



POTATO LATE BLIGHT IN LATINAMERICA

Acuña, Ivette¹; Florencia Lucca², Silvia Restrepo³; and Jorge Andrade⁴

¹Instituto de Investigaciones Agropecuarias INIA, Chile. ²Instituto Nacional de Tecnología Agropecuaria INTA, Argentina. ³Universidad de Los Andes, Colombia. ⁴International Potato Center CIP, Perú

3rd AsiaBlight International Meeting, October 25 to 27, 2019. Beijing, China.



**CHILE LO
HACEMOS
TODOS**



Topics

- **Tizon Latino Network**
- **Monitoring and Characterization of *P. infestans***
- **IPM:**
 - ❖ **Host**
 - ❖ **DSS**
 - ❖ **Control strategies**
 - ❖ **Impacts**

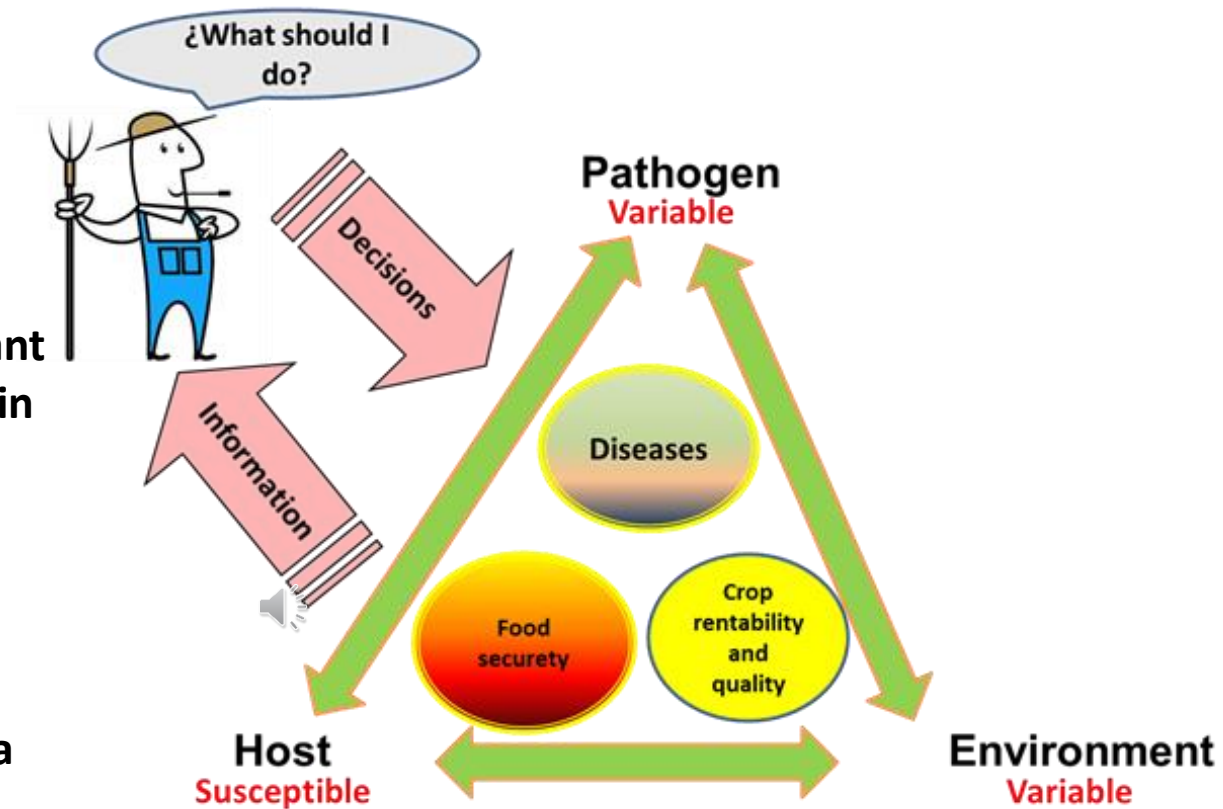




Late blight

Late blight is the most important Solanaceae crop disease in Latin America, causing productive losses and affecting food security.

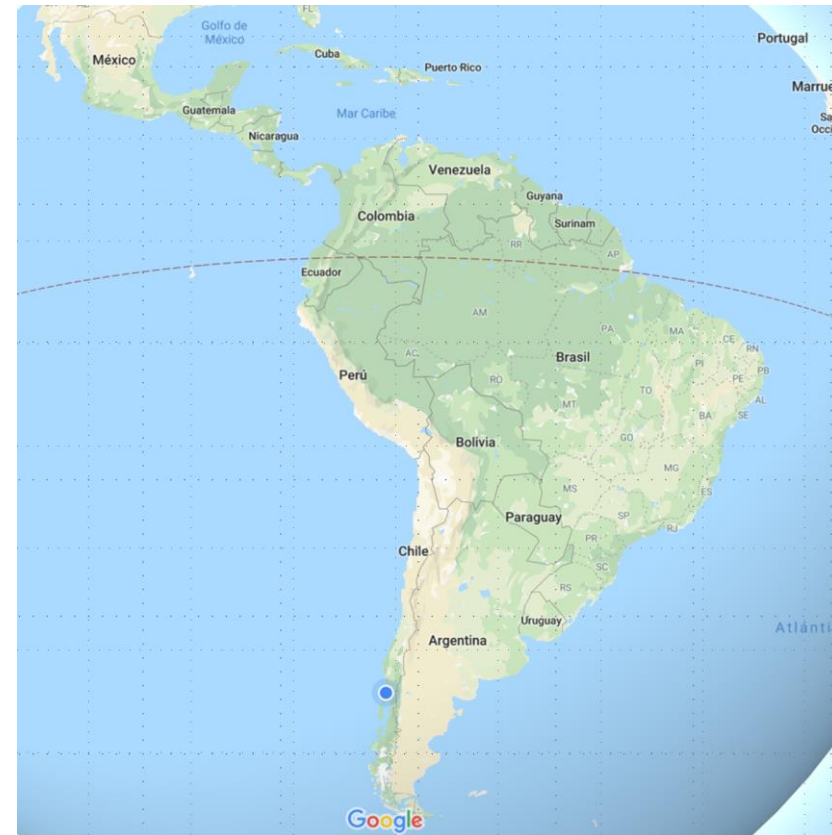
In addition, *Phytophthora infestans* originated in America and co-evolved with its host potato.





