

Bitter rot (ABR) & Glomerella leaf spot (GLS) delle pomacee

R.Bugiani



Colletotrichum gloeosporioides – C.acutatum

Biologia ed epidemiologia

- Si conserva nei mesi invernali sui frutti infetti caduti a terra o mummificati rimasti sulla pianta, nelle fessurazioni della corteccia, sui cancri causati da altre malattie e sui rami secchi (anche potature non rimosse), sotto forma di periteci della forma perfetta (*Glomerella cingulata*) e acervuli della forma agamica (*Colletotrichum gloeosporioides*).
- Le infezioni sono causate dalle ascospore e dai conidi, rilasciati per tutto il periodo vegetativo in concomitanza di eventi piovosi e diffusi tramite il vento e l'acqua.
- Condizioni favorevoli alle infezioni sono: frutti prossimi alla maturazione, periodi caldo umidi (UR prossima alla saturazione) e temperature di $>26^{\circ}\text{C}$.
- Varietà di melo suscettibili: Golden delicious, Honey-crisps, Gala



Conidi di *Colletotrichum gloeosporioides*



Glomerella fructicola

First Report of *Colletotrichum fructicola* Causing Apple Bitter Rot in Europe

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Bitter rot is one of the prevalent diseases of apple (*Malus pumila* Mill.) worldwide. The disease affects the fruit pre-harvest in orchards and/or post-harvest in storage, causing considerable economic losses. Until recently the reported causal agents in Europe were the *Colletotrichum acutatum* species complex (Baroncelli et al. 2014; Nodet et al. 2018); however, species belonging to *C. gloeosporioides* species complex were reported recently in Belgium (Grammen et al. 2018). In September 2017, bitter rot symptoms were observed on apple fruit (cultivars Joya Cripps Red, Granny Smith, and Pink Lady) in orchards in the region of Occitanie in France. The rot began as circular brown lesions 2–3 mm in diameter, which enlarged rapidly (e-Xtra 1).

Disease Note

Diseases Caused by Fungi and Fungus-Like Organisms

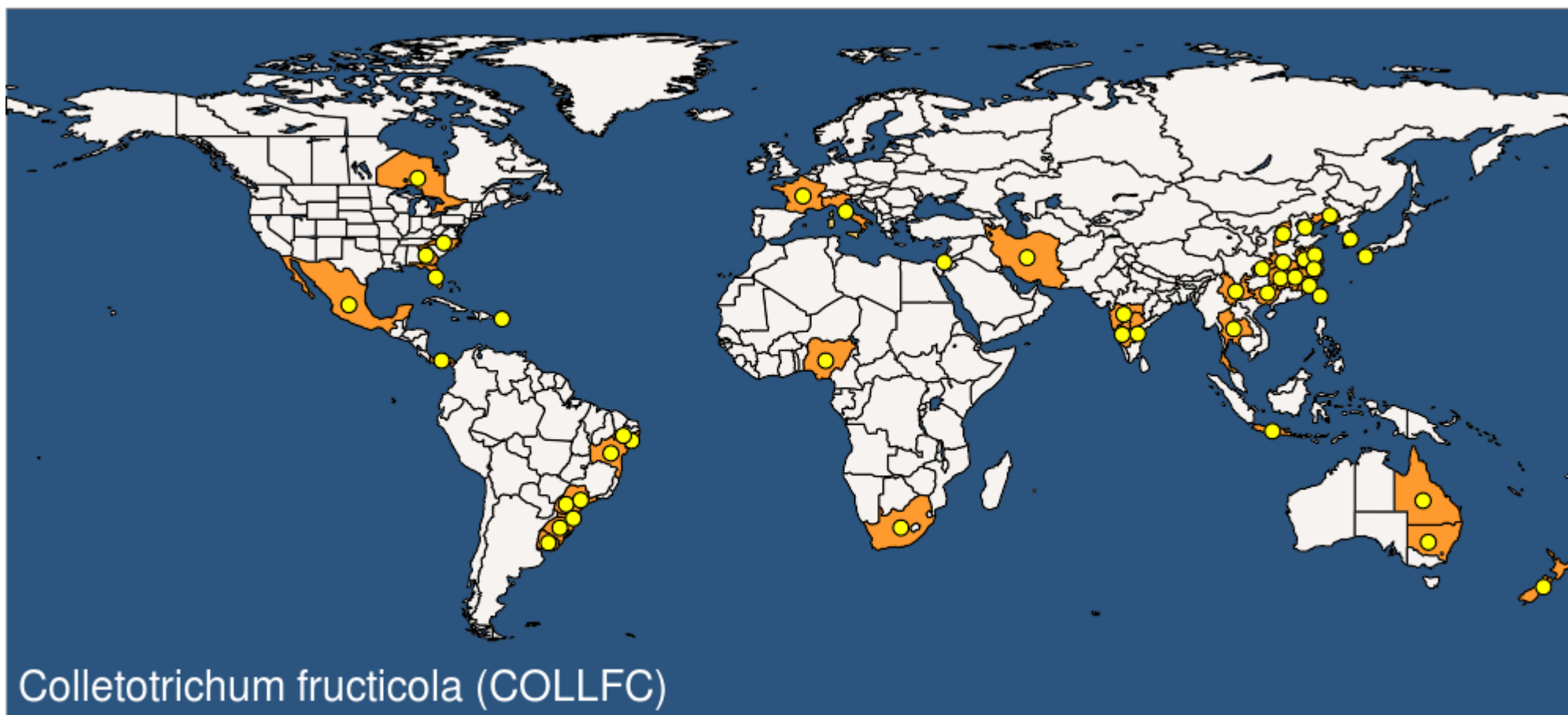
First Report of Preharvest Fruit Rot of ‘Pink Lady’ Apples Caused by *Colletotrichum fructicola* in Italy

M. Wenneker,[†] K. T. K. Pham, E. Kerkhof, and D. O. C. Harteveld

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Plant Dis. 0:1, 2021; published online as <https://doi.org/10.1094/PDIS-11-20-2404-PDN>. Accepted for publication 5 January 2021.

In late summer 2019, a severe outbreak of fruit rot was observed in commercial ‘Pink Lady’ apple orchards (>20 ha in total) in the region of Emilia-Romagna (Northern Italy). The symptoms on the fruit appeared as small circular red to brown lesions. Disease incidences of over 50% of the fruits were observed. To isolate the causal agent, 15 affected apples were collected, and small portions of fruit flesh were excised from the lesion margin and placed on potato dextrose agar (PDA). The plates were incubated at 20°C in the dark, and pure cultures were obtained by transferring hyphal tips on PDA. The cultures showed light to dark gray, cottony mycelium, with the underside of the culture being brownish and becoming black with age. Conidia ($n = 20$) were cylindrical, aseptate, hyaline, rounded at both ends, and 12.5 to 20.0×5.0 to 7.5 μm . The morphological characteristics were consistent with descriptions of *Colletotrichum* species of the *C. gloeosporioides* species complex, including *C. fructicola* (Weir et al. 2012). The identity of two representative isolates (PinkL2 and PinkL3) from different apples was confirmed by means of multilocus gene sequencing. Genomic DNA was extracted using the LGC



