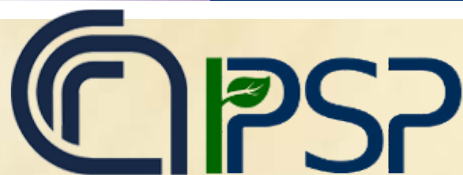


# THE ASSOCIATION OF GRAPEVINE PINOT GRIS VIRUS WITH LEAF DEFORMATION AND MOTTLING

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DEGLI STUDI DI BARI  
ALDO MORO

DIPARTIMENTO DI SCIENZE DEL SUOLO  
DELLA PIANTA E DEGLI ALIMENTI



FONDAZIONE  
EDMUND  
MACH



# GRAPEVINE PINOT GRIS VIRUS *AN EMERGING PATHOGEN*

A large, light blue arrow pointing from the bottom-left towards the top-right, containing three blue circular markers. The markers are positioned at the start, middle, and end of the arrow, corresponding to the years 2003, 2012, and 2014 respectively.

**2003**  
Symptom appearance in  
Trentino vineyards

GPGV identification  
through NGS

**2012**

**2014**

Extensive spread  
of disease reports







genus *Tricovirus*  
*Colomerus vitis* field transmission

Dr. Terai, Japan (retired) Japan (retired)

# Grapevine Pinot gris virus related to *Grapevine berry inner necrosis virus*

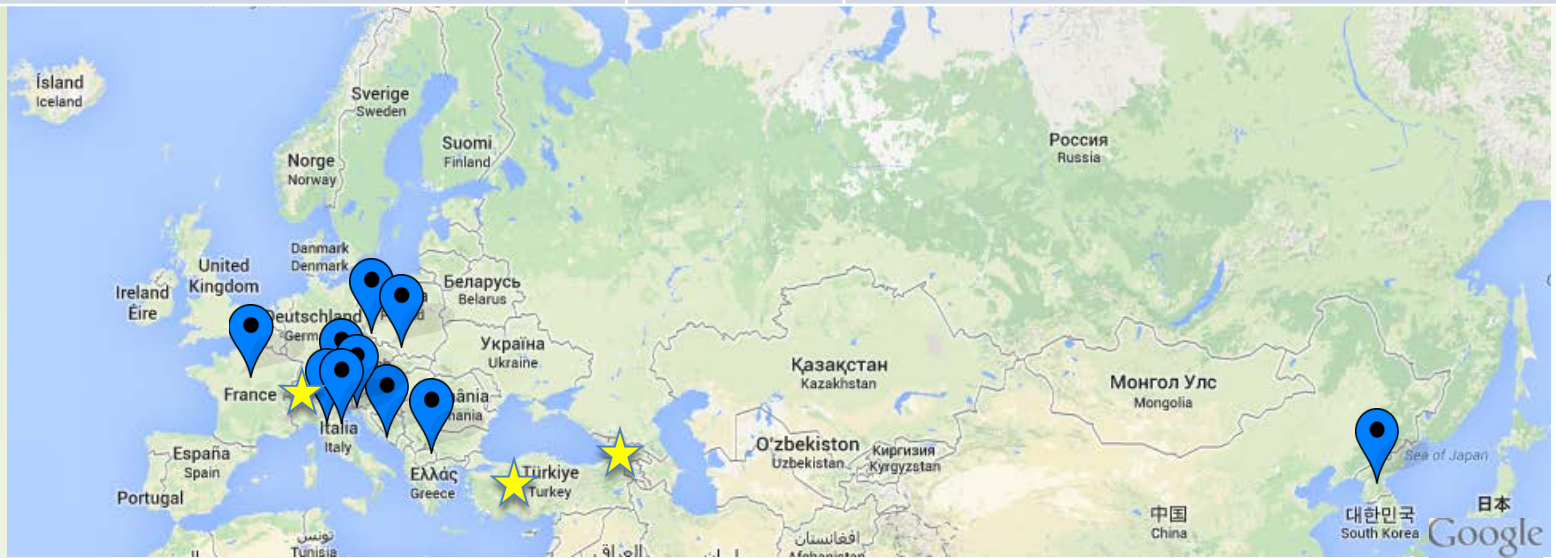


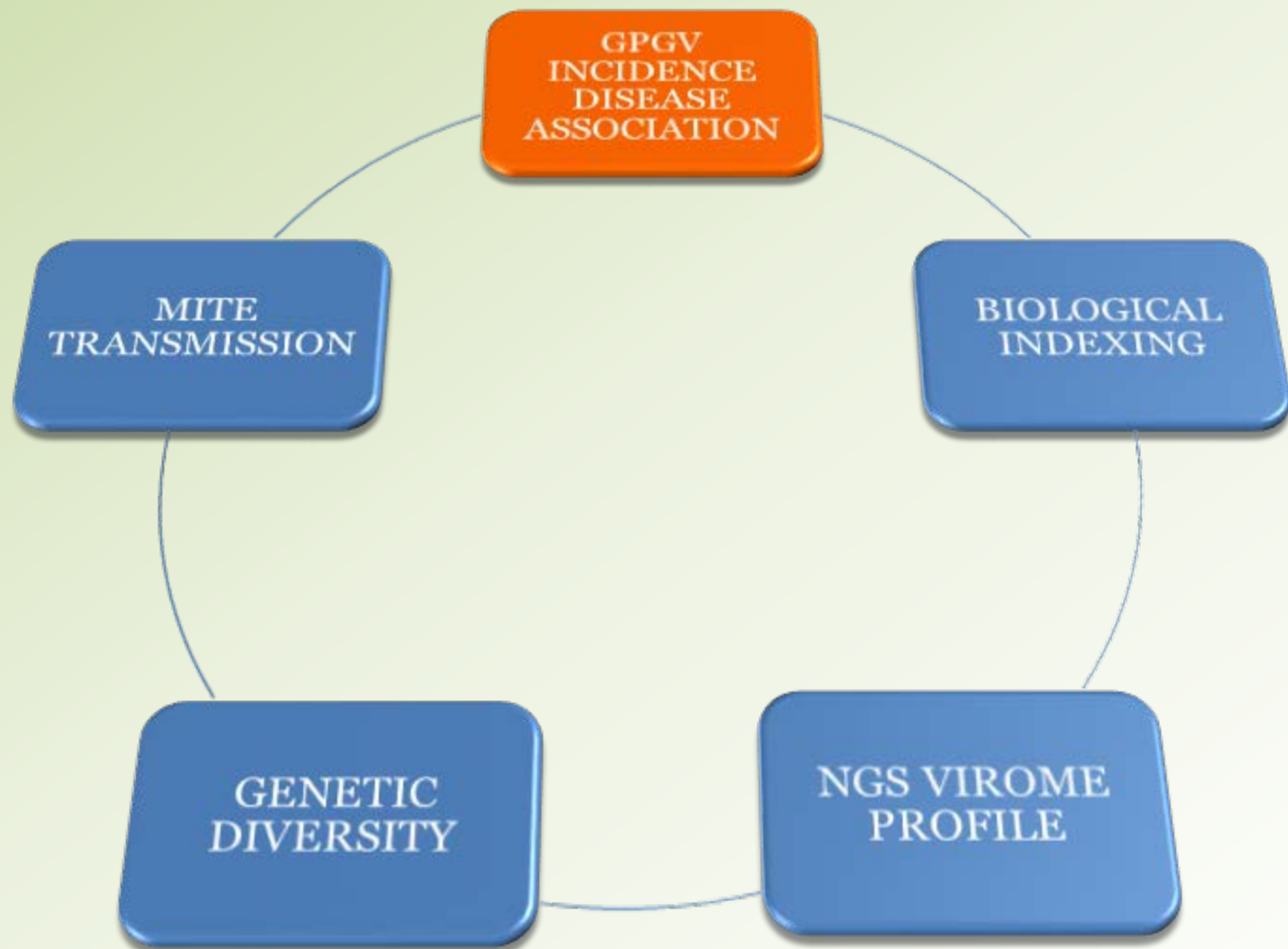
genus *Tricovirus*  
*Colomerus vitis* field transmission

Dr. Terai, Japan (retired) Japan (retired)

# GPGV GEOGRAPHICAL OCCURRENCE

COUNTRY	YEAR	AUTHOR
Italy, Trentino	2012	Giampetruzzi et al., Malossini et al.
Italy, Friuli Venezia Giulia	2012, 2015	Malossini et al., Bianchi et al.
Italy, Veneto	2013	Raiola et al.
Republic of South Korea	2013	Cho et al.
Italy, Emilia Romagna	2014	EPPO report
Italia, Apulia	2014	Morelli et al.
Slovenia	2013	Plesko et al.
Czech Republic	2014	Glasa et al.
Slovak Republic	2014	Glasa et al.
Greece	2014	Maliogka et al. ( <i>p. communication</i> )
France	2015	Beuve et al.