Tizon Latino Network

- **TizonLatino was formed in September 2014 at the Latin America Potato Association meeting (ALAP) in Bogota, Colombia.**
- **It was born from the need to work together on a disease and hosts originating in Latin America, which causes serious losses and affects the food security of the region.**
- **Today, fifteen Latin American countries are part of this network.**





INIA

TizonLatino approach are:



Monitoring and characterization of pathogens.



Study the effects of late blight on potato landraces due to climate change and its impact on diversity and food security.



Search for durable resistance and breeding populations.



Develop integrated pest management strategies using decision support systems, fungicides and resistant cultivars.



Extension and technology transfer focusing on the development and implementation of management strategies, based on vulnerability and food security in Latin America and for adaptation to climate change.



Fuente: CIP (2012)



¿QUÉ ES TIZÓN LATINO?

La red de cooperación Tizón Latino se constituyó en el año 2014 en el marco del XXVI Congreso de la Asociación Latinoamericana de la Papa en Bogotá, Colombia. Nuestro objetivo principal es lograr un control sostenible del tizón tardío de las solanáceas mediante el intercambio de información y recursos de investigación sobre *Phytophthora infestans*, el patógeno causante de la enfermedad, y sus manifestaciones patológicas en las plantas.

Asimismo, se busca expandir de manera coordinada la colaboración con [USAblight](#) y [Euroblight](#), las redes de tizón tardío en Norteamérica y Europa.

Leer más



<https://tizonlatino.github.io/>



Recent collecting and characterization development of *Phytophthora infestans* (Mont) de Bary, en central México.

- *P. infestans* collecting and characterization in the central highlands of México have been a continuous concern for the international scientific community.
- Host specificity, fungicide sensitivity, genotyping, evolution, selection pressure by production systems and habitats, and geographic distribution, are the current issues.
- No clear correlations among most of the above topics have been identified in the *P. i.* populations, which reveals the great genetic diversity and plasticity that explains its pathogenic fitness potential.



Lozoya et al, 2014.



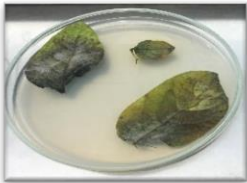
Genotyping of *Phytophthora* spp. populations in Latin America



DNA



Panel of 12 microsatellite markers (Euroblight)





Argentina, Brazil and Chile (2017-18)

POPULATION

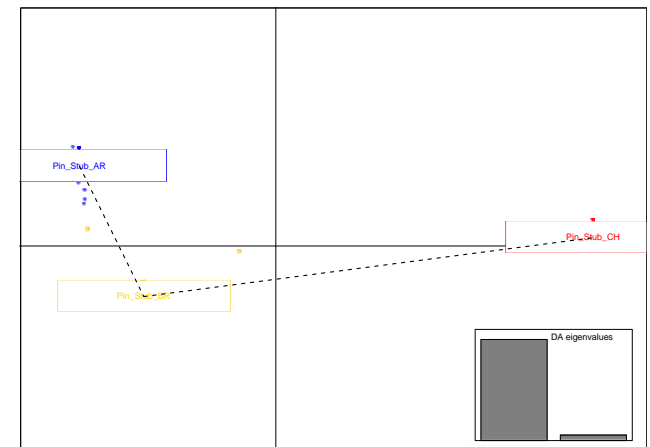
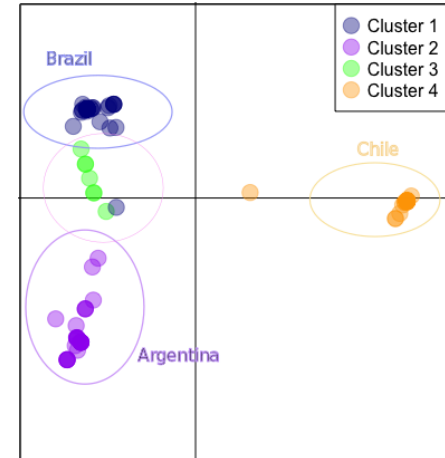
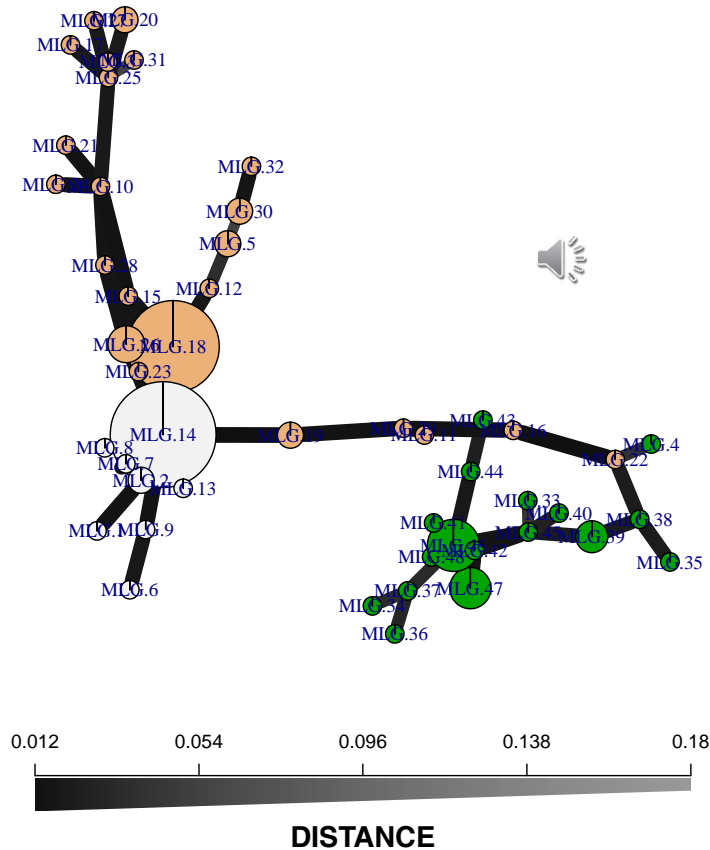
- Pin_Stub_AI
- Pin_Stub_BI
- Pin_Stub_CI

Samples/Node

33

25

1





Genotyping at Genomic Unit - INTA



Argentina

Tucumán

Córdoba

Southeast of Buenos Aires Prov.