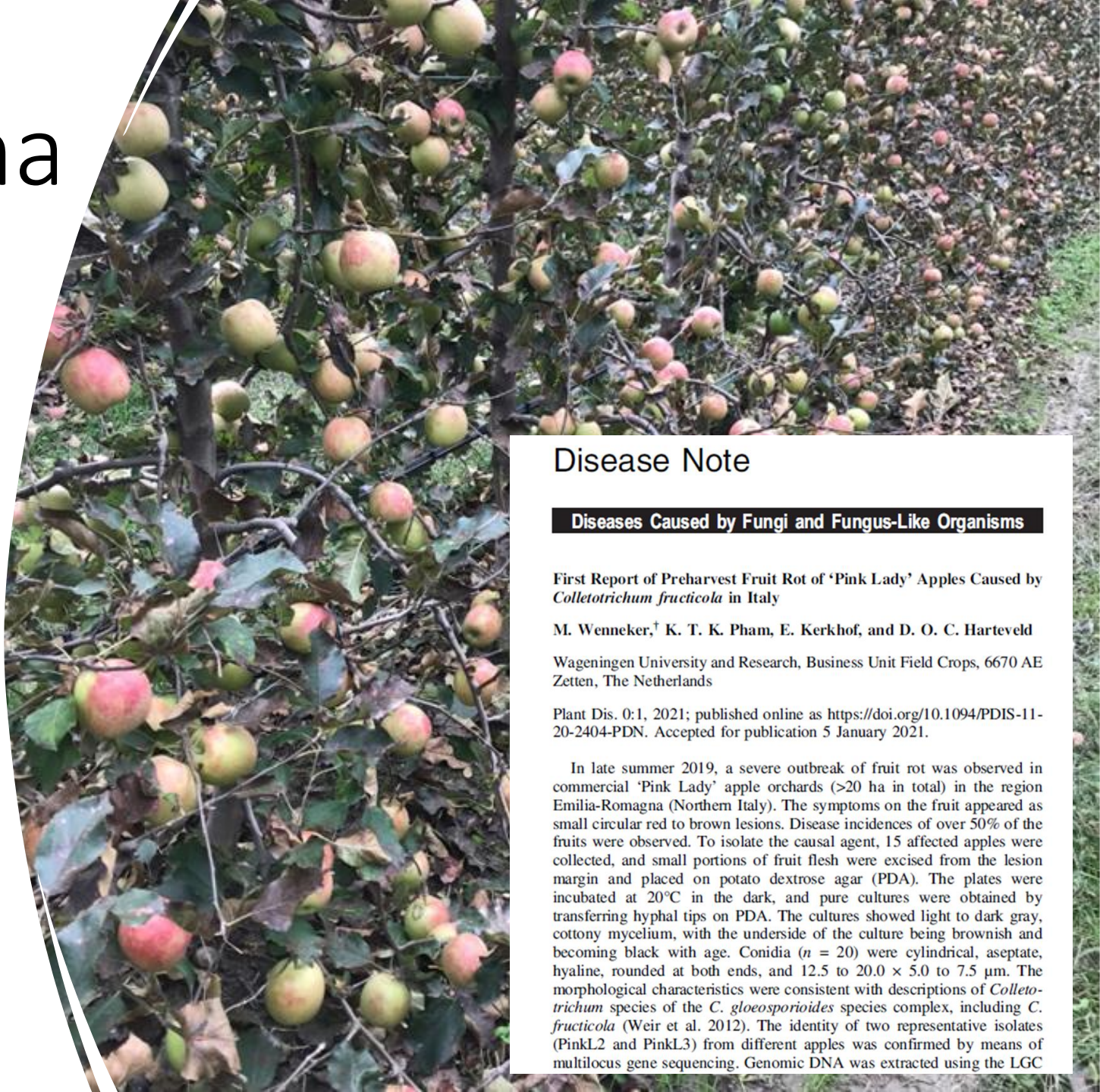
● Present

● Transient

2021-09-30
(c) EPPO <https://gd.eppo.int>

GLS in E-Romagna

- Prima segnalazione nel 2019 in Emilia-Romagna e Veneto. Ricomparsa nel 2023, mentre nel 2020, 2021, 2022, non si era manifestata con virulenza (influenza del regime pluviometrico). **In espansione nel 2023.**
- Intense **defogliazioni** a partire da cv Gala, Granny Smith, Pink Lady.
- **Marciumi lenticellari dei frutti** (Gala, Pink Lady, Story Inored, Esmeralda),
- Condizioni climatiche favorevoli sono caratterizzate da piogge intense e temperatura elevate).



Disease Note

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SITUAZIONE GLS NORD ITALIA

Diffusione: * bassa; ** Media; *** Elevata

Anni	2019	2020	2021	2022	2023
E-Romagna	**				***
Piemonte				*	***
Prov. Aut. Bolzano		*		**	***
Prov. Aut. Trento				**	
F.V. Giulia		*		*	***
Veneto	*	**		**	***
Lombardia					



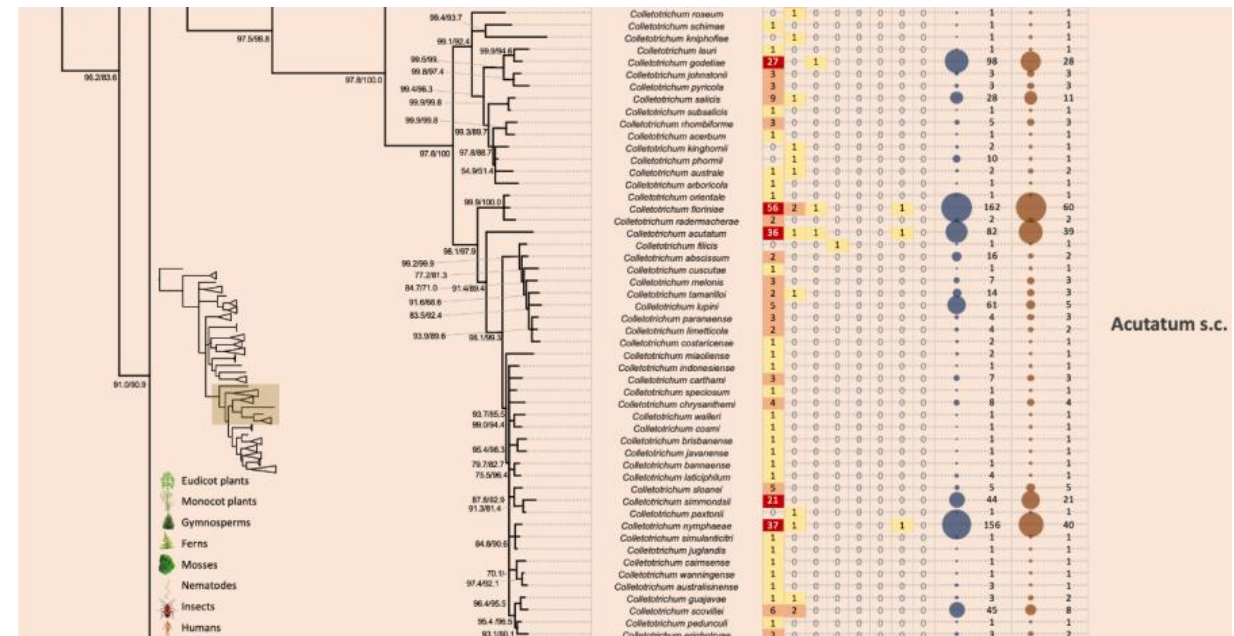
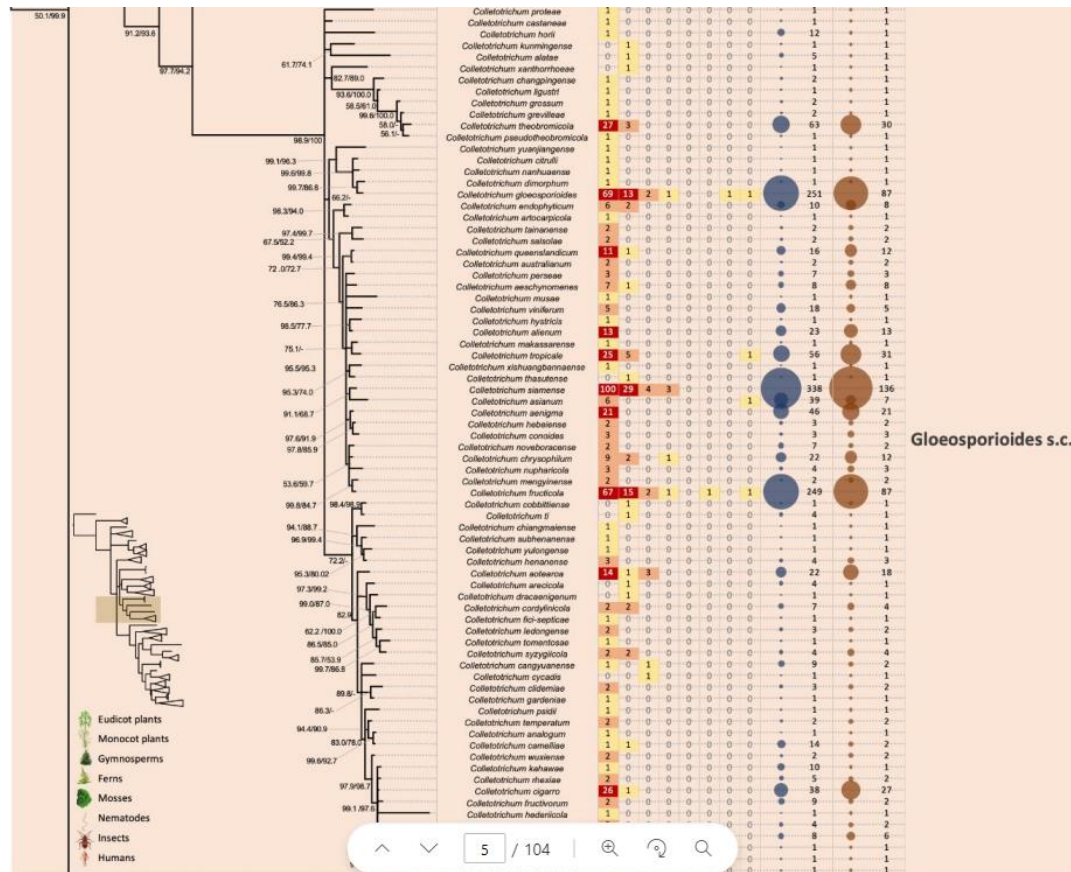
SINTOMATOLOGIA

