Could *Reptalus quinquecostatus* play a role in Bois Noir epidemiology?

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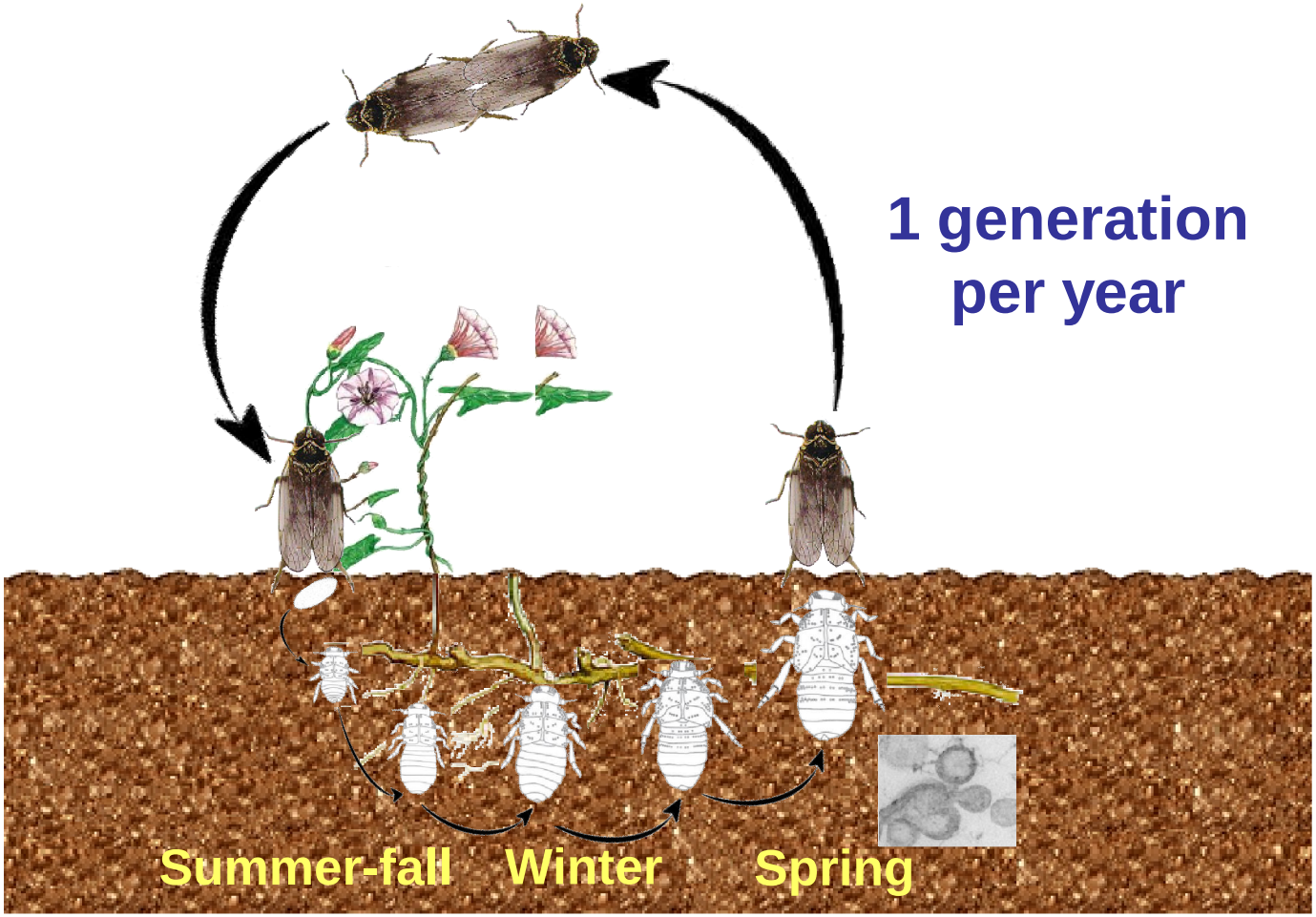
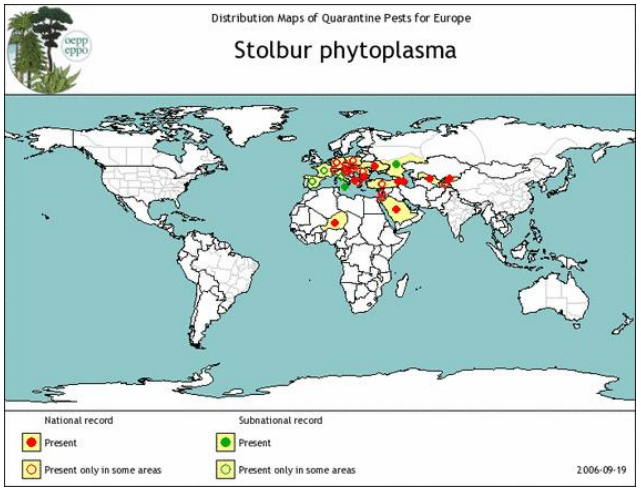
Reptalus quinquecostatus