AG_1 (before 2000) **EU 2_A1**

Chile

Coquimbo

Los Ríos

La Araucanía

Los Lagos

Valparaíso

US-1 (until 2006) **EU 2_A1**

Brasil

Paraná

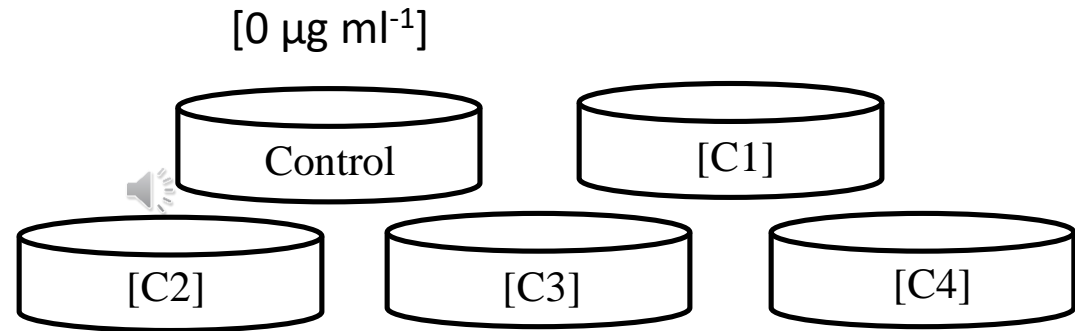
Rio Grande do Sul

Sao Paulo

Minas Gerais

BR-1, **EU 2_A1**, **US-1** (in Tomato)

Sensitivity of *Phytophthora infestans* isolates to the most commonly used systemic fungicides

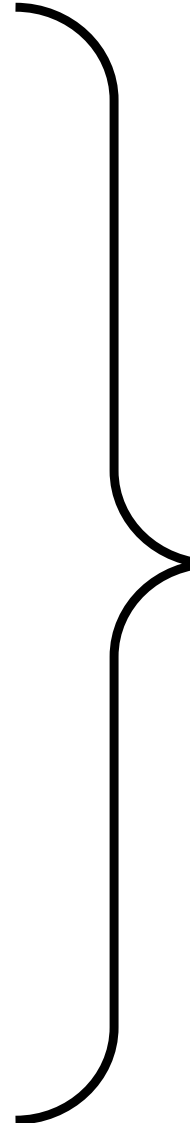
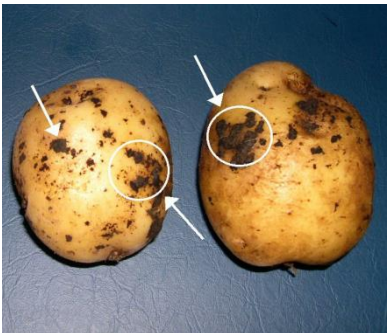
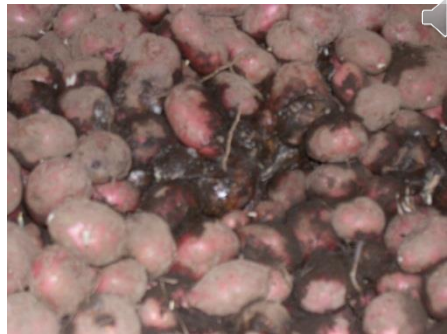


Three technical replicates and
three biological replicates

1. Cymoxanil (acetamide)
2. Dimetomorph (cinnami acid derivative)
3. **Propamocarb HCl (Carbamate)**
4. Mefenoxam (Phenylamide)
5. **Fluopicolide (Benzamide)**



Integrated Crop Management (ICM) means finding a sensible and economic combination of all available pest control methods (ECPA, 2010).



P. Infestans : host

- Potato (*Solanum tuberosum*)
- Yellow potato (*Solanum phureja*)
- Tomato (*Solanum lycopersicum*)
- Tree tomato (*Solanum betaceum*)
- Lulo (*Solanum quitoense*)
- Uchuva (*Physalis peruviana*)



Uchuva



Tomate de árbol



Lulo



Tomate



Papa criolla



Characterization of *Phytophthora infestans* (Mont.) De Bary. Subpopulations obtained from wild *Solanum* species





Host of *Phytophthora infestans* (Pi), *P. andina* (Pa) and another non classified isolates (U) report by 7 countries in S. America

