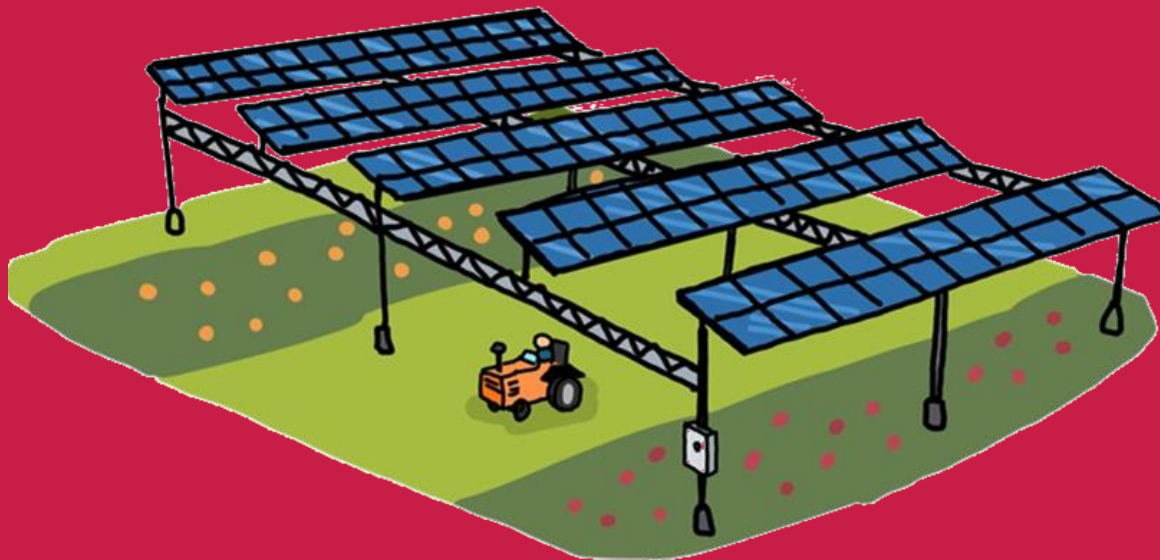
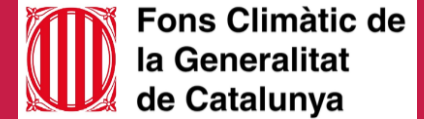
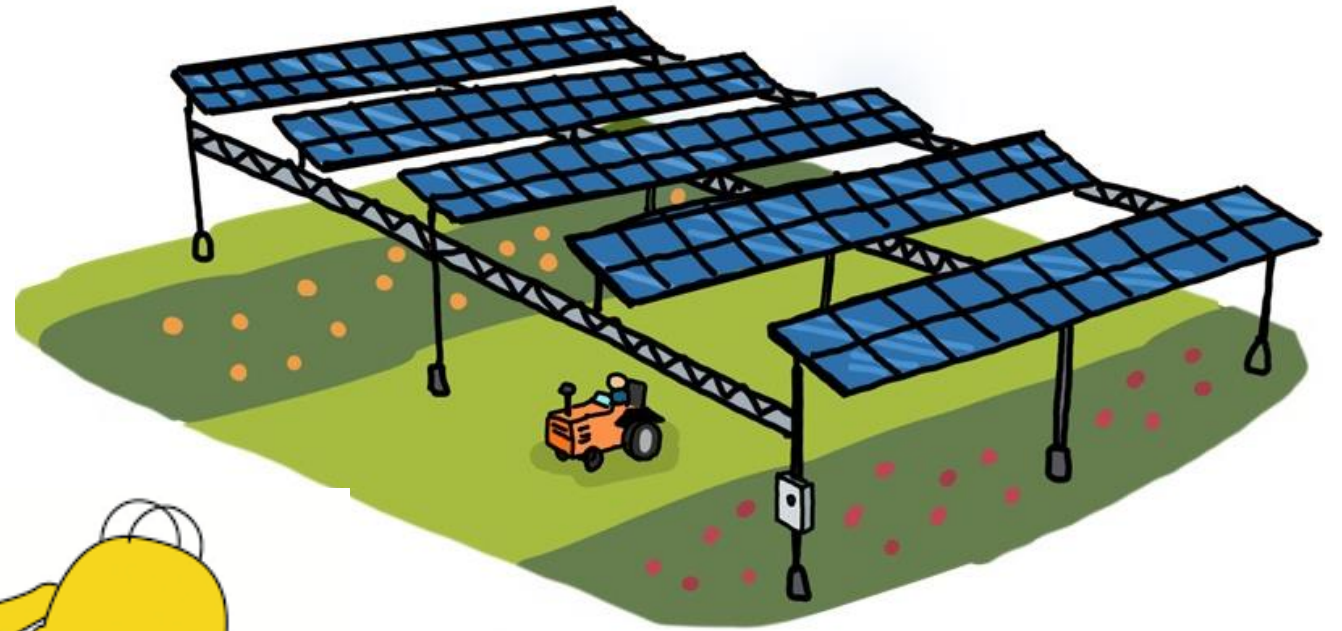
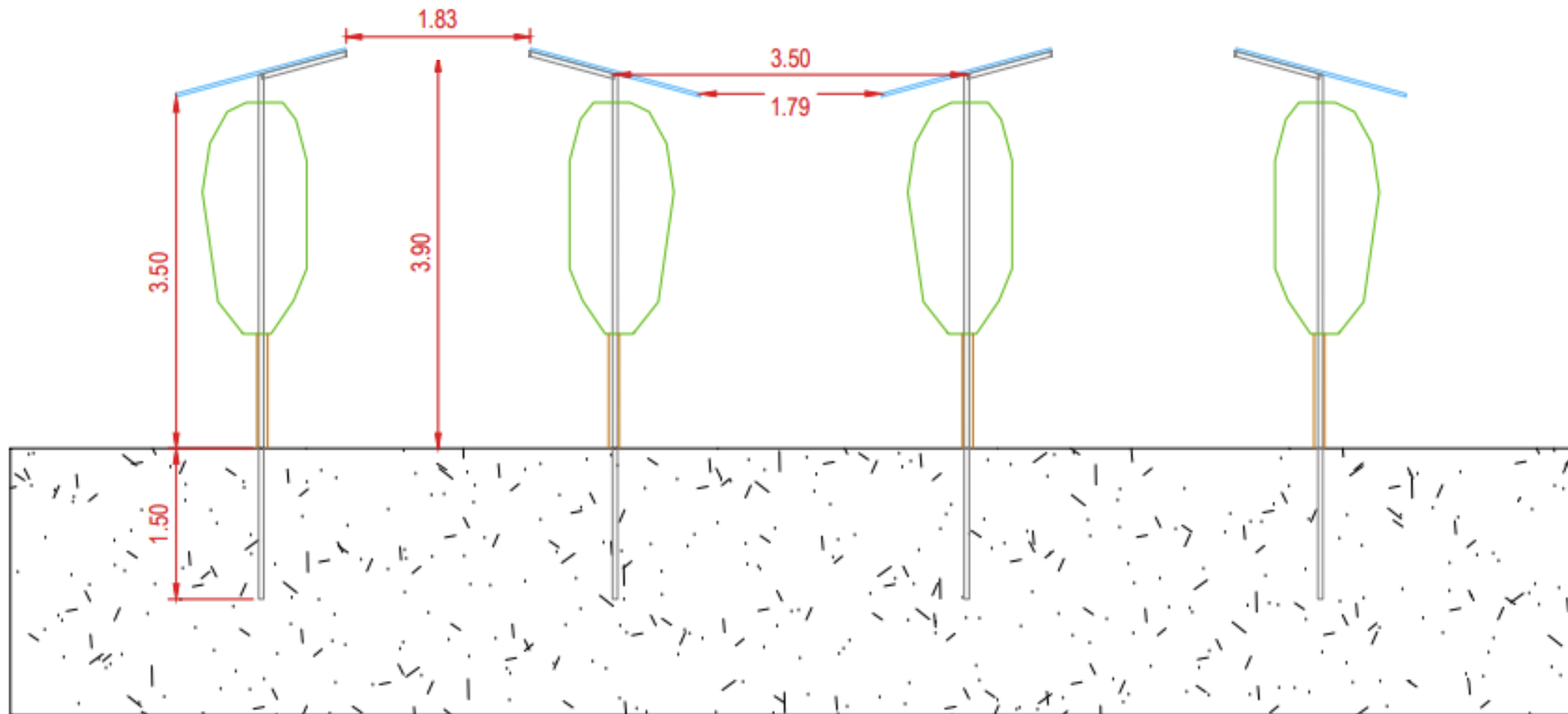


L'agrovoltaica a la pràctica: Experiència en fruiters





Un exemple per plantacions de fruiters



PROJECTE PILOT



Situació

Finca Experimental IRTA
Mollerussa (Lleida)

Disseny Experimental

4 Estratègies:

- Control (UTC)
- Xarxa antipedra (NET)
- APV Sistema Dinàmic (DS)
- APV Sistema Fixe (FS)

Varietat

'Golden Reinders'
'Gala DeCarli'

Any de plantació

Febrer 2018

Marc de plantació

3,6 x 0,9 m - Golden
3,6 x 1 m - Gala

Sistema de formació

Mur Fruiter



Sistema Fixe

- Sense seguidors
- Panels semitransparents ~ 30-35%
- 408m² superfície mòduls
- 750m² superfície ocupada
- 216 mòduls de 245Wp/mòdul

- Seguidors – “Smart-piloting”
- Panels bifacials
- 443m² superfície mòduls
- 800m² superfície ocupada
- 216 mòduls de 400Wp/mòdul



Sistema dinàmic





Campanyes 2024-2026



1. Mesures a camp

- Espectre de llum
- Intercepció de llum
- Intercanvi de gasos
- Conductancia estomàtica
- T_a , PAR, vent, pluja, potencial hídric terra, etc.