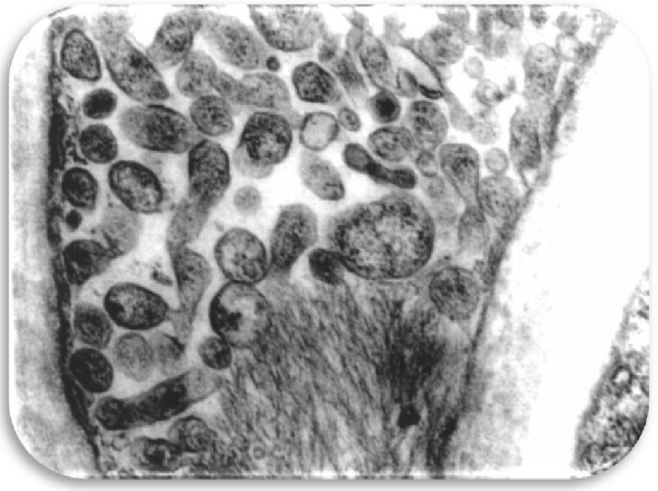
1 generation per year

Cixiid typical life cycle.

Stolbur



Worldwide problem



Vector-borne disease caused by *'Candidatus* phytoplasma solani'




> 60 plant species affected
Numerous crops, mainly Solanaceae

Pentastiridius leporinus

Macrosteles quadripunctulatus

Bactericera trigonica

> 15 insect vectors
Especially Cicadellidae & Cixiidae

Bois Noir epidemiology

Bois Noir : stolbur on grapevine

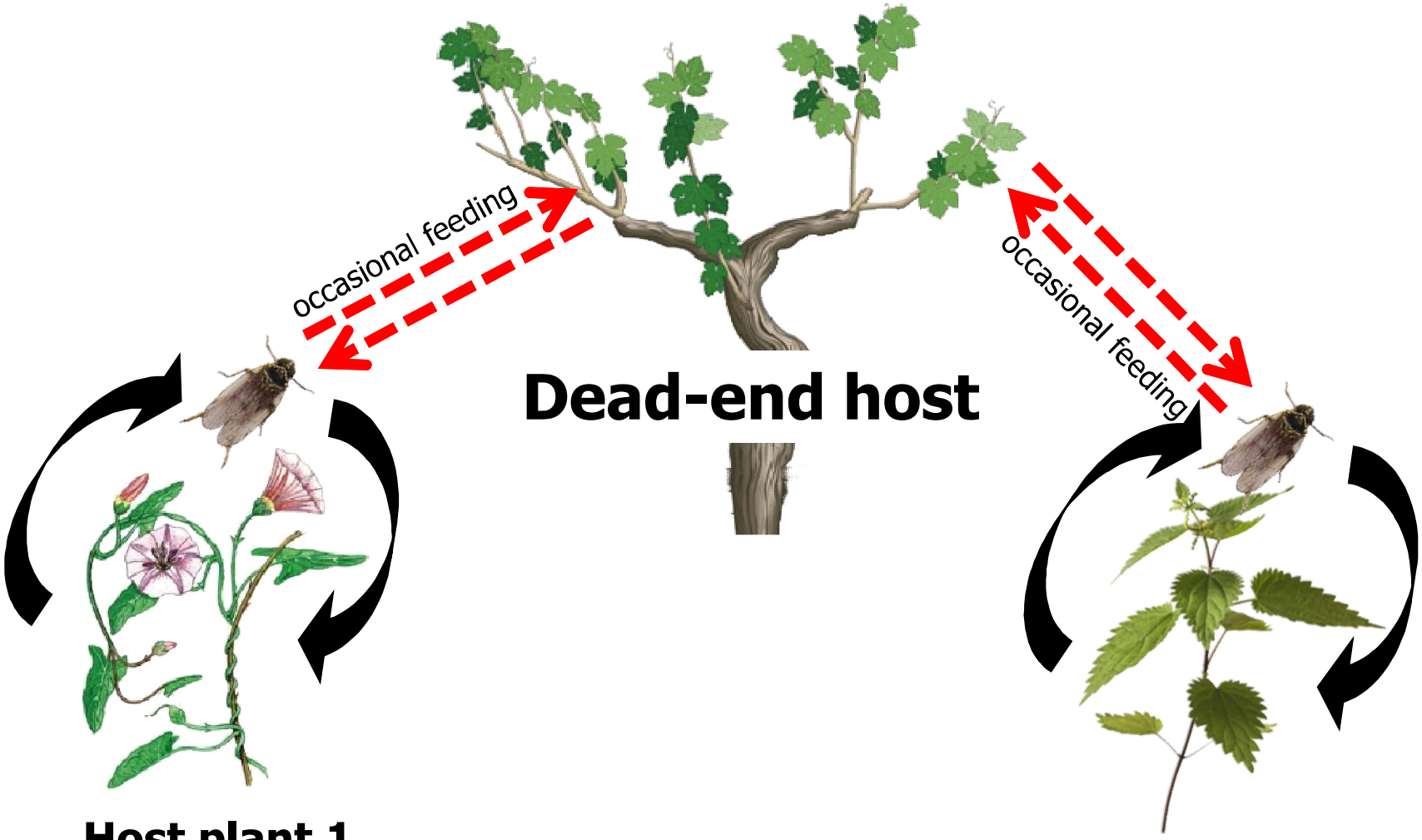
Caused by different '*Candidatus* phytoplasma solani' strains

Grapevine is a dead-end host for BN phytoplasma

Transmitted from wild plants to grapevines

Main vector: *Hyalesthes obsoletus* (Hemiptera: Cixiidae)

Bois Noir epidemiology : importance of weeds



Common paradigm

Bois Noir epidemiology

Battle *et al.* 2000

Table 1. BN incidence in different wine-growing regions and most relevant species of insects captured in 2006.

Location	BN incidence	no. insects captured (no. positives insects/total analyzed)						