macchie necrotiche fogliari - Defogliazione precoce - Bitter rot sui frutti



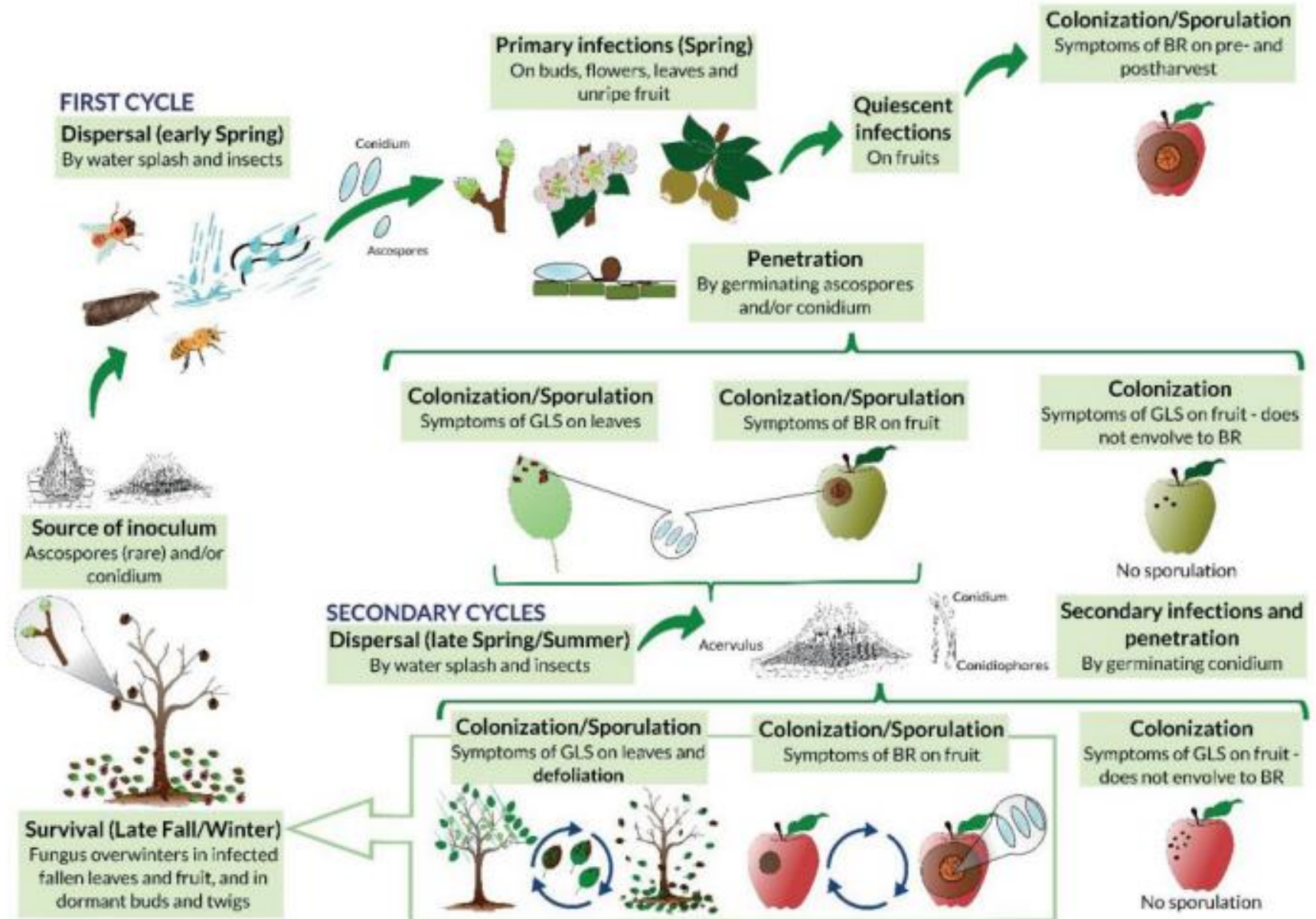
GLS (Glomerella Leaf Spot)

DIFESA DALLE MALATTIE



- CGSC (*C. gloeosporioides* species complex)
- CASC (*C. acutatum* species complex)
- COSC (*C. orchidearum* species complex)