2. Paràmetres de producció - Collita

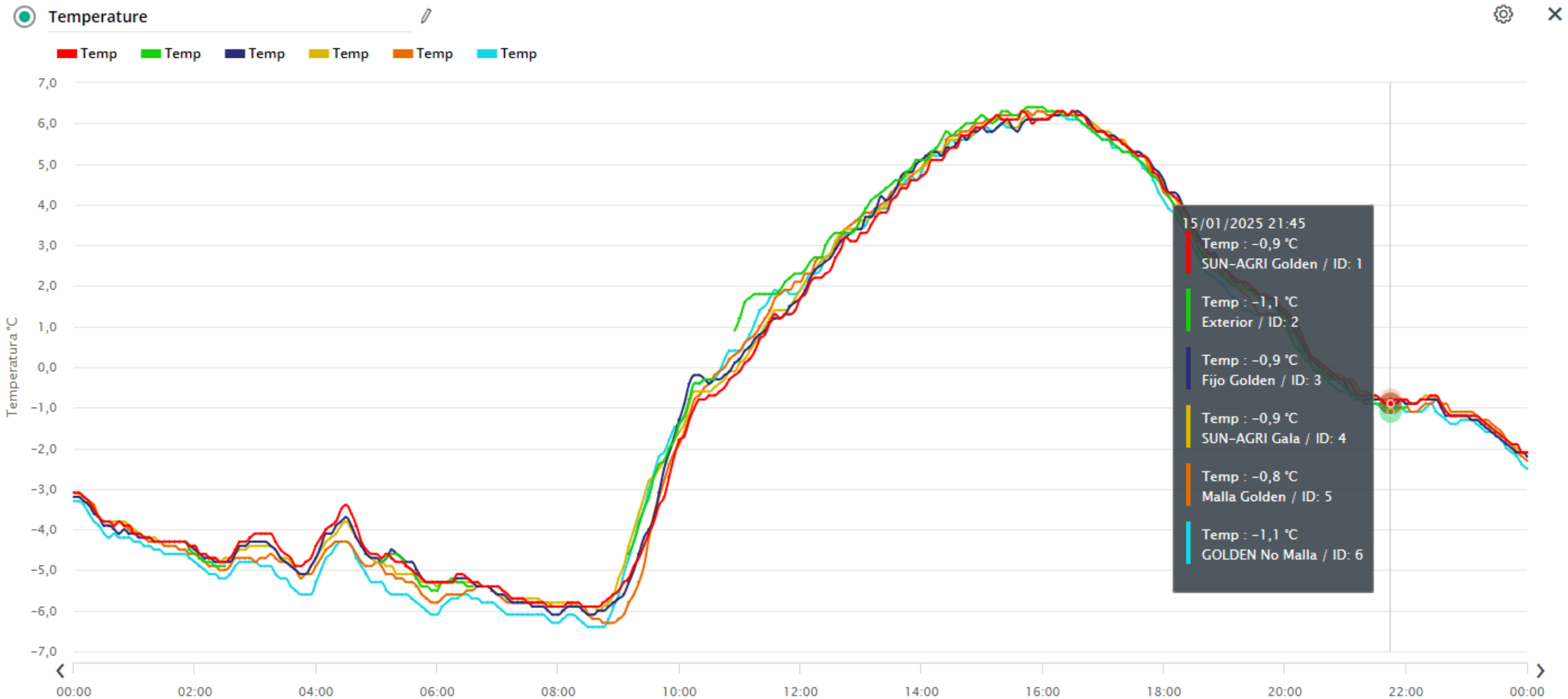
3. Paràmetres de qualitat

4. Anàlisis bioquímics

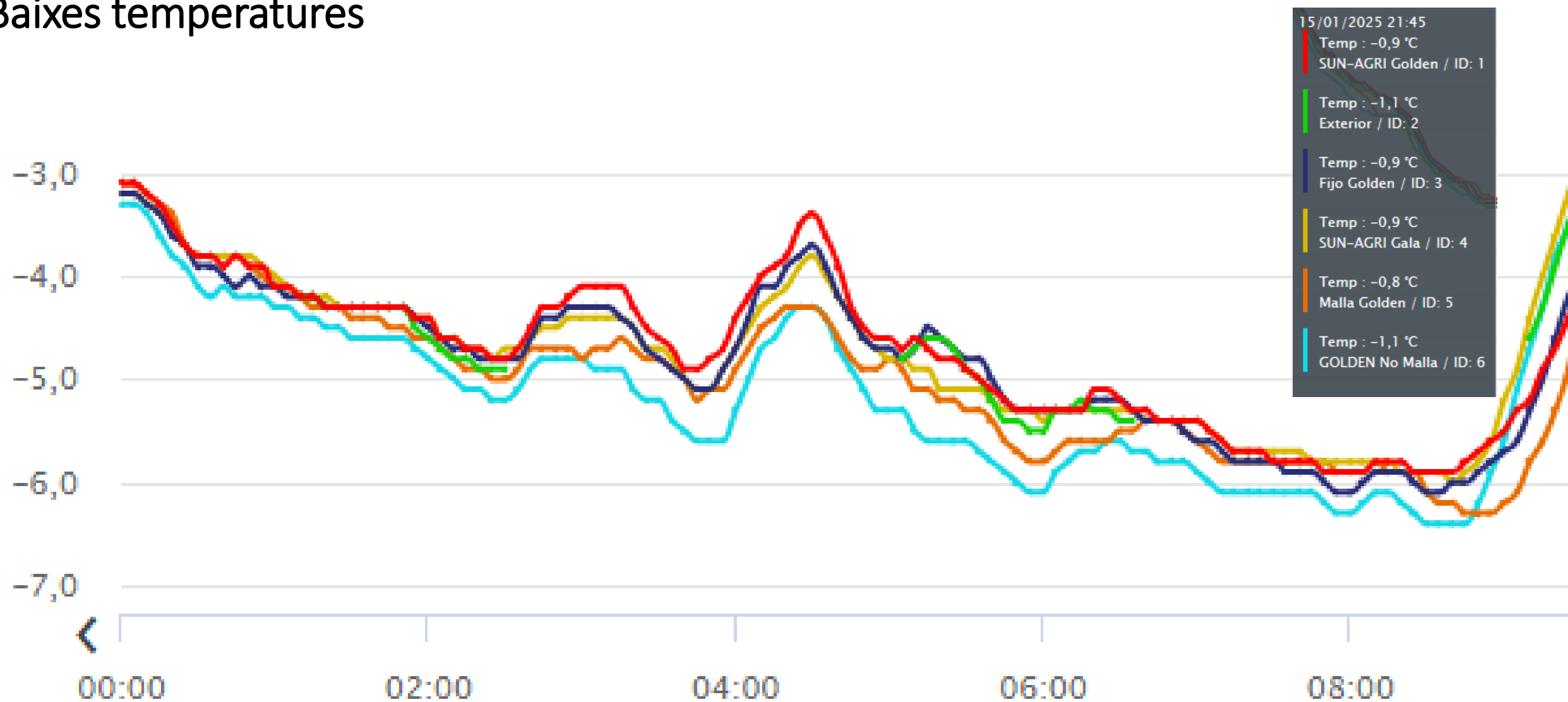
- Pigments fotosintètics, carbohidrats, marcadors de estrès, hormones.



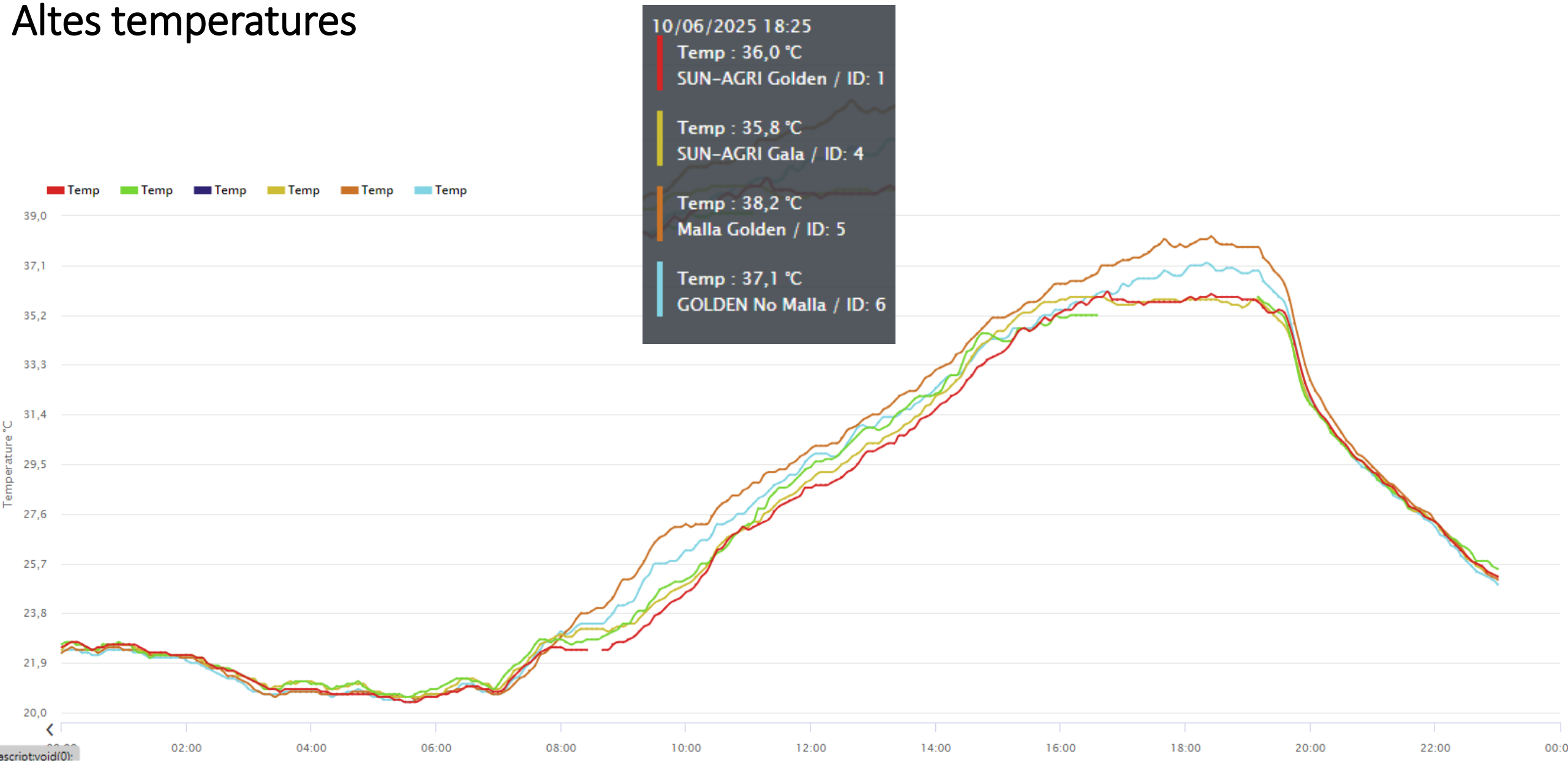
Baixes temperatures



Baixes temperatures



Altes temperatures



1. Intercepció de llum





Este



Oeste

% Luz transmitida o incidente respecto a la luz solar total

9,2	33,0	86,5	94,2	94,2	94,2	89,3
8,9	25,1	69,8	78,3	77,0	73,9	70,0
5,2	6,0	7,9	11,3	12,9	53,7	81,1
6,5	10,7	18,1	20,1	24,3	77,0	86,8

Control
Net
DS
FS

% Luz transmitida o incidente respecto a la luz solar total

8,5	13,9	53,2	90,9	92,0	88,7	93,9
8,3	12,7	38,3	74,5	74,1	70,7	70,0
5,6	5,6	7,4	9,1	11,5	15,1	71,3
6,3	8,7	14,0	21,3	27,6	60,2	90,2



Este



Oeste

% Luz transmitida o incidente respecto a la luz solar total

58,2	93,3	95,1	95,4	95,7	94,8	89,3
49,1	77,5	77,1	74,7	77,8	76,8	72,5
8,4	36,1	85,1	86,8	85,4	36,8	9,0
16,8	22,6	72,2	92,0	92,0	88,2	32,1

Control
Net
DS
FS

% Luz transmitida o incidente respecto a la luz solar total

47,3	91,1	92,7	93,3	91,7	92,2	87,3
48,4	75,9	74,9	71,9	72,7	74,7	67,1
7,6	11,5	56,6	86,6	85,7	75,4	17,6
15,3	41,1	84,7	89,0	88,4	89,4	61,7



Este



Oeste

% Ilum transmesa o incident respecte llum solar total

89,3	94,7	94,6	95,3	94,7	90,2	34,3
70,2	76,7	73,1	76,8	77,6	70,2	21,0
78,7	87,2	76,3	24,0	12,7	9,1	5,5
63,1	90,7	90,5	91,1	41,4	23,2	9,1

Control
Net
DS
FS

% Ilum transmesa o incident respecte llum solar total

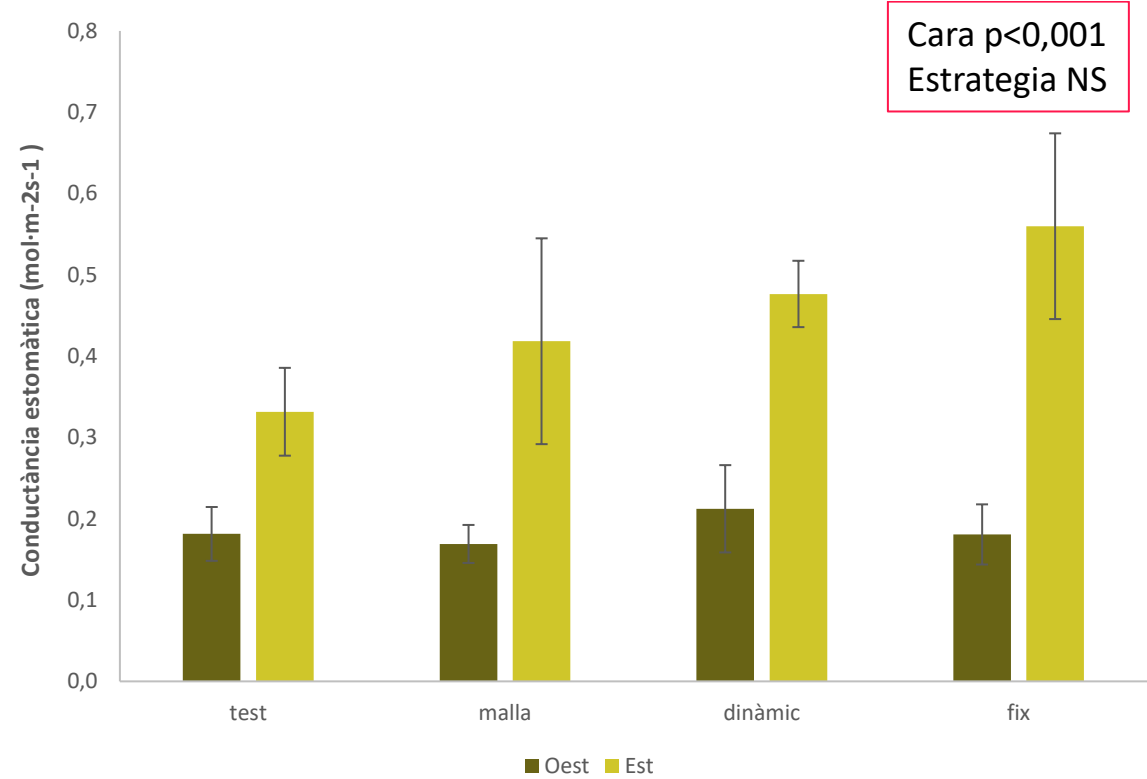
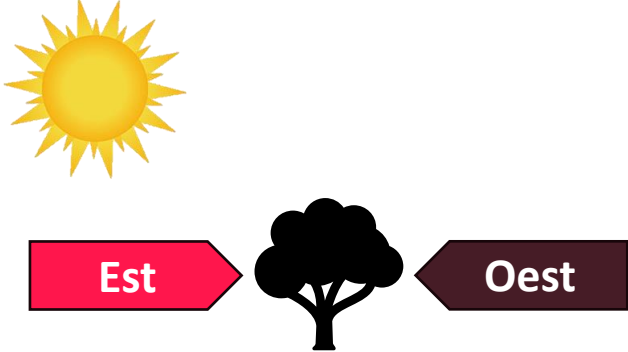
81,5	92,6	93,7	94,1	94,8	91,6	42,9
66,9	76,2	72,1	77,8	77,7	76,0	37,2
62,7	86,2	86,0	56,7	10,4	8,7	6,2
84,1	89,9	90,5	90,8	54,0	26,5	9,1