		H. obsolethus	*E. variegatus*	*A. laevis*	*M. quadripunctulatus*	*P. striatus*	*L. striatellus*	*N. fenestratus*
Alava								
Morrolavieja	1%	4(1+/3)	13(2+/13)	12/0+/3)	2(1+/2)	45(0+/10)	1	2
Carrabañas	3-4%	5(2+/5)	3(0+/2)	14(0+/2)	3(1+/3)	59(1+/7)	2(0+/1)	5(0+/3)
Aragón								
Vero1	55%	15(6+/8)	41(0+/41)	7(0+/2)	0	92(0+/13)	5(0+/4)	1(1+/1)
Vero2	53%	4(1+/2)	32(1+/32)	60(0+/11)	0	343(0+/19)	34(0+/17)	5(2+/4)
La Rioja								
Manjarres	70%	1(1+/1)	7(0+/7)	5(2+/3)	0	57(1+/25)	14(0+/1)	1(1+/1)
Aranzana	70%	8(1+/5)	13(0+/13)	26(0+/9)	1 (0+/1)	1(0+/1)	5(0+/5)	1(0+/1)
Tudelilla	2%	0	1(0+/1)	3(0+/3)	0	6(0+/3)	8	0
Autol	2%	0	4(0+/4)	4(0+/2)	0	1(0+/1)	0	0
Navarra								
Montitura	70%	10 (5+/10)	174(4+/140)	100(1+/2)	0	480(0+/15)	44(3+/15)	0
Saso	10%	3(1+/3)	47(0+/39)	30(1+/10)	0	53(0+/12)	13(0+/6)	1(1+/1)
Cataluña								
Pla de Penede	70%	0	138 (2+/130)	7		13	41(1+/40)	0
Avinyo	5%	5(2+/2)	1	6		7	0	0

Strong BN incidence not always correlated to high densities of *H. obsoletus* populations.