# FIELD SURVEY AND VIRUS FREQUENCY

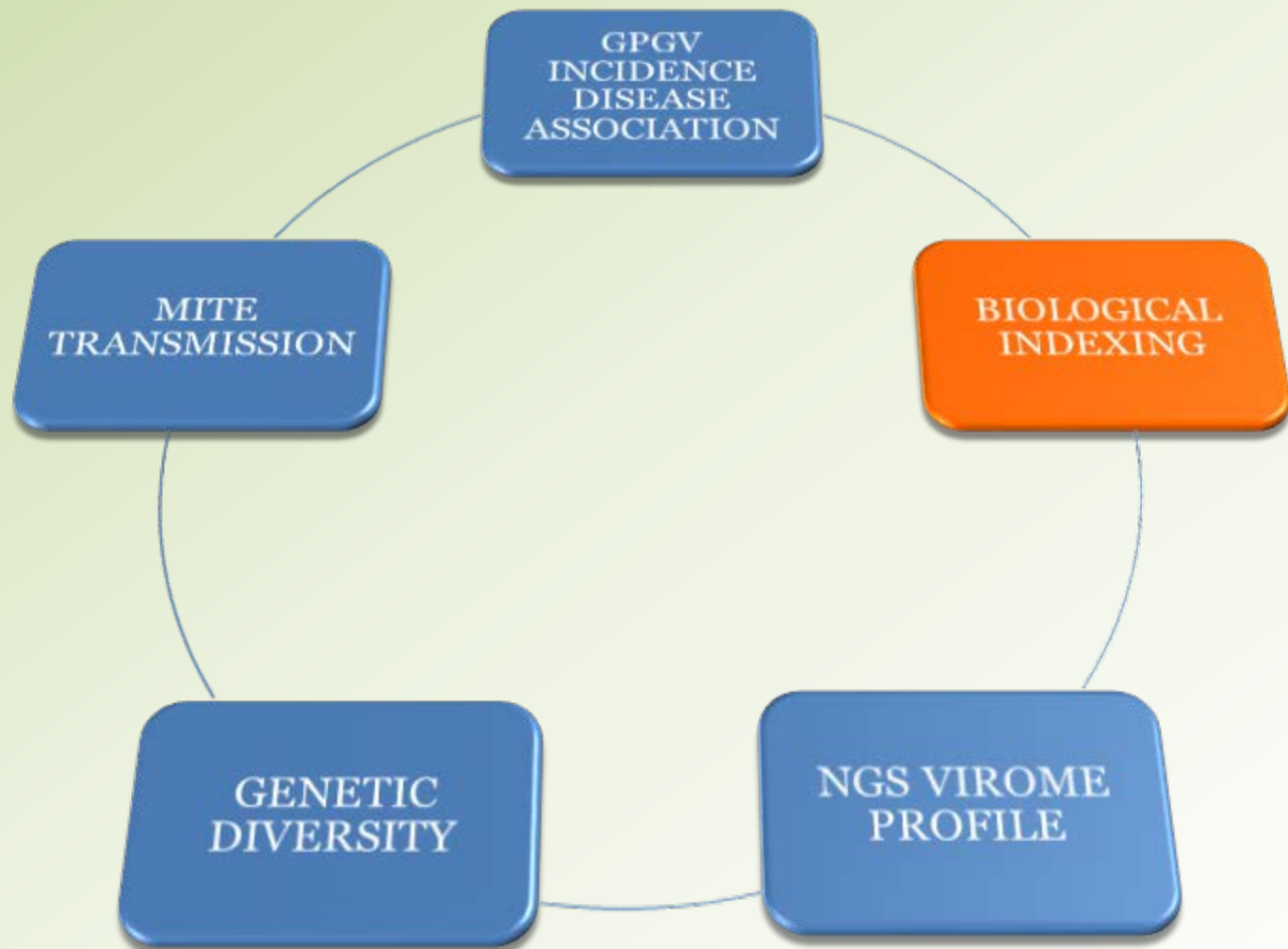
RT-PCR	Symptomatic plants		Symptomless plants		Total
	N	%	N	%	N
GPGV +	59	79	16	21	75
GPGV -	0	0	17	100	17
	<b>59</b>		<b>33</b>		<b>92</b>

**82%**  
GPGV  
FREQUENCY

**21%**  
GPGV  
SYMPTOMLESS

**79%**  
GPGV /SYMPTOMS  
ASSOCIATION





# BIOLOGICAL INDEXING



# BIOLOGICAL INDEXING

	Scion	Indicator	Total	Sympt. +	Sympt. -
Bud Grafting	Sympt. (+) Pinot Gris	Cabernet Franc	7	0	7
		<i>V. rupestris</i>	5	0	5
		Pinot Gris	29	25	4
		Traminer	4	4	0
	Sympt. (-) Pinot Gris	Cabernet Franc	11	0	11
		<i>V. rupestris</i>	10	0	10
		Pinot Gris	45	0	45
		Traminer	8	0	8
Green Grafting	Sympt. (+) Pinot Gris	Pinot Gris	3	2	1
		Traminer	8	8	0
	Sympt. (-) Pinot Gris	Traminer	3	0	3

