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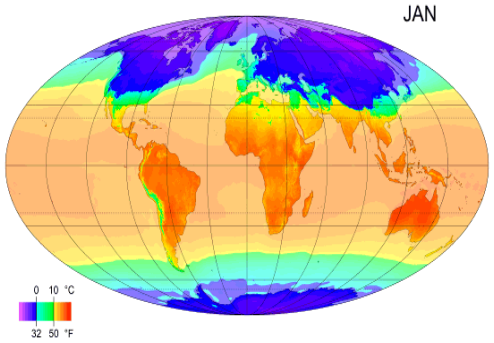
Frutales de Hueso
Grupo Operativo

CSIC
Consejo Superior de Investigaciones Científicas

Adaptation strategies of apricot and other stone fruit crops to climate change in warm production areas



David Ruiz

Department of Plant Breeding CEBAS-CSIC

***Prunus* Breeding Group**

FRUIT2050
Imagine the future of fruit production
The European Event
BY SIVAL

Fruit production facing climate change: anticipating and taking action for tomorrow

Present in SIVAL ANGERS 14-15-16 JANUARY 2020
www.sival-angers.com

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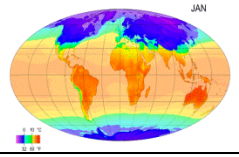
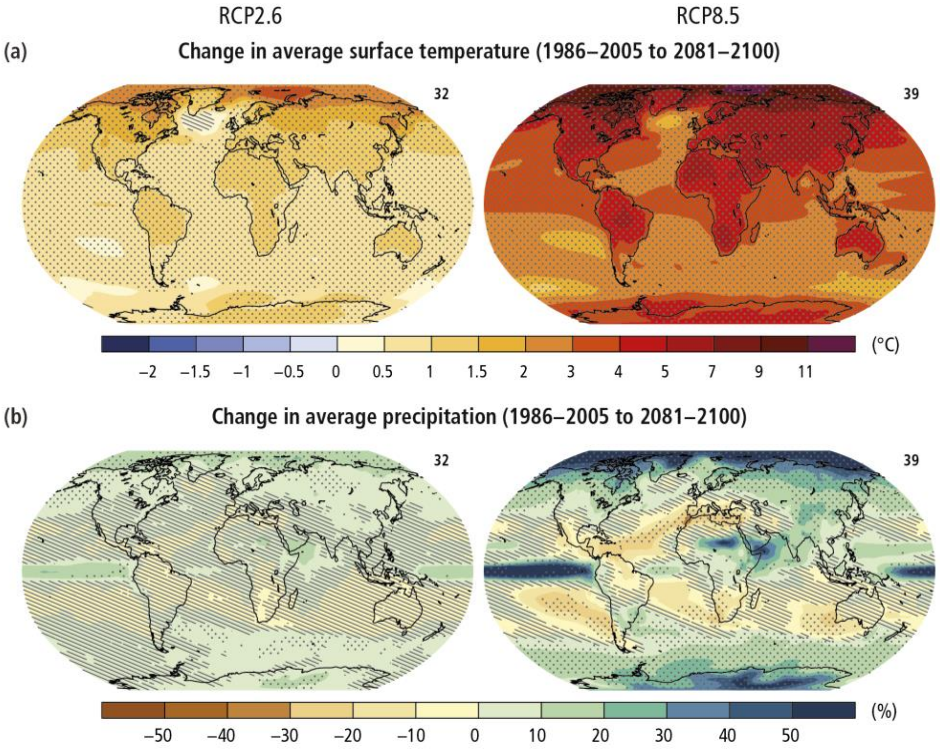
GLOBAL WARMING - CLIMATE CHANGE

