

# FRUITFUL CONNECTIONS.

FRUIT  
LOGISTICA

Berlin 5|6|7 Feb 2025



# MICROCLIMATE, YIELD AND COLD STORAGE WITH DIFFERENT PLASTIC COVERS ON TABLE GRAPES

Experimental Trial by CREA-VE and RETILPLAST SRL

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# Agenda

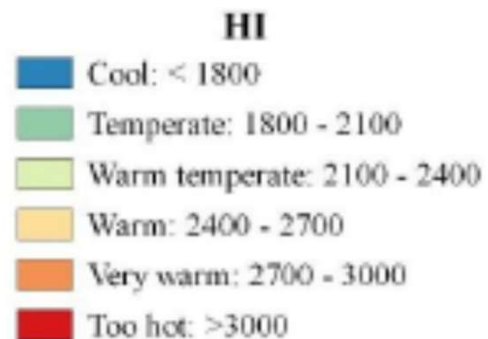
- ☐ Introduction
- ☐ Climate change
- ☐ Materials
- ☐ Plastic cover properties
- ☐ Effects on yield and morphological aspects
- ☐ Cold storage
- ☐ Future scenarios

# INTRODUCTION

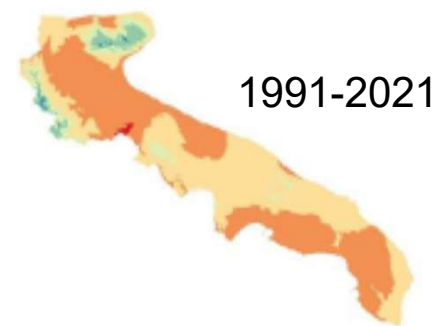
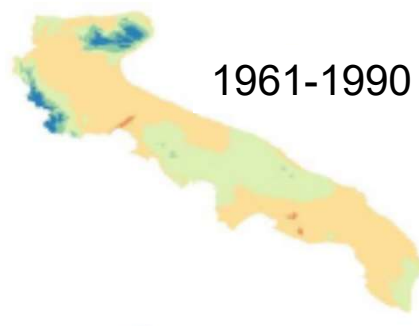
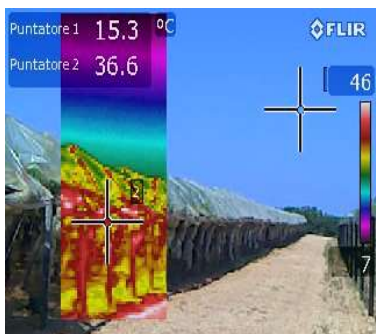


# Climate change

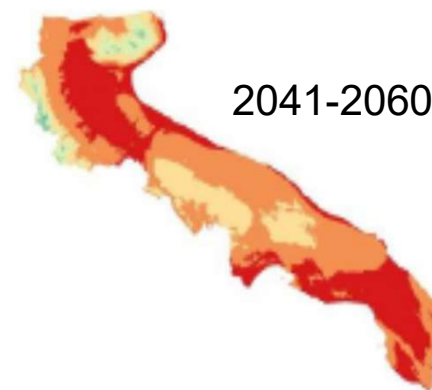
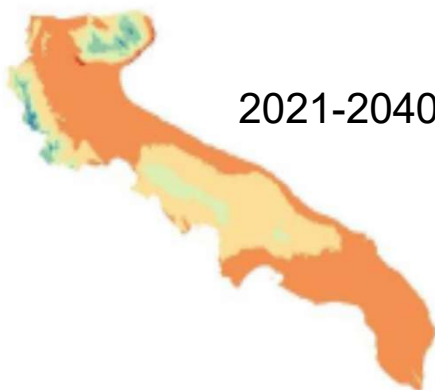
## Historical data



