICIDES	SCADENZA AUTOR. DATA REVOCA	DATA UTILIZZO
BOSCALID, CAPTANO, DITHIANON[1]	31/07/2023	2025?
FLUAZINAM[2]	28/02/2023	2025/2026?
METIRAM[3]	31/01/2023	2024/2025
TEBUCONAZOLO[4]	31/08/2023	2024
ZIRAM[5]	30/04/2023	2026?

HERBICIDE	SCADENZA AUTOR. DATA REVOCA	DATA UTILIZZO
GLIFOSATE	?	?

EMAMECTINA ETOFENPROX METHOSSIFENOZIDE PIRIMICARB	FOR NEXT REPLACEMENT

DIFENCONAZOLO FLUDIOXONIL	FOR NEXT REPLACEMENT

DIFLUFENICAN OXYFLUORFEN PENDIMETHANIL	FOR NEXT REPLACEMENT

First activities

- We started to use **caolin** against psilla during leaf fall
- **Rimpro model** in order to better finalize the timing of treatment againts S. Vesicarium
- On Scenario 2030 plot the plants seem to be healthier and more vigorous (to be confirmed with production results)

Pear survey on Valsa

(*Cytospora* = *Valsa pyri*)

related to nutritional status of the plants

Started 2023

Management of Valsa Canker on Apple with Adjustments to Potassium Nutrition

H. X. Peng, X. Y. Wei, and **Y. X. Xiao,** State Key Laboratory of Crop Stress Biology for Arid Areas and College of Plant Protection, Northwest A&F University, Yangling, Shaanxi, 712100, China; **Y. Sun,** Faculty of Science, National University of Singapore, Singapore 117543; **A. R. Biggs,** Kearneysville Tree Fruit Research and Education Center, West Virginia University, Kearneysville 25443; **M. L. Gleason,** Department of Plant Pathology and Microbiology, Iowa State University, Ames 50011; and **S. P. Shang, M. Q. Zhu, Y. Z. Guo,** and **G. Y. Sun,** State Key Laboratory of Crop Stress Biology for Arid Areas and College of Plant Protection, Northwest A&F University

Abstract

Peng, H. X., Wei, X. Y., Xiao, Y. X., Sun, Y., Shang, S. P., Biggs, A. R., Gleason, M. L., Zhu, M. Q., Guo, Y. Z., and Sun, G. Y. 2016. Management of Valsa canker on apple with adjustments to potassium nutrition. Plant Dis. 100:884-889.

Valsa canker, caused by the fungus *Valsa mali*, is one of the most destructive diseases of apple in the primary production areas of China and other East Asian countries. Currently, there are no effective control methods for this disease. We investigated the occurrence of Valsa canker in 24 apple orchards in Shaanxi Province in concert with foliar nutrient analysis, and found that there was a significant negative correlation of leaf potassium (K) content with incidence and severity of Valsa canker. Fertilization experiments showed that increasing tree K content enhanced resistance to pathogen colonization and establishment. Apple trees with leaf K content greater than 1.30% exhibited almost complete resistance to *Valsa mali*. Field trials demonstrated that increasing K fertilization could significantly reduce disease incidence. Improved management of tree nutrition, especially K content, could effectively control the occurrence and development of Valsa canker.

Orchard code	Nutrition levels[x]			Disease development[y]	
	N (%)	P (%)	K (%)	Disease index[z]	Disease incidence (%)
A	2.18	0.26	0.58	25.2	50
B	2.03	0.22	0.61	22.3	43.3
C	2.17	0.26	0.65	21.1	33.3
D	2.36	0.32	0.75	12.1	31.8
E	2.52	0.33	0.75	19.6	40
F	2.07	0.29	0.75	20.7	43.3
G	2.29	0.27	0.76	16.3	40
H	2.33	0.29	0.76	16.7	43.3
I	2.41	0.26	0.77	18.4	43.3
J	2.26	0.22	0.77	6.7	16.6
K	2.32	0.25	0.86	10.4	16.6
L	2.4	0.27	0.89	1.1	3.3
M	2.84	0.28	0.91	1.5	3.3
N	2.07	0.33	1.02	0	0
O	2.21	0.22	1.05	2.6	6.8
P	2.37	0.23	1.15	1.1	3.3
Q	2.44	0.26	1.16	1.6	3.3
R	2.33	0.22	1.18	1.1	3.3
S	2.69	0.24	1.18	1.1	3.3
T	2.17	0.25	1.23	1.5	3.3
U	2.5	0.25	1.24	0	0
V	2.52	0.24	1.24	1.1	3.3
W	2.49	0.23	1.25	0	0
X	2.62	0.24	1.32	0	0

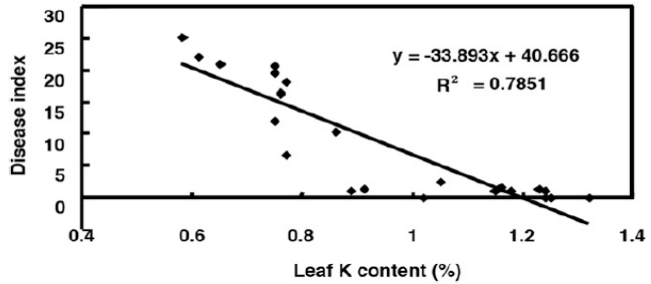


Fig. 1. Relationship between apple leaf potassium (K) content and Valsa canker disease index. Each data point represents leaf K and disease index from 24 orchards sampled in 2012.

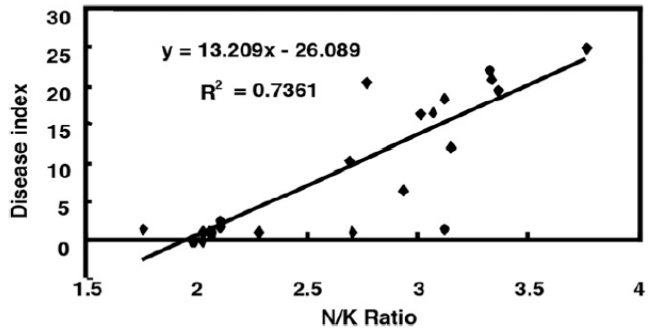


Fig. 2. Relationship between nitrogen/potassium (N/K) ratio and disease index. Each data point represents leaf N/K ratio and disease index from 24 orchards sampled in 2012.

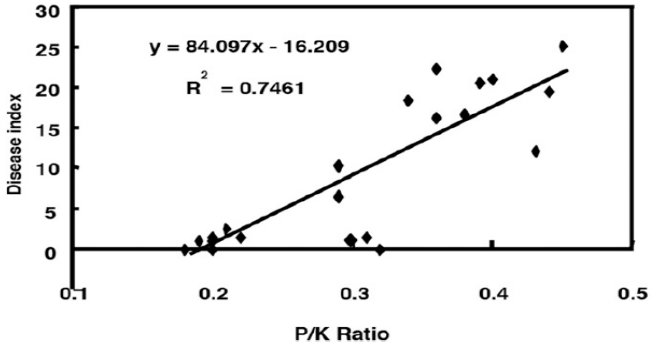


Fig. 3. Relationship between phosphorus/potassium (P/K) ratio and disease index. Each data point represents leaf P/K ratio and disease index from 24 orchards sampled in 2012.

MATERIAL and METHODS:

Survey on 40 orchard cv Abate Fetel (10 Modena provence, 10 Ferrara, 10 Bologna and 10 Ravenna) with different problems caused by Valsa.

