



UNIVERSIDAD DE CHILE
Facultad de Ciencias Agronómicas
Departamento de Sanidad Vegetal
Laboratorio de Fitovirología

El cerezo y los virus: ¿Unión indisoluble?”

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PROSPECCIÓN FRUTALES DE CAROZO (2006-2011)



**Región
Valparaíso**

**Región
Metropolitana**

**Región
O'Higgins**

SURVEY OF STONE FRUIT VIRUSES AND VIROIDS IN CHILE

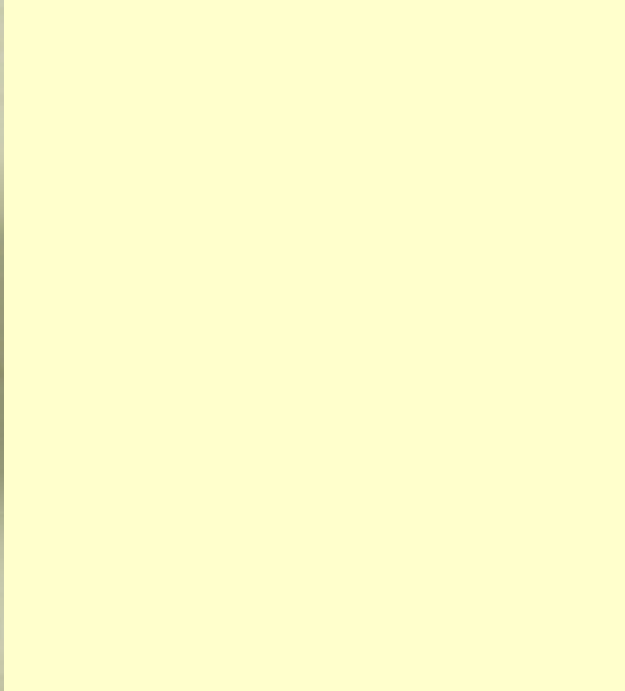
N. Fiore, A. Zamorano, A.M. Pino, F. González, I.M. Rosales, J.A. Sánchez-Navarro and V. Pallás

Journal of Plant Pathology (2016), 98 (3), 631-635

| ESPECIE | VIRUS | | | | | | VIROIDES | |
|---------------|-------------------|--------------------|-----------------|-----------------|--------------------|------------------|-----------------|--------------------|
| | PPV | PDV | ACLSV | ApMV | PNRSV | ToRSV(p) | HSVd | PLMVd |
| Almendro | | | | | 1/10 (10%) | | | |
| CEREZO | | 12/37 (32,4%) | | | 11/37 (29,7%) | | | |
| Damasco | 2/84 (2,4%) | 5/44 (11,4%) | | | 5/44 (11,4%) | 1/4 (25,0%) | | |
| Ciruelo e. | 1/38 (2,6%) | 3/17 (17,6%) | | | 2/17 (11,8%) | 1/4 (25,0%) | | |
| Ciruelo j. | 7/559 (1,3%) | 40/245 (16,3%) | | | 19/245 (7,8%) | 2/50 (4,0%) | | 1/245 (0,4%) |
| Durazneros | 22/1106 (2,0%) | 185/518 (35,7%) | 4/442 (0,9%) | 6/470 (1,3%) | 206/518 (39,8%) | 8/33 (24,2%) | 6/476 (1,3%) | 136/518 (26,3%) |
| Nectarino | 13/614 (2,1%) | 111/268 (41,4%) | 5/200 (2,5%) | 6/247 (2,4%) | 115/268 (42,9%) | 11/52 (21,2%) | 7/243 (2,9%) | 156/268 (58,2%) |