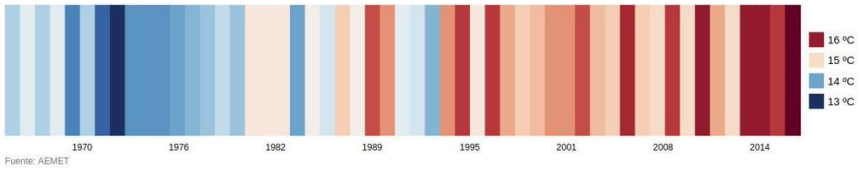


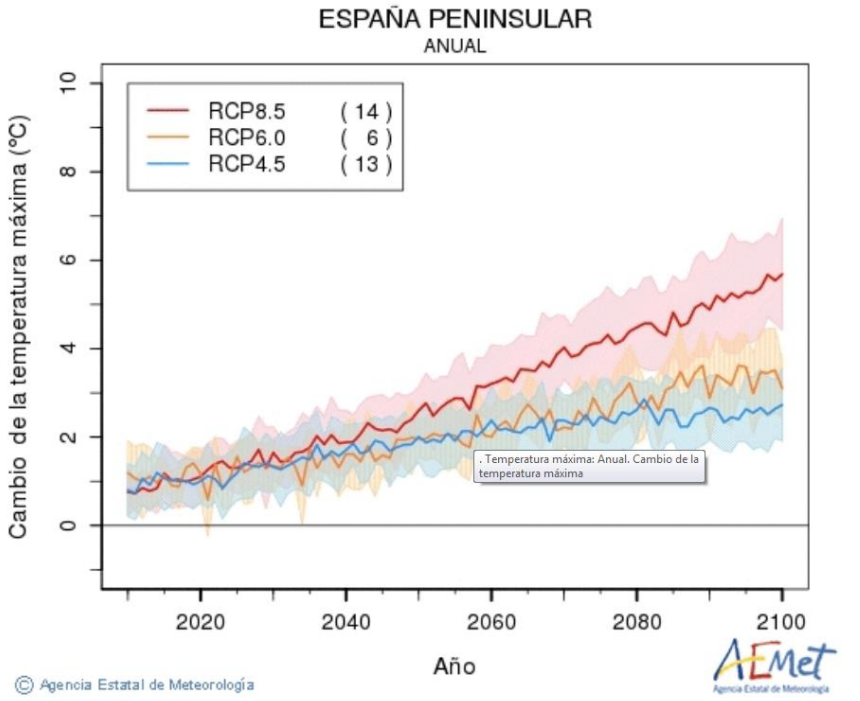
↑ Temperature

Intergovernmental Panel on Climate Change (IPCC)



Evolution of average temperature in Spain (1965-2018)