Evaluated presence and severity of damages

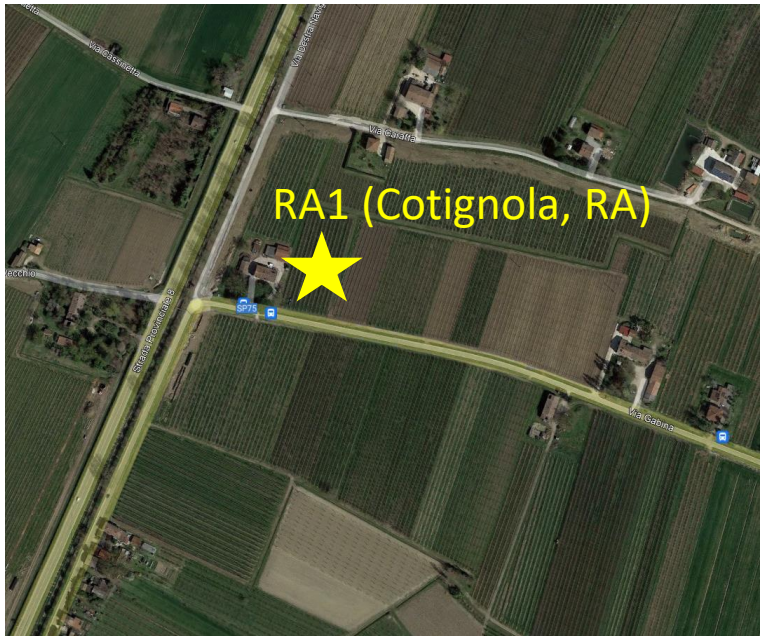
Determination of the level of foliar nutrition with analysis

TABELLA A - Scala arbitraria d'incidenza e severità della malattia

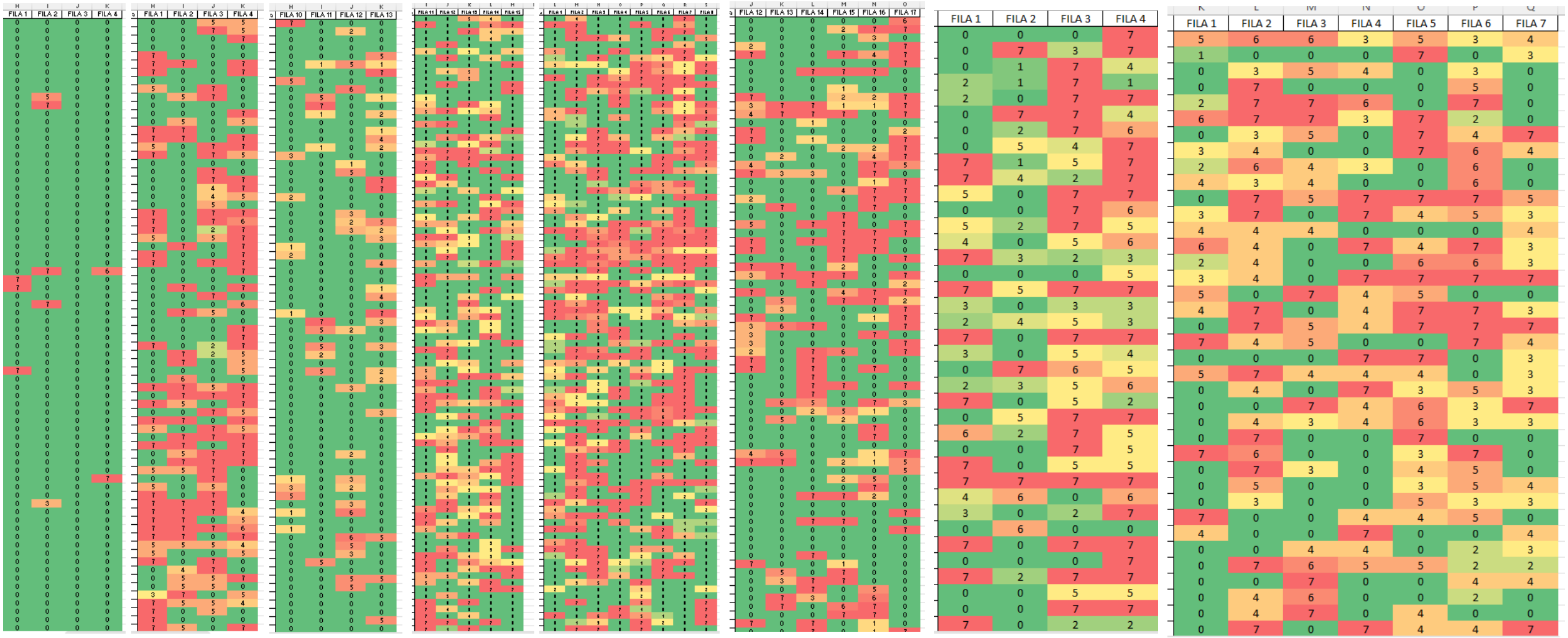
Classi sintomatiche	Valore medio
A = pianta asintomatica	0,00
S = pianta sintomatica, appartenente a una delle seguenti sottoclassi:	
S1 = sintomi che si osservano sull'1-5% della struttura legnosa	2,55
S2 = sintomi che si osservano sul 5,1-10% della struttura legnosa	7,55
S3 = sintomi che si osservano sul 10,1-25% della struttura legnosa	17,55
S4 = sintomi che si osservano sul 25,1-40% della struttura legnosa	32,55
S5 = sintomi che si osservano sul 40,1-70% della struttura legnosa	55,05
S6 = sintomi che si osservano su oltre il 70,1% (fino al 99,9%) della struttura legnosa	85,00
M = pianta morta	100
F = solo fallanza, cioè la pianta è stata rimossa ed è assente	100
R = solo rimpiazzo, cioè una pianta più giovane rispetto all'età dell'impianto	100
F/R = fallanza e rimpiazzo nella stessa posizione (sostituzione di pianta)	100

n.pianta	FILA 1	FILA 2	FILA 3	FILA 4	FILA 5	FILA 6	FILA 7	FILA 8	FILA 9	FILA 10	FILA 11	FILA 12
1	7	0	0	0	0	0	0	0	0	0	0	0
2	0	0	7	0	0	0	0	6	0	0	0	0
3	0	0	0	0	0	3	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	5	0	0	0
6	0	0	0	0	0	0	0	7	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	7	0	0	0	0	0	7	0	0	0
10	0	0	1	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	1	0
12	0	0	0	0	7	0	0	0	0	0	7	0
13	0	0	0	0	0	0	0	0	0	7	0	0
14	0	0	0	0	0	0	7	0	0	0	0	0
15	0	0	0	5	4	7	0	5	4	0	0	0
16	0	0	0	0	0	0	4	7	0	0	0	0
17	0	0	2	0	0	4	0	0	0	0	0	7
18	0	7	0	0	7	4	0	0	0	0	0	0
19	0	0	0	0	4	0	0	0	0	0	7	0
20	0	0	0	0	0	0	0	0	0	4	0	5
21	0	0	0	0	0	0	0	0	3	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	4	0	0	0
24	0	4	0	0	0	3	0	0	0	0	0	0
25	0	0	0	0	0	3	4	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	5	4	0	0	3	0	0	2
28	4	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	7	0	0
30	0	0	0	0	0	3	0	0	0	0	0	0
31	0	0	0	7	7	3	0	0	0	0	0	0
32	0	1	0	7	0	5	3	0	0	0	0	0
33	0	0	0	0	0	0	0	7	0	0	0	0
34	0	0	0	0	4	0	0	0	5	0	0	0
35	3	7	0	0	0	0	0	0	0	7	0	0
36	0	0	7	0	0	0	3	0	0	0	0	0
37	0	0	0	0	3	0	0	0	0	0	0	0
38	0	0	0	0	0	0	3	0	3	0	0	0
39	0	0	0	0	0	0	0	0	0	1	0	0
40	0	0	2	4	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0	7	0	0	0
42		0	0	0	0	0	0	0	0	0	0	0
43		0							0	0	0	0
44		0										
45		0										

ESEMPIO DI RACCOLTA DATI (RA1):