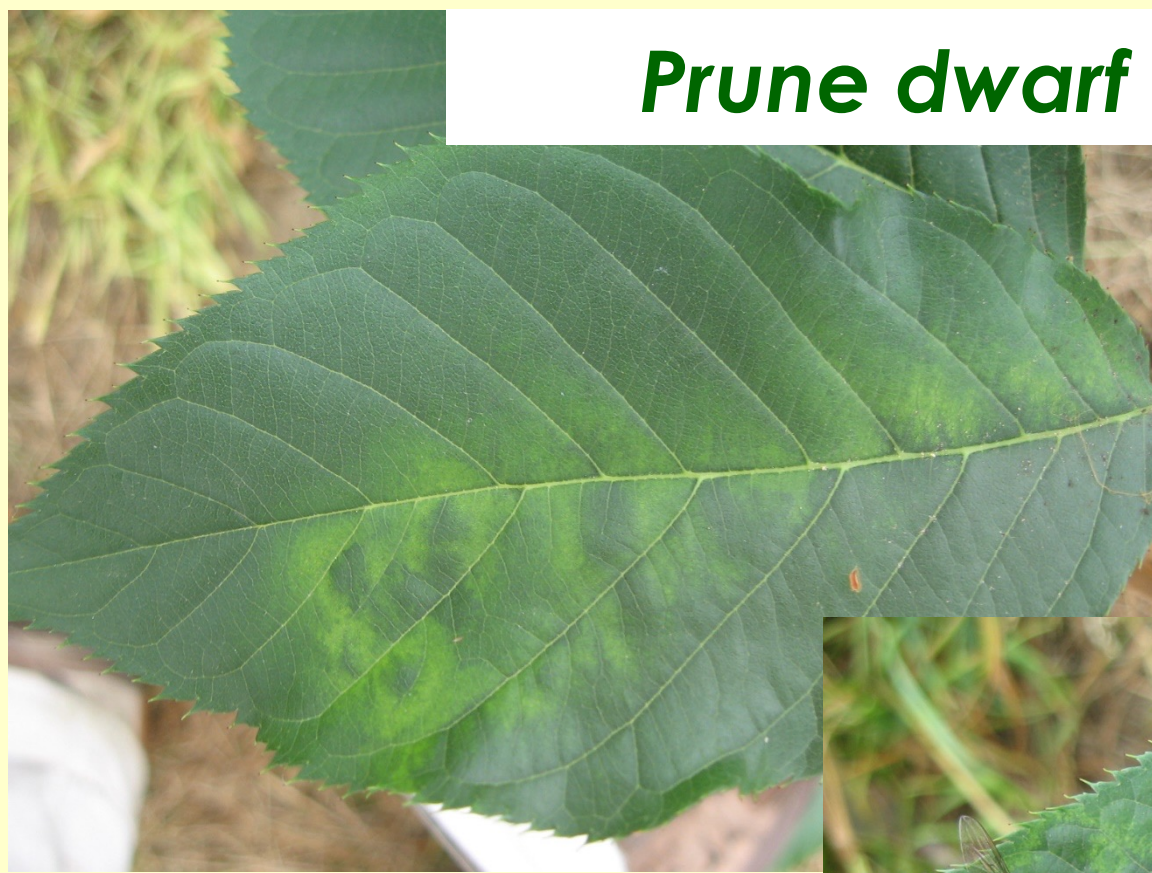


Prunus necrotic ringspot virus (PNRSV)





Prune dwarf virus (PDV)



Cherry green ring mottle virus (CGRMV)

Cherry necrotic rusty mottle virus (CNRMV)

| CGRMV | CNRMV |
|---------|---------|
| 18/37 | 14/37 |
| (48,6%) | (37,8%) |



**FIRST REPORT OF CHERRY GREEN RING MOTTLE VIRUS AND
CHERRY NECROTIC RUSTY MOTTLE VIRUS IN SWEET CHERRY
(PRUNUS AVIUM) IN CHILE AND SOUTH AMERICA**

N. Fiore and A. Zamorano

August 2013, Volume 97, Number 8 Page 1122

Prunus necrotic ringspot virus
(PNRSV)

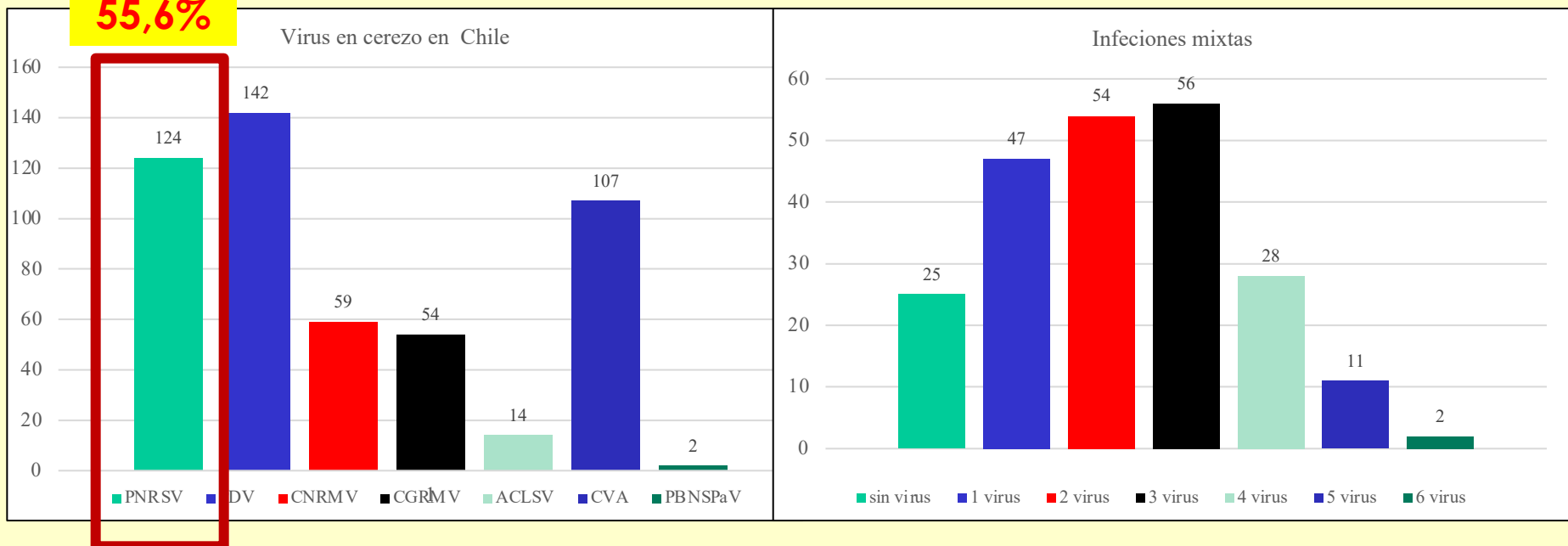
Prune dwarf virus (PDV)