Other Vectors ?

Bois Noir epidemiology

Above 50 additional species were found carrying *Ca.* P. solanio without any evidence of plant inoculations.

Issus sp.

Aphrodes bicinctus

7 more insect species are BN vectors (demonstrated in lab. experiments)

Euscelis obsoletus

Euscelidus variegatus

?

Reptalus panzeri

Macrosteles quadripunctulatus

Reptalus quinquecostatus

Reptalus quinquecostatus

Cixiidae like *H. obsoletus*

Close to *Reptalus panzeri* vector of *'Ca.* P solani' on maize (maize redness, Jović *et al.* 2007) and grapevine (Cvrković *et al.* 2014)

Commonly observed on grapevines in several European vineyards (Mazzoni 2005; Mazzoni *et al.* 2005; Alma et *al. 2008*).

Infected individuals collected on grapevines in Italy (Trivellone *et al.* 2005; Alma *et al.* 2008) and in Serbia (Cvrković *et al.* 2013).

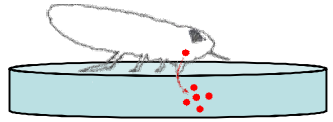
***R. quinquecostatus* also found in other crops infected by `*Ca.* P. solani' such as lavender**

Reptalus quinquecostatus: what is known ?

Detection of phytoplasma in insect body do not imply transmission ability.

Transmission to grapevine failed (CvrkoviĺÍ *et al.* 2014).

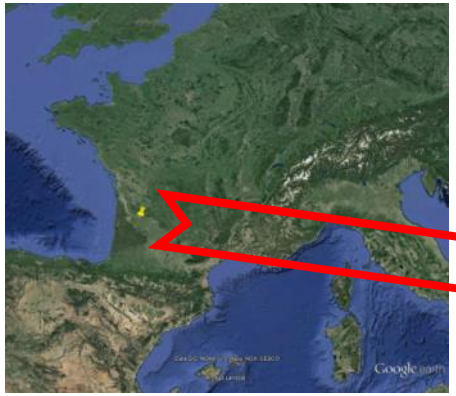
Inoculation into a feeding medium succeeded (Pinzauti *et al.* 2008).



Suspicion for possible role of *R. quinquecostatus* as a vector but no proof.

Need of plant transmission success to validate vector status.

Sampling site



July 2012 & 2013

Sampling of BN grapevine with entomological net (1km around BN diseased grapes)