Ciclo biológico



Habitus

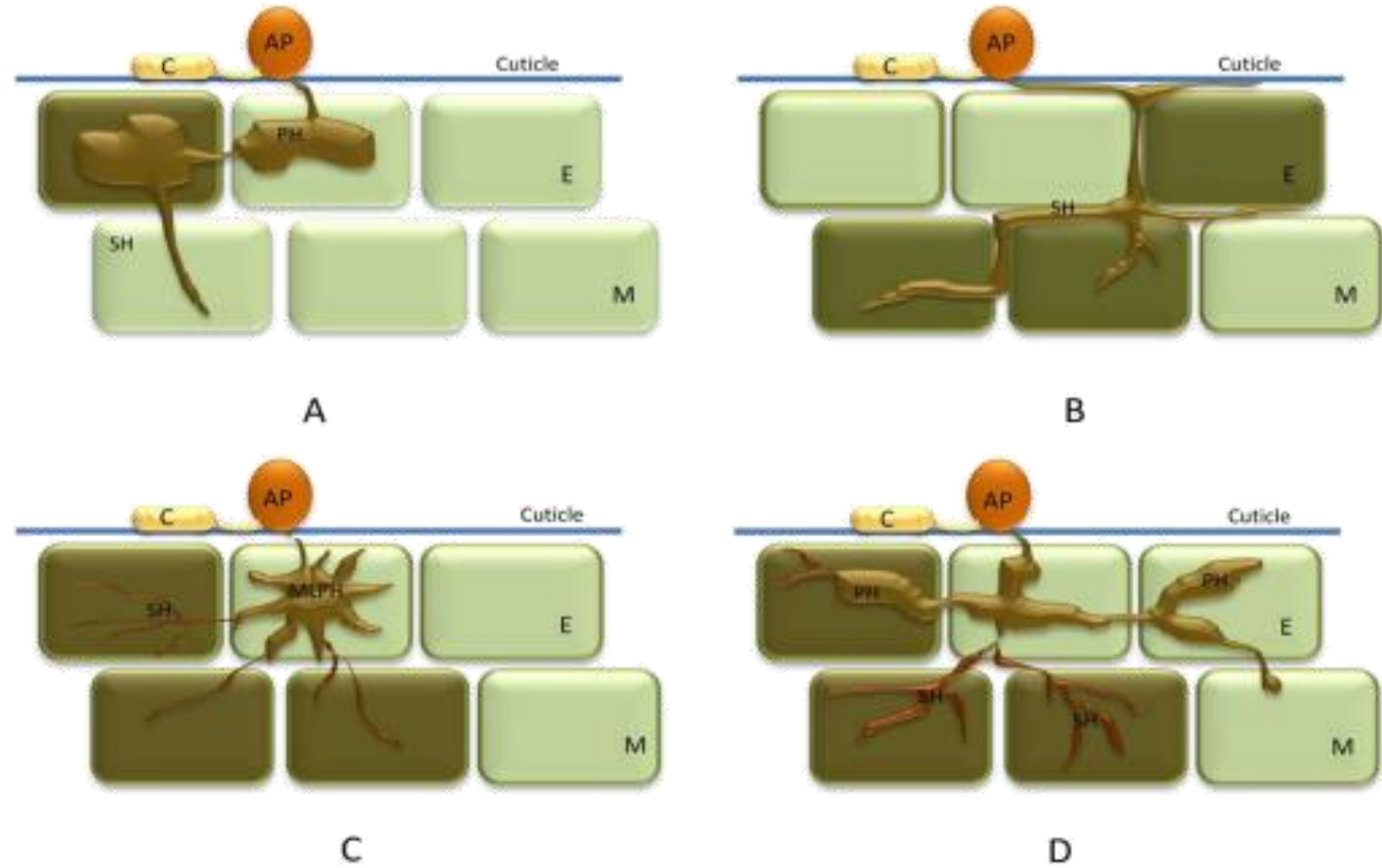
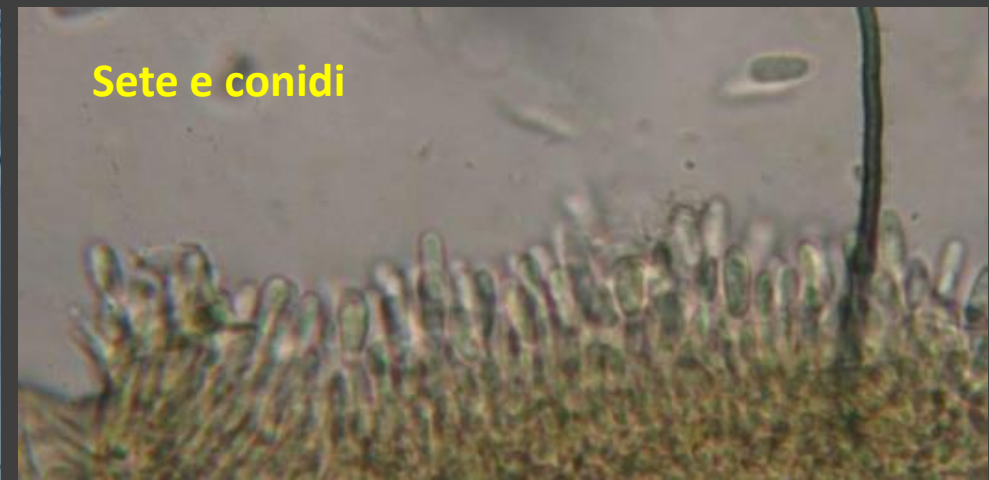
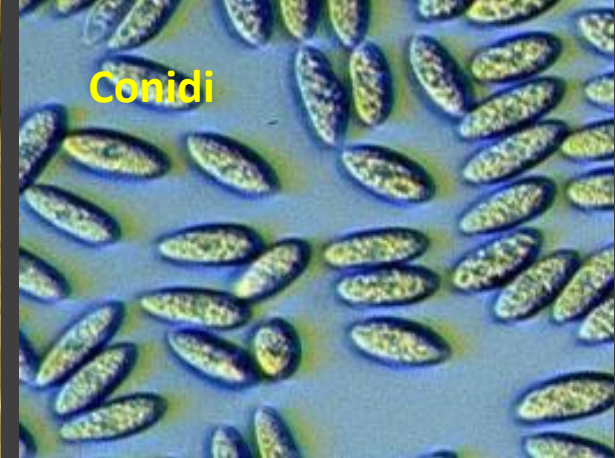


Fig. 4 – Post infection strategies adopted by *Colletotrichum* species A: Intracellular hemibiotrophy B: subcuticular, intramural necrotrophy C: localized hemibiotrophic infection with multilobed primary hyphae D: Extended hemibiotrophy. C: conidia, AP: appressoria E: epidermal cells, M: mesophyll cells, PH: Primary hyphae, SE: Secondary hyphae, MLPH: multilobed primary hyphae.

Eziologia



Varietà



Tollerante/resistente

Suscettibile

Sopravvivenza

gemme (conidio)
Piccoli cancri (conidio)
Foglie infette cadute a
terra (peritecio)

J. I. Boneti







Diverse sintomatologie



Da non confondere con la necrosi fogliare fisiologica.....



GLS (Glomerella Leaf Spot)