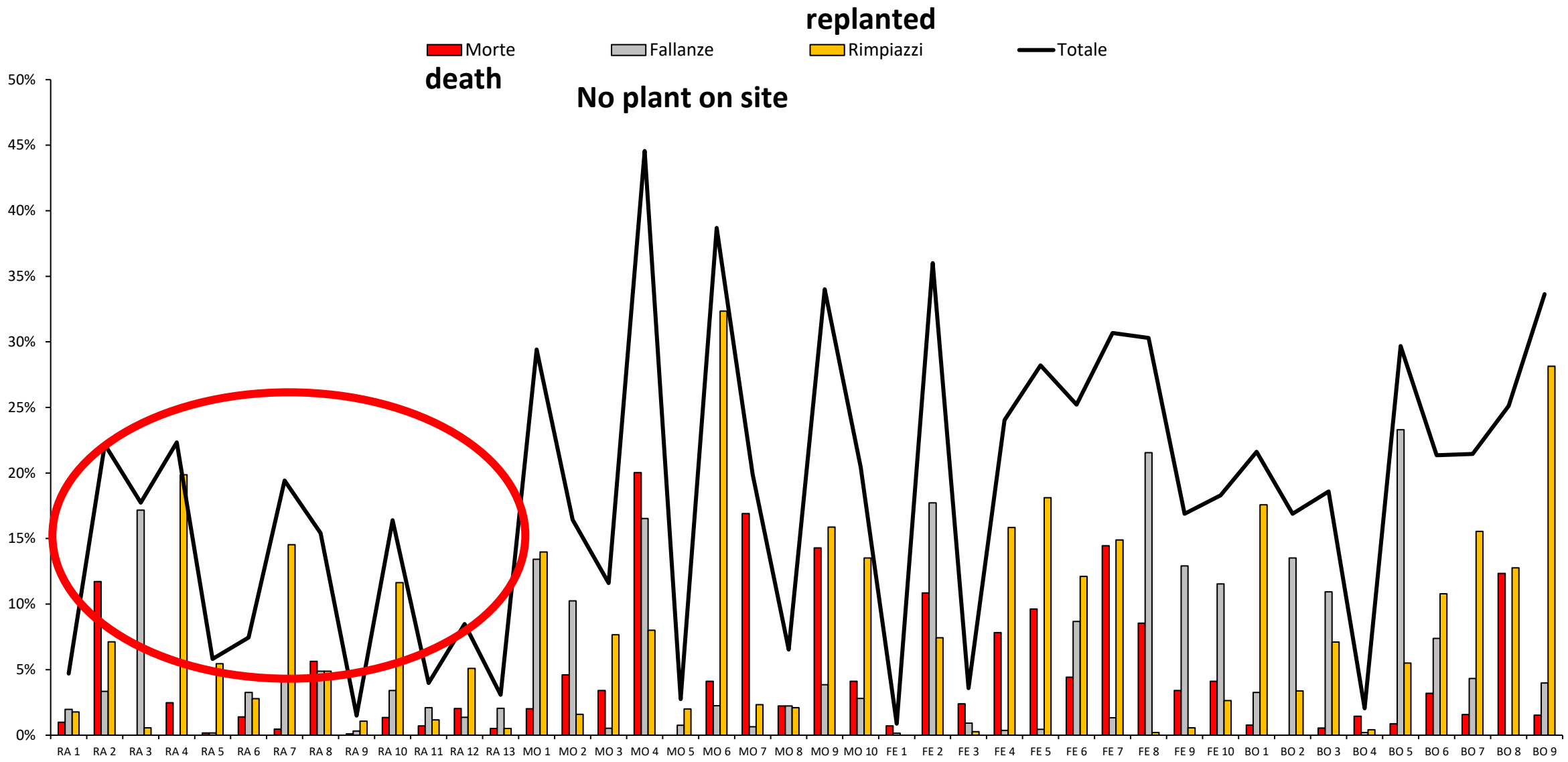
Peso ponderato	Classe	n°
0	0	444
2,55	1	4
7,55	2	3
17,55	3	13
32,55	4	14
55,05	5	7
85	6	1
100	M	5
100	F	10
100	R	9
	TOT	510
	Proporzione sani	0,87
	Incidenza (%)	12,94
	Severità (%)	7,03



FILA 1	FILA 2	FILA 3	FILA 4
0	0	0	7
0	7	3	7
0	1	7	4
2	1	7	1
2	0	7	7
0	7	7	4
0	2	7	6
0	5	4	7
7	1	5	7
7	4	2	7
5	0	7	7
0	0	7	6
5	2	7	5
4	0	5	6
7	3	2	3
0	0	0	5
7	5	7	7
3	0	3	3
2	4	5	3
7	0	7	7
3	0	5	4
0	7	6	5
2	3	5	6
7	0	5	2
0	5	7	7
6	2	7	5
0	0	7	5
7	0	5	5
7	7	7	7
4	6	0	6
3	0	2	7
0	6	0	0
7	0	7	7
0	0	0	7
7	2	7	7
0	0	5	5
0	0	7	7
7	0	2	2

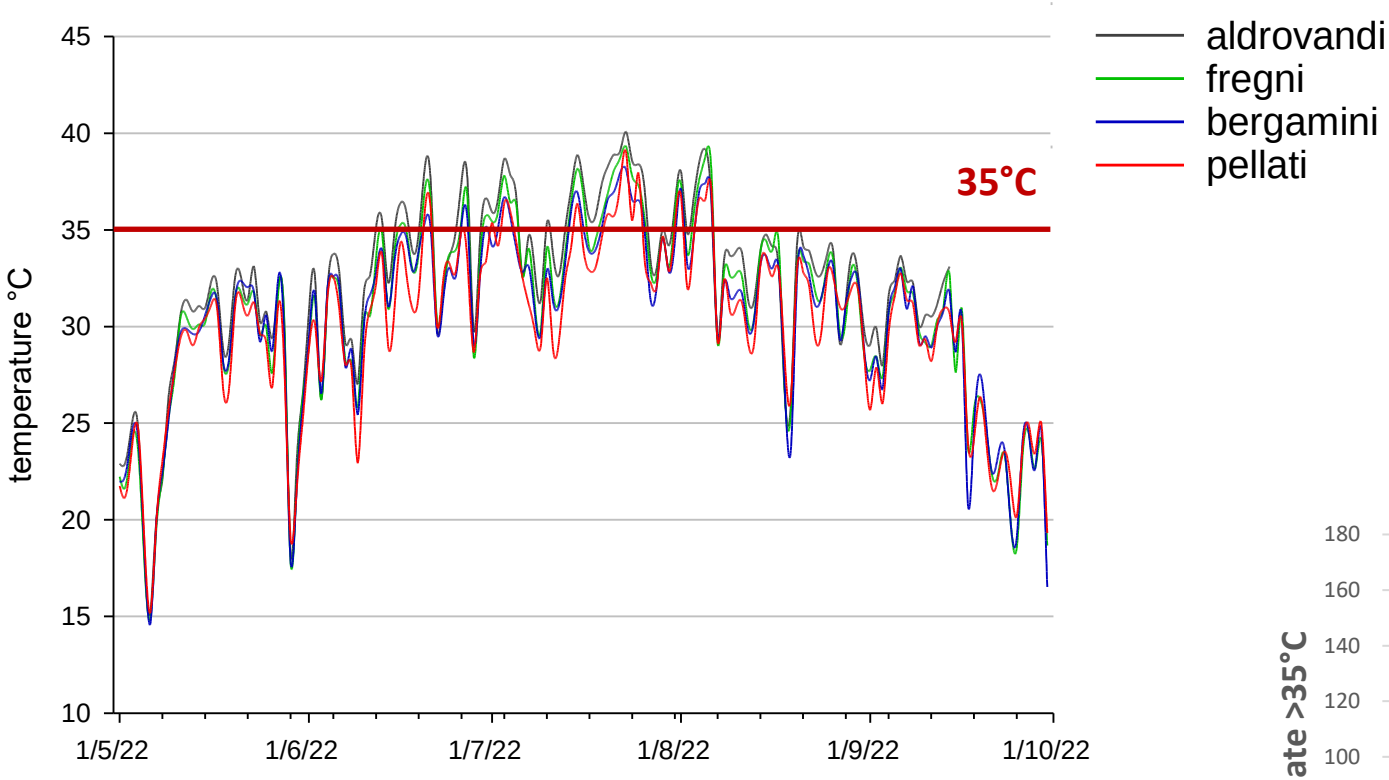
FILA 1	FILA 2	FILA 3	FILA 4	FILA 5	FILA 6	FILA 7
5	6	6	3	5	3	4
1	0	0	0	7	0	3
0	3	5	4	0	3	0
0	7	0	0	0	5	0
2	7	7	6	0	7	0
6	7	7	3	7	2	0
0	3	5	0	7	4	7
3	4	0	0	7	6	4
2	6	4	3	0	6	0
4	3	4	0	0	6	0
0	7	5	7	7	7	5
3	7	0	7	4	5	3
4	4	4	0	0	0	4
6	4	0	7	4	7	3
2	4	0	0	6	6	3
3	4	0	7	7	7	7
5	0	7	4	5	0	0
4	7	0	4	7	7	3
0	7	5	4	7	7	7
7	4	5	0	0	7	4
0	0	0	7	7	0	3
5	7	4	4	4	0	3
0	4	0	7	3	5	3
0	0	7	4	6	3	7
0	4	3	4	6	3	3
0	7	0	0	7	0	0
7	6	0	0	3	7	0
0	7	3	0	4	5	0
0	5	0	0	3	5	4
0	3	0	0	5	3	3
7	0	0	4	4	5	0
4	0	0	7	0	0	4
0	0	4	4	0	2	3
0	7	6	5	5	2	2
0	0	7	0	0	4	4
0	4	6	0	0	2	0
0	4	7	0	4	0	0
0	7	0	7	4	4	7