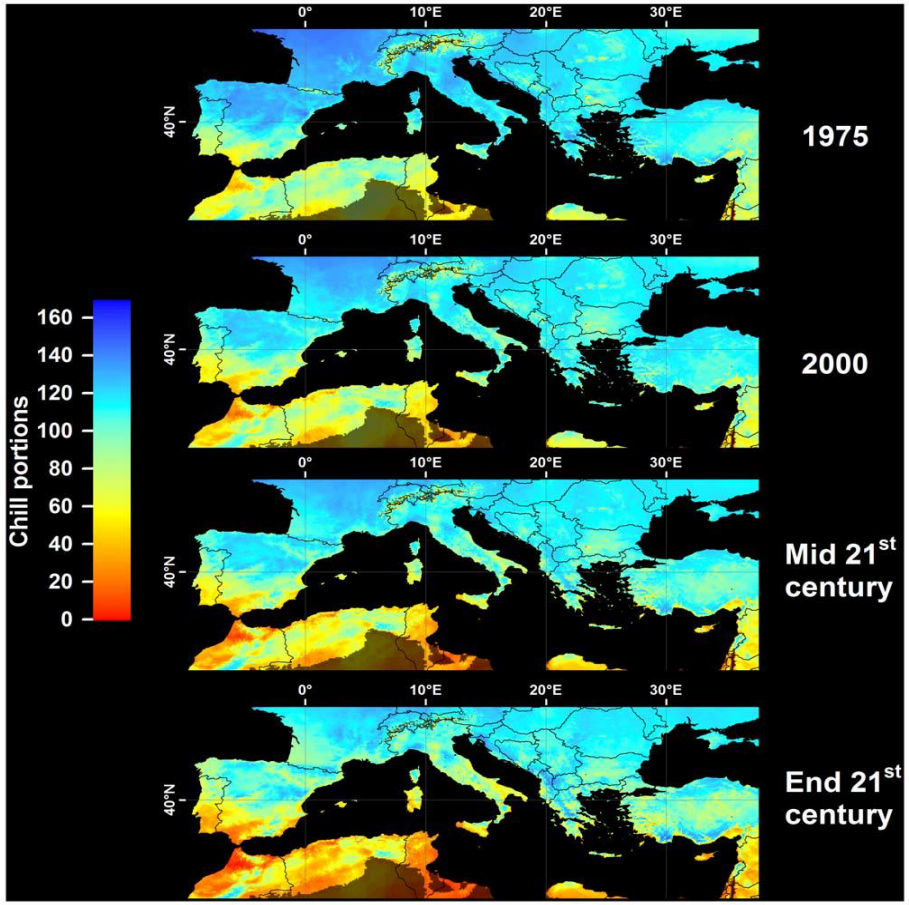




Source: Aemet

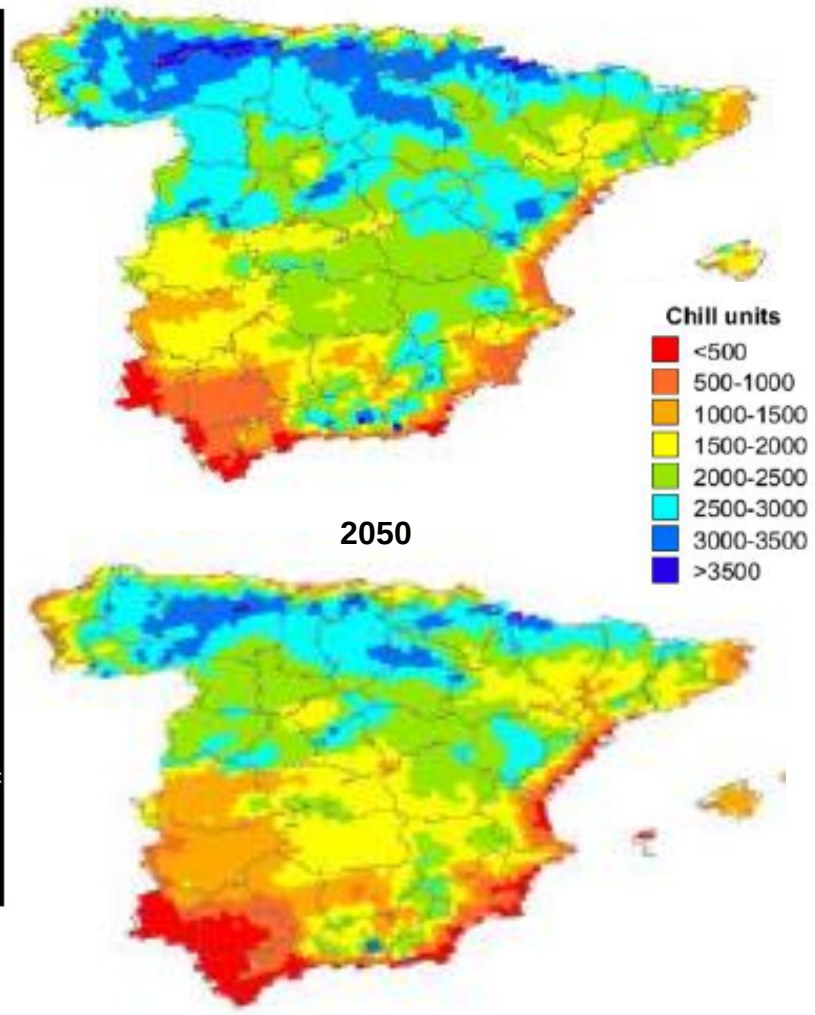
GLOBAL WARMING - CLIMATE CHANGE

Chilling accumulation



Luedeling et al. 2011

2005



Rodriguez et al. 2019

EFFECTS OF CLIMATE CHANGE IN APRICOT AND OTHER STONE FRUIT CROPS

⬇ Crop yield

- **Variations in phenology** (breaking dormancy date, flowering and ripening date, fruit development cycle) and fruit quality

- **Lower chilling accumulation ➡ No fulfillment of chilling requirements:**
  - High % bud drop
  - Deficient vegetative bud breaking (poor vegetation)
  - Lack of synchronization between flowering and vegetation
  - Loss of uniformity in flowering
  - Abnormalities in pistils and pollen

- **Extreme events:** Drought, Lack of chilling, frost…
- **Reduction of the availability of water resources**
- **Salinity**
- **Increase in the prevalence of pests and pathologies**

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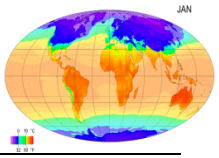
EFFECTS OF CLIMATE CHANGE IN APRICOT AND OTHER STONE FRUIT CROPS



Mid April

Effects of Non-fulfillment of CR: Flowering delay

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EFFECTS OF CLIMATE CHANGE IN APRICOT AND OTHER STONE FRUIT CROPS