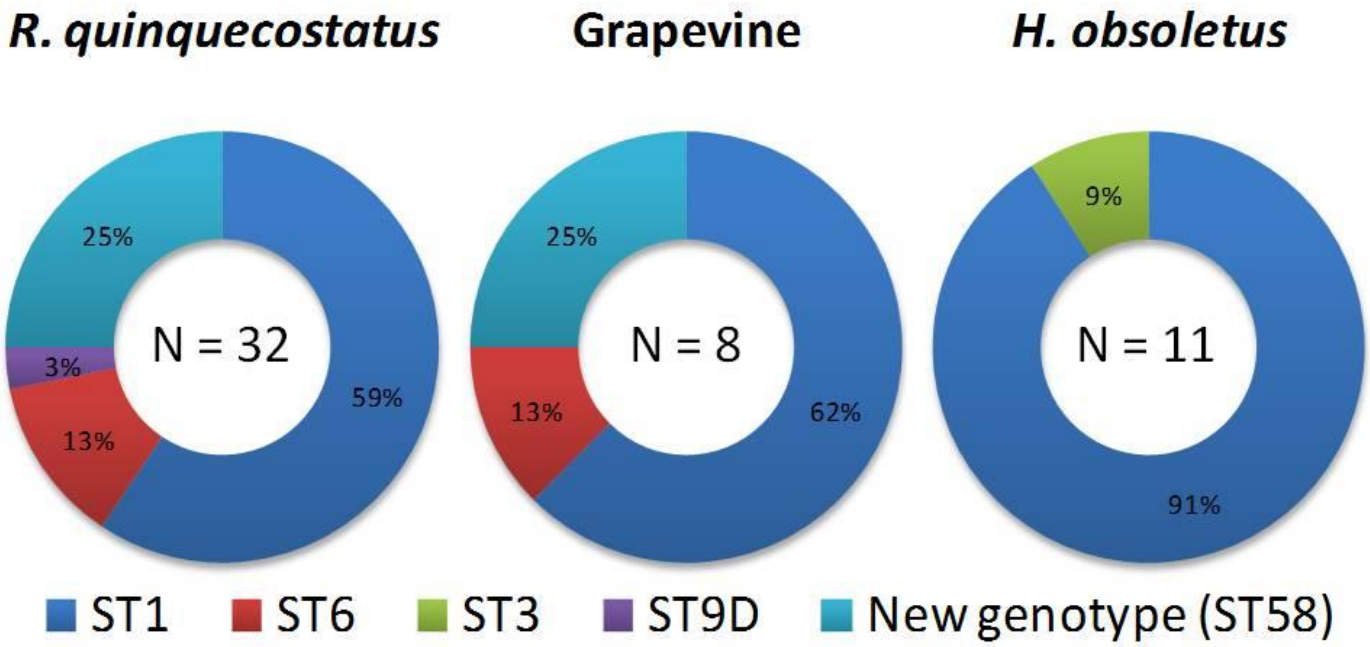
>>> more Reptalus* than *Hyalesthes

Ground cover: *Convolvulus arvensis* (predominant species), Poaceae spp. and dicotyledon plants, such as *Plantago* sp. (no *Urtica dioica,* no *Calystegia sepium*).

Vector species and phytoplasma strains distribution

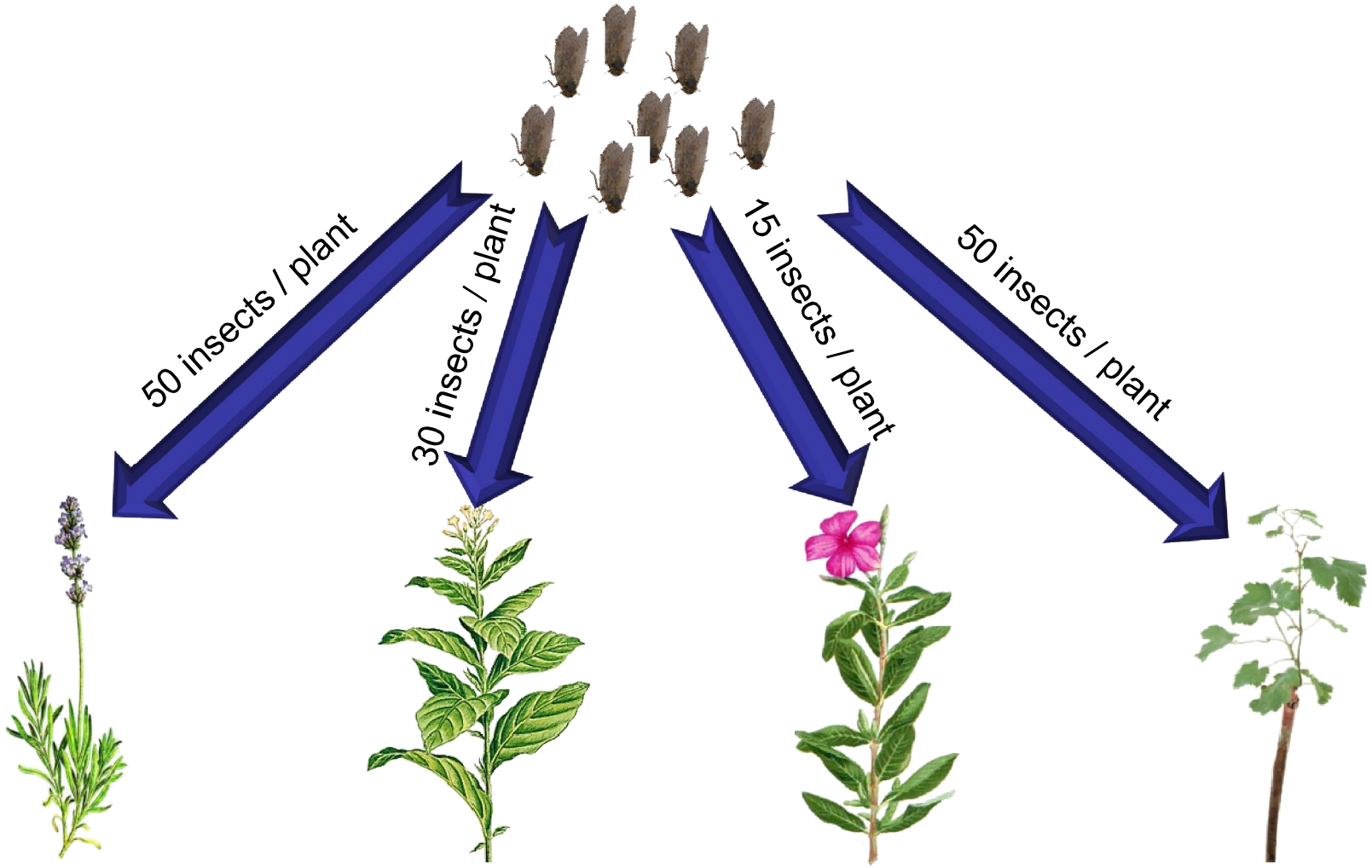
	Positive/Tested		Infection Rate (%)	
	R. quinquecostatus	*H. obsoletus*	*R. quinquecostatus*	*H. obsoletus*
2012	1/40	11/29	2.50	37.93
2013	54/623	0/10	8.67	0
Total	55/663	11/39	8.30	28.20