# BIOLOGICAL INDEXING

	Scion	Indicator	Total	Sympt. +	Sympt. -
grafting	Sympt. (+) Pinot Gris	Cabernet Franc	7	0	7
		<i>V. rupestris</i>	5	0	5
		Pinot Gris	29	25	4
		Traminer	4	4	0

GPGV VARIANTS?  
UNKNOWN VIRUSES?

		Pinot Gris	45	0	45
		Traminer	8	0	8
Green Grafting	Sympt. (+) Pinot Gris	Pinot Gris	3	2	1
		Traminer	8	8	0
	Sympt. (-) Pinot Gris	Traminer	3	0	3

# NGS VIROME PROFILING

	SYMPTOMLESS		SYMPTOMATIC	
Grapevine accession	ZA505-1N		ZA505-2A	
k-mer	15	17	15	17
Total number of contigs	6493	2557	6254	2326
Grapevine Pinot gris virus ITA (NC_015782)	9	6	44	45
Grapevine Pinot gris virus SK30 (KF686810)	51	31	23	11
Grapevine rupestris stem pitting associated virus	295	141	223	119
Grapevine yellow speckle viroid 1	11	22	9	3
Hop stunt viroid	9	9	8	3
Grapevine rupestris vein feathering virus	0	0	70	57

A T C T G G

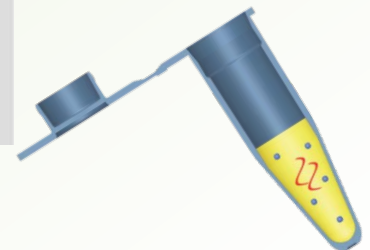
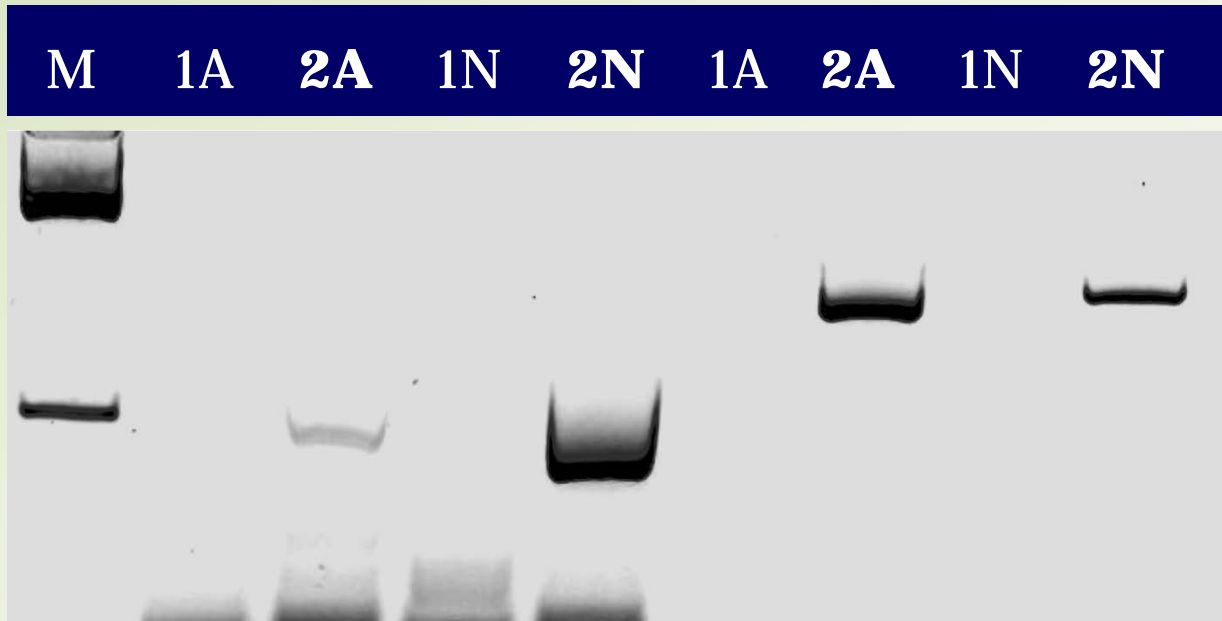