Cherry necrotic rusty mottle virus
(CNRMV)

Cherry green ring mottle virus
(CGRMV)

Viroma del cerezo en Chile

- Muestreo de 223 plantas de cerezo **mayoritariamente con síntomas**
- Detección de 29 virus y dos viroides **mediante RT-PCR**
 - Partidores obtenidos de la literatura
 - Diseño de partidores a partir de secuencias genéticas (GenBank)



Apple chlorotic leaf spot virus (ACLSV)



***Plum bark necrosis stem pitting-
associated virus (PBNSPaV)***



Nuevas detecciones

***Apple chlorotic leaf spot virus
(ACLSV)***

***Plum bark necrosis stem pitting-
associated virus (PBNSPaV)***

Cherry virus A (CVA)

**“secuenciación masiva”
(deep sequencing, NGS)**

Resultados de la “secuenciación masiva” en 20 muestras de cerezo

| | PNRSV | PDV | CNRMV | CVA | CGRMV | ACLSV | PBNSP | LChV-1 |
|-------|-------|-----|-------|-----|-------|-------|-------|--------|
| 10426 | Pos | Pos | Neg | Pos | Neg | Neg | Neg | Neg |
| 10381 | Pos | Pos | Neg | Pos | Neg | Neg | Pos | Neg |
| 10383 | Neg | Neg | Neg | Neg | Neg | Neg | Neg | Neg |
| 10395 | Pos | Pos | Pos | Pos | Pos | Neg | Neg | Neg |
| 10402 | Pos | Neg | Neg | Pos | Pos | Neg | Neg | Pos |
| 10433 | Pos | Neg | Pos | Pos | Pos | Neg | Neg | Pos |
| 10442 | Pos | Pos | Pos | Pos | Pos | Neg | Neg | Neg |
| 10449 | Pos | Pos | Pos | Pos | Pos | Neg | Neg | Pos |
| 10456 | Neg | Neg | Neg | Neg | Neg | Neg | Neg | Neg |
| 10473 | Neg | Neg | Neg | Neg | Neg | Neg | Neg | Neg |
| 10514 | Neg | Neg | Neg | Pos | Neg | Neg | Neg | Neg |
| 10517 | Pos | Pos | Pos | Pos | Neg | Neg | Neg | Neg |
| 10530 | Pos | Pos | Neg | Pos | Pos | Pos | Neg | Neg |
| 10538 | Pos | Pos | Pos | Pos | Pos | Neg | Neg | Pos |
| 10541 | Pos | Pos | Neg | Pos | Neg | Neg | Neg | Neg |
| 10560 | Pos | Pos | Neg | Pos | Neg | Neg | Neg | Neg |
| 10562 | Pos | Pos | Neg | Pos | Neg | Neg | Neg | Neg |
| 10571 | Neg | Neg | Neg | Neg | Neg | Neg | Neg | Neg |
| 10587 | Neg | Pos | Neg | Neg | Neg | Neg | Neg | Neg |
| 10596 | Neg | Neg | Neg | Pos | Neg | Neg | Neg | Neg |

Little cherry virus 1 (LChV-1)