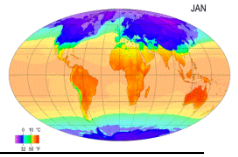

Foto: D. Ruiz

Foto: J. García

Effects of Non-fulfillment of CR: High % bud drop, poor vegetation

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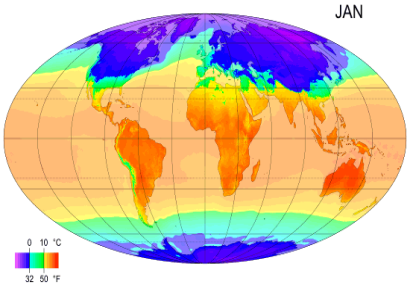
EFFECTS OF CLIMATE CHANGE IN APRICOT AND OTHER STONE FRUIT CROPS

Effects of Non-fulfillment of CR: Loss of uniformity

Strategies to facilitate the adaptation of stone fruit crops to climate change in warm areas



A) Breeding for low-chilling requirements cultivars

B) Identification of agro-climatic areas. Modeling in the future scenarios of climate change

C) Guidelines for cultivar choice, considering chilling requirements (CR)
   i) Cultivar availability of stone fruits grouped by CR

D) Design, development and optimization of cultivation systems and methods to minimize the effect of climatic change

A) Breeding for low-chilling requirements cultivars

- Currently we only have extra-low chilling cultivars in peach (<300 Chill Units)
- *Prunus* breeding programmes must be addressed on this objective

CEBASfruit www.cebasfruit.com CSIC

Apricot breeding programme (CEBAS-CSIC)

New cultivars

~ 38 Porciones / 620 CU

Japanese plum breeding programme (CEBAS / IMIDA)