# GRV FV RT-PCR DETECTION

Grapevine accession	SYMPTOMLESS		SYMPTOMATIC	
	ZA505-1N	ZA505-2A	ZA505-1N	ZA505-2A
k-mer	15	17	15	17
Grapevine rupestris vein feathering virus	0	0	70	57

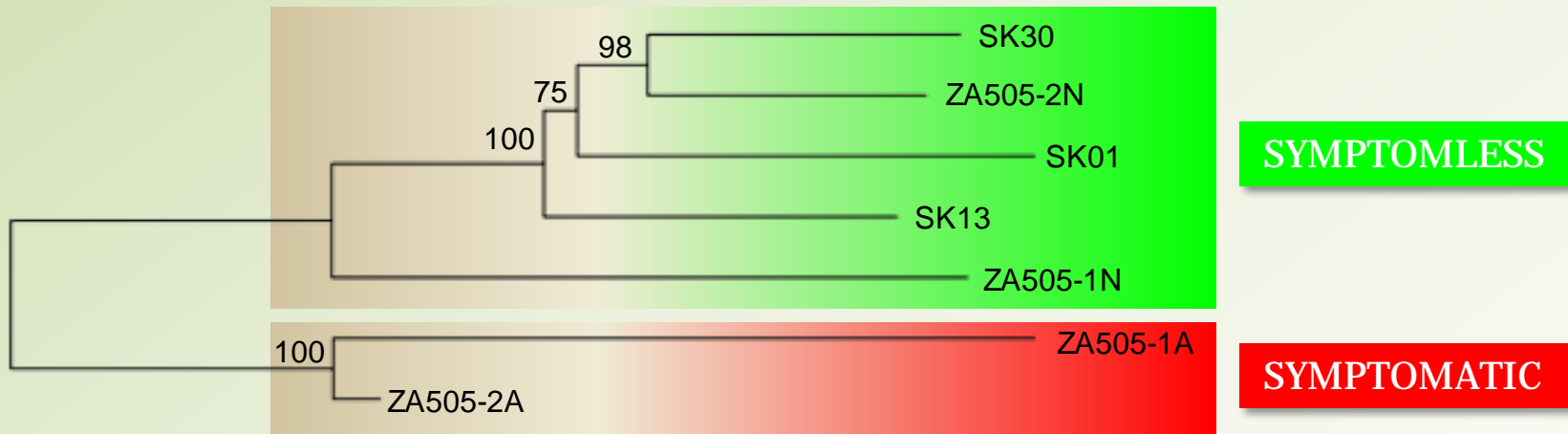
PRIMER SET A

PRIMER SET B



# GENETIC DIVERSITY OF GPGV ISOLATES

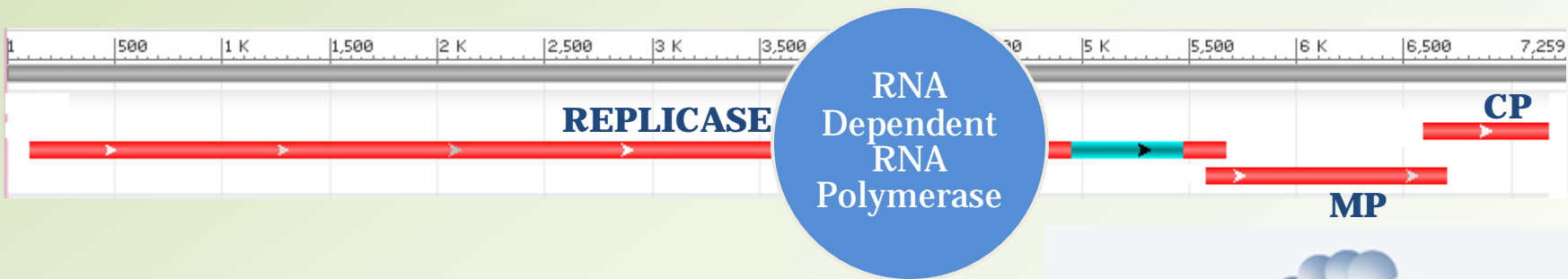
**WHOLE GENOME**



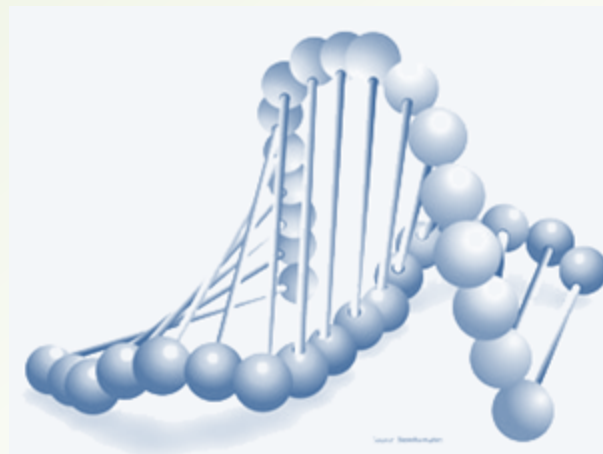
Maximum likelihood phylogeny  
1000 replicates bootstrap