PNRSV PDV CVA LChV-1



PNRSV PDV CVA

PNRSV, CGRMV, CNRMV



PNRSV PDV CNRMV CGRMV CVA
LChV-1

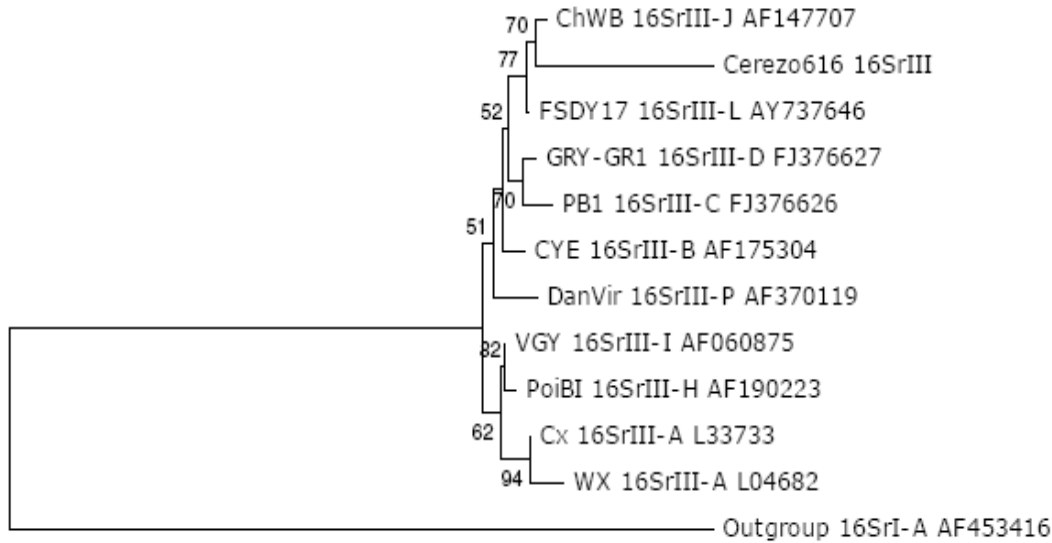


PNRSV PDV CNRMV CVA CGRMV

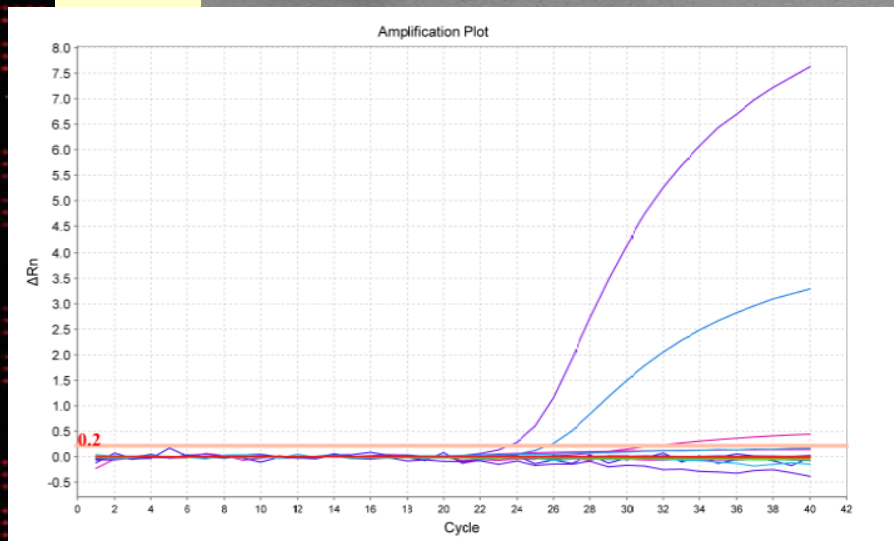
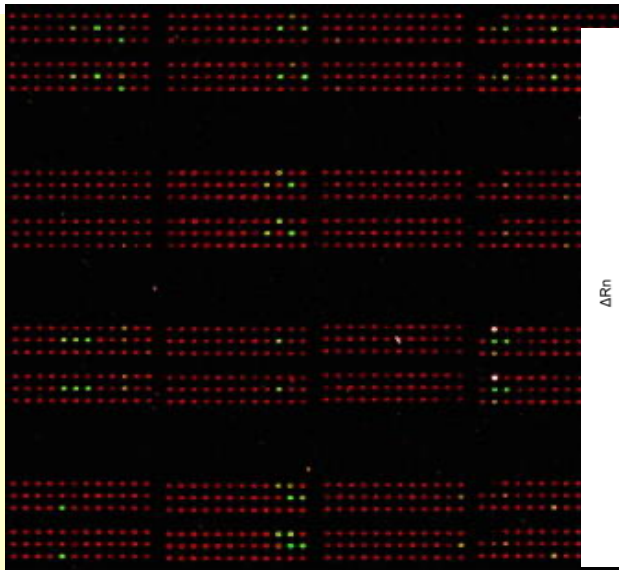
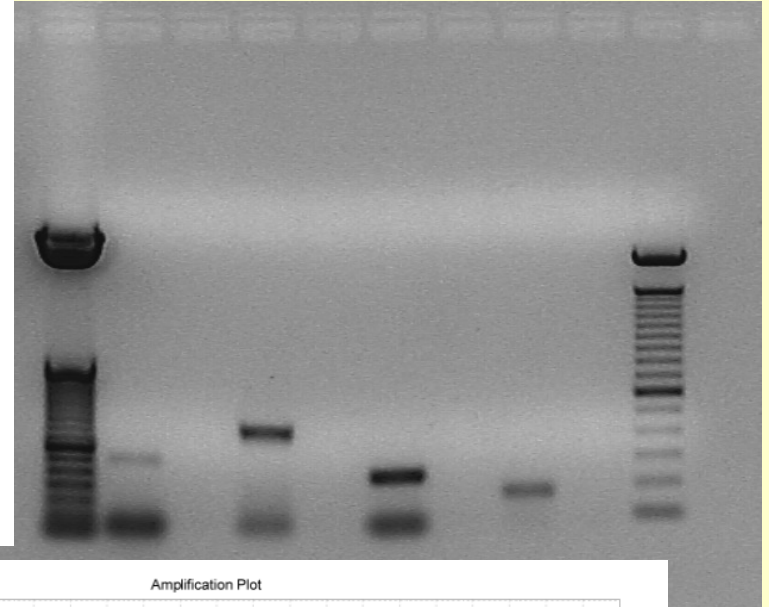
Virus que infectan al cerezo en Chile

1. *Prunus necrotic ringspot virus* (PNRSV)
2. *Prune dwarf virus* (PDV)
3. *Cherry green ring mottle virus* (CGRMV)
4. *Cherry necrotic rusty mottle virus* (CNRMV)
5. *Apple chlorotic leaf spot virus* (ACLSV)
6. *Plum bark necrosis stem pitting-associated virus* (PBNSPaV)
7. *Cherry virus A* (CVA)
8. *Little cherry virus 1* (LChV-1)
9. *Apple mosaic virus* (ApMV)
10. *Tomato ringspot virus* (ToRSV)