New advanced selections

< 25 Porciones / < 400 CU

Adaptation strategies of apricot to climate change in warm production areas

Apricot crop in warm European areas

Very low-chilling requirements apricot cultivars

Valencianos

~ 36 Portions / 600 CU

CEBASfruit CSIC

Cebasred

Primorosa

~ 38 Portions / 620 CU

Low-chilling requirements apricot cultivars

CEBASfruit CSIC

www.cebasfruit.com

Mirlo Anaranjado

Mirlo Rojo

Cebas 57

PSB

Colorado

Mikado

COT

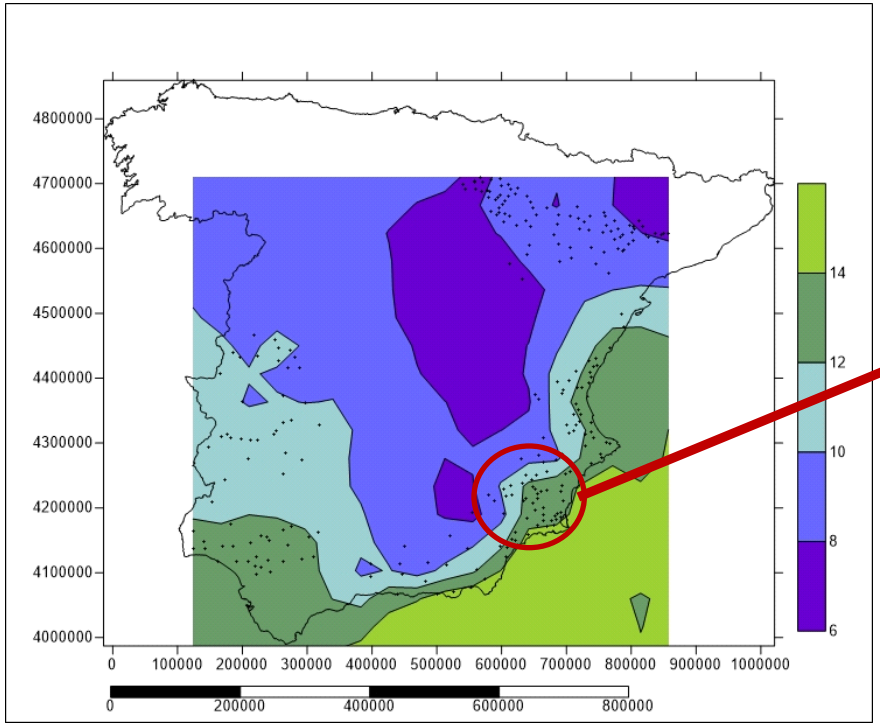
Maya Cot

~ 45 Portions / 700 CU

B) Identification and characterization of agro-climatic areas. Modeling in the future scenarios of climate change

- ❖ Mapping chill accumulation (homo-climatic areas)
- ❖ Current and future scenarios
- ❖ Displacement of climatic zones in the new future scenarios