Huglin' index  
regions



## Forecasted data

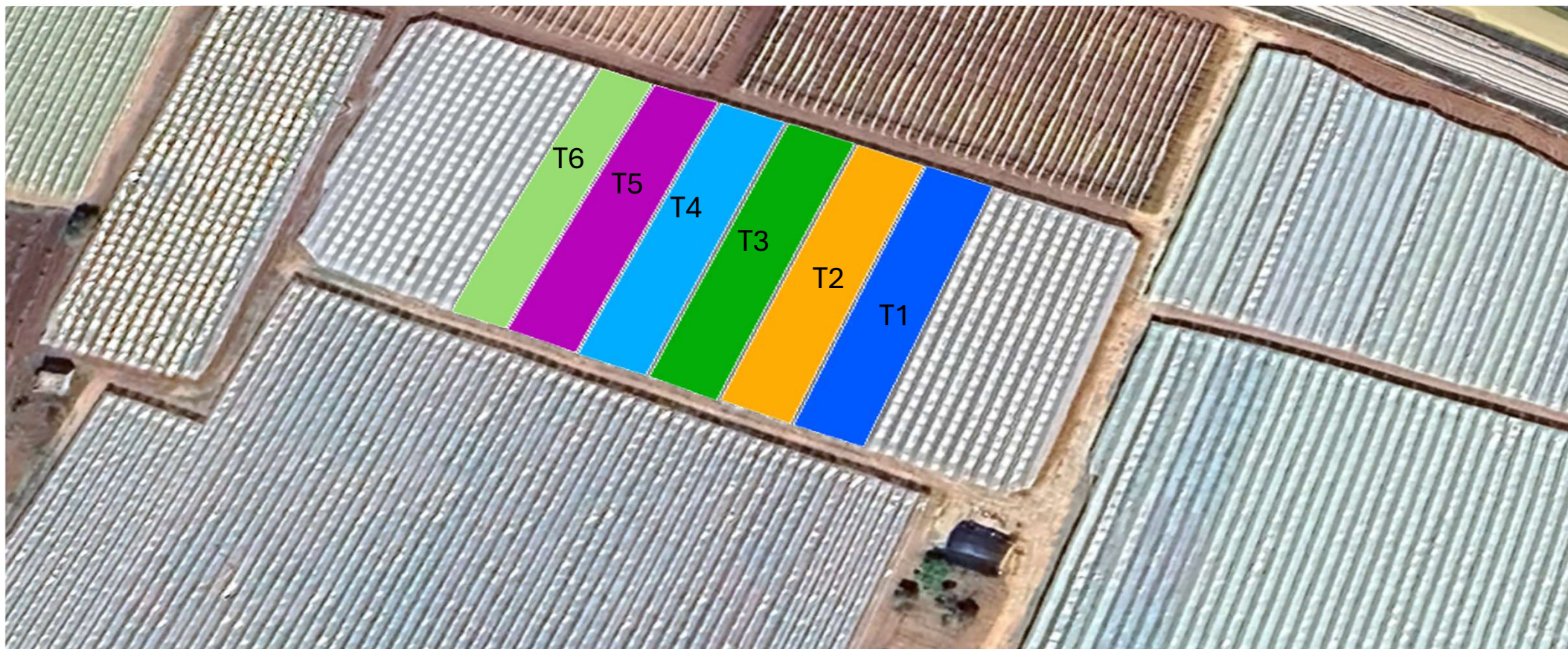


- Six different plastic covers (T1-T2-T3-T4-T5-T6)
- Seedless variety “Autumn Crisp”.
- Cold storage behavior.

## The main targets:

- To provide ripe grapes as soon as possible.
- To find the best indicators to consider the variety ready for harvesting and cold storage condition.
- To preserve the most of freshness as long as possible in cold storage.