DIFESA DALLE MALATTIE



COLLETOTRICHUM SU MELO

Gala



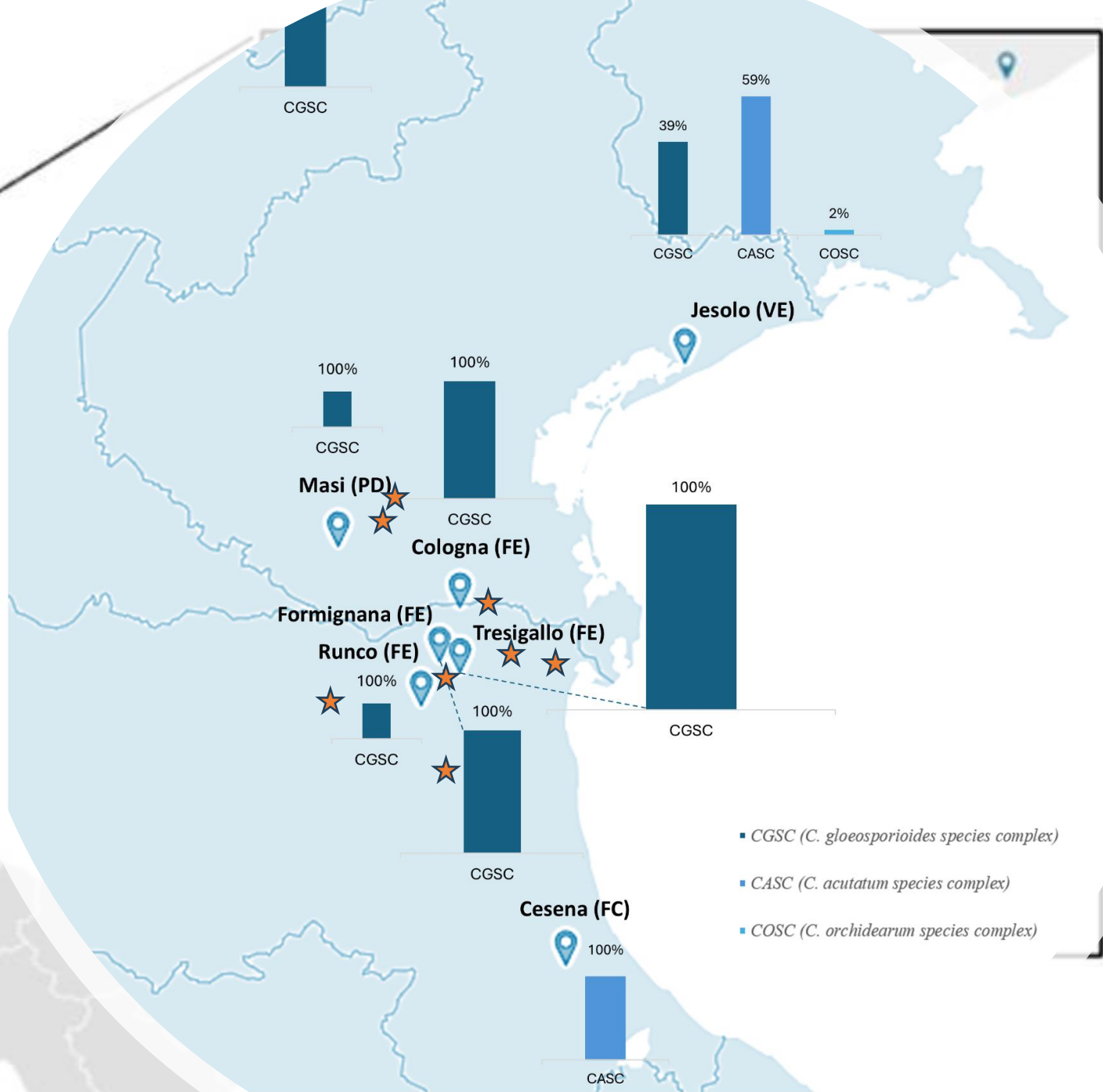


Granny smith



Pink Lady

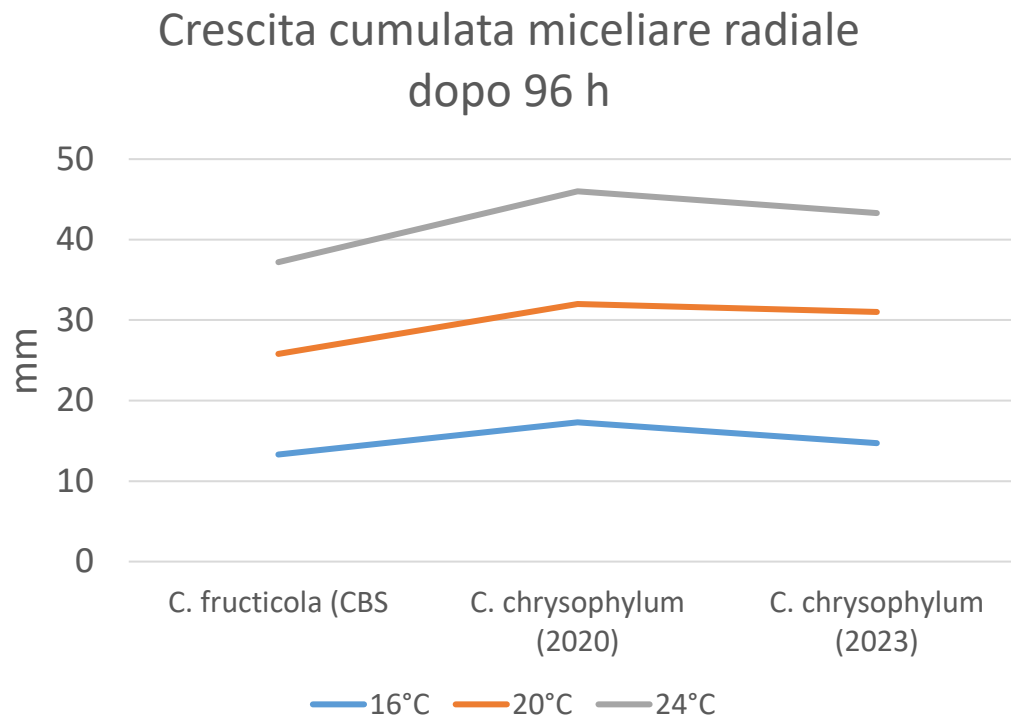




Fonte: UNIBO

RISULTATI

Effetti della temperatura sulla crescita di *Colletotrichum*

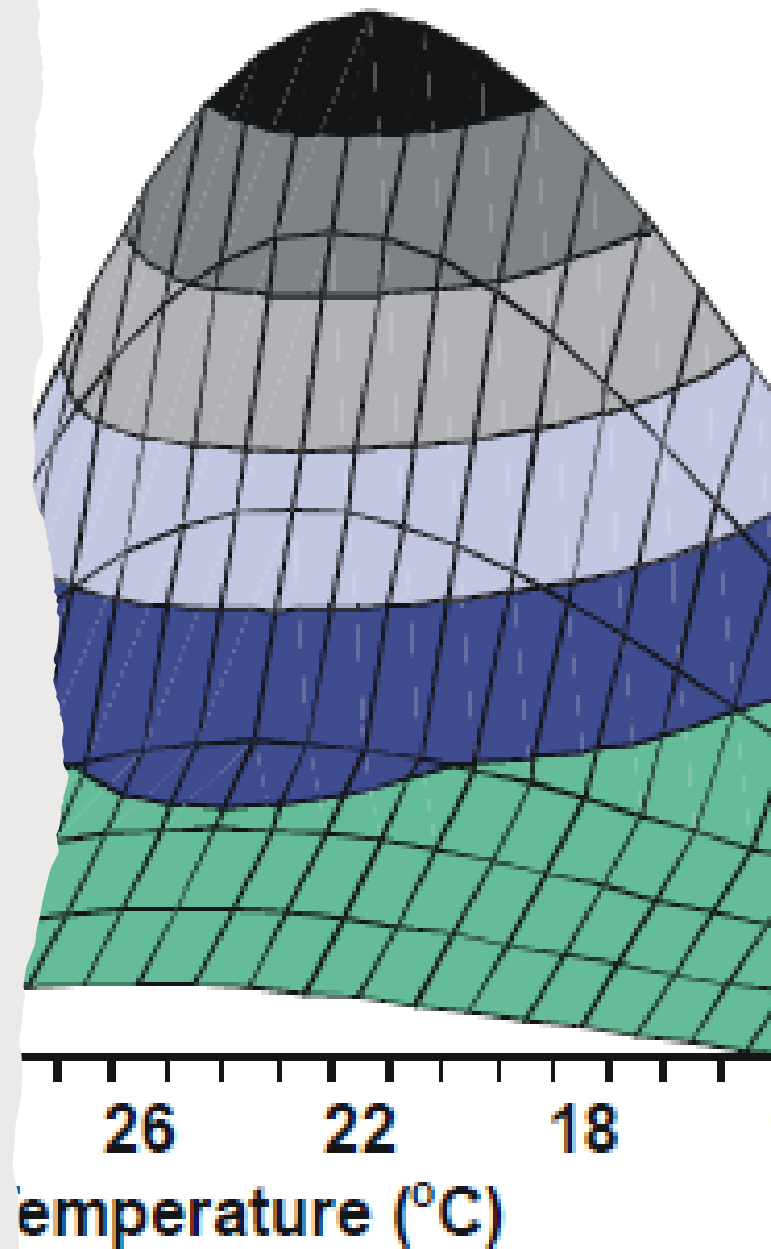
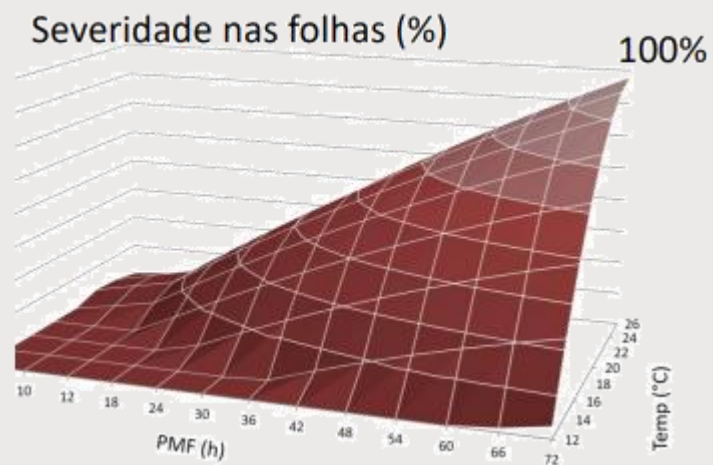