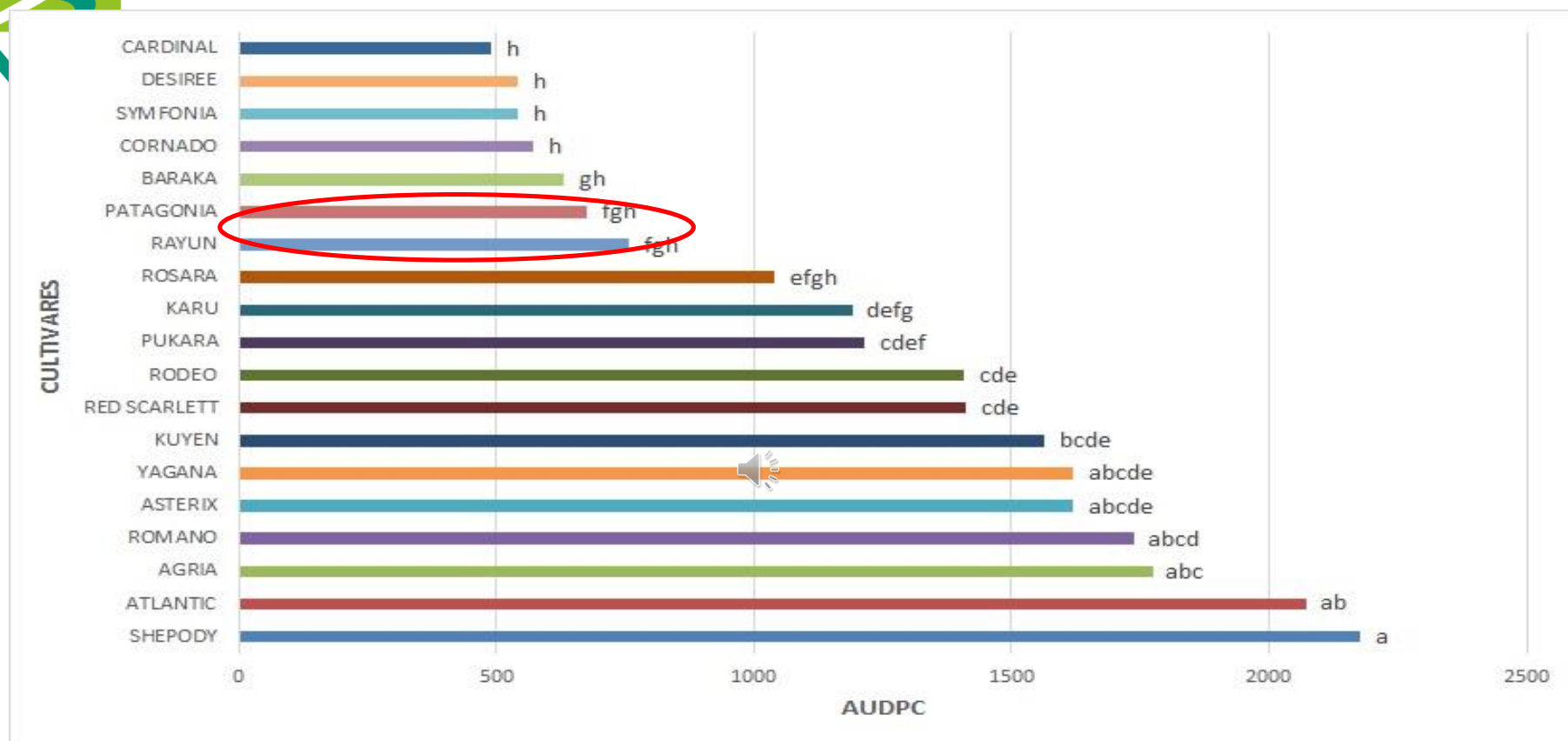
	CO	VE	BO	EC	PE	AR	CH
Cultivated Taxa							
Tuber bearing ¹	Pi	Pi	Pi	Pi	Pi	Pi	Pi
<i>S. betaceum</i>	Pi/Pa/U			Pa	Pa		
<i>S. quitoense</i>	Pi	Pi		Pa/Pi			
<i>Physalis peruviana</i>	Pi						
<i>S. muricatum</i>	Pi			Pi/Pa ²	Pi		
<i>S. lycopersicum</i>	Pi	Pi	Pi	Pi	Pi	Pi	Pi
Wild taxa							
Tuber bearing	Pi			Pi	Pi		
<i>S. caripense</i>	Pi			Pi	Pi		
<i>S. juglandifolium, S. ochrantum</i>	Pi,			Pi/U			
<i>Solanum</i> section <i>Anarrichomenum</i>				Pa			
<i>S. marginatum</i>	Pi						
<i>S. hispidum</i>				Pa			
<i>Datura stramonium</i>	Pi						
<i>Brugmansia spp</i> ³				Pa			

1- *Solanum chaucha*,
Solanum tuberosum ssp.
andigena,
Solanum phureja,
Solanum goniocalyx,
Solanum stenotomum,
Solanum hygrothermicum,
Solanum ajanhuiri and
Solanum juzepczukii,
Solanum curtilobum

2- *P. andina* was found attacking *S. muricatum* in one field but across two consecutive seasons (Adler, Chacón, Flier, & Forbes, 2002, p. 2); no other reports are known.

3- Only on flower petals

HOST: Variety resistance to Late blight in Chile



- INIA breeding program (Patagonia, Rayun).

- Introduction of R genes from *S. demissum* using the differentials from Mastembroek and Black series.

- Characterization for disease resistance of *landraces potatoes from Chiloé*. Chile is the center of origin of *S. tuberosum Chilotanum* group, which has been the basis of improved varieties available around the world



Environment: Decision support system in Chile

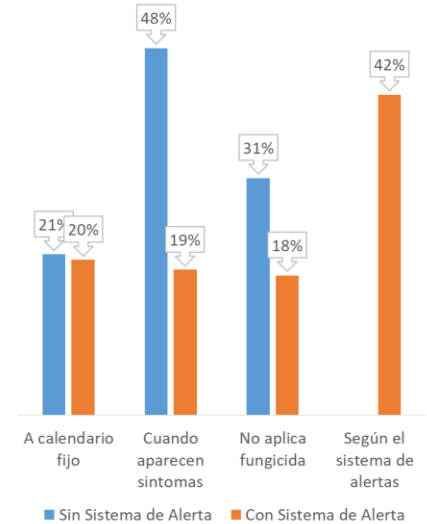
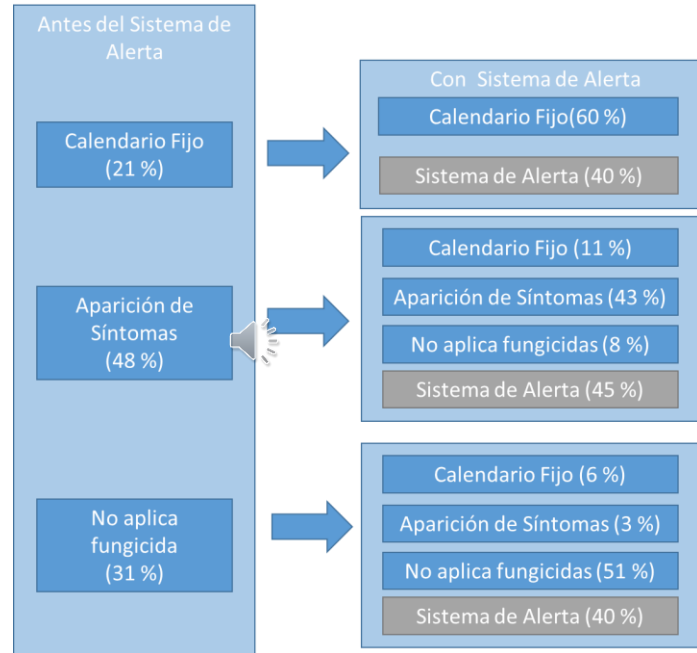
- In Chile, Late blight DSS is available since 2007.
- This DSS utilizes weather data, from the national weather station network, to do the warning.
- The information is delivered to the farmers through a web page, SMS and e-mail.