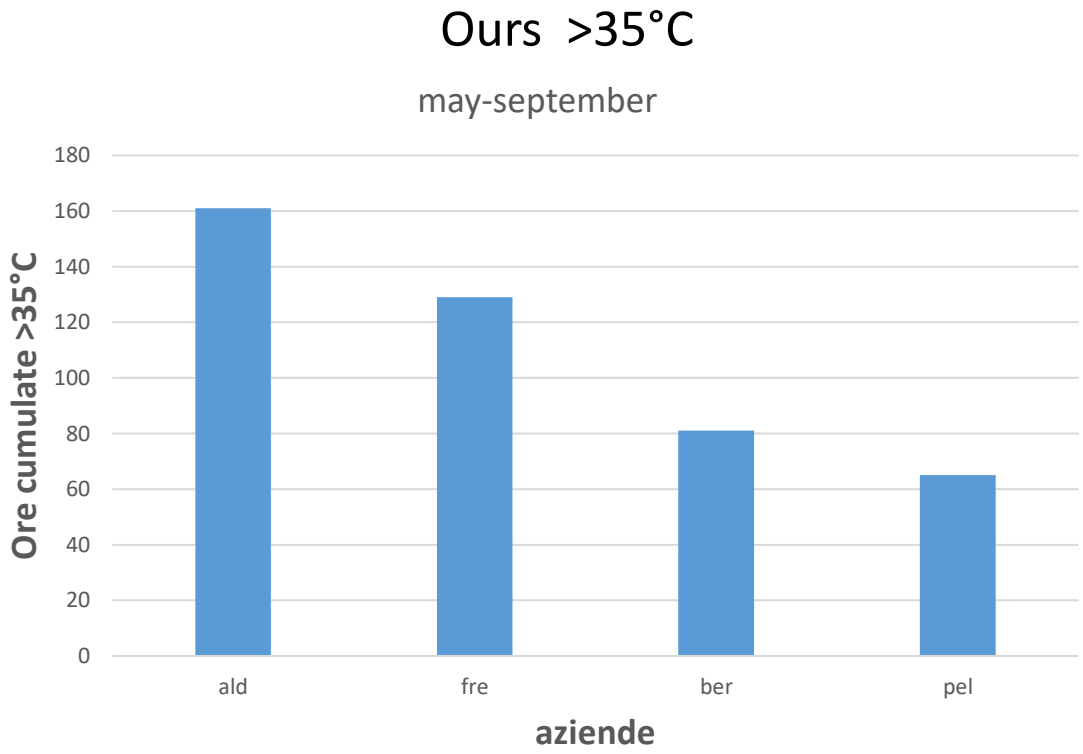
Plant death, fallacy, replanted (%)



Rootstock trial, why?

Air temperature



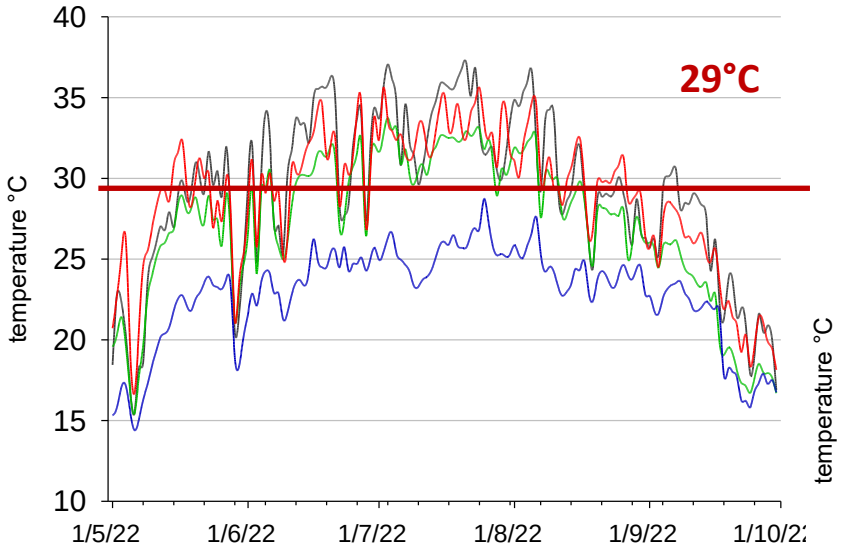


Soil Temperature

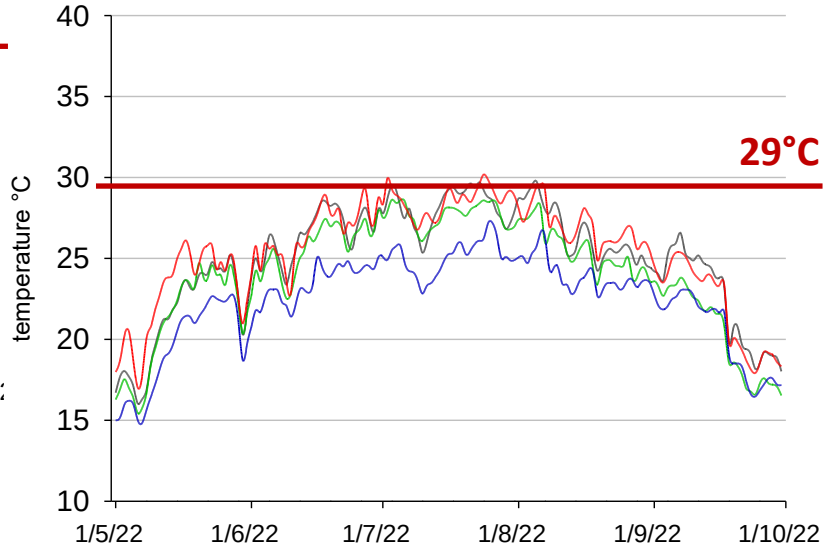
(may-september)

aldrovandi
fregni
bergamini
pellati

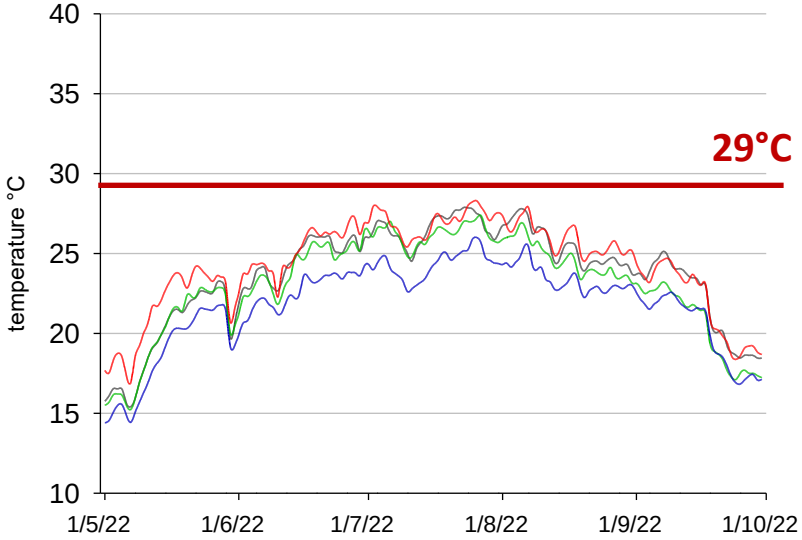
depth 10 cm



depth 20 cm



depth 30 cm



Abate trial planted 2024

FILA 1	FILA 2	FILA 3	FILA 4	FILA 5	FILA 6
8	8	7	7	7	10
6	6	5	5	5	7
6	6	5	5	5	7
6	6	5	5	5	7
6	6	5	5	5	7
6	6	5	5	5	7
6	6	5	5	5	7
6	6	5	5	5	7
6	6	5	5	5	7
6	6	6	5	5	7
6	6	6	5	5	7
6	6	6	5	5	7
6	6	6	5	5	7
6	6	6	5	5	7
6	6	6	5	5	7
6	6	6	5	5	7
6	6	6	5	5	7