BN strains compositions similar for *R. quinquecostatus* and grapevine.



Transmission trials (3 insect doses)

4 species (cultivars very susceptible to stolbur)



Lavandula x intermedia (Abrial)

7 plants tested

Nicotiana tabacum (ITB 683)

3

Catharanthus roseus (periwinkle)

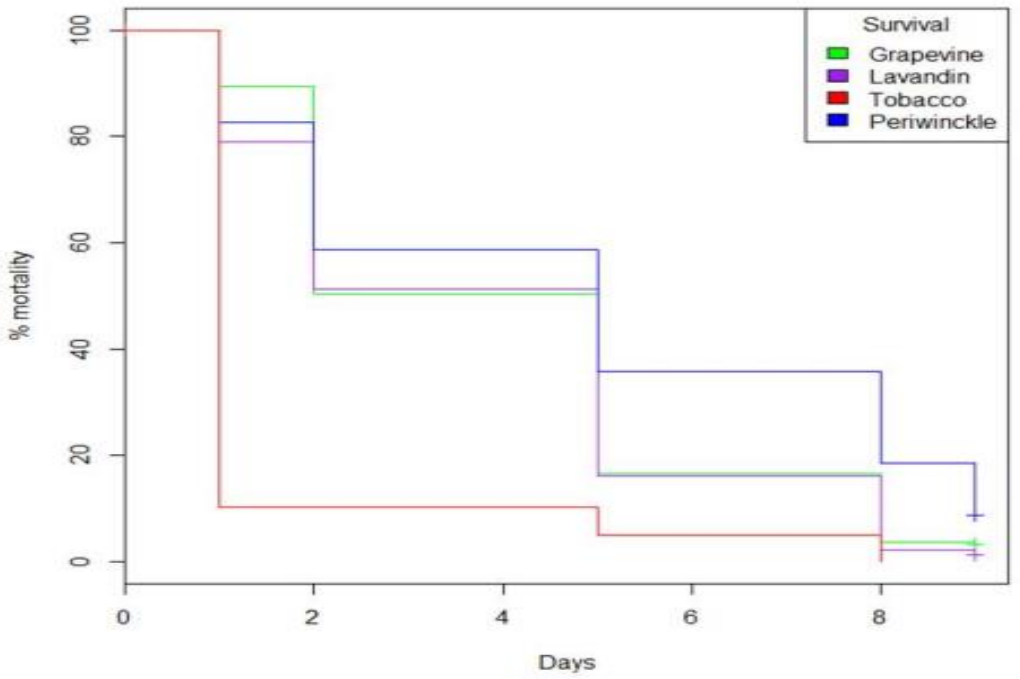
10

Vitis vinifera (Chardonnay)