Impacts:

In a survey done about using the system, it shows that 42% of the farmers applied fungicide based on DSS information with 50% less sprays compared to a schedule application (Bravo et al, 2016).

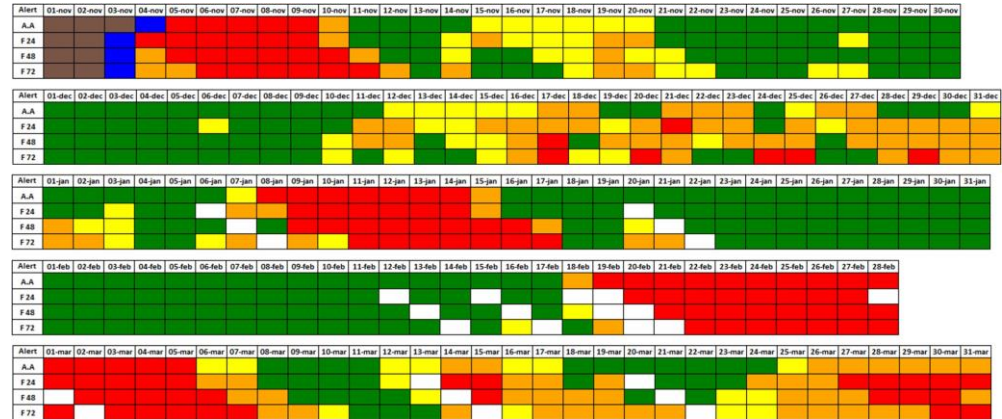




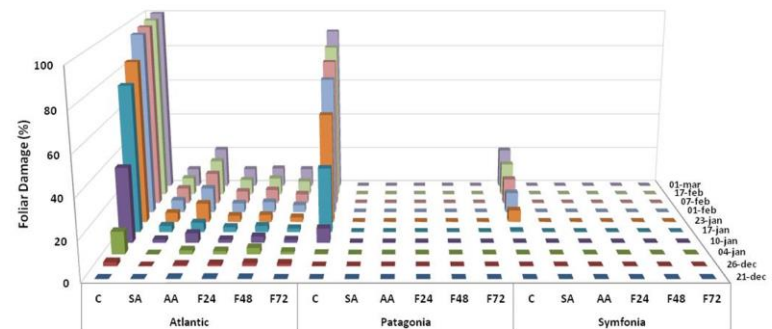
Use of 3 days forecasting data into the warning system model (24, 48 and 72 hrs.)

Few differences in late blight control were detected between INIA warning system, 24, 48 and 72 hrs forecast system and scheduled application, however, the last one required almost twice as many chemical sprays.

Therefore, warning system using forecast data to control LB is a good alternative to improve chemical control efficacy.



Alerts conditions by each model during the growing season: A.A= INIA warning system; F 24= 24 hrs forecast system; F 48= 48 hrs forecast system; F 72= 72 hrs forecast system. Green: Conditions not favorable for disease development; Yellow, Orange and Red are conditions low, medium and high for disease development, respectively. Brown: accumulation of data, Blue: Firth alert. White: no data.



Late blight damage level, expressed as percentage of foliar damage (%FD) in cultivars Atlantic, Patagonia and Symfonia, under different warning treatments during the season. INIA Remehue, Chile

3 days forecasting

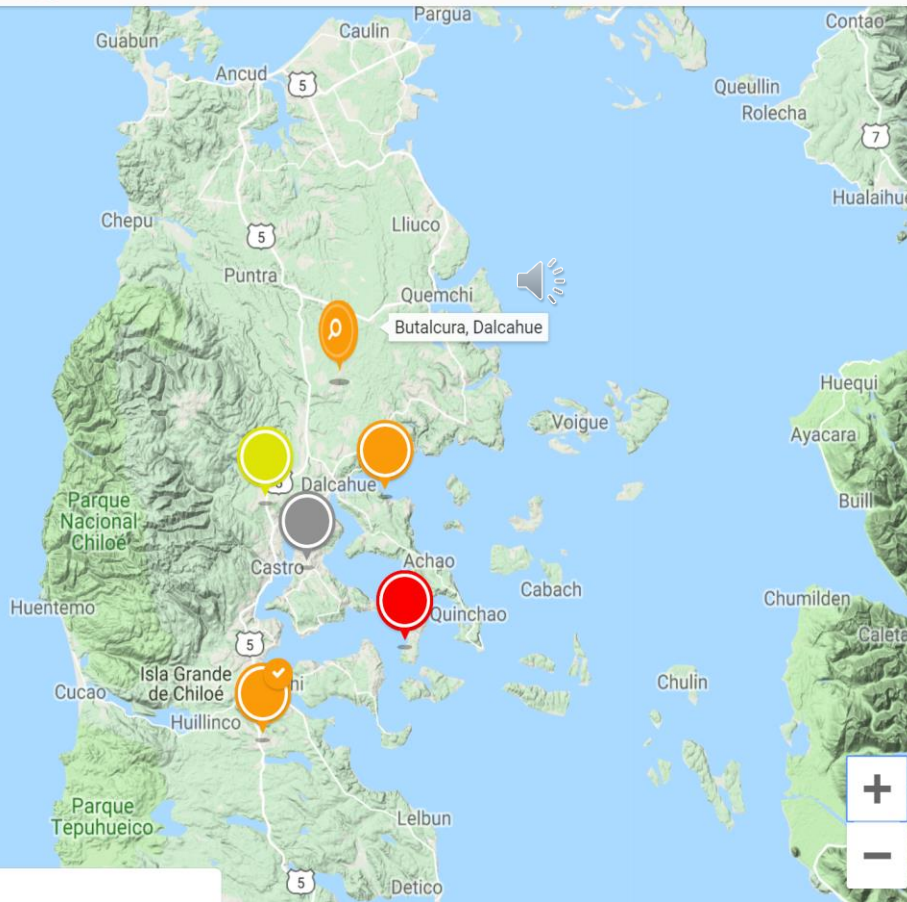
Centrar mapa en

- Todas
- Bío Bío
- La Araucanía
- Los Ríos
- Los Lagos

Mapa de Alertas

16-01-2019

Ver Simbología



Estaciones Visibles (6)