		Distanza	Pte/campata	Pte totali
	Autoradicato William	1,50	6	104
	Autoradicato Conference	1,50	6	104
	Farold 40	1,50	6	48
	Franco	1,80	5	47
	William Franco	1,80	5	87
	Autoradicato Abate	1,80	5	87
	BA29 Posta	1,28	7	66
	BA29/BH	1,28	7	56

To avoid problem with selfrooted plant

Selfrooted in pot

Selfrooted classic in the nursery field

To avoid problem with selfrooted plant

Pre harvest monitoring and Post harvest activity-Abate

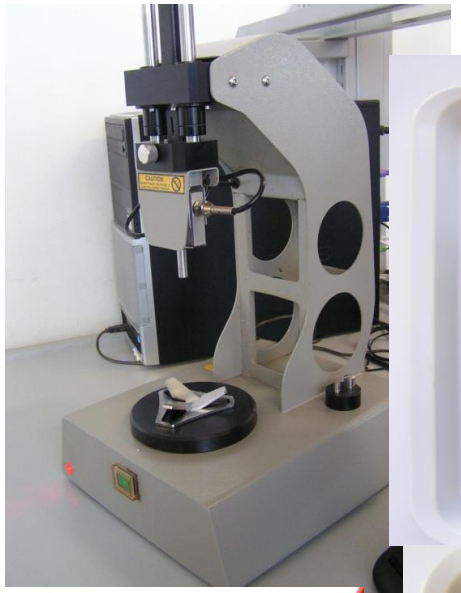
Pre harvest fruit monitoring in order to:

- Set up the optimal picking time
- Enhance quality and yield
- Have good result against pear superficial and soft heating

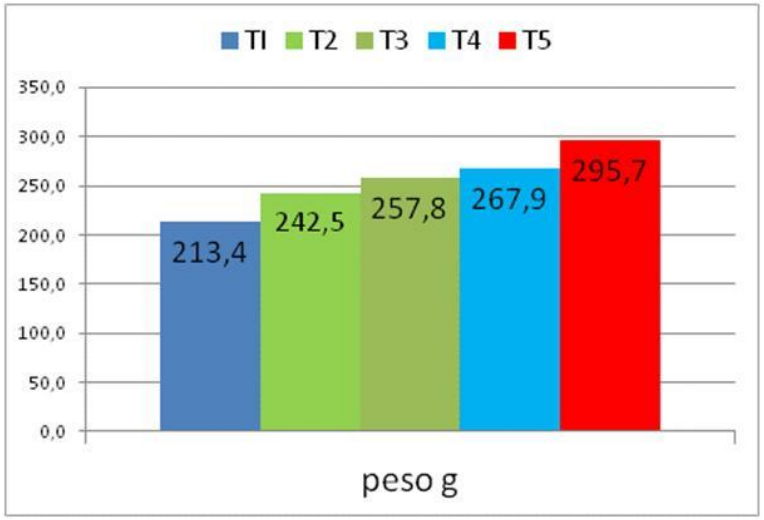
- In order to prevent scald problem:
- Pick time 150 DAFB
- Fruit firmness > 6,1 kg/cm2
- DA meter index > 1,9

From beginning of August-once a week-Laboratory analysis

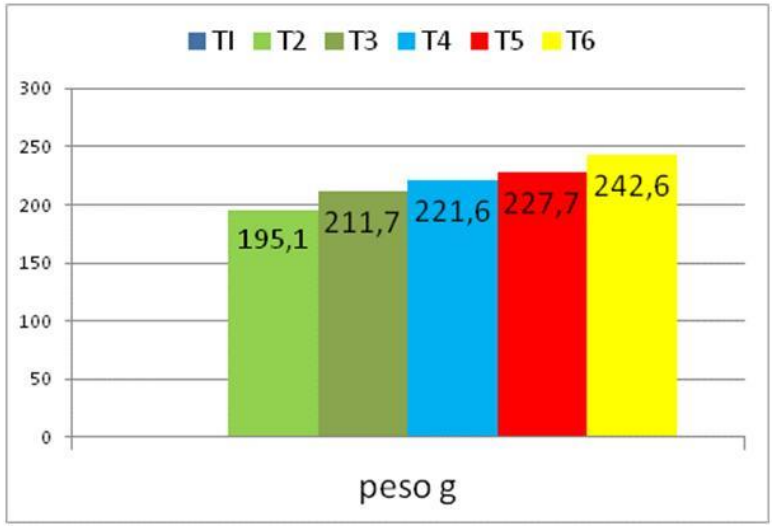
- Fruit size
- Firmness
- SSC (°Brix)
- Acidity
- Starch degradation
- DA index



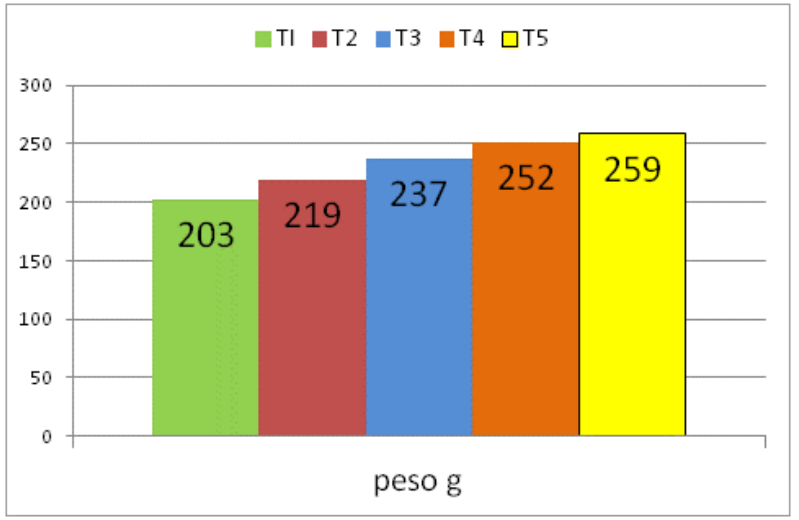
Fruit weight increasing in 5 weeks (T1-T2-T3-T4-T5)