Conductancia estomática

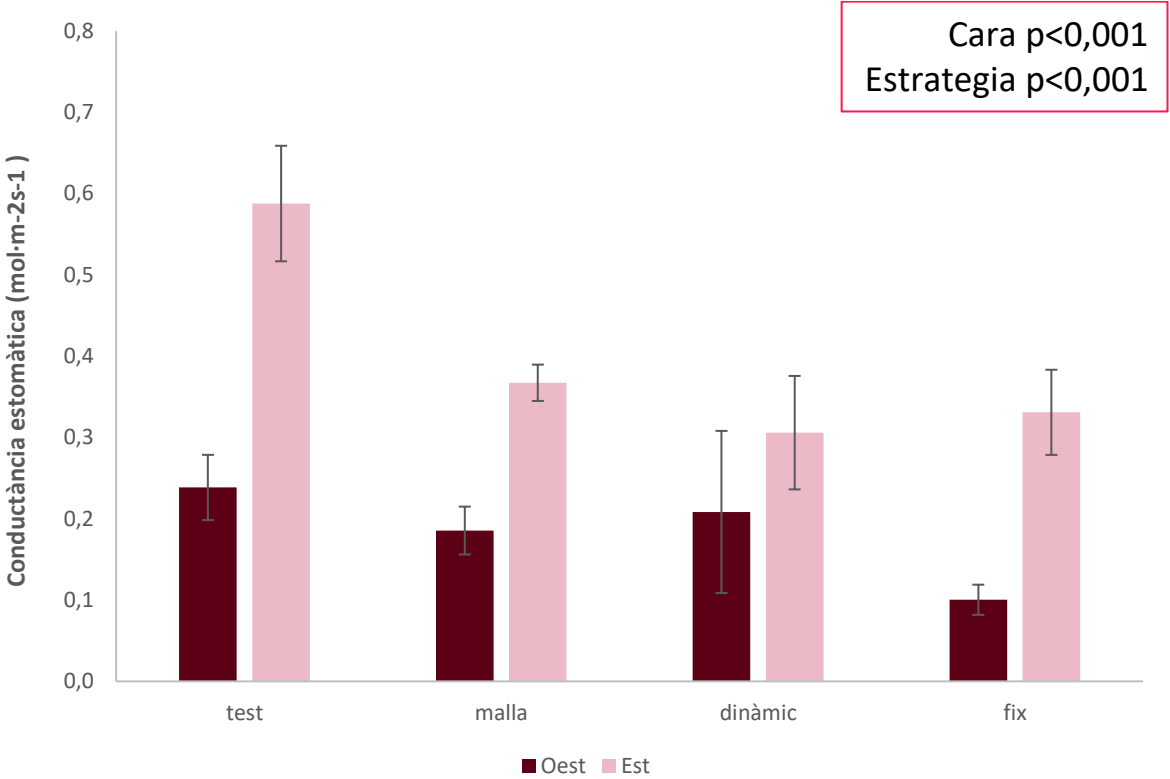
- I. Mensual → Sol / Sombra
- II. Diferentes horas → Sol / sombra



Stomatal conductance - July (11-12h)

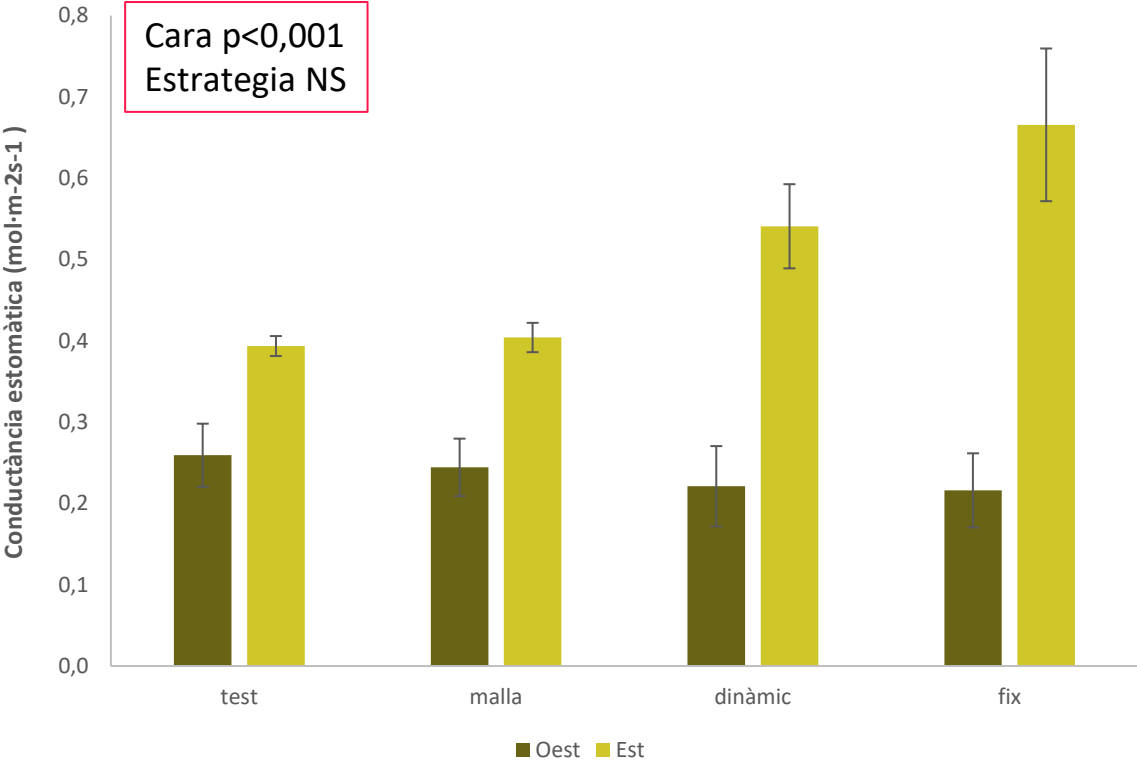


Golden

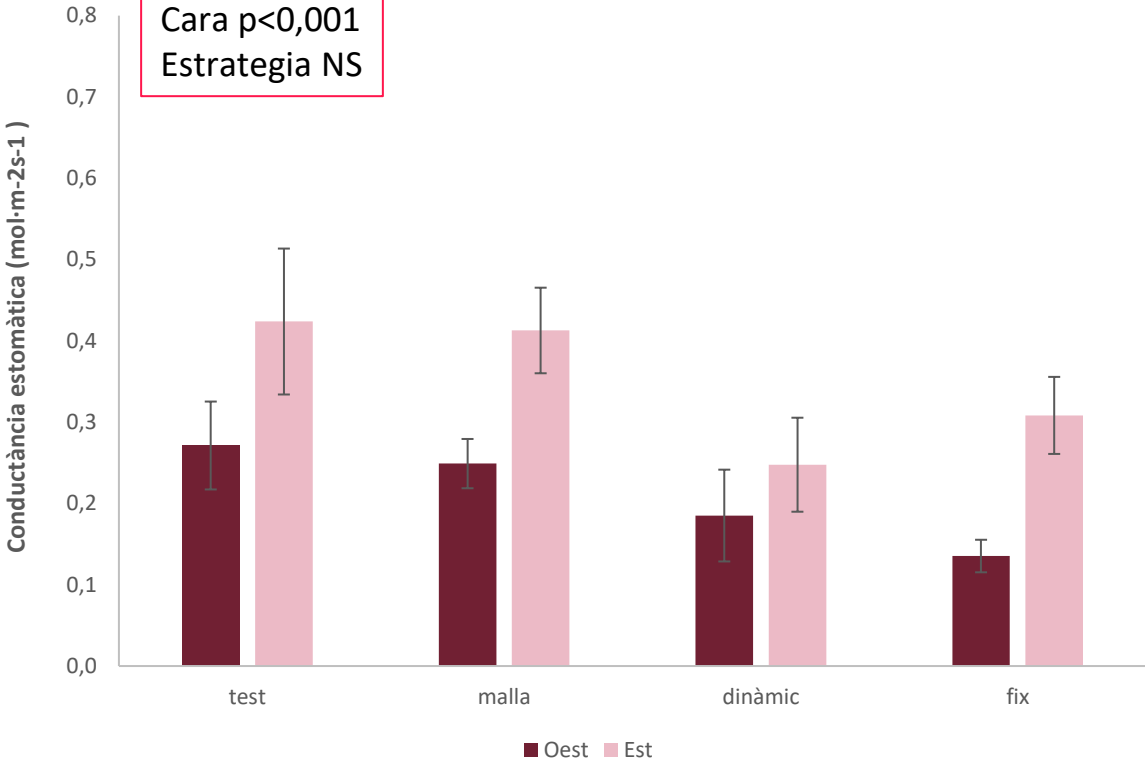


Gala

Stomatal conductance - July (12-13h)