Butalcura, Dalcahue

16 Ene : **NARANJA** 17 Ene : **ROJA**
 18 Ene : **ROJA** 19 Ene : **AMARILLA**

Huyar Alto, Curaco de Vélez

16 Ene : **NARANJA** 17 Ene : **NARANJA**
 18 Ene : **NARANJA** 19 Ene : **NARANJA**

Pid-Pid, Castro

16 Ene : **AMARILLA** 17 Ene : **SIN DATOS**
 18 Ene : **SIN DATOS** 19 Ene : **SIN DATOS**

Quilquico, Castro

16 Ene : **SIN DATOS** 17 Ene : **SIN DATOS**
 18 Ene : **SIN DATOS** 19 Ene : **SIN DATOS**

Isla Chelín, Castro

16 Ene : **ROJA** 17 Ene : **SIN DATOS**

+ SUSCRIBIRME

Butalcura

📍 Dalcahue, Los Lagos

Alerta :

Aplicar Plaguicidas *** :

16 Ene

actual

NARANJA

sin calcular

17 Ene

pronóstico

ROJA

×

18 Ene

pronóstico

ROJA

×

19 Ene

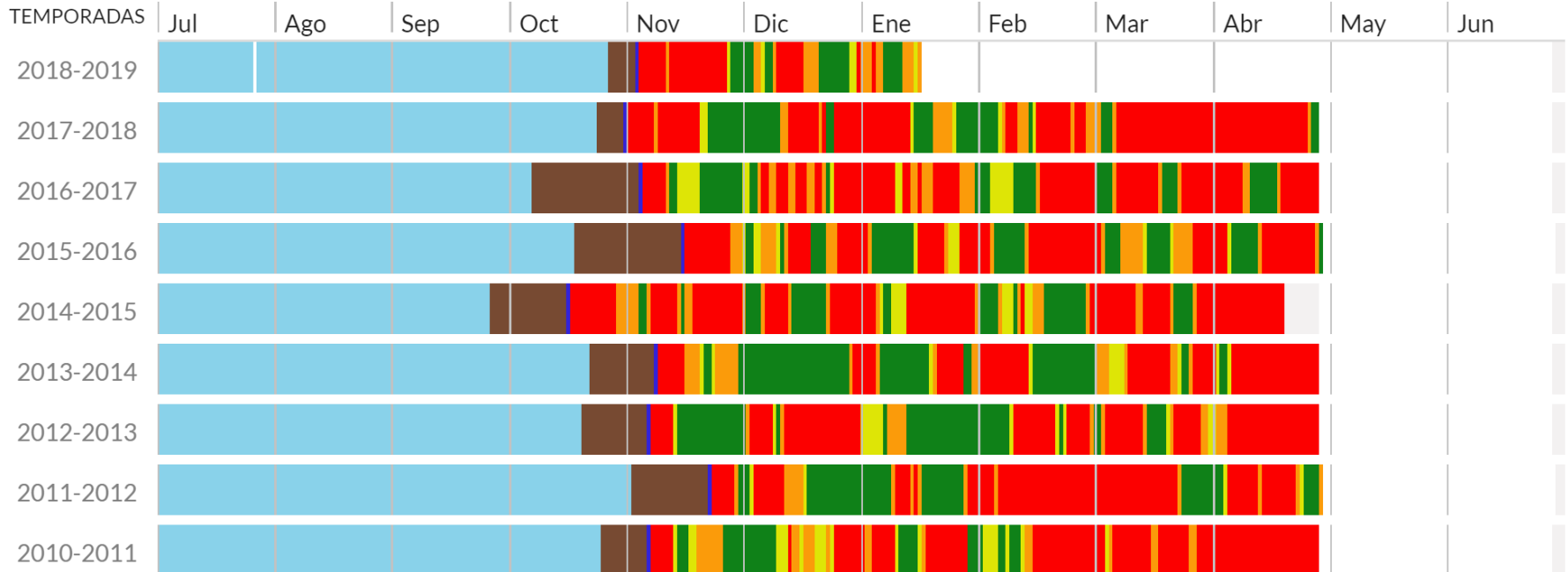
pronóstico

AMARILLA

×

SIMULAR RIEGO

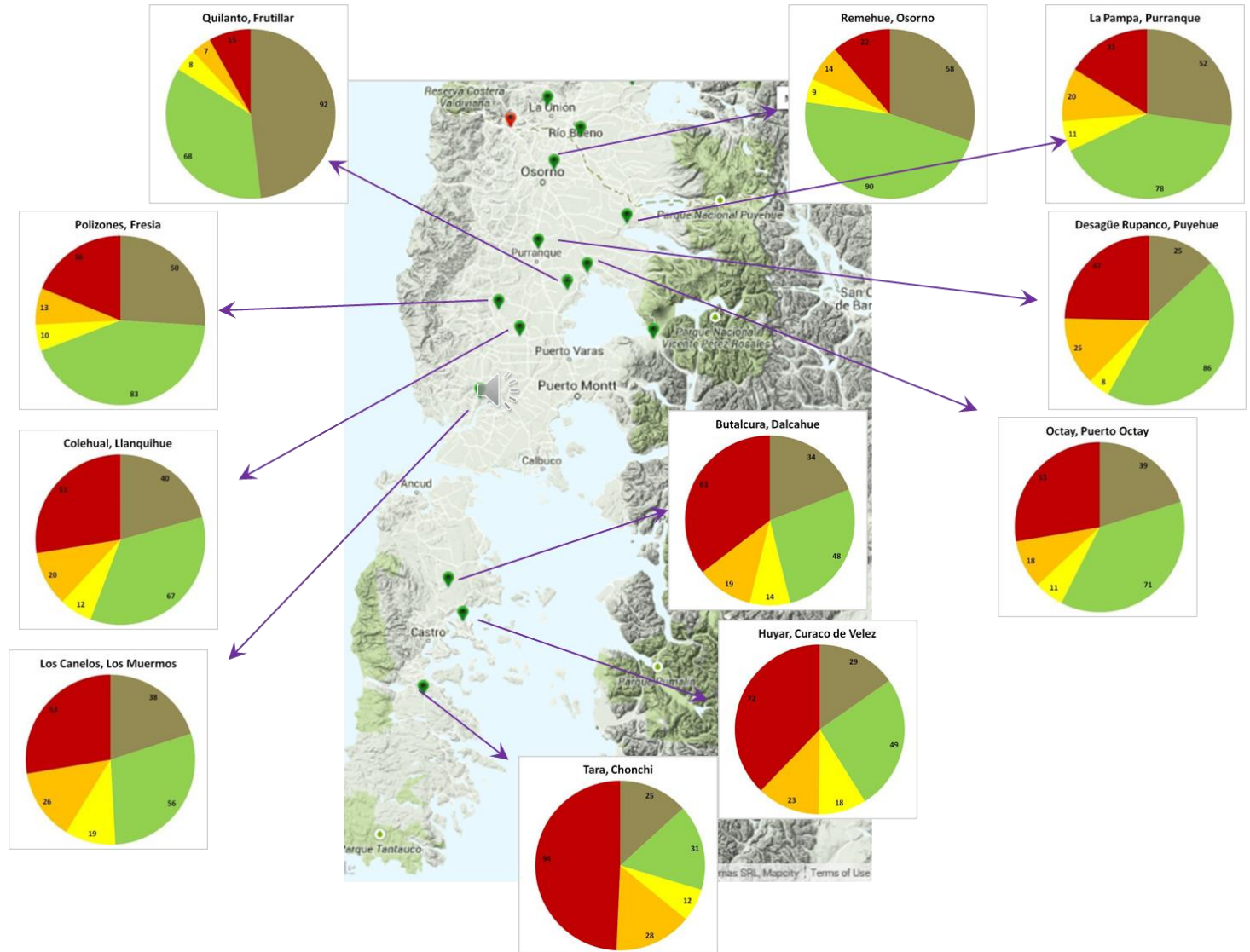
celeste cafe azul verde amarilla naranja roja