Optimizar la detección de virus

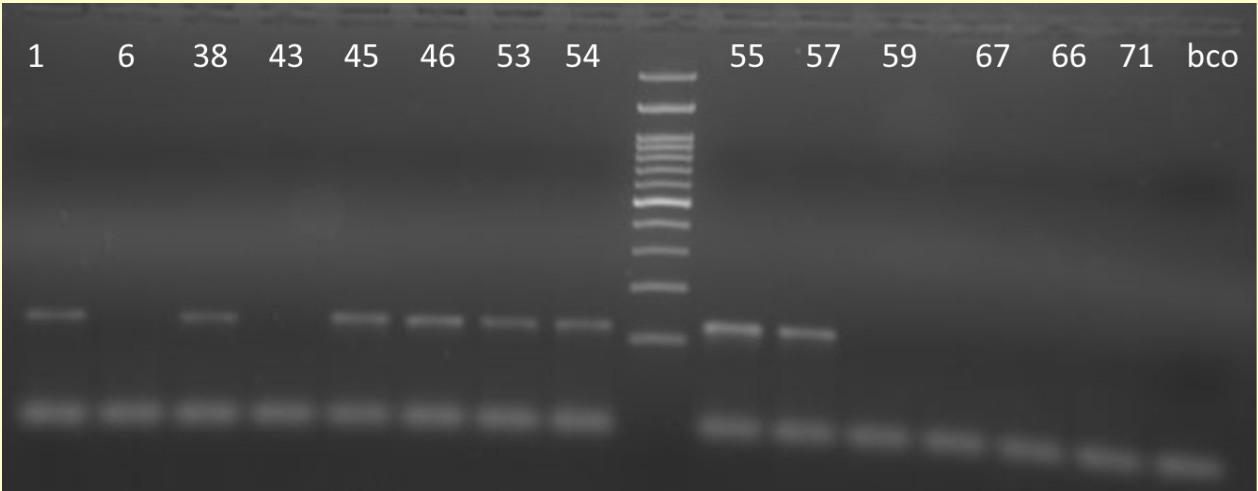
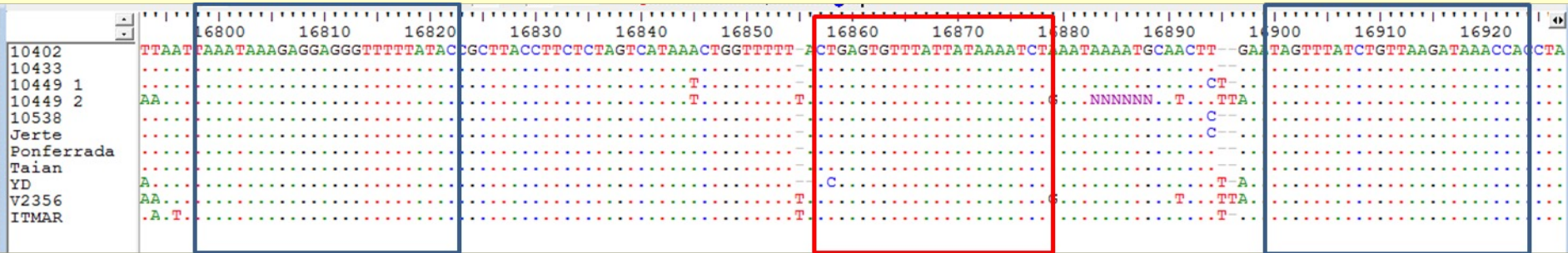


0.01



Diseño de partidores para LChV-1, PBNSPaV, CVA

LChV-1



DAÑOS POR VIRUS

- **PNRSV + PDV en frutales de carozo**
 - pérdidas de producción hasta 50%
 - disminución éxito de lo injertos hasta 50%
- **CGRMV + CNRMV en cerezo**
 - pérdidas de producción del 20 hasta 40%
- **CGRMV + CNRMV + PNRSV en cerezo**
 - hasta el 60% de pérdida de producción
- **PNRSV en cerezo**
 - Chile/CHINA

CONTROL

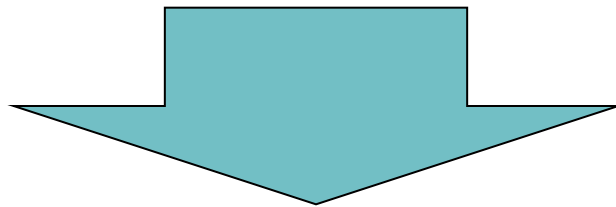
**Basado principalmente en la
prevención**

Transmisión de virus

**Propagación de
material vegetal
infectado**

Transmisión de virus

- **Monitoreo (detección, caracterización molecular, secuenciación de genomas completos)**
- **Realizar estudios de EPIDEMIOLOGÍA**
- **Control de los vectores**
- **Uso de variedades resistentes**
- **Eliminación de las fuentes de inóculo**
- **Manejo agronómico equilibrado del huerto**
- **Selección sanitaria**
- **Saneamiento**