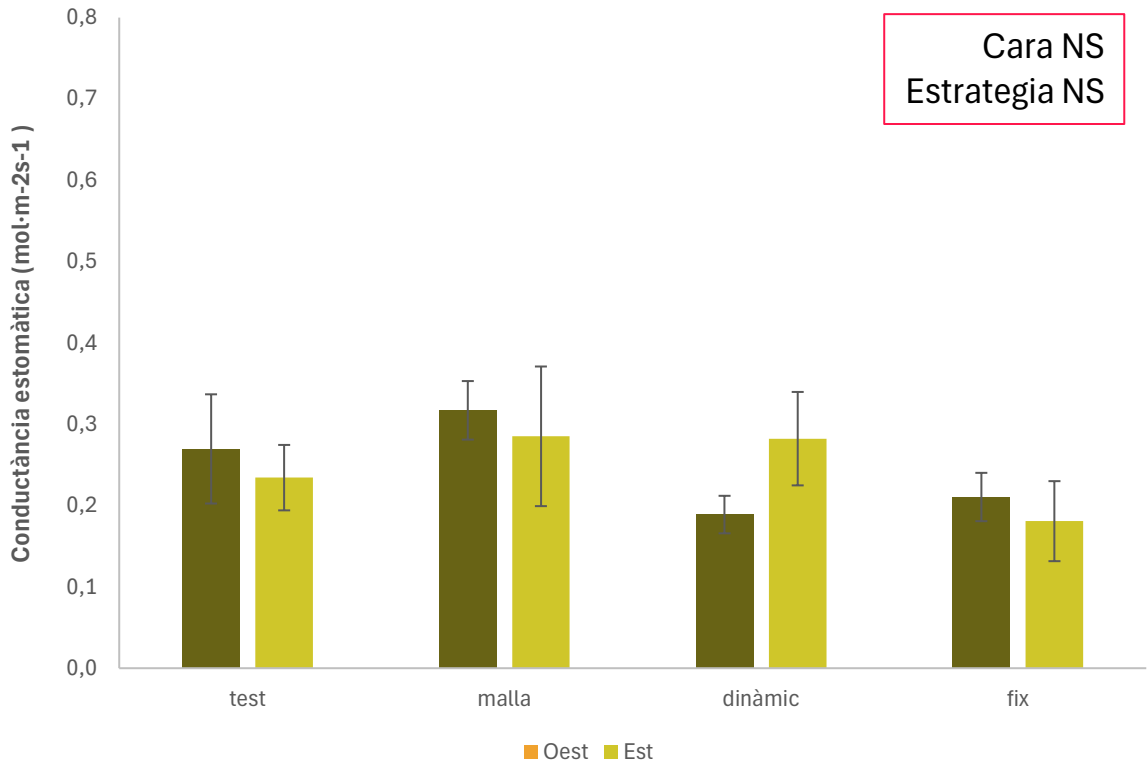


Golden

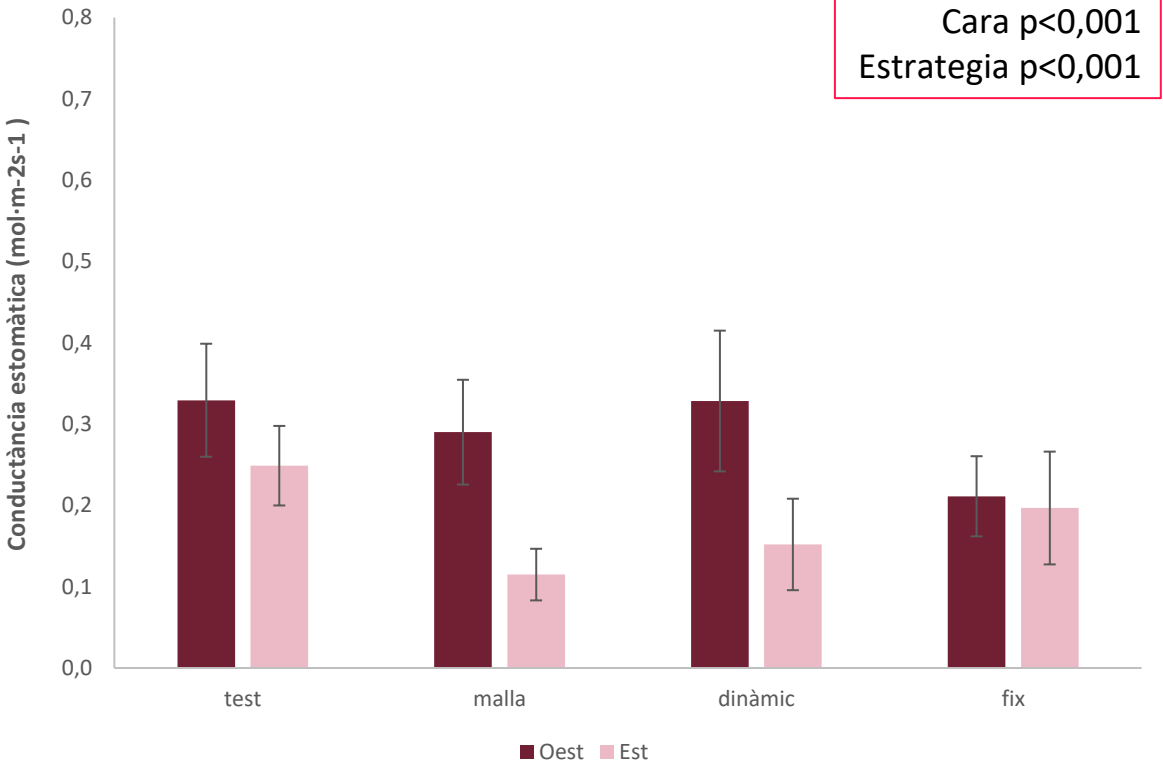


Gala

Stomatal conductance - July (13-14h)



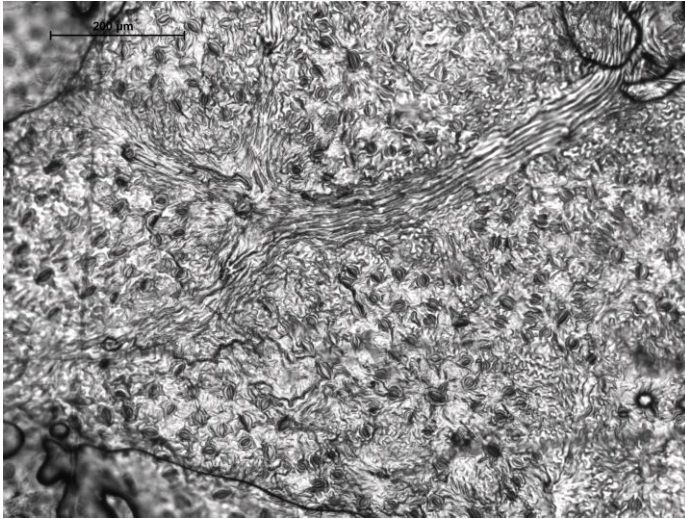
Golden



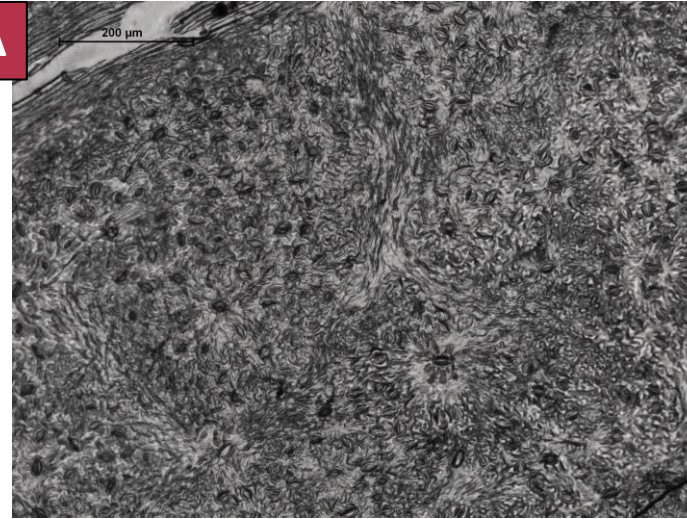
Gala

Microscopi – Estomas Gala

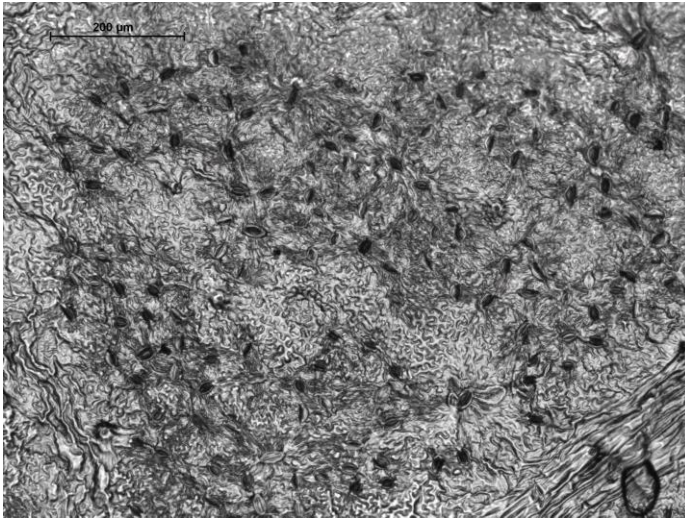
TEST



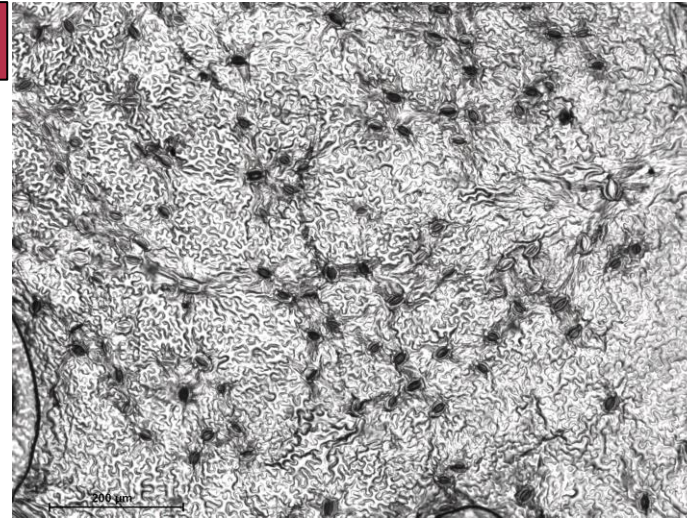
XARXA



DS



FS

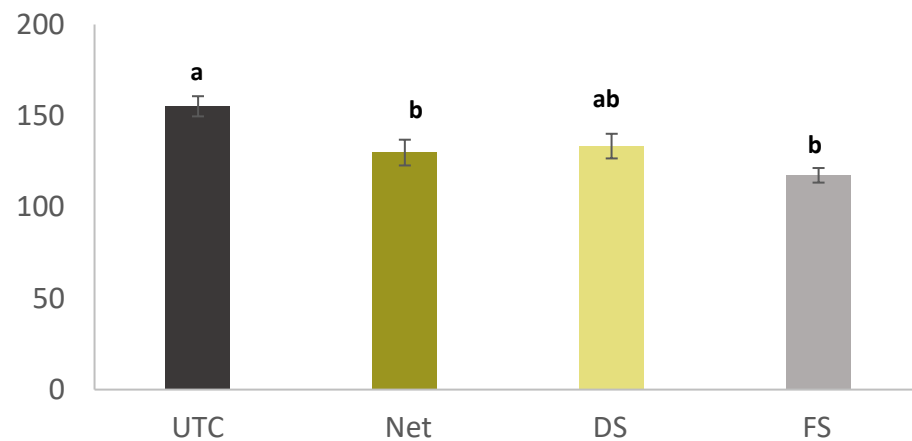


Parámetros de producción - Golden

2024

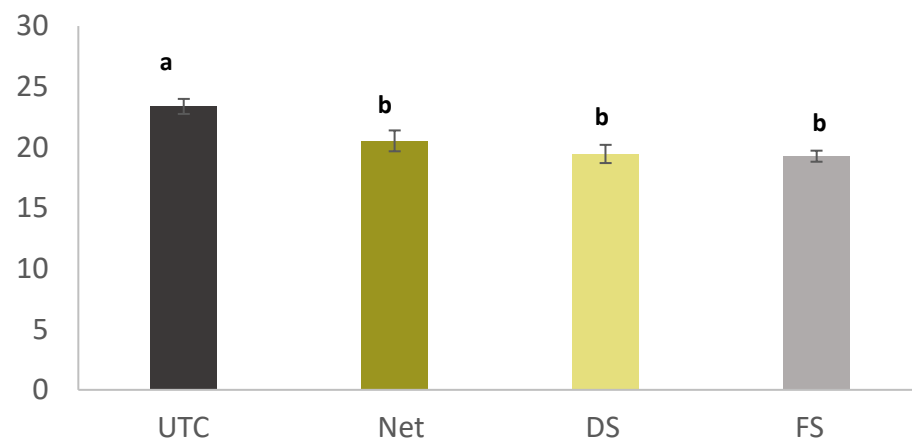
Frutos totales/árbol

$p=0,001$



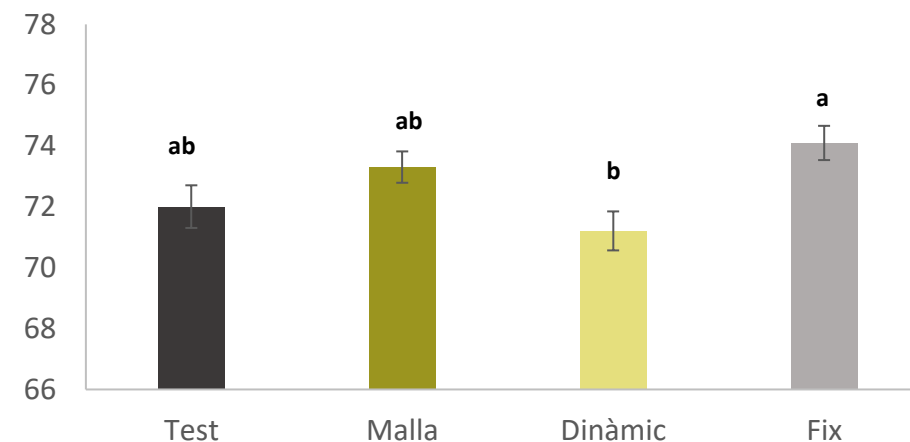
Producción total/árbol (kg)

$p=0,001$



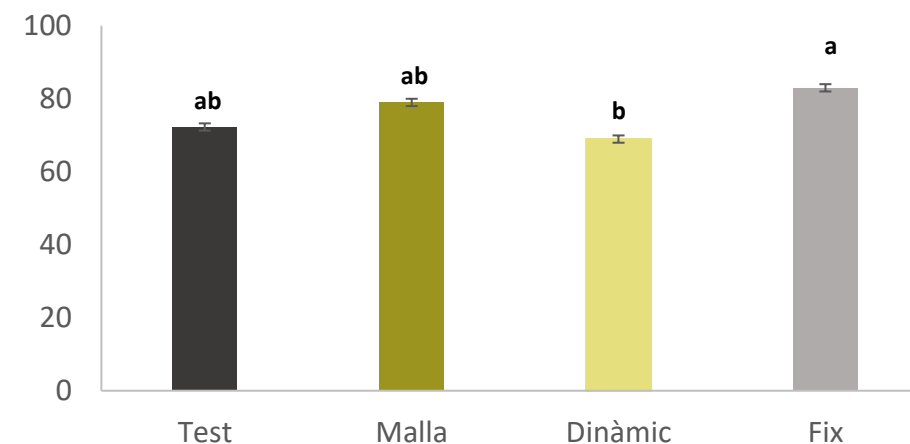
Calibre (mm)