# GENETIC DIVERSITY OF GPGV ISOLATES

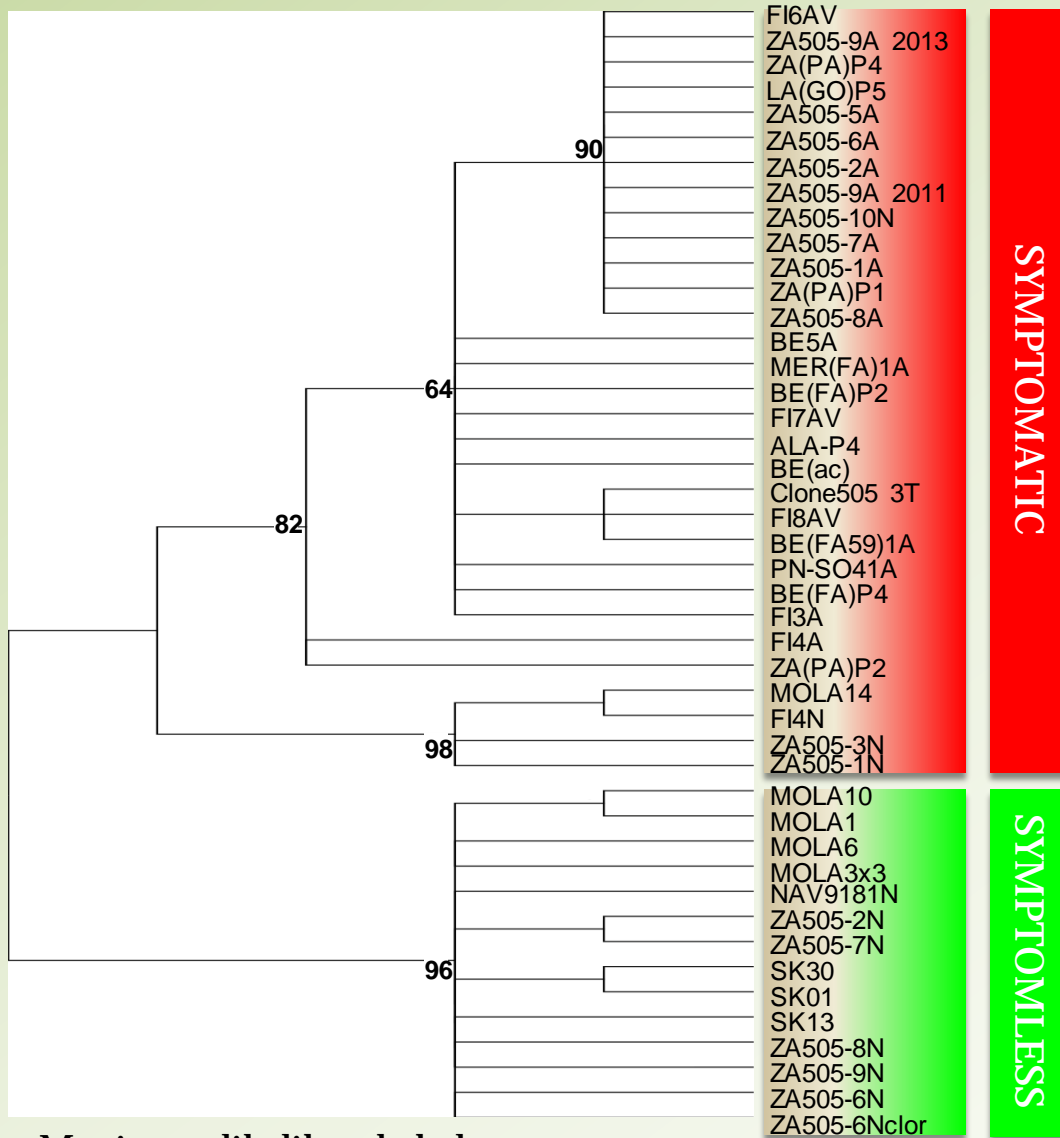


**TARGET GENES**



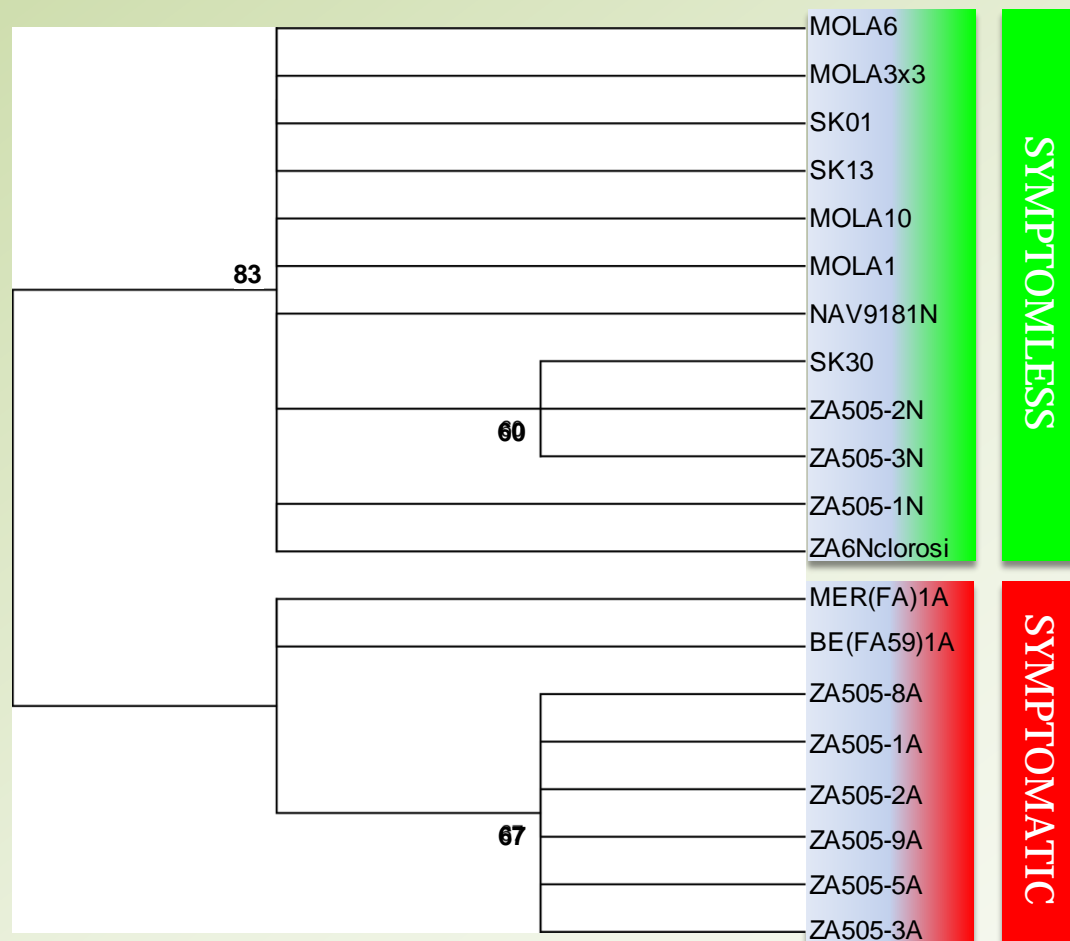


# GENETIC DIVERSITY OF GPGV ISOLATES



Maximum likelihood phylogeny  
1000 replicates bootstrap

# GENETIC DIVERSITY OF GPGV ISOLATES



Maximum likelihood phylogeny  
1000 replicates bootstrap

RdRp

# EVALUATION OF GRAPE ERINEUM MITE ROLE IN GPGV TRANSMISSION

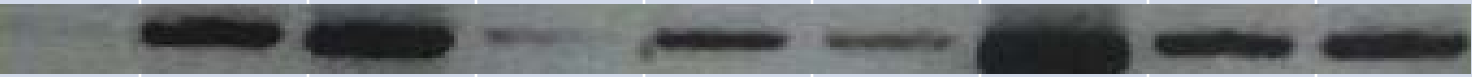