Year 1

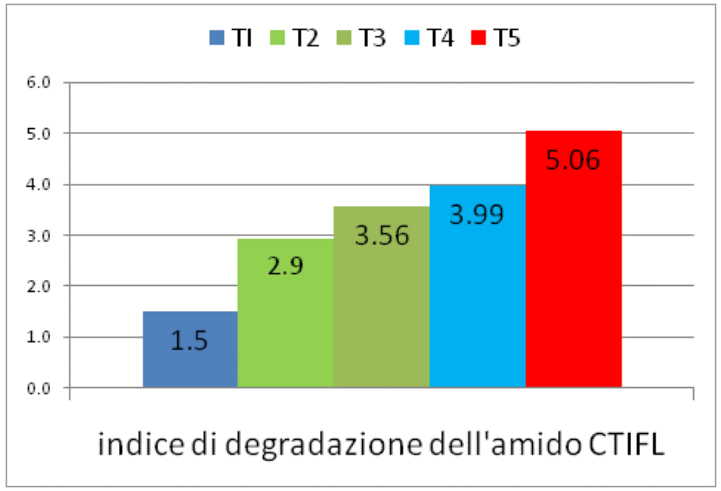


Year 2

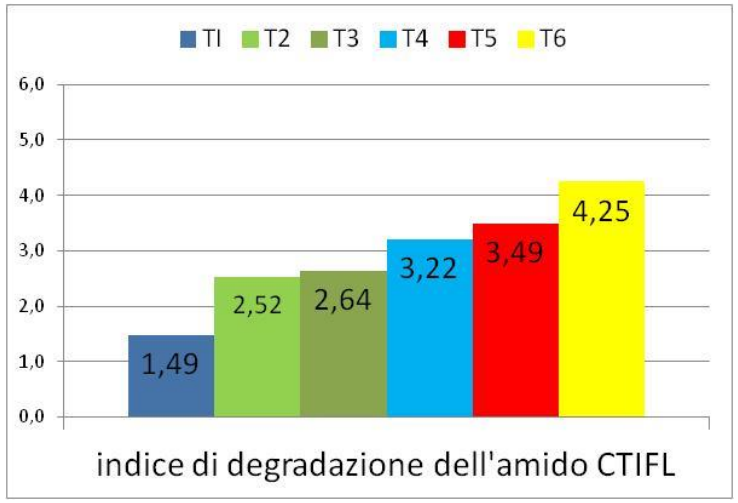


Year 3

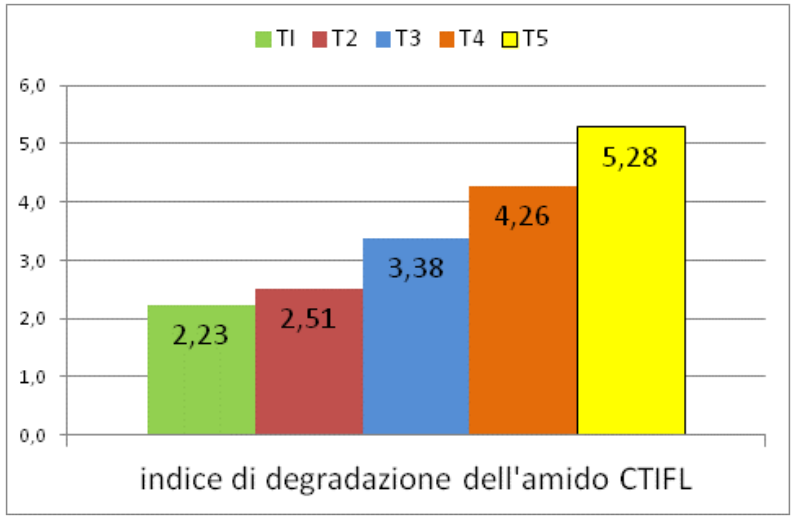
Stach degradation



Year 1



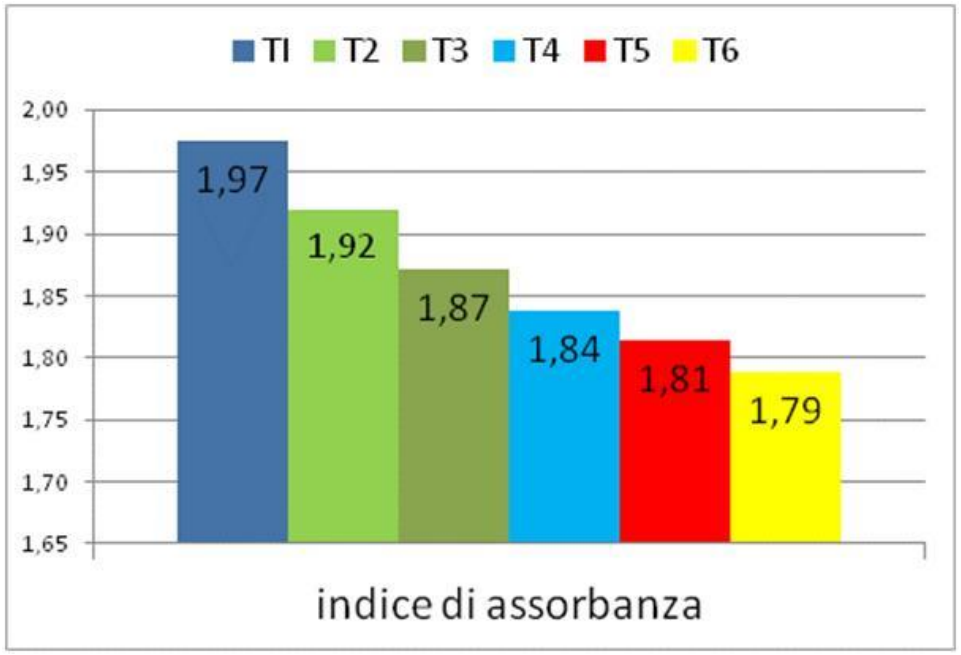
Year 2



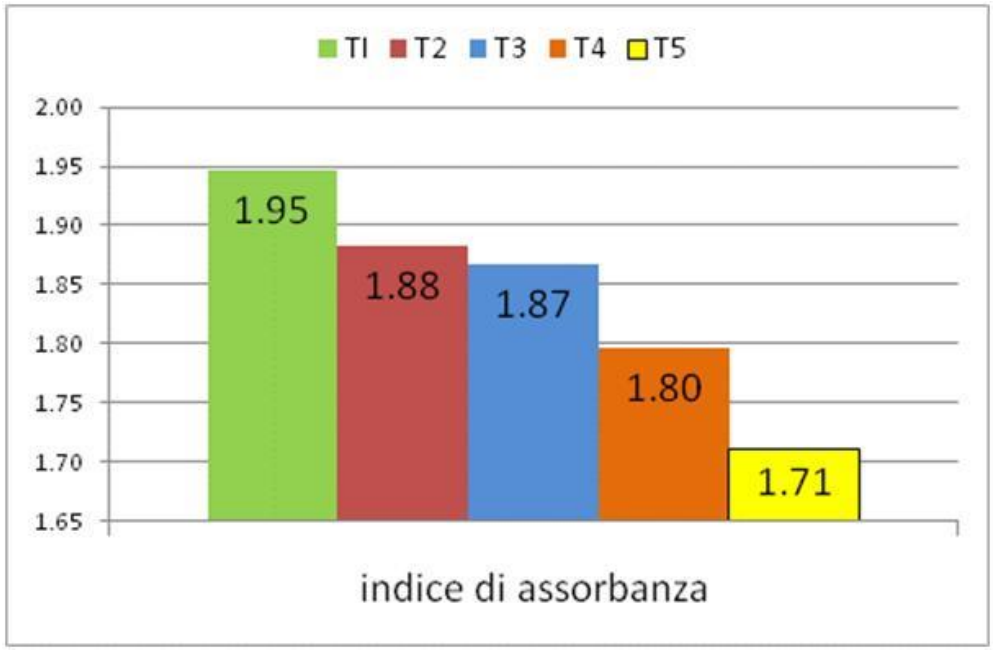
Year 3

Within 5 weeks, 50% of starch degradation

DA Index



Year 1

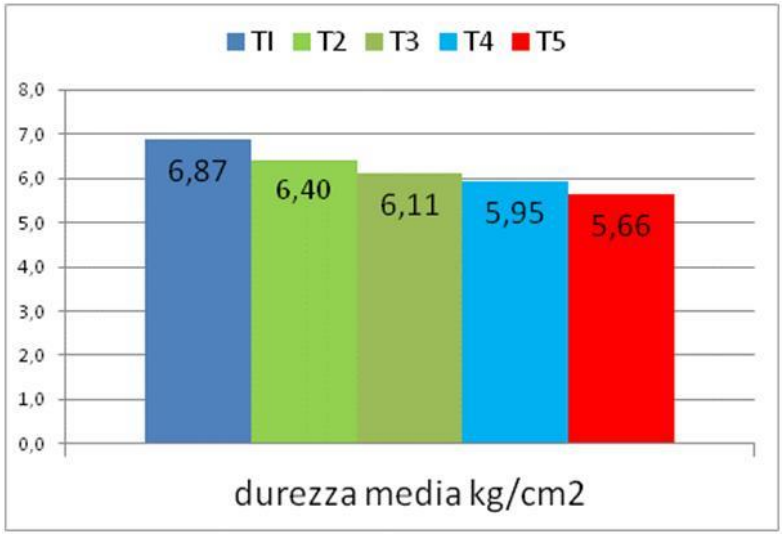


Year 2

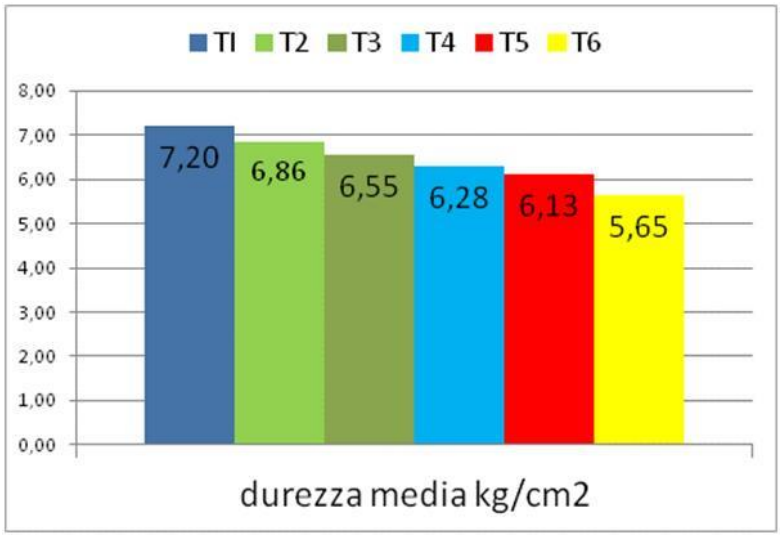
Same trends over two years

Also the same levels through different years

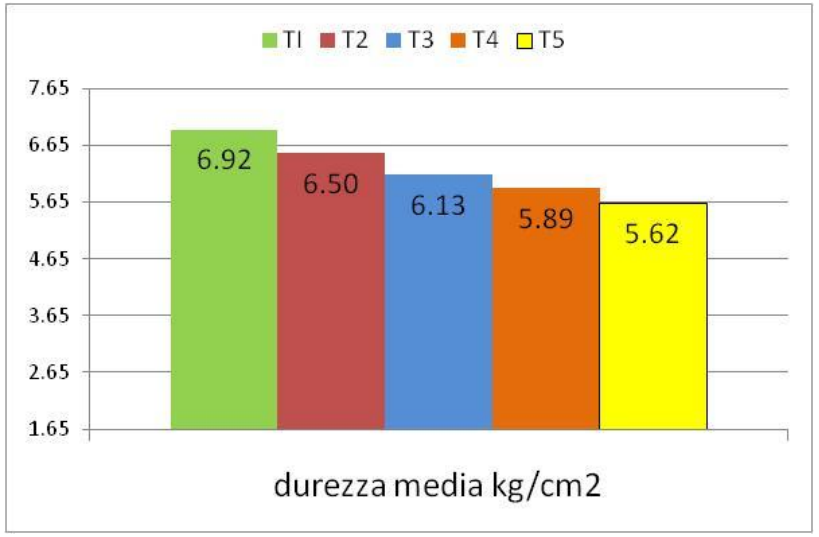
Fruit firmness (Kg/cm2)



Year 1



Year 2



Year 3

Starting at 7 kg/cm2, weekly weight loss 0.3 kg.

MONITORING ABATE 2023-MODENA AREA-FIRMNESS

MONITORING ABATE 2023-AREA RAVENNA-FIRMNESS

SUPERFICIAL SCALD

CLASSE 0

RS su lo 0% del frutto

CLASSE 1

RS su 0%-25% del frutto

CLASSE 2

RS su 25%-50% del frutto

CLASSE 3

RS più del 50% del frutto

$$\text{Indice di riscaldo} = \sum_{0}^{4} \frac{(\text{gravità del sintomo}) x (\text{numero di frutti nella classe di RS})}{\text{numero totale dei frutti}}$$

We are developing a **previsional model**, based on pre harvest and on farm (management, type of soil) data. Different lots are divided based on **scald susceptibility**, into:

Lots susceptibility	Cold room	Temperature	Storage Time	System	1MCP treatment
High	Traditional	0, -1°C	Max 3 months		NO
High	Controlled atmosphere		Max 5 months	DCA Isolcell	NO
Low	Traditional	0, -1°C	Max 4 months		NO
Low	Controlled atmosphere		Max 6 months	DCA Isolcell	NO