National level



Regional level

Particular conditions in Murcia Region

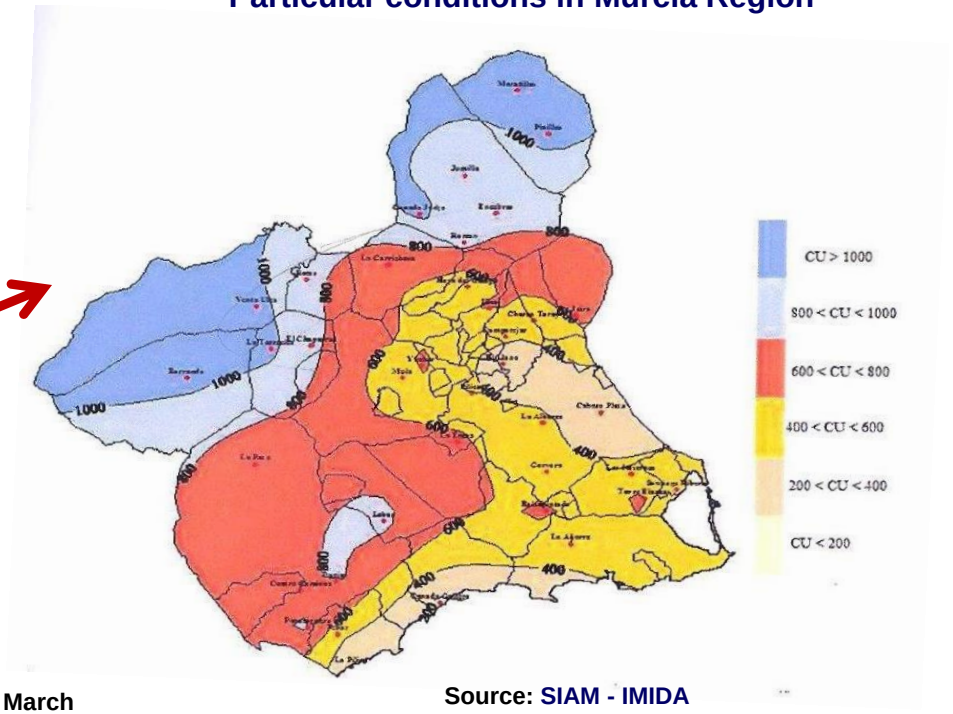
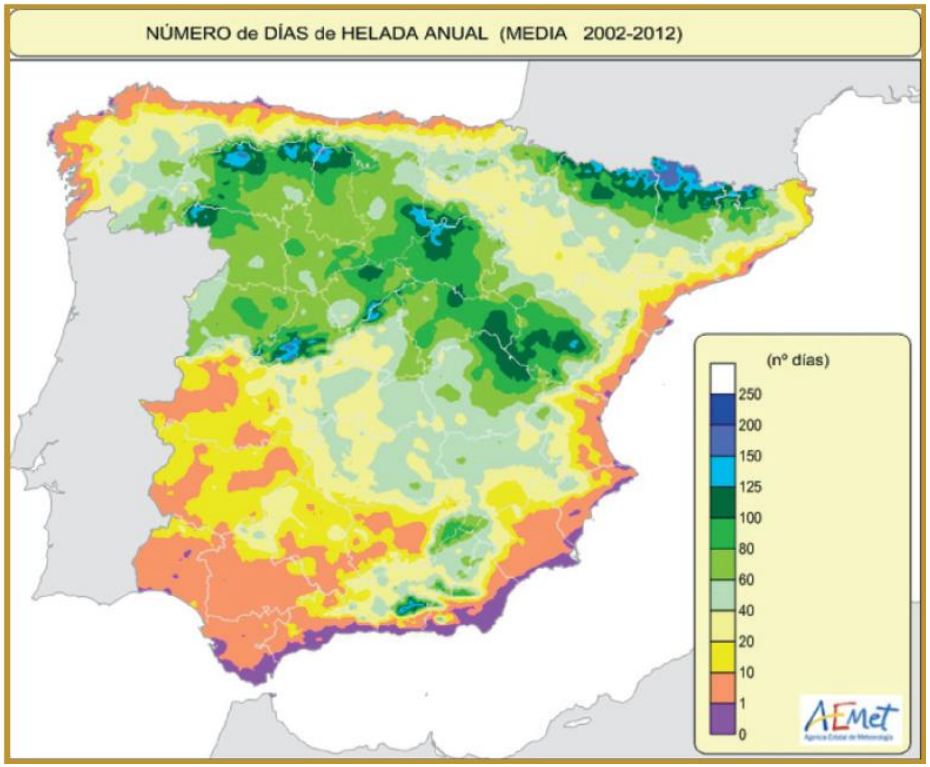