USO DE MATERIAL VEGETAL SANO DESTINADO A LA MULTIPLICACIÓN



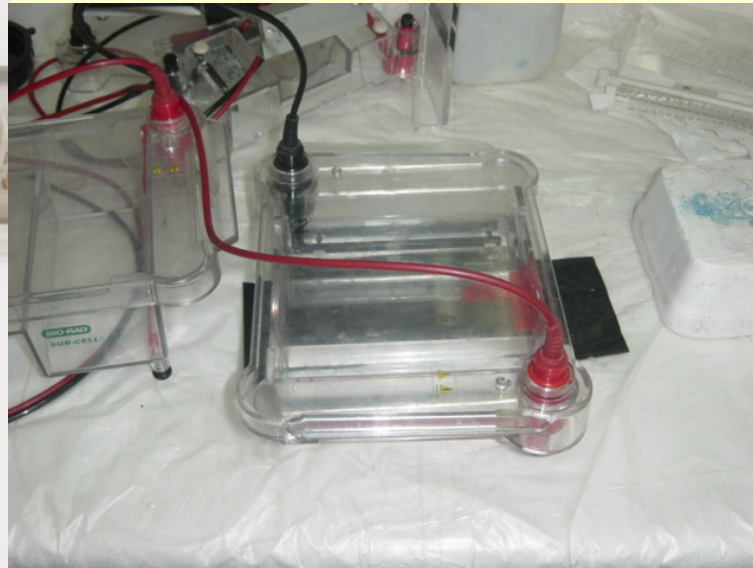
¿Cómo obtener material vegetal
libre de virus?