FIRST RESULTS 2023 AFTER STORAGE

LOW SUSCEPTIBLE AFTER 4 MONTHS

HIGH SUSCEPTIBLE AFTER 4 MONTHS

NEW VARIETIES TRIAL

- **EARLY GIULIA**
- **FRED**
- **EDEN**
- **CHEEKY**

- **Selections from**
- **UNIBO**
- **CREA (Italian Ministry of Agriculture Institute)**
- **Breeding program all around the world**

- **Assesment about agronomic value and post harvest quality**

Crea 98.M2.130.368

Picking time	10 agosto 2023
Bloom period	Medium (+2 William)

Plant	
Vigour and growht habit	Medium, Standard

Quality	
Taste	Good, sweet and juicy.

Size

65-70	70-75	75-80	80-85	85+
10%	10%	10%	20%	50%

Firmness kg	4,7
RSR ° Brix	18,5

Sel. UNIBO PE 15/1

Origin: sel NY10355 x Max red Bartlett

Picking time: II – III decade agosto

	Firmness at ahrvest
22/08/22	5,3 kg
17/08/23	5,0 kg

Plant: vigour medium, standard habith, compact tree

High Yield.

Very late bloom period.

- **Resistant to *S. vesica*rium**
- Susceptible to *E. amylovora*

DEVELOPMENT OF PROTOCOLS FOR THE INDUCTION OF RESISTANCE/TOLERANCE TO STEMPHYLIUM VESICARIUM THROUGH GENE SILENCING STRATEGIES

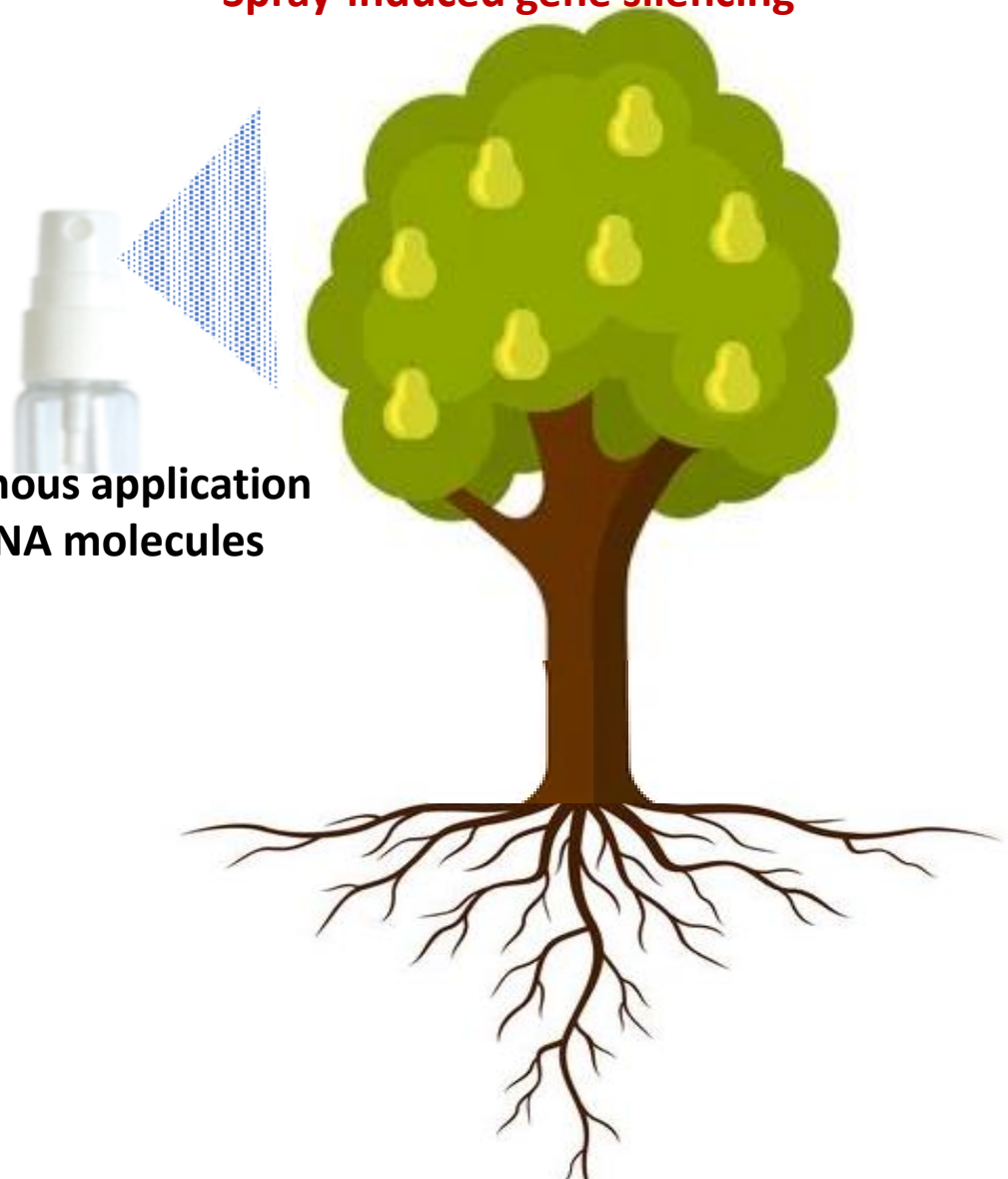
ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

Development and production of dsRNA molecules against Stemphylium vesicarium for exogenous application on pear plant tissues (SIGS)

Development of gene silencing techniques through stable expression in plants of RNAi sequences against target genes of the pathogen and verification of their effectiveness in the control of S. vesicarium (HIGS)