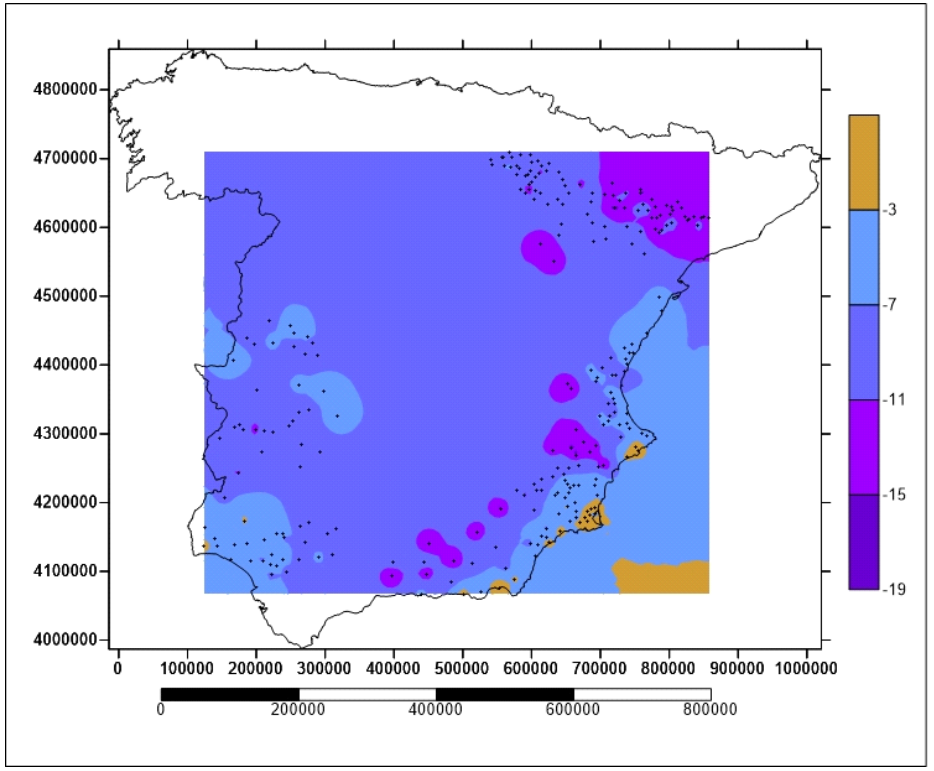
Figure 1. Isotherm map of the average temperature for the period from October to March

Source: SIAM - IMIDA

Phenological projection models

❖ Mapping risk of frost. Current and future scenarios





Isotherm map of minimum temperatures
Source: SIAM - IMIDA

Low Chilling Requirements cultivars / Cold Areas

Early flowering → **In cold areas, risk of frost**

C) Guidelines for cultivar choice, considering chilling requirements

❖ Cultivar availability of stone fruits grouped by chill requirements (chill units)

Apricot

Peach

Sweet Cherry

Japanese Plum

SOME IDENTIFIED GAPS…

- **Scarce information regarding CR.** Determination of chilling requirements in cultivars that we do not have information
- **Models and methodology.** Optimization of the models for chill accumulation determination. Standardization of the methodology and protocols for the assessment of chilling requirements for breaking dormancy and heat requirements for flowering
- **Validation of chilling requirements data** in different climatic conditions, especially in warm areas

D) Design, development and optimization of cultivation systems and methods to minimize the effect of climatic change

- Optimization of treatments with biostimulant products for improving vegetation and flowering
- Shading nets to increase chilling accumulation
- Reduction and optimization of irrigation (monitoring with sensors, biodegradable plastic padding, etc.)

IN WARM AREAS, APPLICATIONS OF BIOSTIMULANT PRODUCTS

i) to improve dormancy release, flowering and vegetation. Uniformity and precocity

ii) to advance breaking dormancy time and consequently flowering and ripening time)

❖ Optimization of treatments with biostimulant products

- Products
- Concentrations
- Moment of application

Compuesto	Concentración	
Cianamida de Hidrógeno 50% (Dormex)	2 %	
DNOC	0,25 %	
TDZ + Aceite Parafínico 83%	200 p.p.m. + 1,5%	
Erger + Activ-Erger	4% + 6%	VALAGRO
Syncron + Nitroactive	1,5% + 4,5%	DAYMSA
Armoblen 650 + KNO3	1% + 5%	MASSÓ
NH4NO3 + Ca(NO3)2 + Aceite Parafínico 83%		
Ca(NO3)2 + KNO3 + Aceite Parafínico 83%		