## EXPERIMENTAL FIELD SET-UP

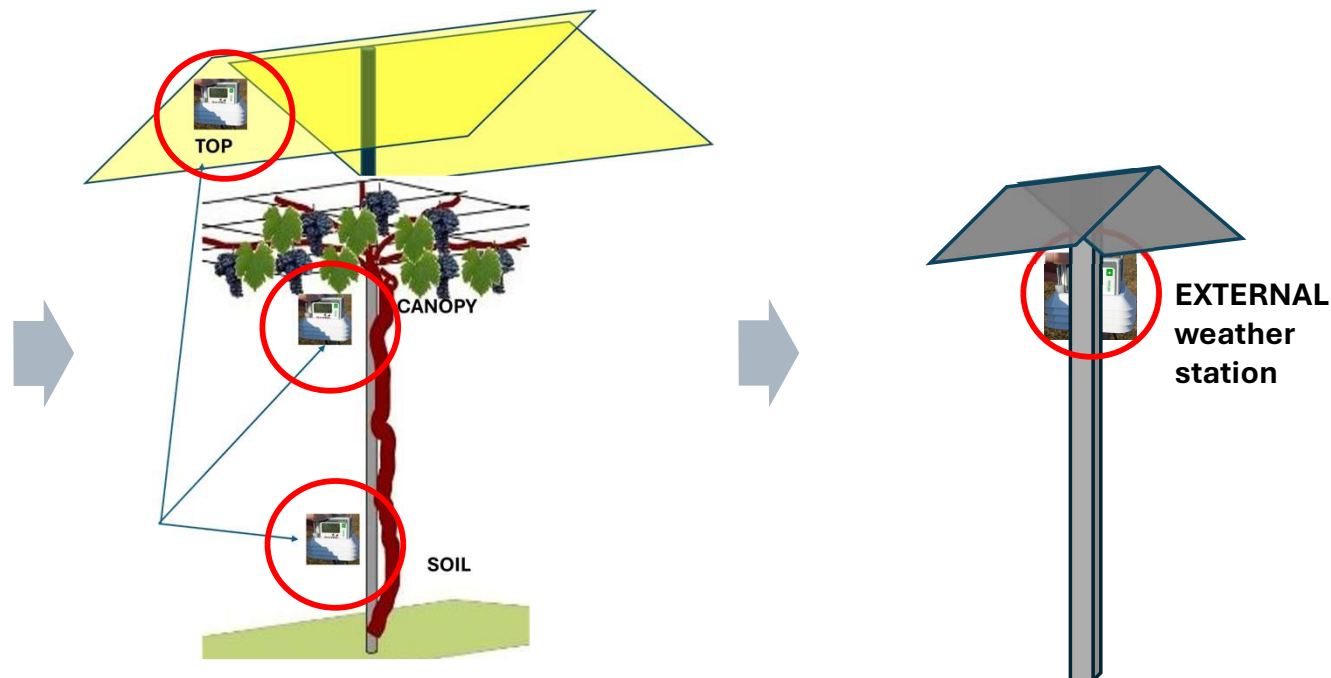


Vineyard in NOICATTARO COUNTRYSIDE - BA

## THERMAL ANALYSIS WEATHER STATIONS - WATCH DOG

Each plastic covering was investigated using  
n.3 Watch Dog weather stations, installed in the following positions (raw):

1. Over the canopy (TOP);
2. Near the canopy (CANOPY);
3. Near the soil (SOIL).



N.18 WEATHER STATIONS recorded continuously

Temperature and  
Relative Humidity  
at 1-hour intervals.

The thermal data were classified in daytime and nighttime (sunrise and sunset in function of the position of the vineyard and corrected astronomically).

## THERMAL AVERAGED DIFFERENCE

Period: 7<sup>th</sup> June – 15<sup>th</sup> November 2024

T°C  
Mean

| T-MIN [°C] | T-MAX [°C] | T-MED [°C] |
|------------|------------|------------|
| 7.00       | 39.00      | 26.26      |
| 7.50       | 34.10      | 20.68      |
|            |            |            |
| 7.00       | 37.40      | 25.66      |
| 7.80       | 36.10      | 25.40      |
| 7.90       | 37.70      | 25.95      |
| 7.00       | 37.80      | 25.80      |
| 6.90       | 42.00      | 26.35      |
| 7.80       | 37.20      | 25.53      |
|            |            |            |
| 7.40       | 31.10      | 20.46      |
| 8.10       | 30.10      | 20.40      |
| 8.10       | 30.60      | 20.67      |
| 7.30       | 31.20      | 20.41      |
| 7.20       | 31.30      | 20.35      |
| 8.00       | 30.60      | 20.51      |