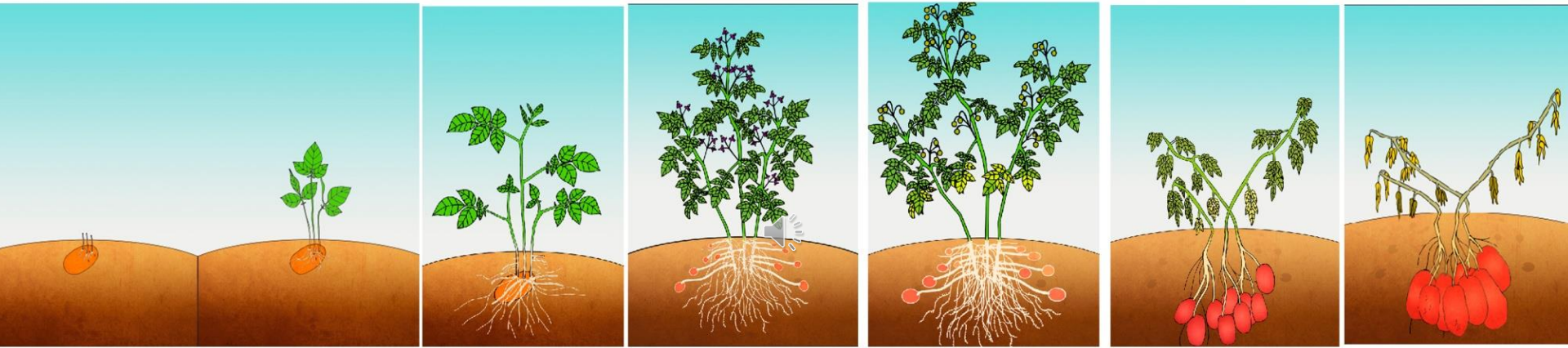


LB historic situation by site to lower the risk of LB

- Ten year LB data allowed to determine the higher risk area in the country



How to manage diseases



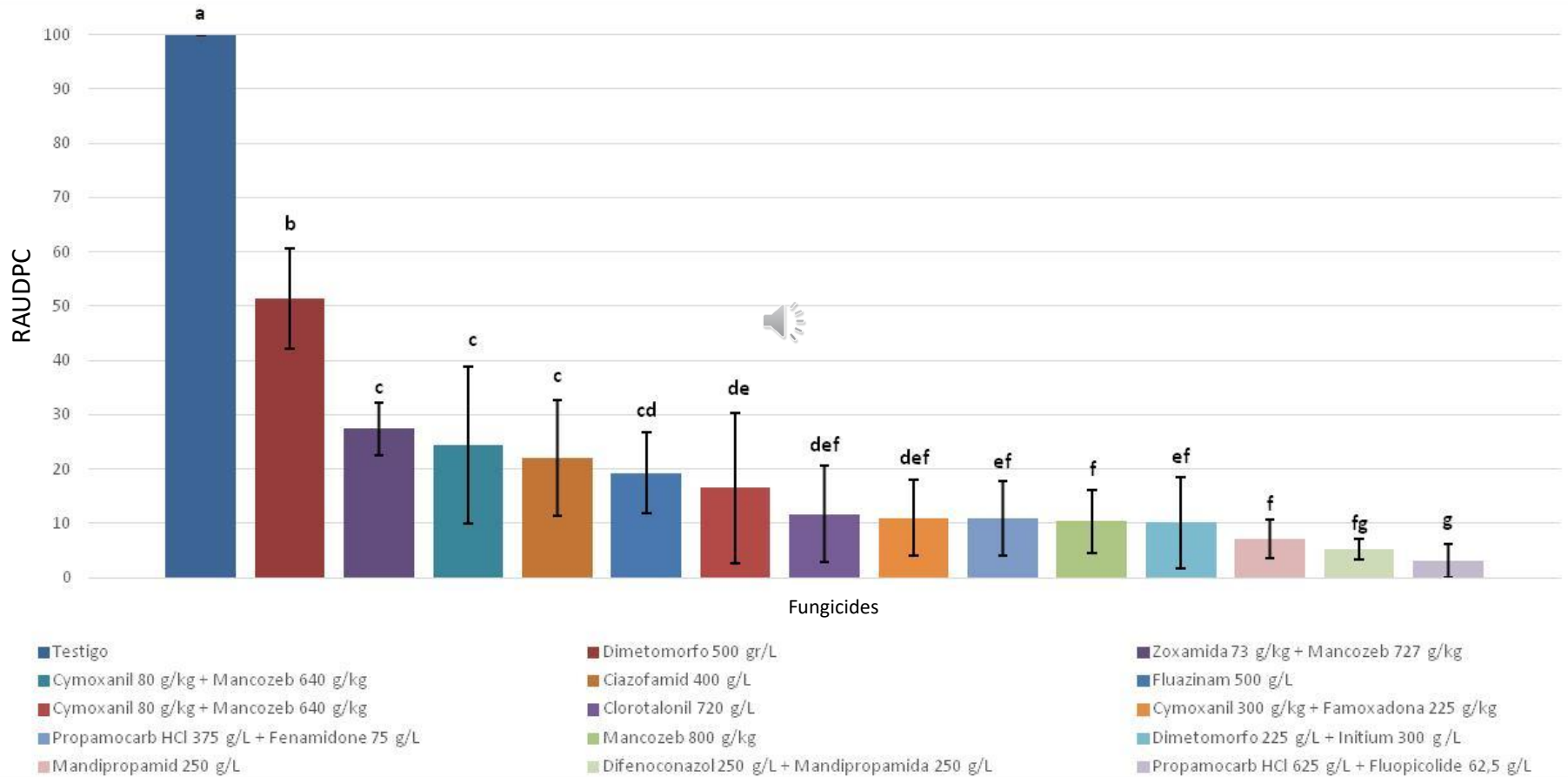
**Sprout
development**

**Vegetative
growth**

Flowering

**Tuber bulking and
maturation**

Fungicide efficacy





Strategies and opportunity

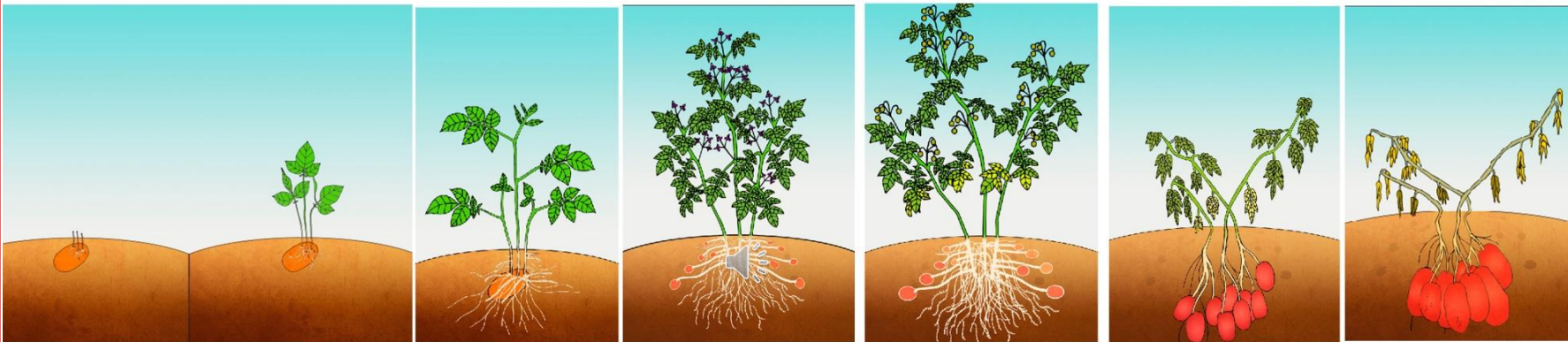
Fungicide

contacto o sistemic

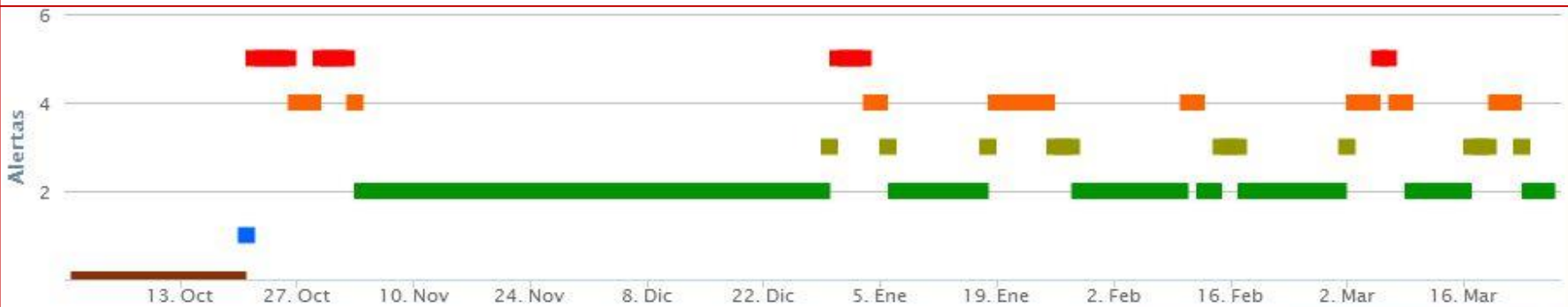
sistemic

contacto o translaminar
(antispোরulant)

State of plant development



Environmental conditions



Para el cálculo de la alerta de un día, se toman valores entre las 12:00 hrs. del día anterior y las 12:00 hrs. del día actual.

Temporada 2014-2015

50% reduction in fungicide sprays



Fontagro Project:

Late blight DSS as a tool to climate change adaptation

ATN/RF 16678-RG



- **Main objective:** To implement an early warning system as a decision support tool in small scale farming in the participating countries, for a preventive and sustainable management of the disease, as an adaptation to the variability of climate change.
- **June 2018- dic 2021**
- **US\$300.000**
- **Participants:** Argentina, Chile, Ecuador, Panama.



Instituto Nacional de
Tecnología Agropecuaria





iiiiThanks you!!!!



iacuna@inia.cl



Ministerio de
Agricultura

Gobierno de Chile