Simulazione della sintomatologia durante la shelf-life

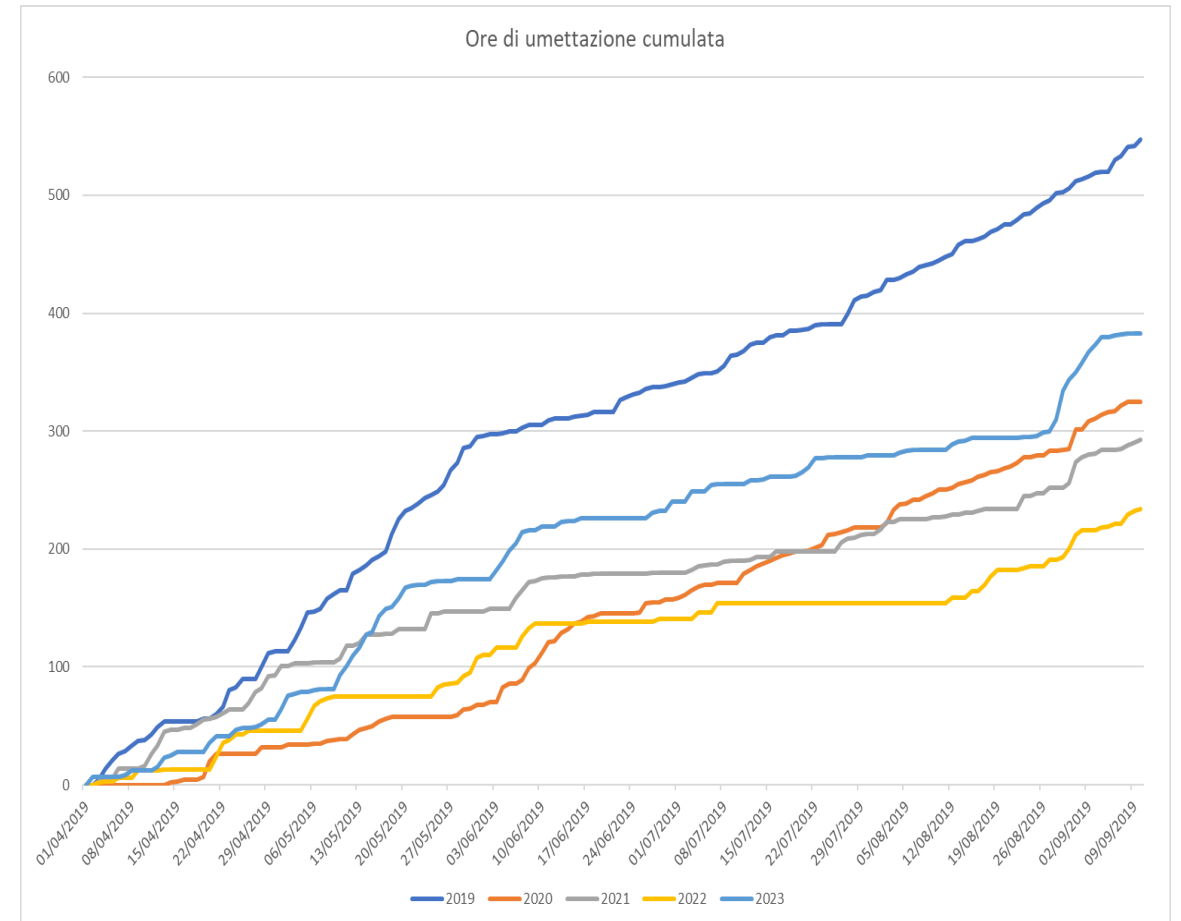
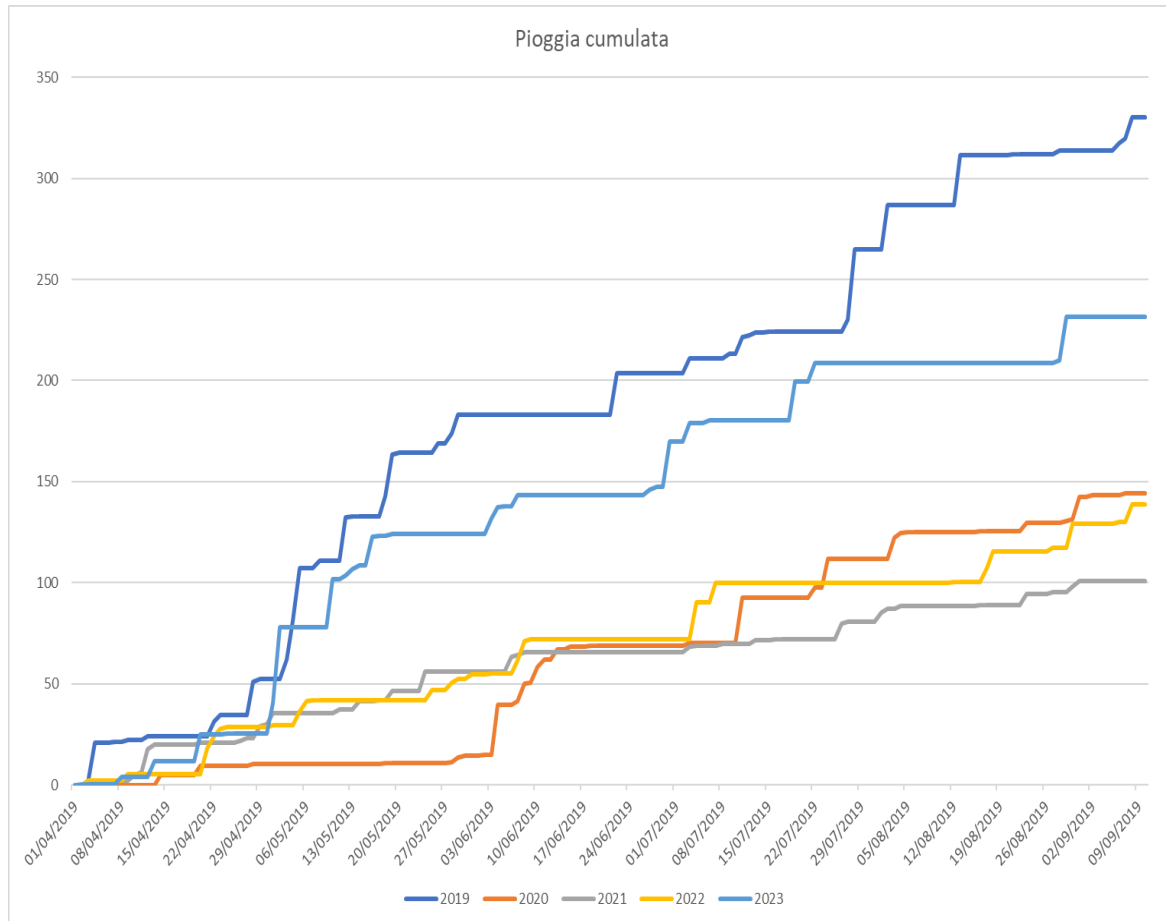
La simulazione dello shelf life per osservare un possibile sviluppo dei sintomi **non ha mostrato una progressione significativa della loro espressione**. Solo in due dei 10 frutti con sintomi di GLS è diventata visibile un'altra macchia durante i 54 giorni a temperatura ambiente. Due dei frutti (uno con e uno senza sintomi di GLS) hanno mostrato un leggero marciume nella zona del peduncolo 34 giorni dopo la raccolta, che si è esteso all'intera mela dopo 54 giorni.

INFEZIONE

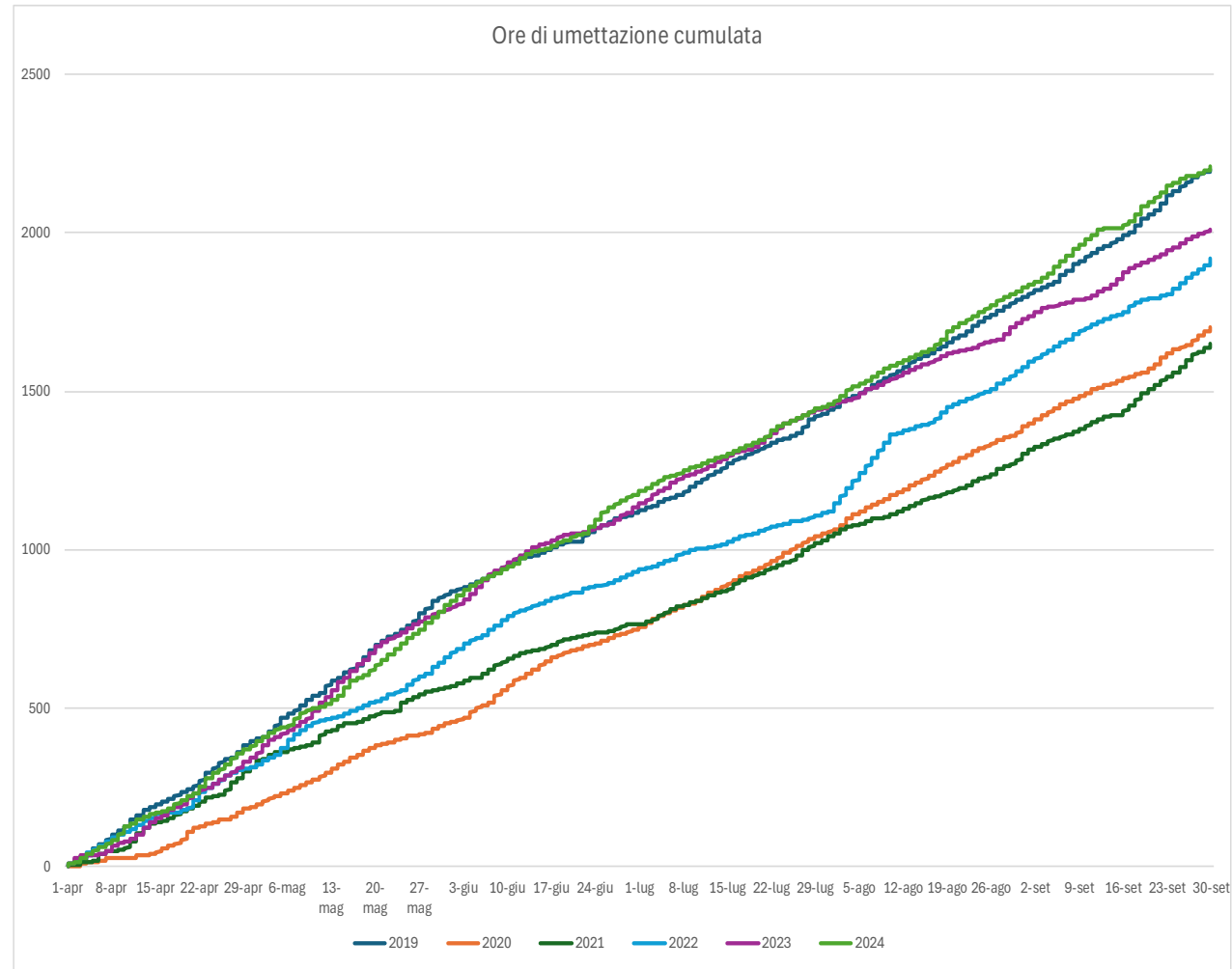
- Temperatura $>14^{\circ}\text{C}$
- T.opt. 26°C
- T.max 35°C
- Bagnatura foliage da 10 ore a 32 ore