SELECCIÓN SANITARIA Y SANEAMIENTO

SELECCIÓN SANITARIA

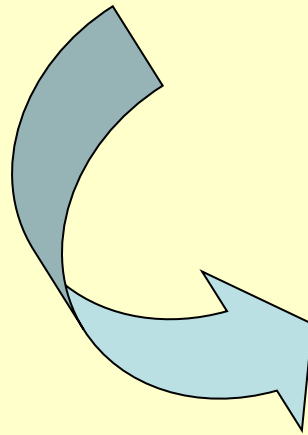


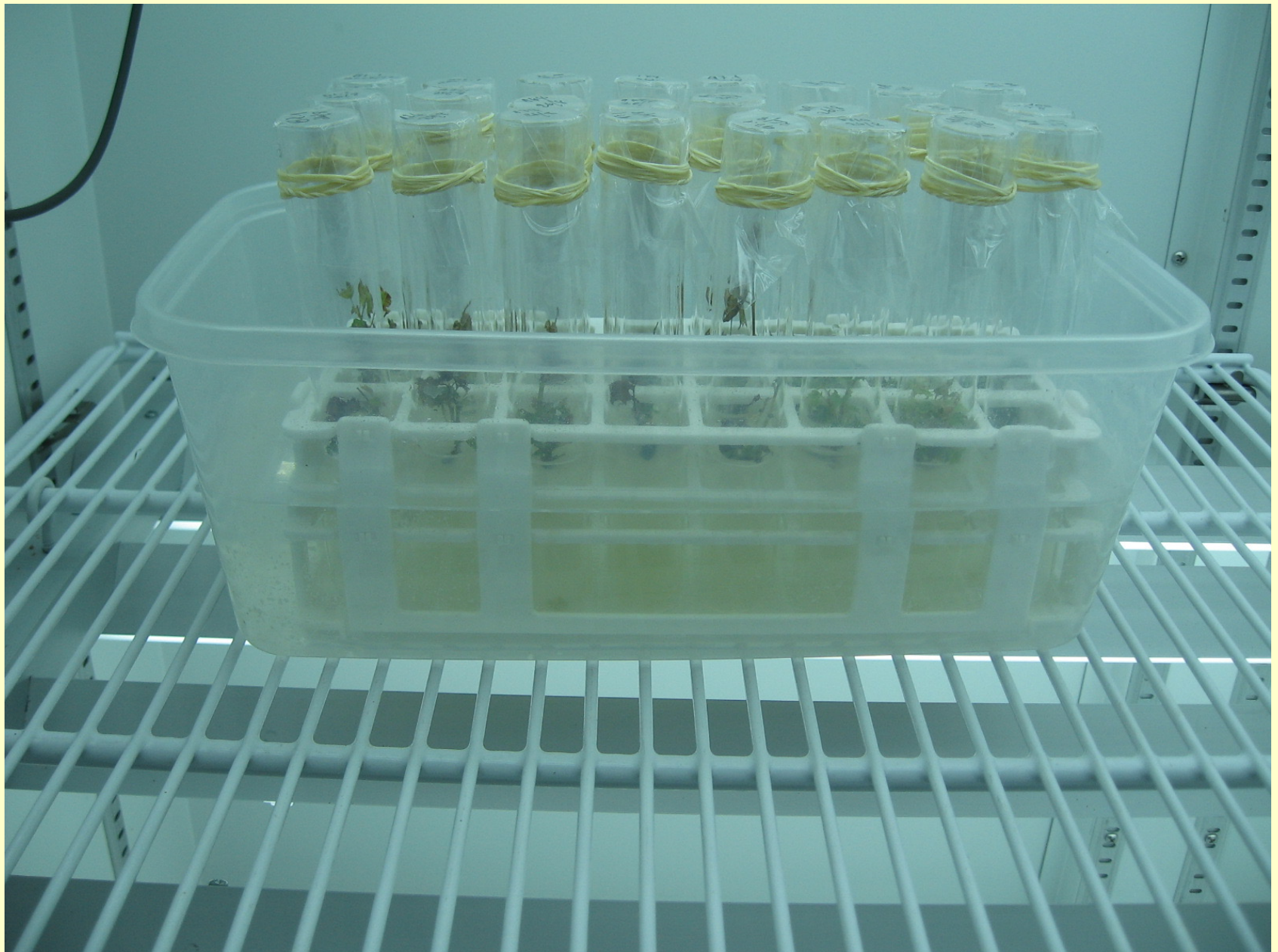
DETECCIÓN CON RT- PCR





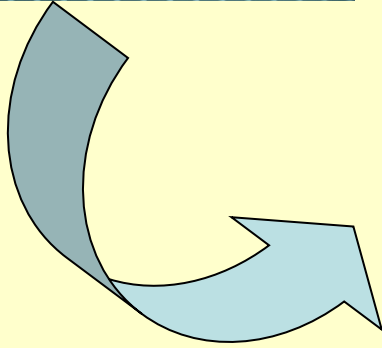
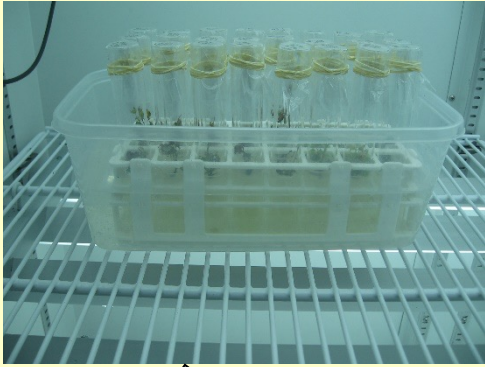
INTRODUCCION IN VITRO





TERMOTERAPIA *IN VITRO*

Obtención de ápices meristemáticos



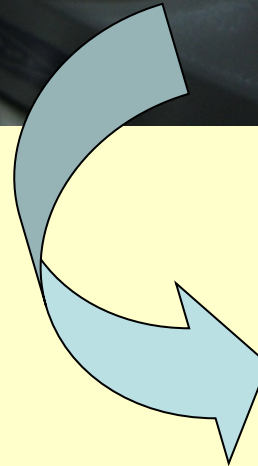
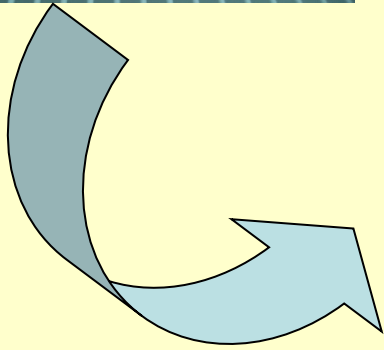
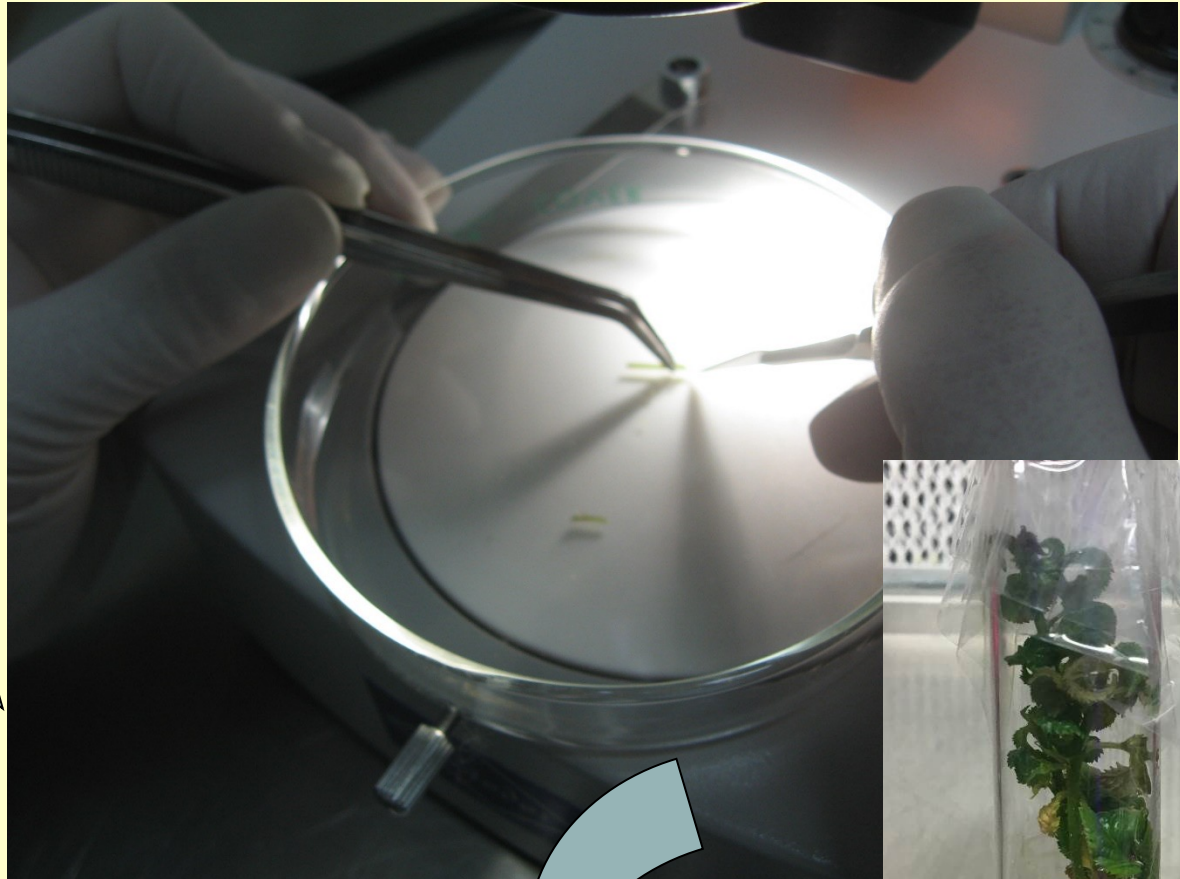
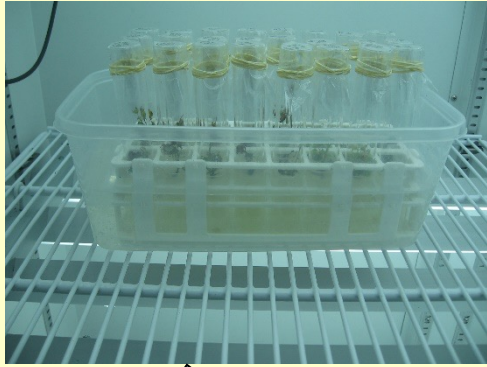
Leaf primordium