RT-PCR DETECTION IN ERIOPHYDE MITE BODIES

TRANSMISSION ASSAYS

# RT-PCR DETECTION OF GPGV IN *COLOMERUS VITIS* BODY

## **DRY EXTRACTION METHOD (NO WASHING)**

id.	1	2	3	4	5	6	7	8	9
n. mites	1	1	1	5	5	5	10	10	10
PCR									

## **WASH AND SIEVE EXTRACTION METHOD (WASHING)**

id.	10	11	12	13	14	15	16	17	18
n. mites	1	1	1	5	5	5	10	10	10
PCR									

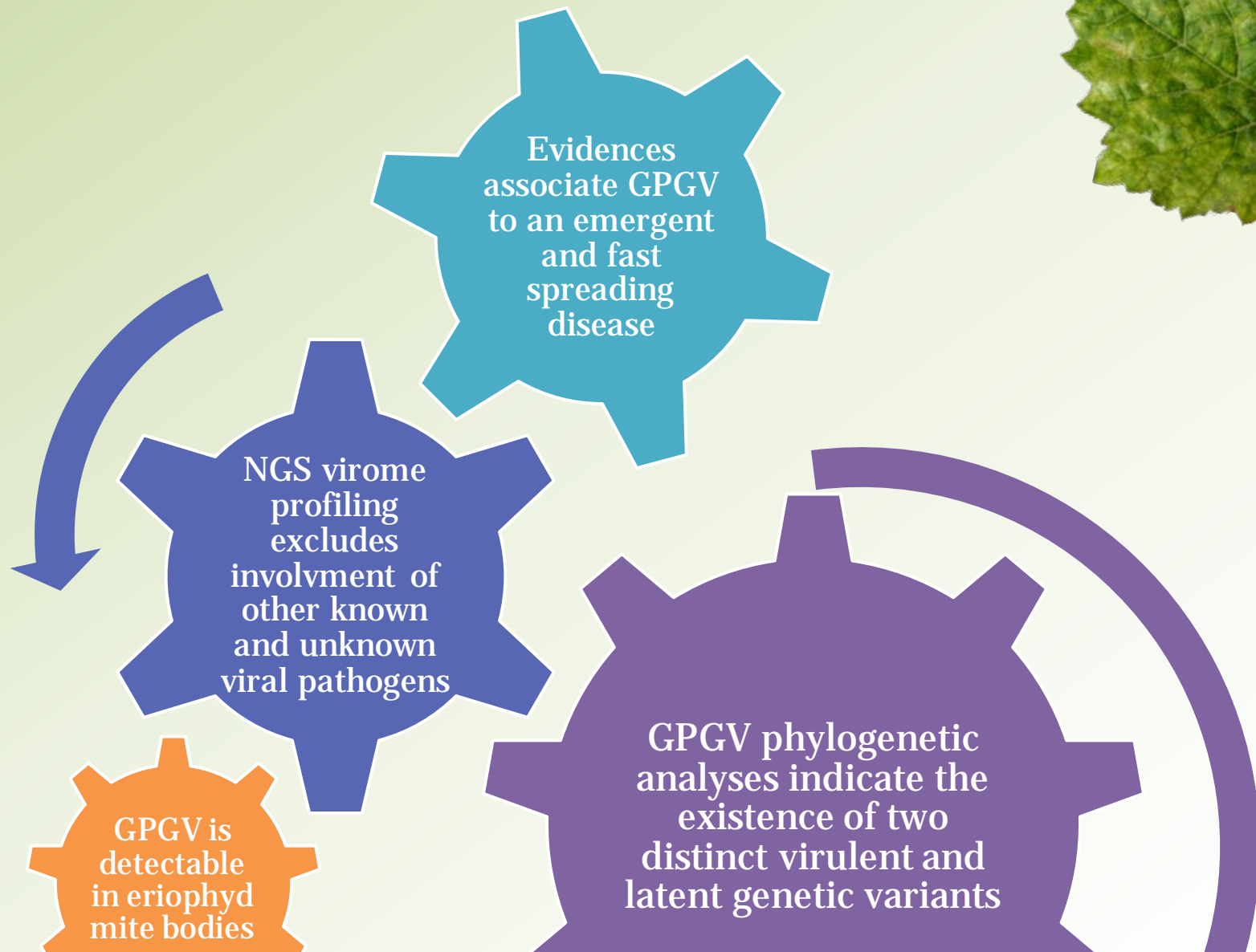


## C. VITIS TRANSMISSION ASSAYS

	SUMMER JULY 2013	SPRING MAY 2014	SUMMER JULY 2014
VIRUS/MITE SOURCE	Pinot Gris leaf erynoses	Pinot Gris dormant buds	Pinot Gris leaf erynoses
INDICATORS	Pinot Gris, Traminer vegetative apices	Verdeca, Italia, Malvasia buds	Grape seedlings, Grape rootstocks, <i>C. quinoa</i> and <i>N. benthamiana</i> leaves
ERYNOSES	+	+	-
VIRUS SYMPTOMS	-	+(Verdeca)	-
RT-PCR	+	+	-



# CONCLUSIONS



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