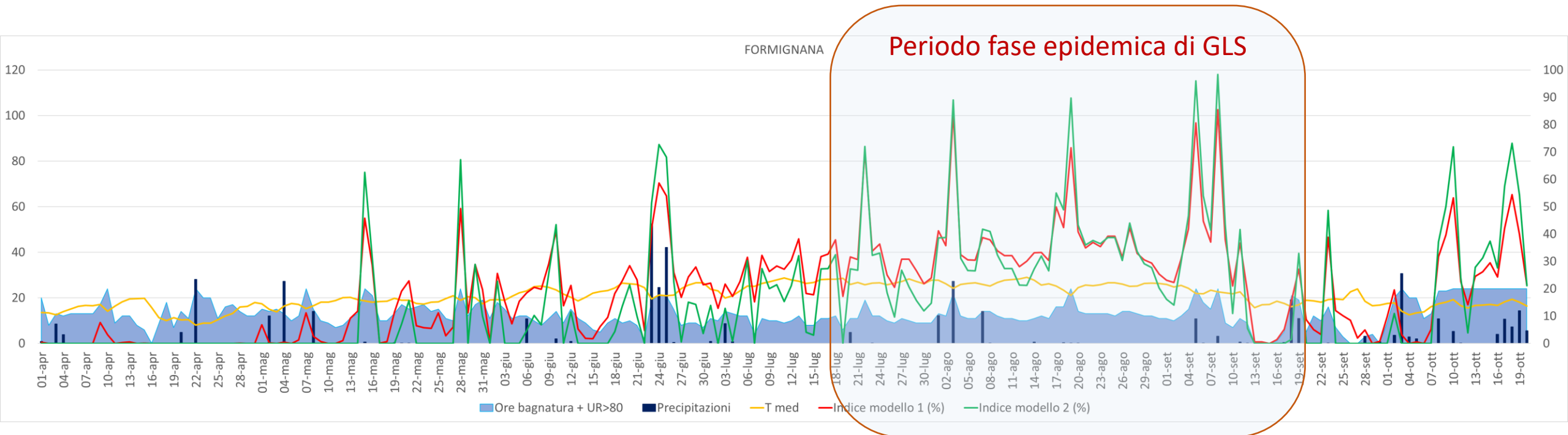
Clima (Portomaggiore – FE)



Clima (Portomaggiore – FE)



Messa a punto di un modello previsionale.....



Comparsa dei sintomi
18-26 luglio



Tabelle 1: Liste der verwendeten Fungizide

Handelsname	Wirkstoff
Bellis	Boscalid Pyraclostrobin
Cantus	Boscalid
Century Pro	K-Phosphonat
Delan Pro	Dithianon K-Phosphonat
Delan 70 WG	Dithianon
Flint	Trifloxystrobin
Fontelis	Penthiopyrad
Geoxe	Fludioxonil
Malvin 80 WG	Captan
Poltiglia disperss	Kupferkalkbrühe
Polyram DF*	Metiram*
Scala	Pyrimethanil
Sercadis SC	Fluxapyroxad
Tiovit Jet	Schwefel
Ulmasud	Gesteinsmehl

*Verliert im November 2024 die Zulassung

Tabelle 2: Hemmung des relativen Myzelwachstums je nach Handelsnamen und Fungizidkonzentration

Handelsname	Hemmung des täglichen relativen Myzelwachstums (%)				
	100 ppm	10 ppm	1 ppm	0,1 ppm	0,01 ppm
Bellis	39	31	9	0*	0*
Cantus	7	12	27	21	16
Century Pro	47	0*	0*	0,55	2
Delan Pro	52	0*	0*	3	0*
Delan 70 WG	40	37	5	0*	0*
Flint	21	14	8	3	5
Fontelis	100	100	85	28	0*
Geoxe	61	58	58	59	10
Malvin 80 WG	80	1	0,28	1	7
Poltiglia disperss	11	0*	0*	0*	0*
Polyram DF*	100	23	7	0*	0*
Scala	40	0*	0*	3	1
Sercadis SC	21	21	17	6	6
Tiovit Jet	0*	0*	0,70	0*	0*
Ulmasud	0*	0*	0*	0*	0*

*Keine Hemmung des Myzelwachstums, das Pilzwachstum war auf der Kontrolle geringer als auf dem Fungizidmedium.

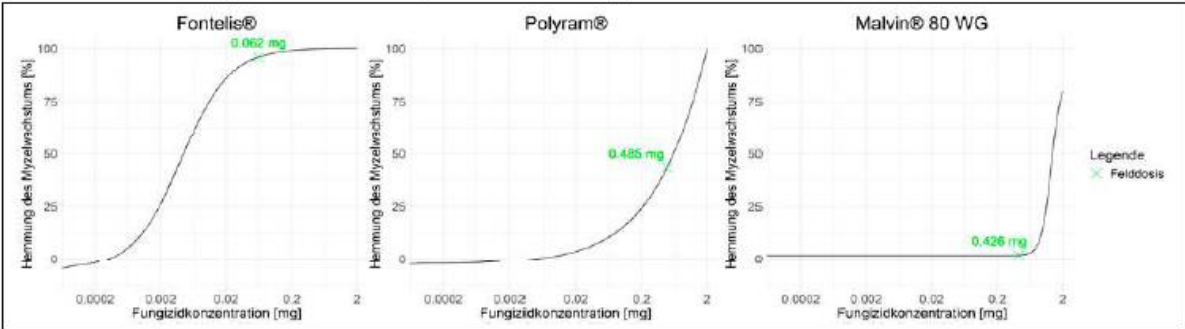
GLS – Symptomatik auf befallenen Blättern



In-vitro-Tests verschiedener Fungizide gegen Glomerella Leaf Spot (GLS)

Evi Deltedesco, Francesca Bottegoni, Emma Rizzolli, Stefanie Primisser, Sabine Öttl, Versuchszentrum Laimburg

Grafik: Dosis-Wirkungs-Kurven der Fungizide Fontelis, Polyram und Malvin 80 WG

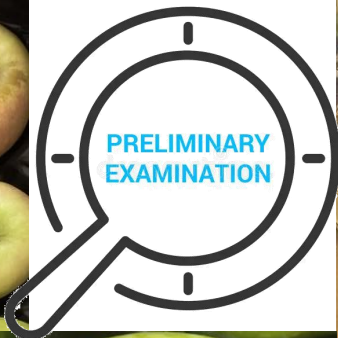


Prova GLS semicampo 2024

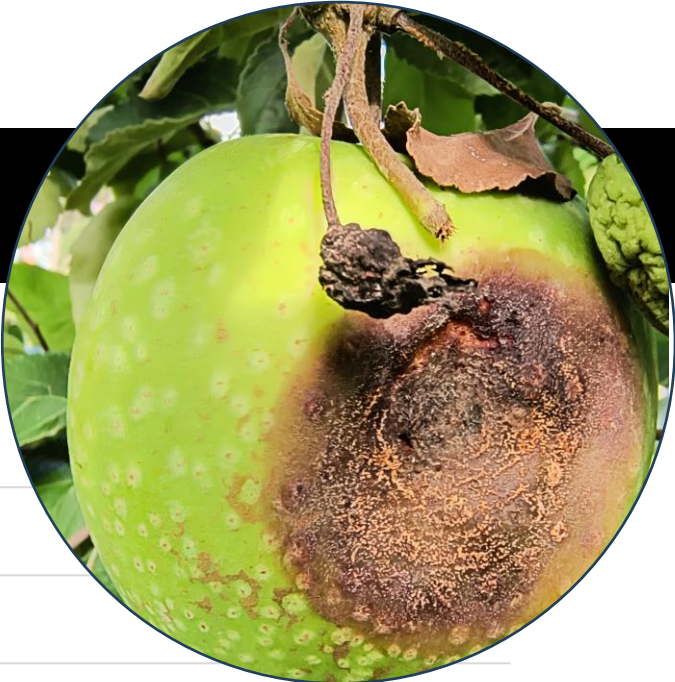
Risultati preliminari prova Glomerella semicampo 2024