$p=0,005$



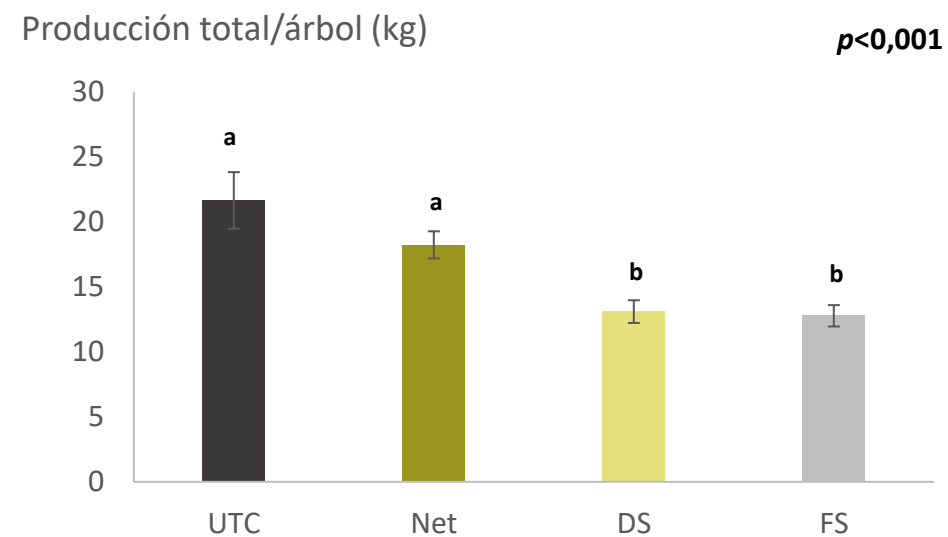
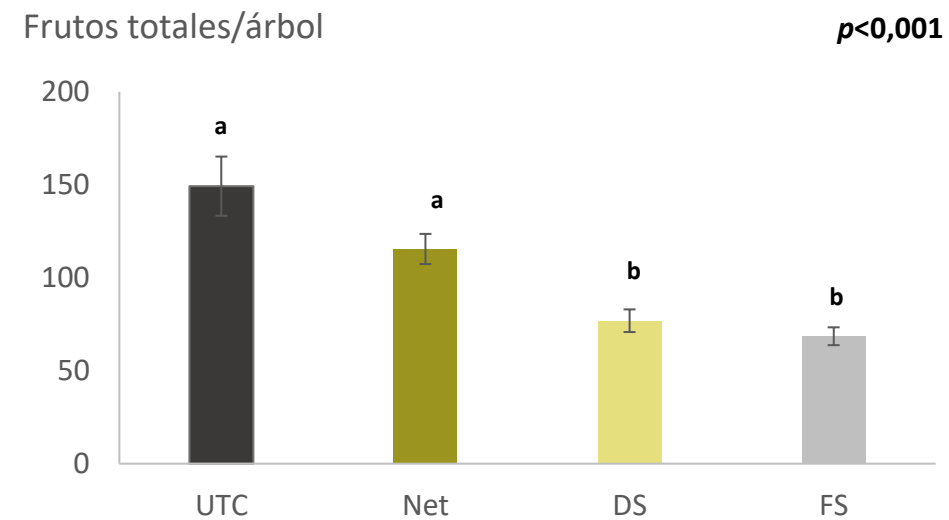
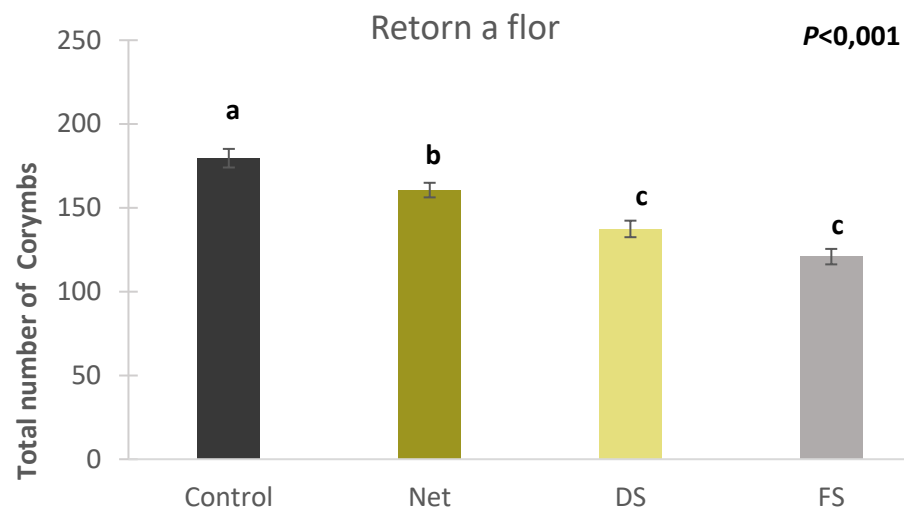
Calibre >70mm (%)

$p=0,017$



Parámetros de producción - Golden

2025

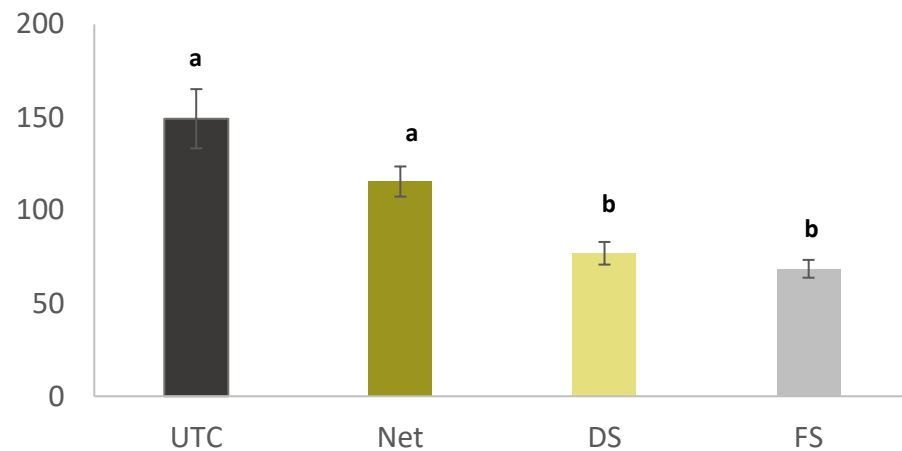


Parámetros de producción - Golden

2025

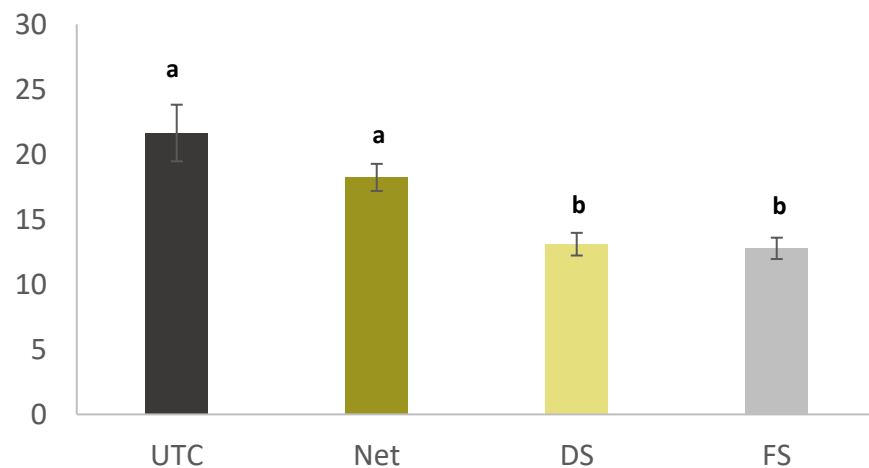
Frutos totales/árbol

$p < 0,001$



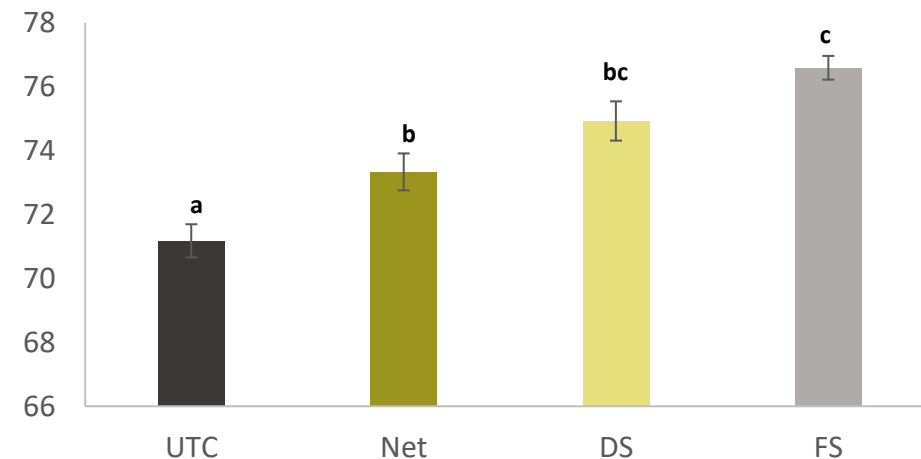
Producción total/árbol (kg)

$p < 0,001$



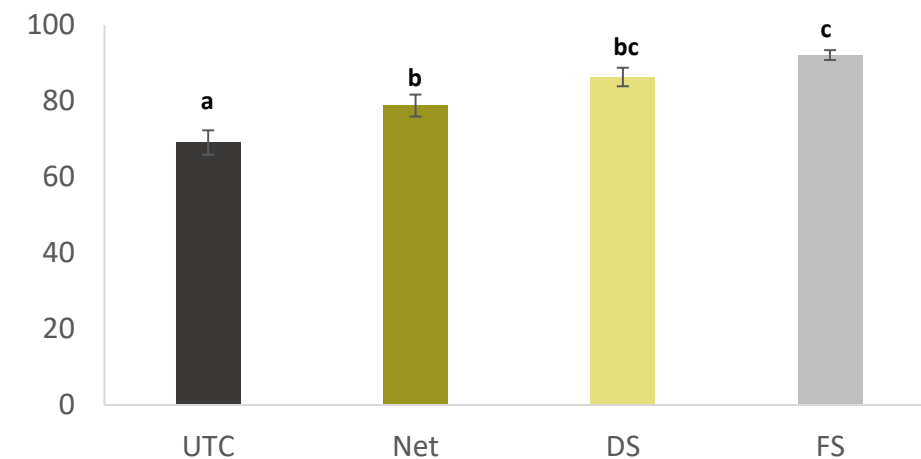
Calibre (mm)

$p < 0,001$



Calibre >70mm (%)