T1

T2

T3

T4

T5

T6

RH %  
Mean

| RH-MIN [%] | RH-MAX [%] | RH-MED [%] |
|------------|------------|------------|
| 22.20      | 99.20      | 60.67      |
| 30.60      | 99.40      | 76.85      |
|            |            |            |
| 36.20      | 98.00      | 69.12      |
| 39.30      | 94.20      | 70.89      |
| 36.30      | 91.90      | 68.31      |
| 33.70      | 97.20      | 70.36      |
| 28.80      | 95.50      | 68.90      |
| 36.80      | 93.90      | 68.68      |
|            |            |            |
| 40.50      | 97.60      | 78.92      |
| 45.20      | 94.20      | 79.86      |
| 43.40      | 91.60      | 76.31      |
| 41.20      | 96.70      | 80.14      |
| 39.30      | 95.50      | 79.00      |
| 43.30      | 93.90      | 78.97      |

T1

T2

T3

T4

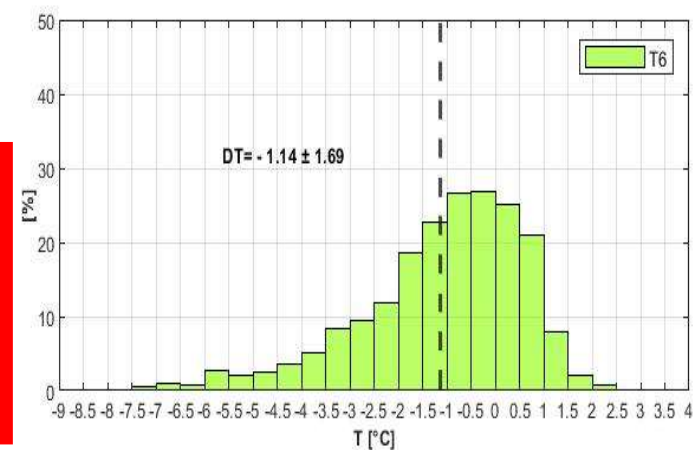
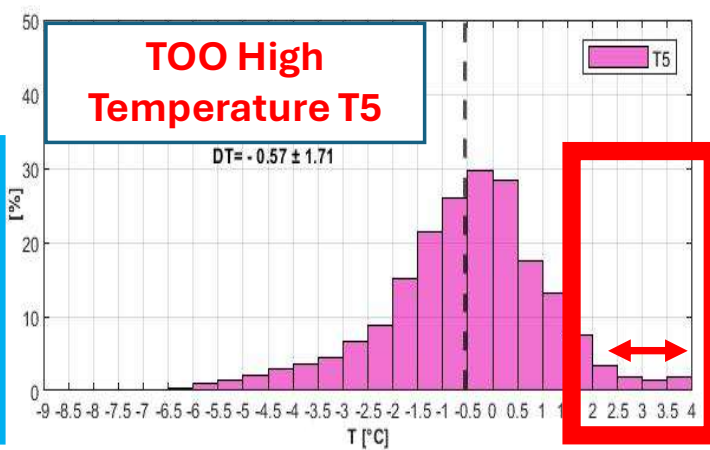
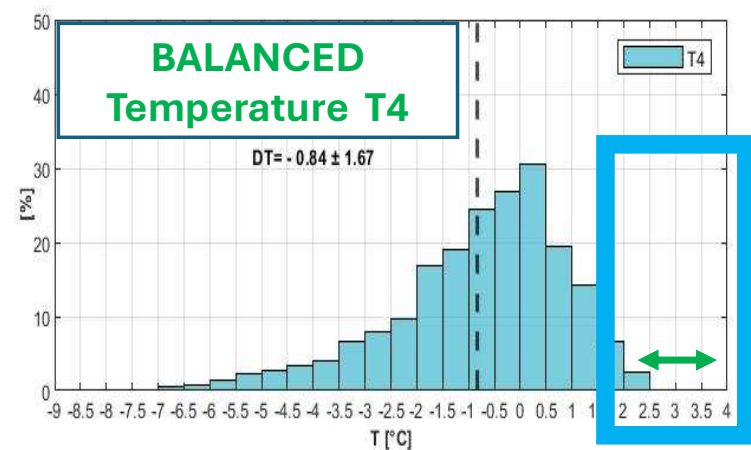
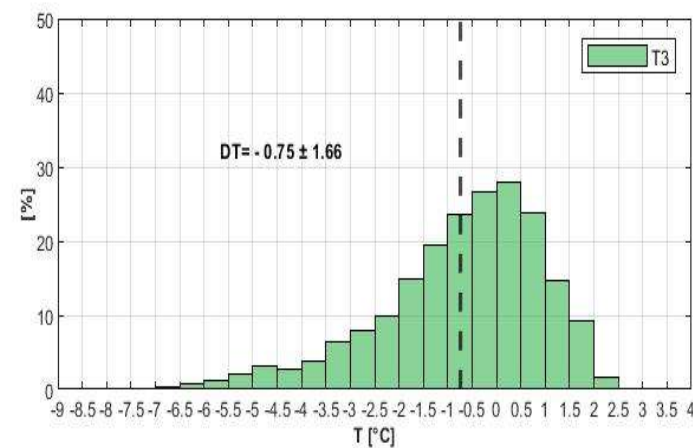
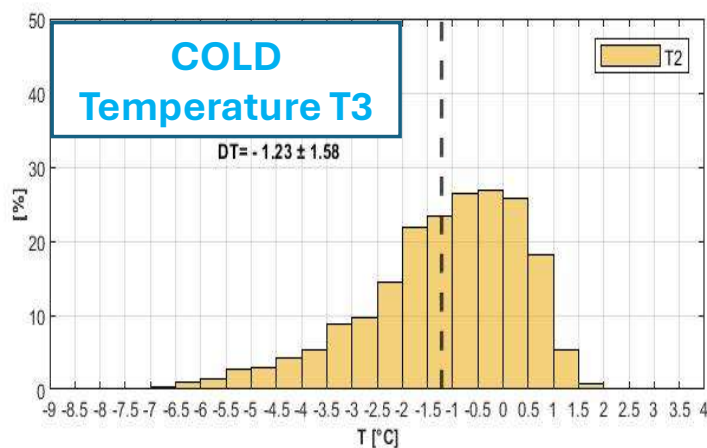
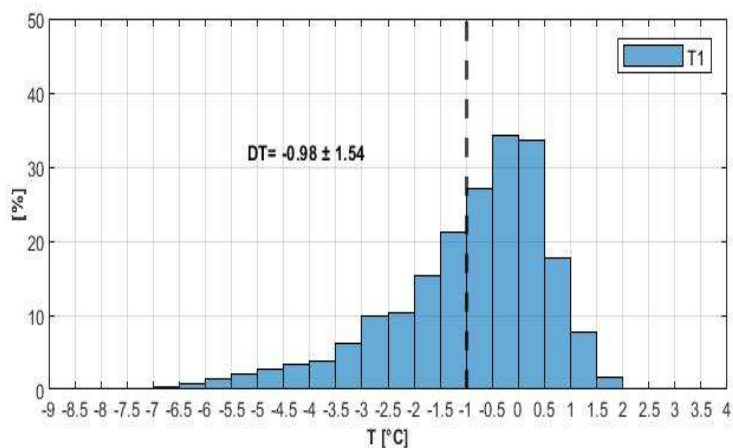
T5