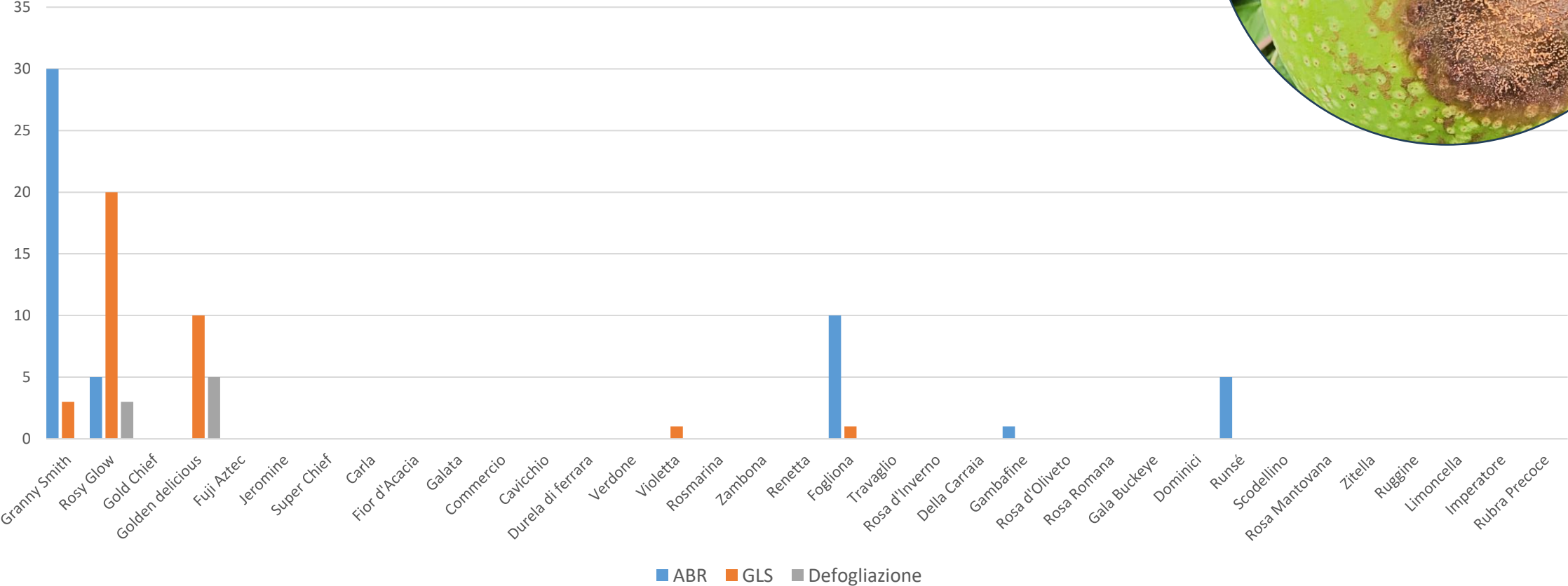
Prova Semicampo 2024 con frutti... susceptibilità varietale inoculate con *C.floriniae* agente di ABR



Suscettibilità varietale.....



Suscettibilità collezione varietale
Bentivoglio 27/09/2024







Difesa

- Il rischio infettivo ha inizio generalmente dalla fine fioritura in poi in funzione delle condizioni climatiche predisponenti caratterizzate da alta frequenza di piogge e dalla prolungata bagnatura fogliare. I trattamenti dovrebbero pertanto essere eseguiti preventivamente seguendo l'andamento pluviometrico con cadenze non superiori a 10 giorni.

Difesa

Mancozeb, metiram, ziram,
captano,
Dithianon
fluazinam.
fosfito di K
Qol
triazoli

Pratiche agronomiche & supporti

Modelli previsionali
Irrigazione sovrachioma
Sanitazione del frutteto
Varietà Samboa tolleranti

Post-raccolta

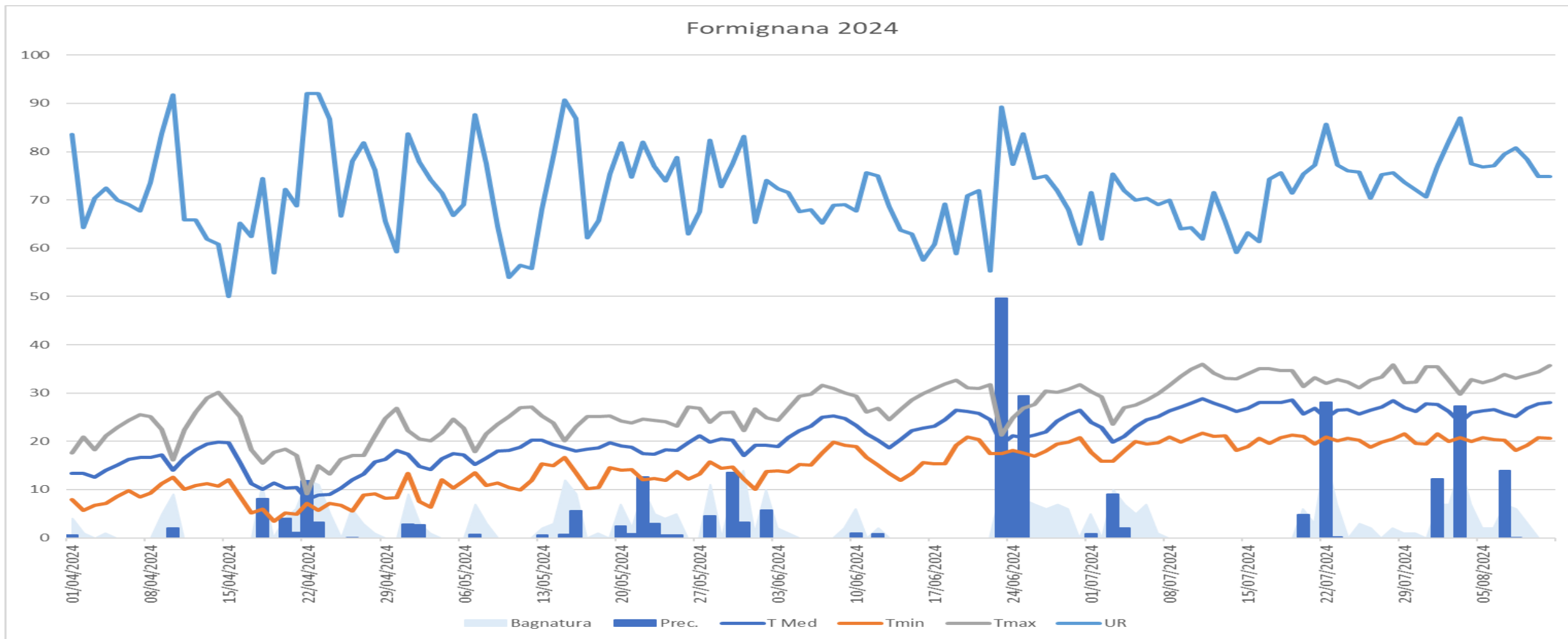
XEDATHANE 20
20% PYRIMETHANIL
La soluzione in post-raccolta
contro le malattie fungine

FUNGICIDA AD
AMPIO
SPETTRO SU
DRUPACEE
POMACEE
AGRUMI



EFFICACE CONTRO
Penicillium
Monilia
Gloeosporium
Botrytis

Meteo



Rischio infettivo per GLS nel 2024