$p < 0,001$

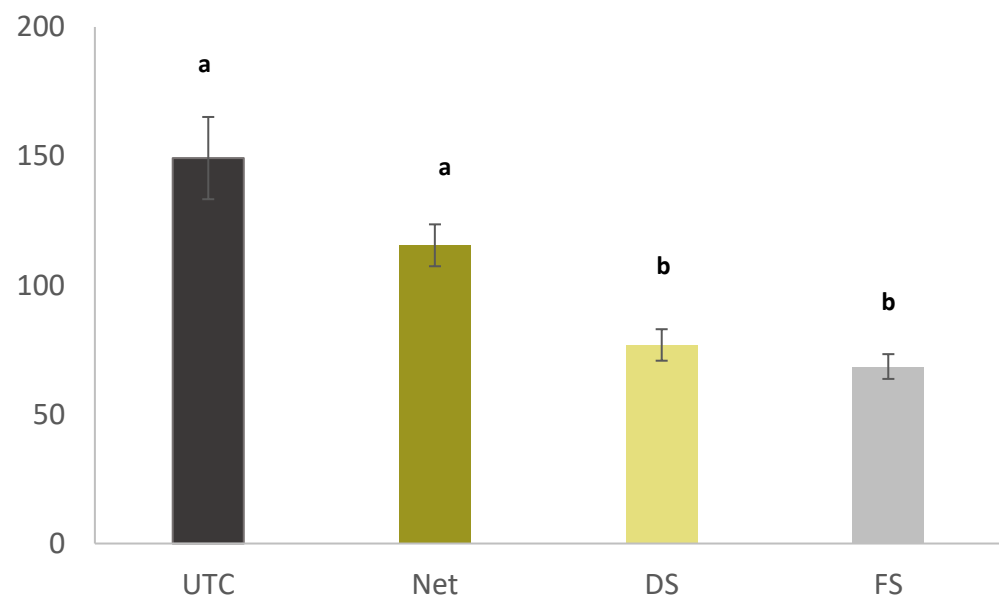


Parámetros de producción - Golden

2025

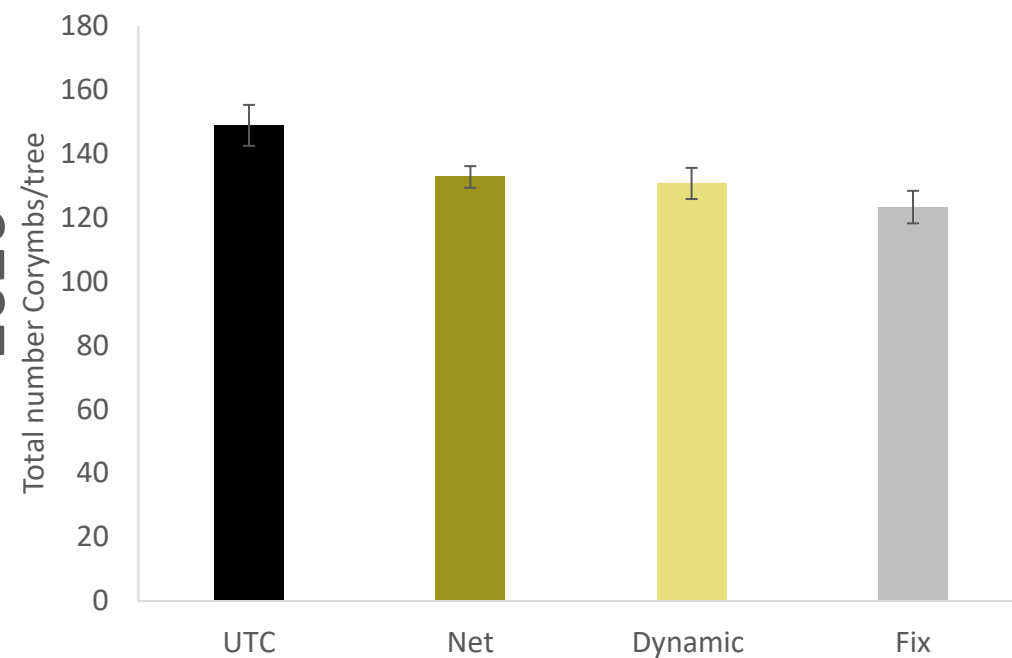
Frutos totales/árbol-2025

$p < 0,001$



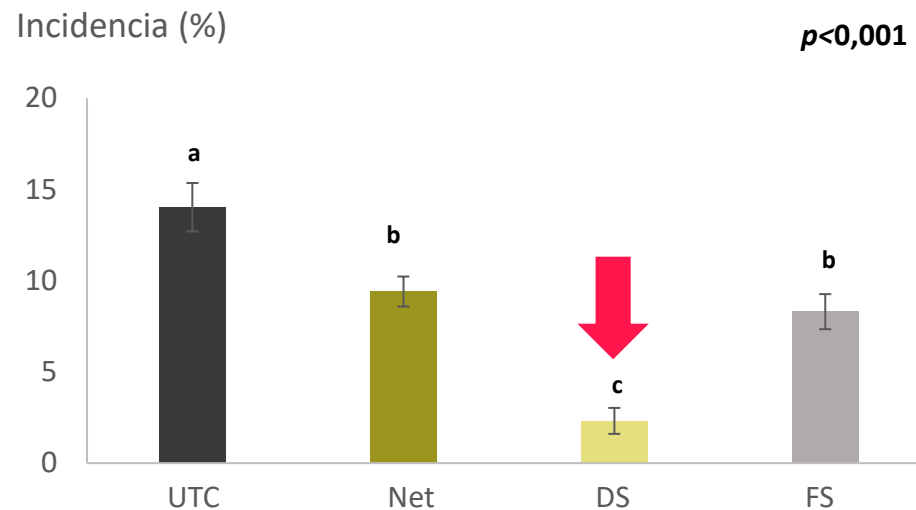
2026

Retorn a flor

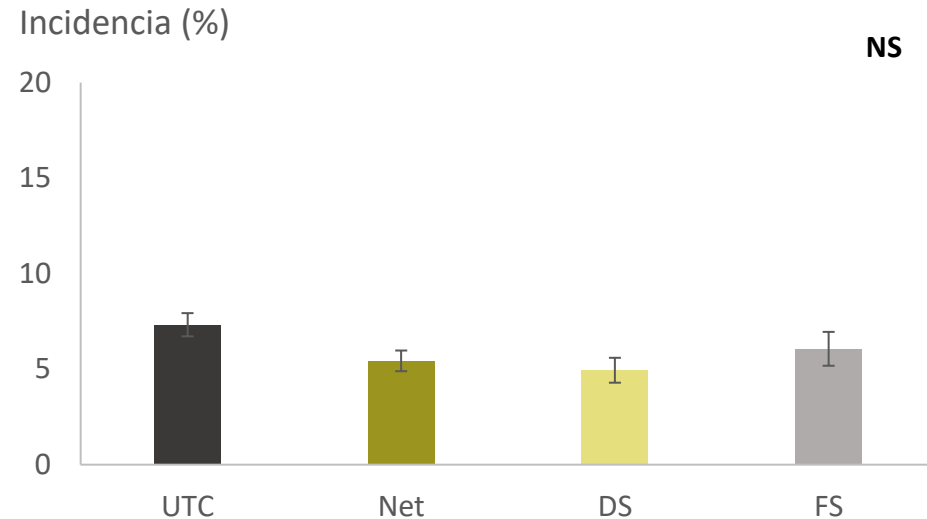


Parámetros de producción - Golden

2024



2025

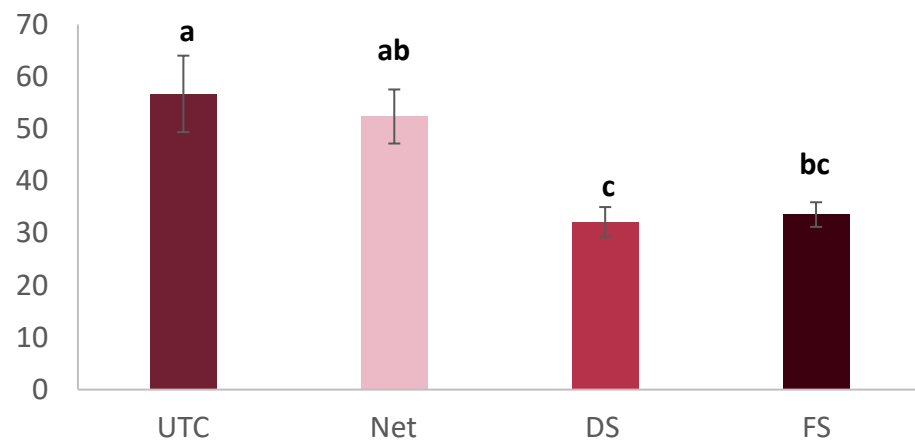


Parámetros de producción - Gala

2024

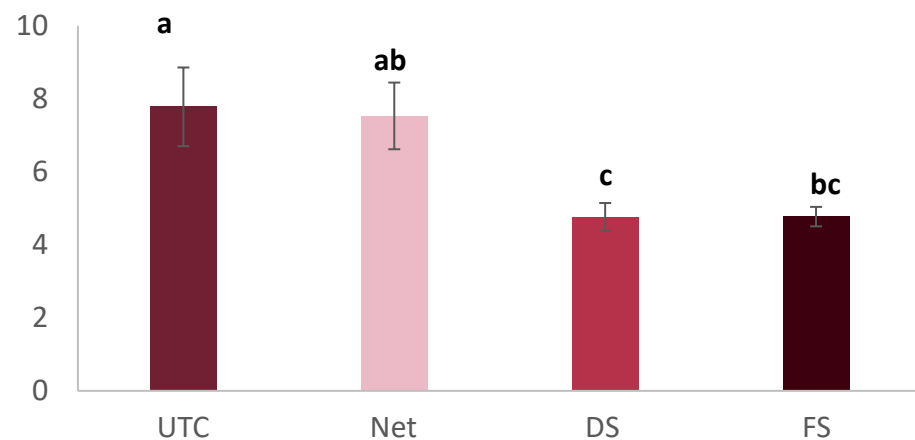
Frutos totales/árbol

$p=0,003$



Producción total/árbol (kg)

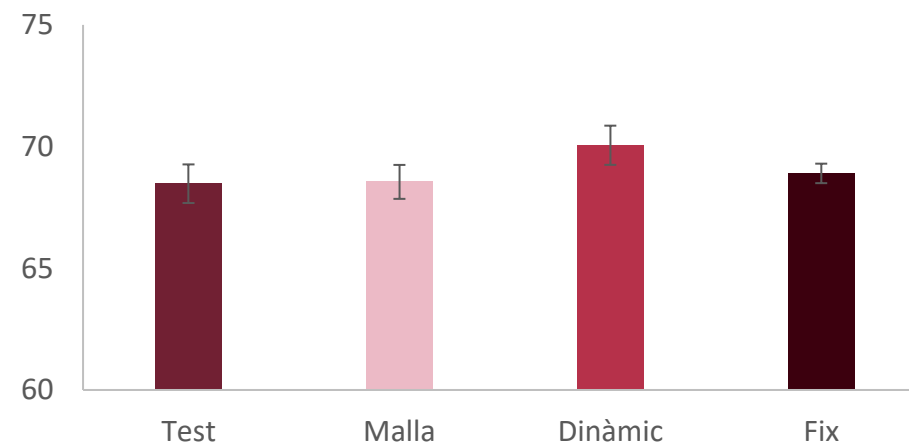
$p=0,005$



2025

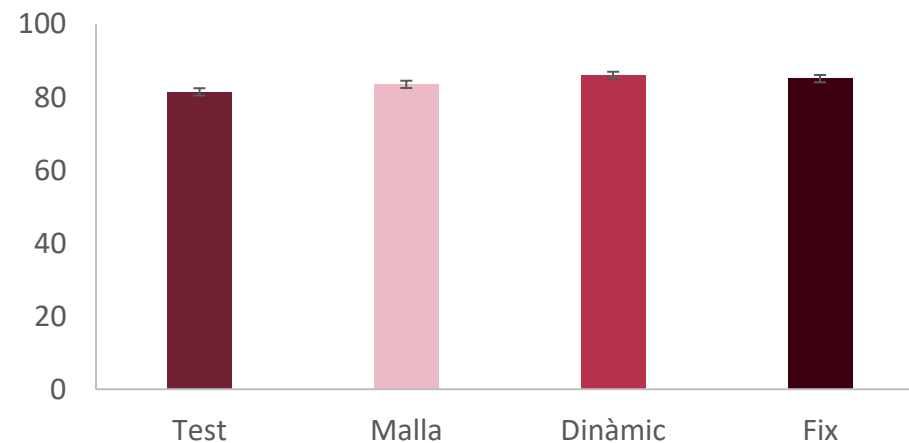
Calibre fruto (mm)