T6

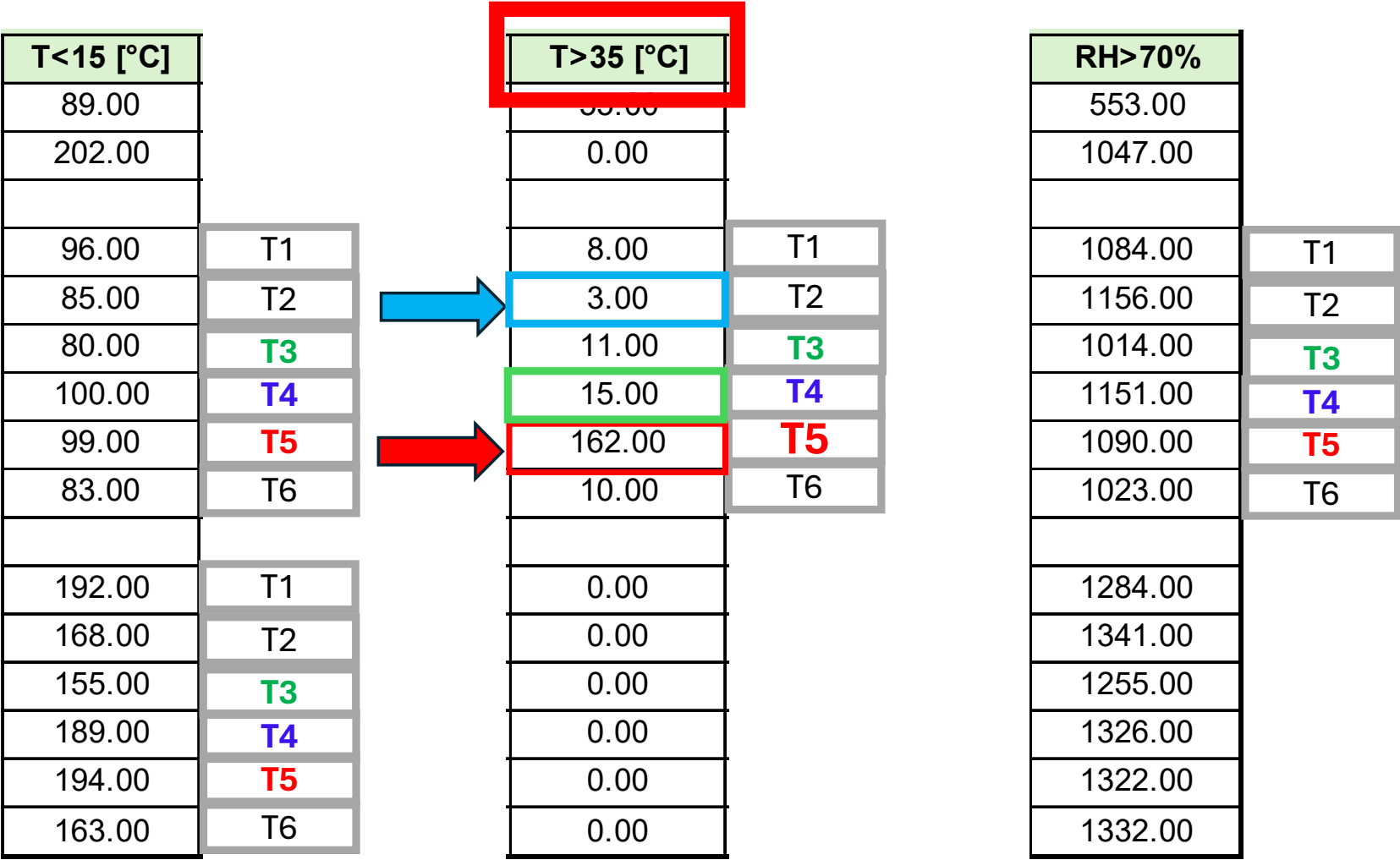
## Yield/ Organoleptic Analysis/ Rheology/ Colour

| Harvest           |                            |  |                           |  |                            |  |                            |  |                             |  |                             |  |         |
|-------------------|----------------------------|--|---------------------------|--|----------------------------|--|----------------------------|--|-----------------------------|--|-----------------------------|--|---------|
|                   | Plastic Films              |  |                           |  |                            |  |                            |  |                             |  |                             |  |         |
|                   | T1                         |  | T2                        |  | T3                         |  | T4                         |  | T5                          |  | T6                          |  | p level |
| Yield parameters  |                            |  |                           |  |                            |  |                            |  |                             |  |                             |  |         |
|                   |                            |  |                           |  |                            |  |                            |  |                             |  |                             |  |         |
| Yield * vine (kg) | 22.45 (6.88) <sup>b</sup>  |  | 33.42 (6.00) <sup>a</sup> |  | 31.29 (8.63) <sup>a</sup>  |  | 33.54 (9.48) <sup>a</sup>  |  | 28.88 (7.74) <sup>ab</sup>  |  | 28.70 (6.66) <sup>ab</sup>  |  | *       |
| TSS * vine (kg)   | 3.58 (1.09) <sup>b</sup>   |  | 5.23 (0.94) <sup>ab</sup> |  | 5.28 (1.45) <sup>ab</sup>  |  | 5.66 (1.60) <sup>a</sup>   |  | 4.33 (1.16) <sup>b</sup>    |  | 4.47 (1.04) <sup>b</sup>    |  | *       |
| Yield * Ha (t)    | 35.92 (11.01) <sup>b</sup> |  | 53.47 (9.61) <sup>a</sup> |  | 50.06 (13.81) <sup>a</sup> |  | 53.67 (15.17) <sup>a</sup> |  | 46.21 (12.39) <sup>ab</sup> |  | 45.93 (10.66) <sup>ab</sup> |  | *       |