10

Transmission trials

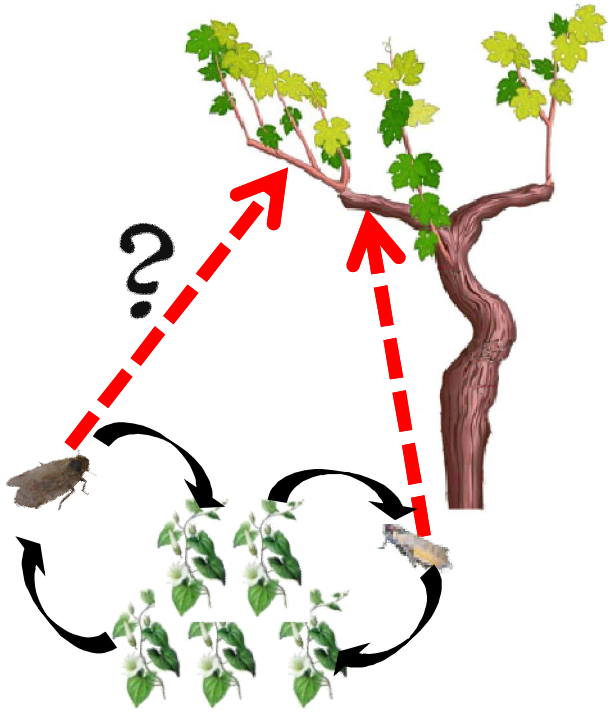
Highest mortality of *Rq* :tobacco
Best survival: periwinkle.



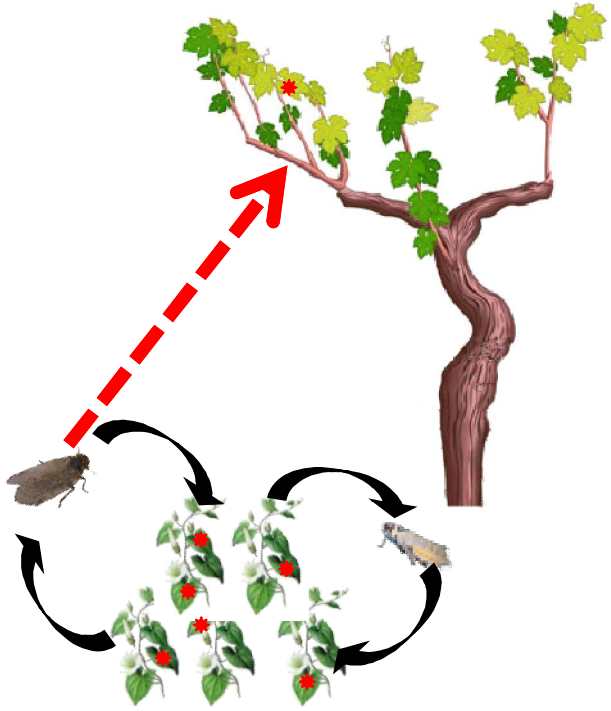
	Rq infected	Plants	
	%	BN +/Tested N	Inoculation efficiency %
Periwinkle	**9.5**	**2/10**	**20**
Chardonnay	**5.9**	**0/10**	**0**
Lavender	**10.2**	**0/7**	**0**
Tobacco	**25.6**	**0/3**	**0**

Role of *Rq* in Bois Noir epidemiology ?

2 alternative hypotheses



Direct role
(not demonstrated here)



Inability of *H. obsoletus* to transmit ST58

>> High probability of *Rq* contribution

Take home message

R. quinquecostatus **is a vector of stolbur phytoplasma.**

Rq **could play either a direct or an indirect role to BN.**

Specificity of ST 58 found in grapes to *Rq* suggests a direct role.

Other vectors than *Hyalesthes obsoletus* should be considered in BN epidemics.

Increase our knowledge of different weeds contribution.


Thank you for attention
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