NS



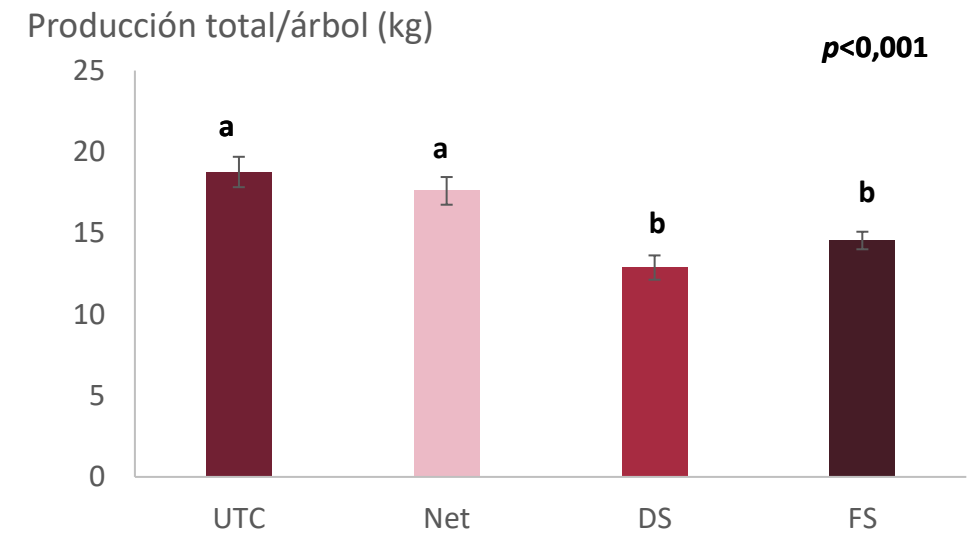
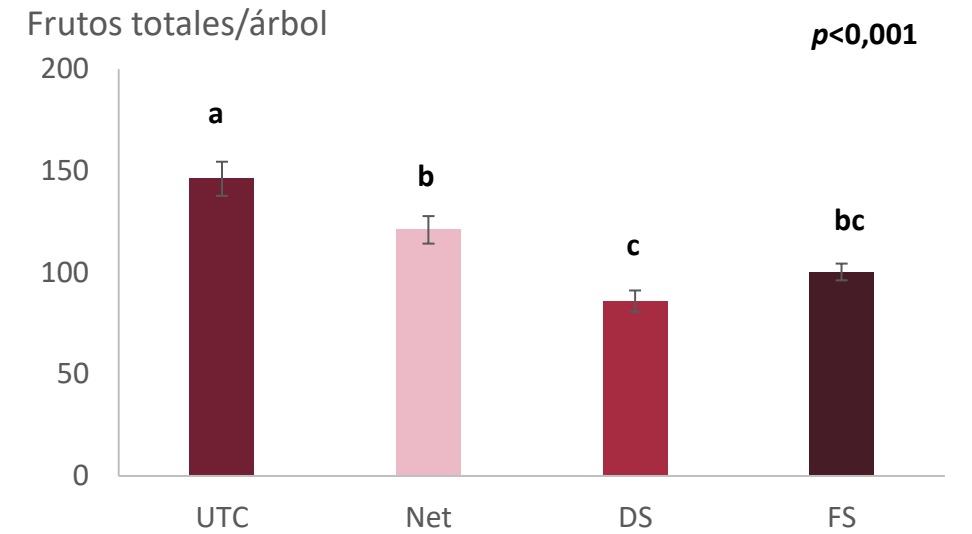
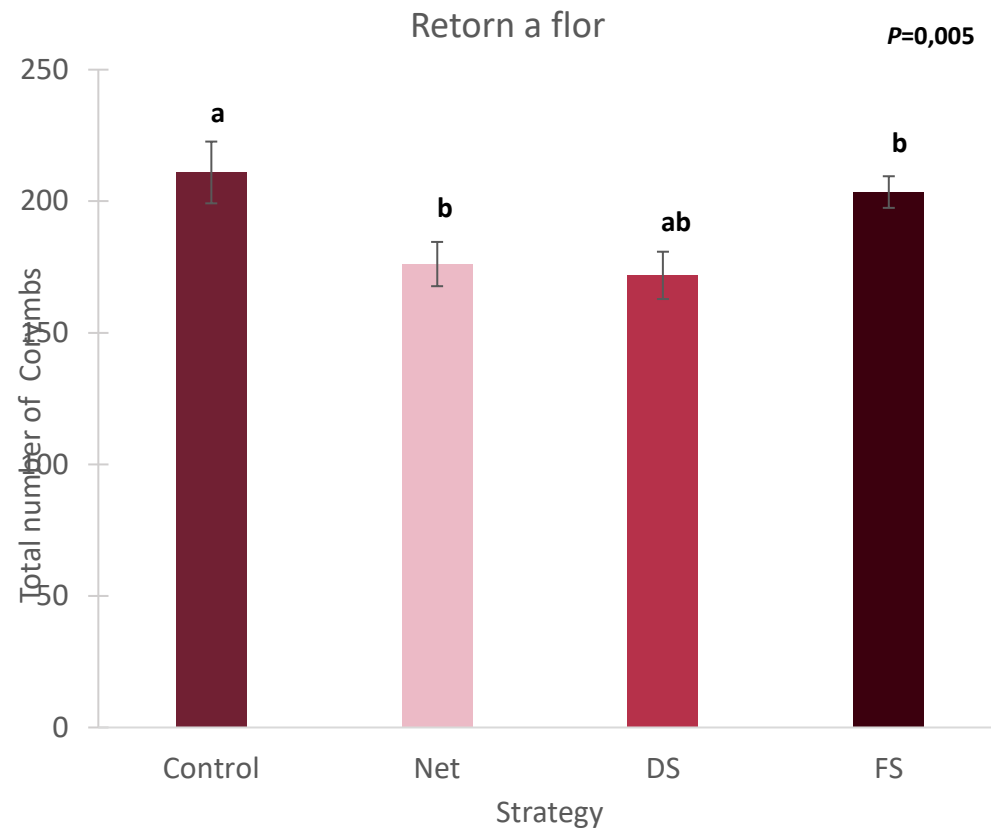
Calibre >65mm (%)

NS



Parámetros de producción - Gala

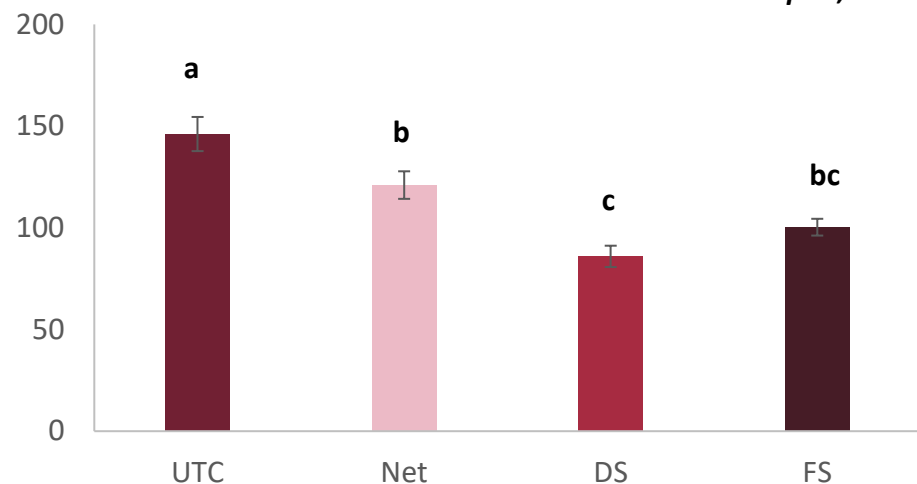
2025



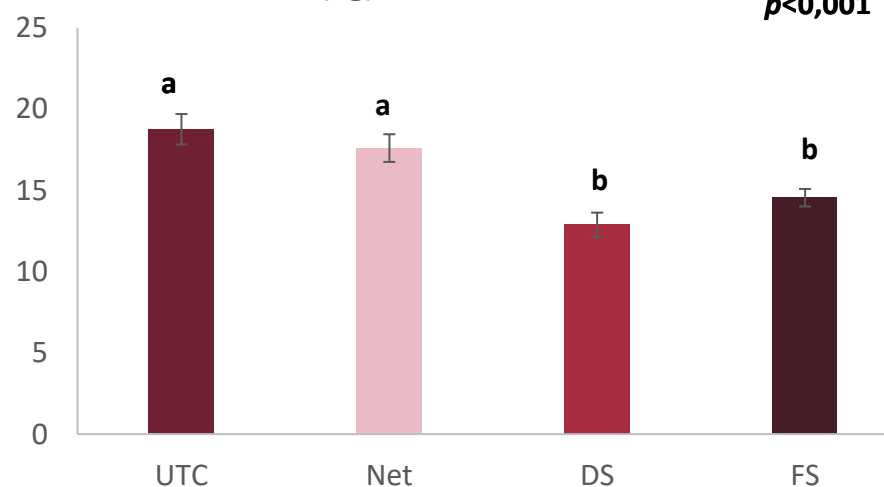
Parámetros de producción - Gala

2025

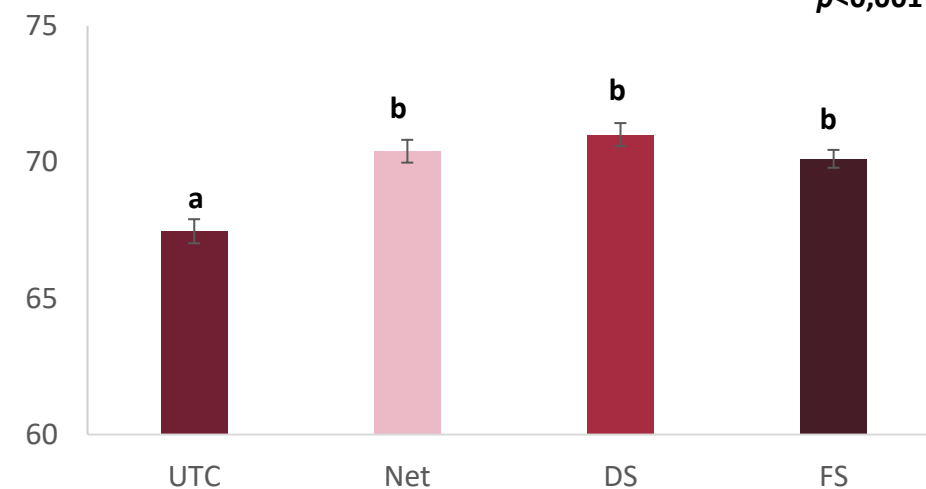
Frutos totales/árbol



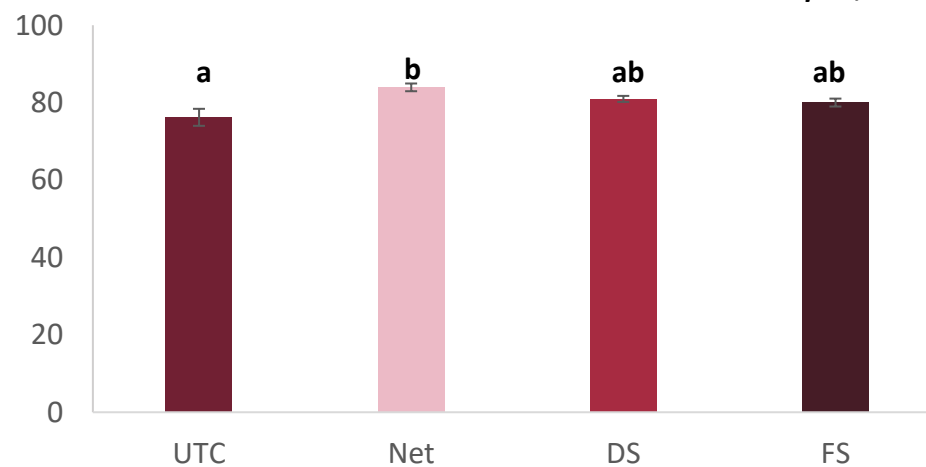
Producción total/árbol (kg)



Calibre fruto (mm)



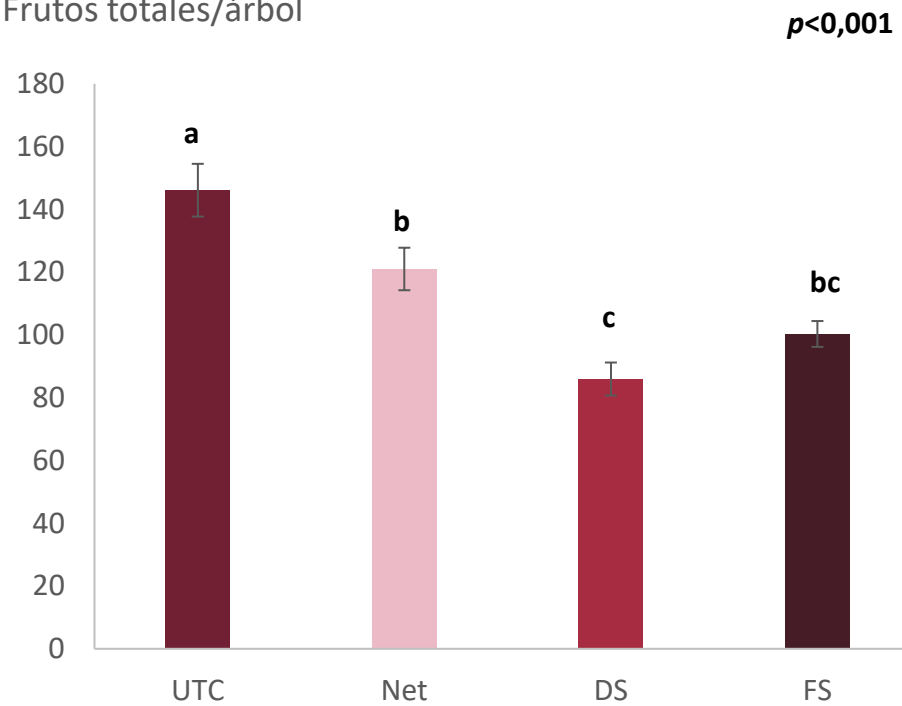
Calibre >65mm (%)