Apical meristem

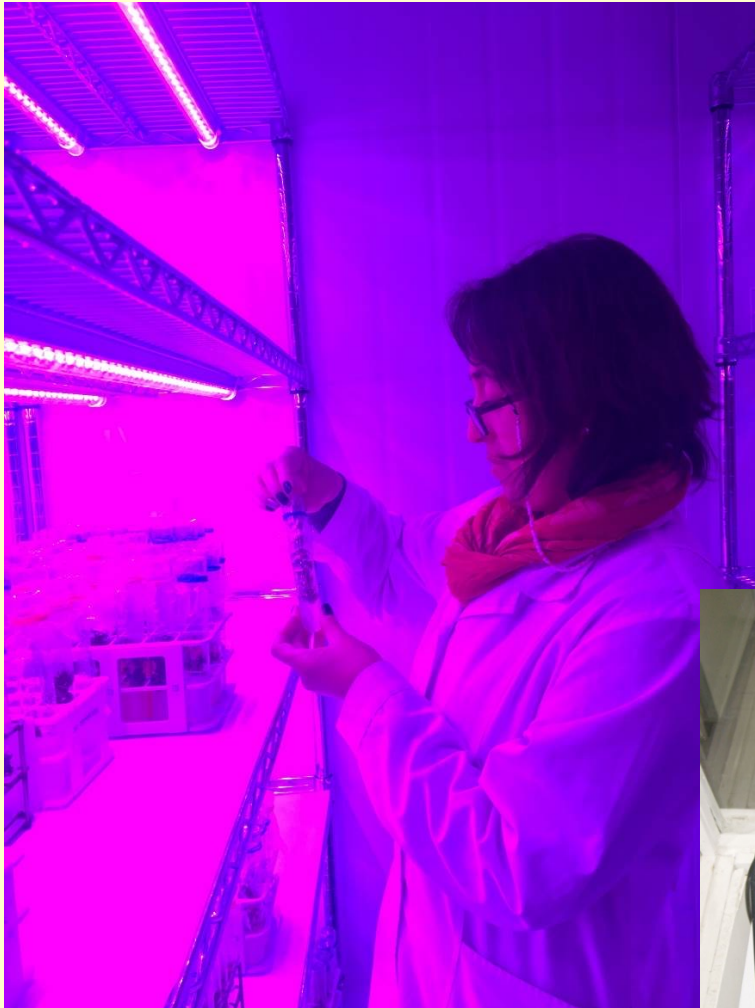
Lateral branch bud



Obtención de ápices meristemáticos



MUPLICACIÓN Y ACLIMATACIÓN



Uso de material vegetal sano

Screen house



CONCLUSIONES

CEREZO \neq VIRUS

-Monitoreo constante

-Utilizar todas las herramientas disponibles para el diagnóstico y/o la detección

-Estudios epidemiológicos

-Selección sanitaria y SANEAMIENTO

-Colaborar



LABORATORIO DE FITOVIROLOGÍA

Universidad de Chile

Facultad de Ciencias Agronómicas

Dpto. Sanidad Vegetal



¡Gracias!

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