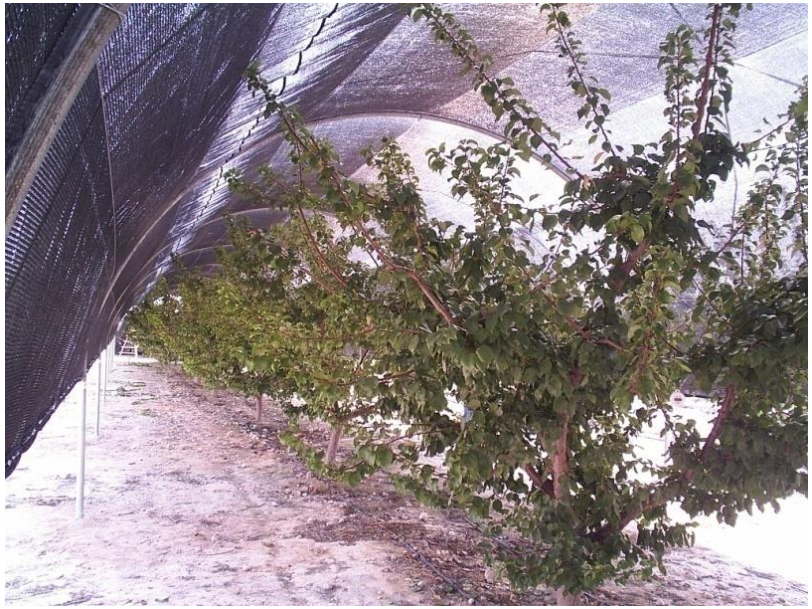
Treatments must be applied when around 75% of chilling requirements are fulfilled

Adaptation strategies of apricot and other stone fruit crops to climate change in warm production areas

Treatments applied when around 75% of chilling requirements are fulfilled

❖ Shading nets

- Type of shading nets
- Moment of installation and removal of the net



To reduce temperature and increase chill accumulation (15-20%)

Installation: when chill accumulation begins
Removal: when chill requirements are fulfilled

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Unión Europea
Fondo Europeo Agrícola de Desarrollo Rural
Europa invierte en las zonas rurales

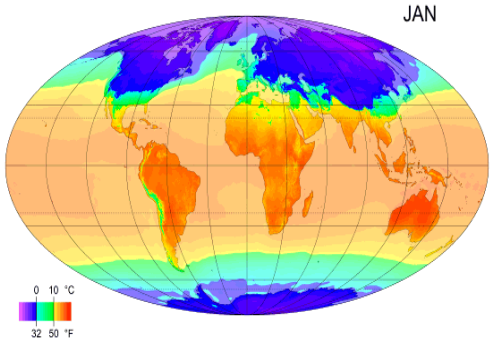
GOBIERNO DE ESPAÑA
MINISTERIO DE AGRICULTURA Y PESCA, ALIMENTACIÓN Y MEDIO AMBIENTE

PNDR
Programa Nacional de Desarrollo Rural 2014-2020

INNOVATION PROJECT (2019-2022) – SPANISH OPERATIVE GROUP

"ADAPTATION OF STONE FRUIT SECTOR TO CLIMATE CHANGE"

www.cambioclimaticofrutadehueso.es



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Instituto Murciano de Investigación y Desarrollo Agrario y Alimentario

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ENAE
Business School

cooperatives agro-alimentàries
Comunitat Valenciana

Fundación cajamar

Frutaria

frutas esther

el Ciruelo

Anabella

bitec

Valagro

Daymsa

"Developing strategies and tools to minimize the effects of climate change in the stone fruit sector"

GENERAL OBJECTIVES OF THE INNOVATION PROJECT

A. **Identification of agro-climatic and homo-climatic areas.** Modeling in the future scenarios of climate change.

B. **Guidelines for cultivar choice, considering chilling requirements.** Adaptation and problems associated with the effects of climate change

C. **Design, development and optimization of systems, methods and practices of production / cultivation**

D. **Agro-economic evaluation**

E. **Integrated decision support system (DSS)**

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Thanks for your attention!!!

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CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS

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