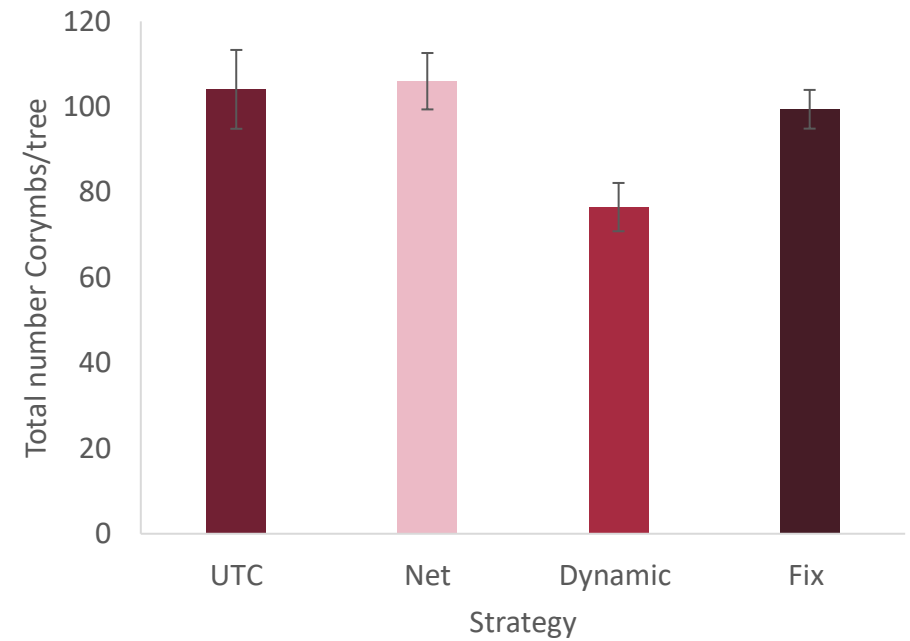
Parámetros de producción - Gala

2025

Frutos totales/árbol

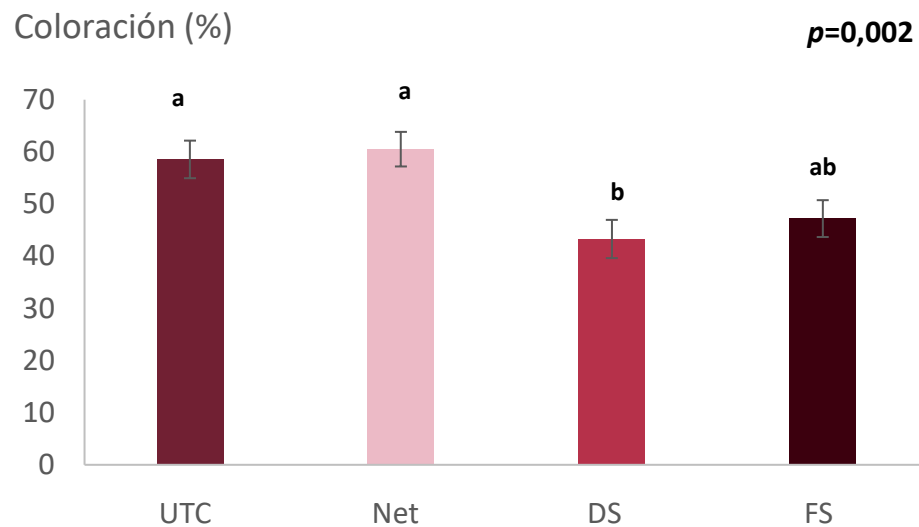


Retorno a flor

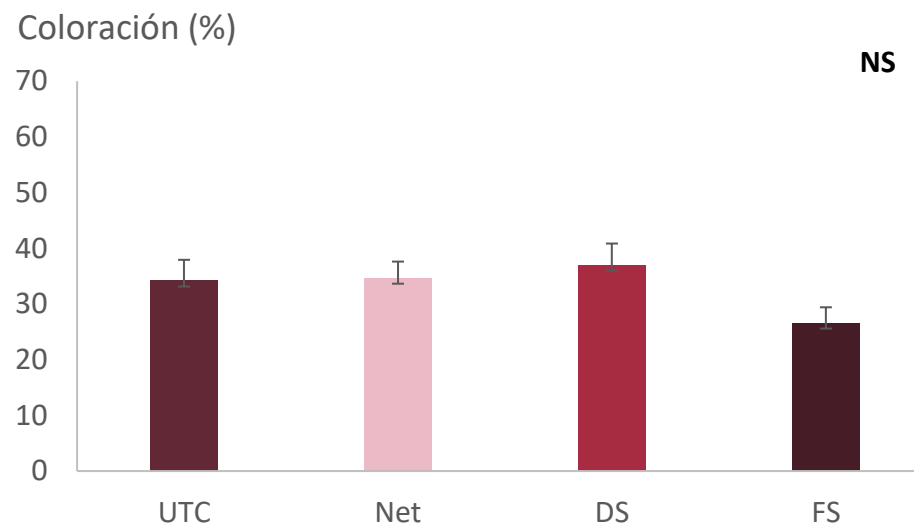


Parámetros de producción - Gala

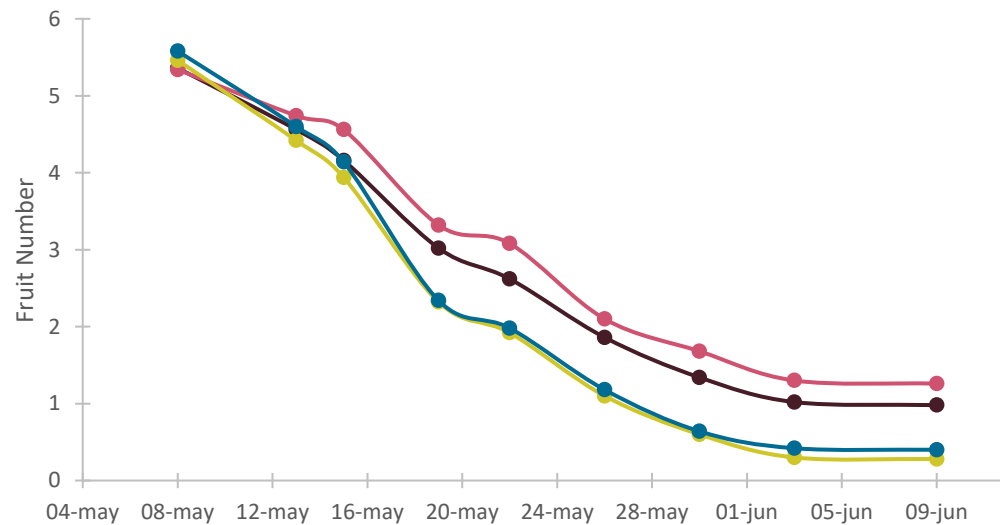
2024



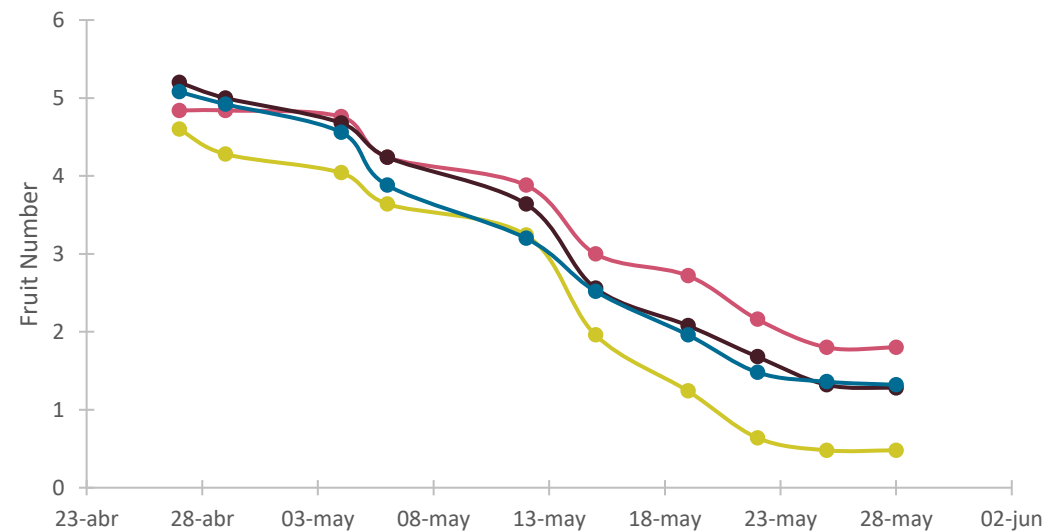
2025



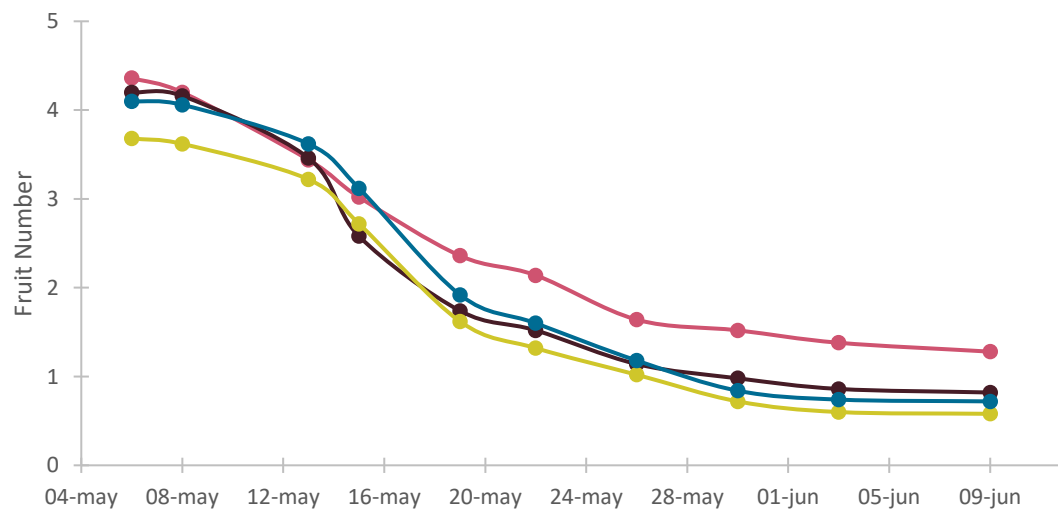
Thinning Dynamics Gala All



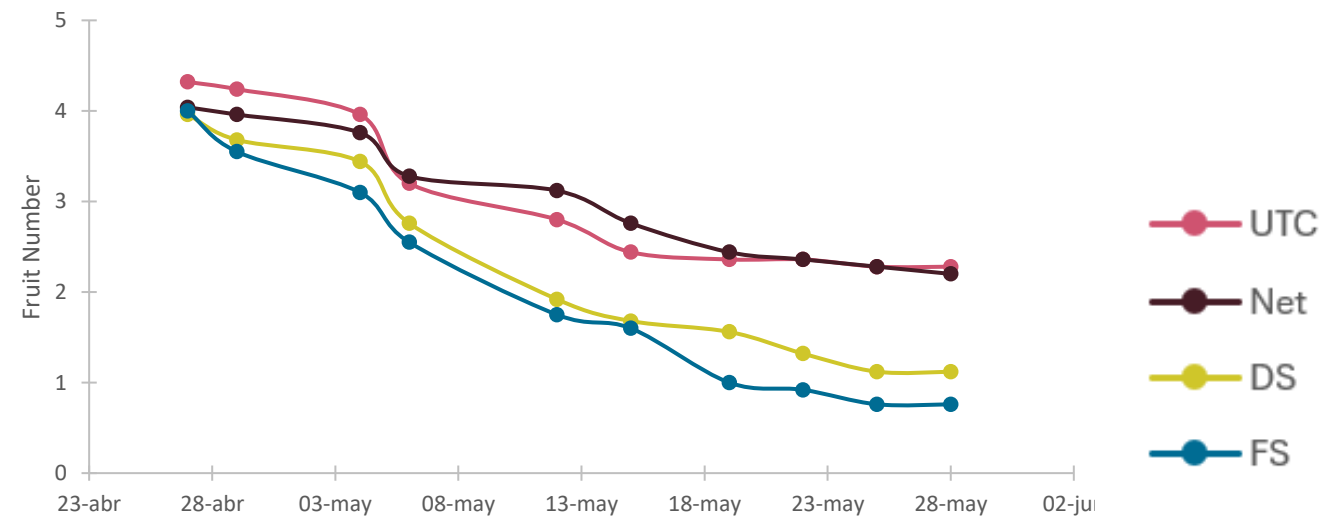
Thinning Dynamics Gala All



Thinning Dynamics Golden All



Thinning Dynamics Golden All





Agrovoltaisme?

- Conreu
- Varietat
- Maneig del conreu
- Gestió energètica



Moltes gracies