SIGS

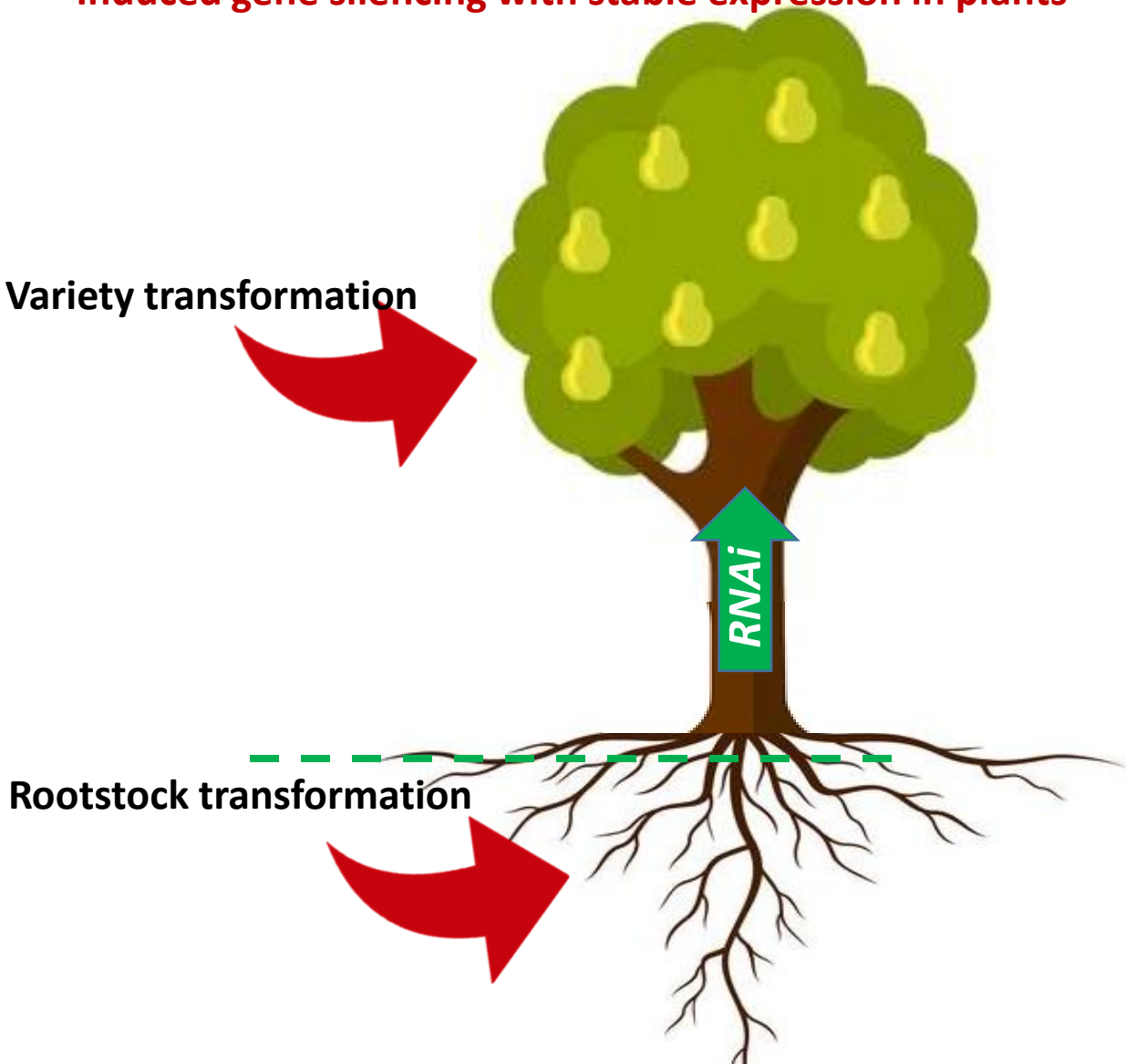
Spray-induced gene silencing



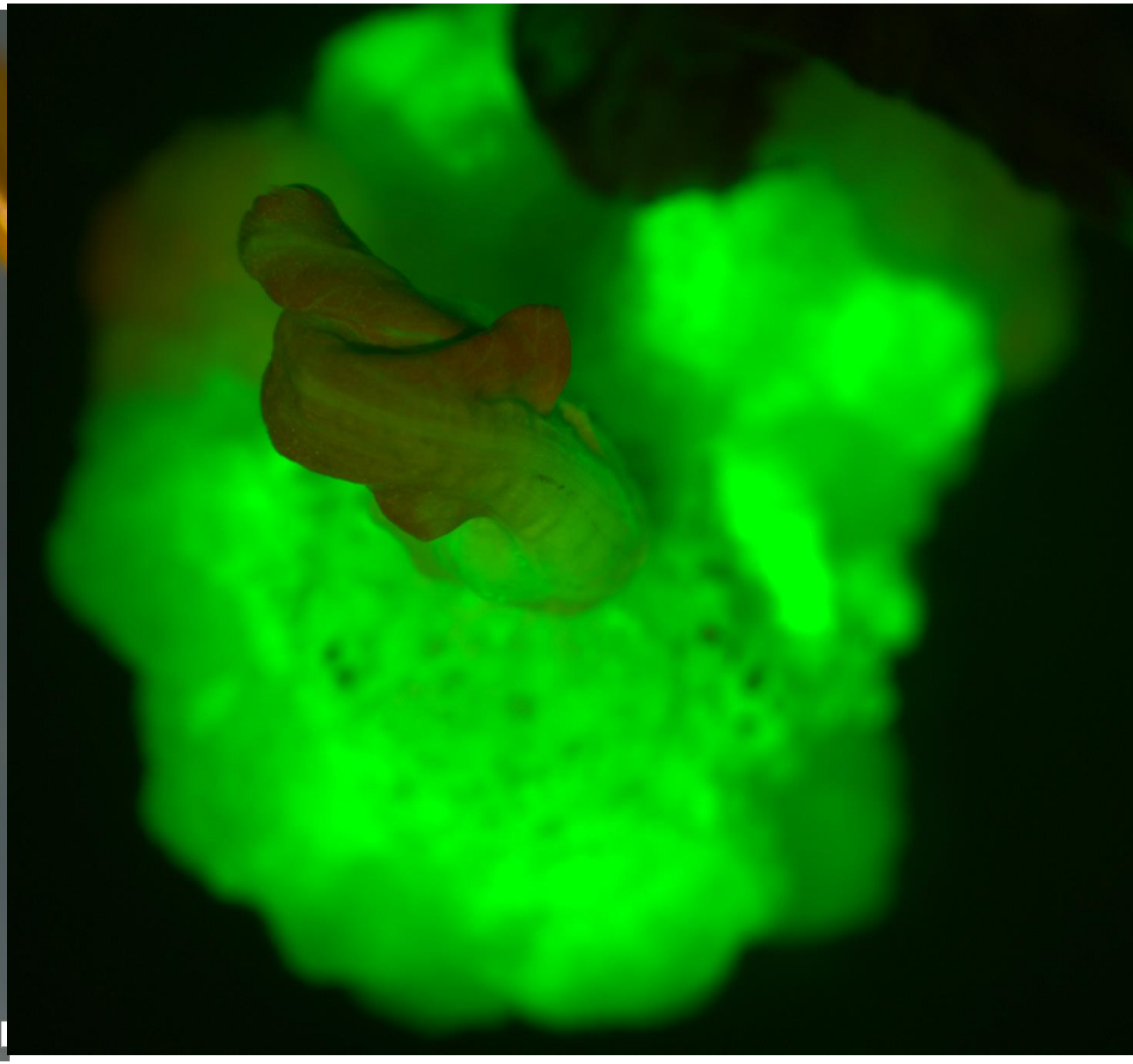
Exogenous application of dsRNA molecules

HIGS

Induced gene silencing with stable expression in plants



Conference pear shOot modified for expression RNAi for controll STEMPHYLLUM VESICARIUM



MANAGEMENT ADVICE FOR PEAR

- More than 1 variety in the field for better pollination.
- 4 rows + 2 rows of compatible variety.
- plan for the use of pollinating insects (bees, bumblebees and osmia) from the beginning of flowering.
- Roofing system strongly recommended
- 2 drip line or sprinkler
- BA29/interstem BH in situation without problem for quince
- Seelfrooted Conference as rootstock for Abate in problematic situation

MANY THANKS

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