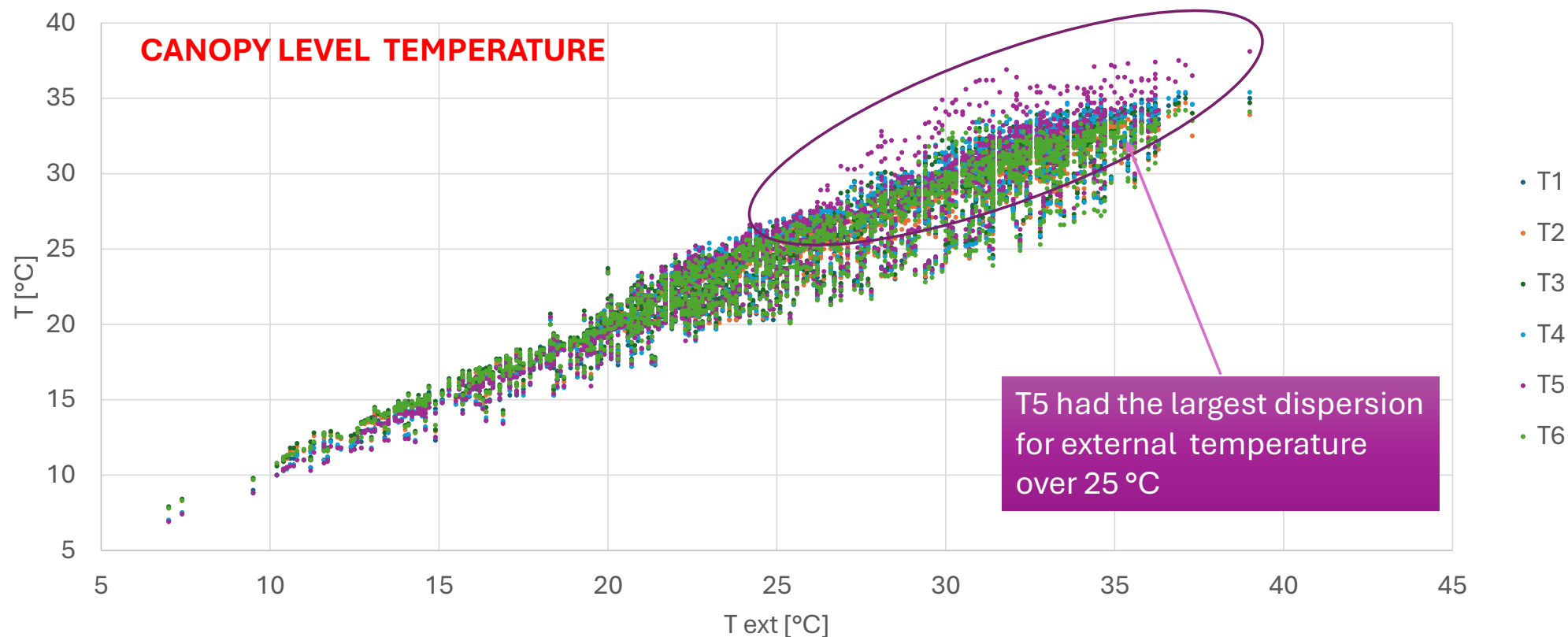
# THERMAL DIFFERENCES DISTRIBUTIONS



# THRESHOLDS OF THERMAL DIFFERENCES DISTRIBUTIONS

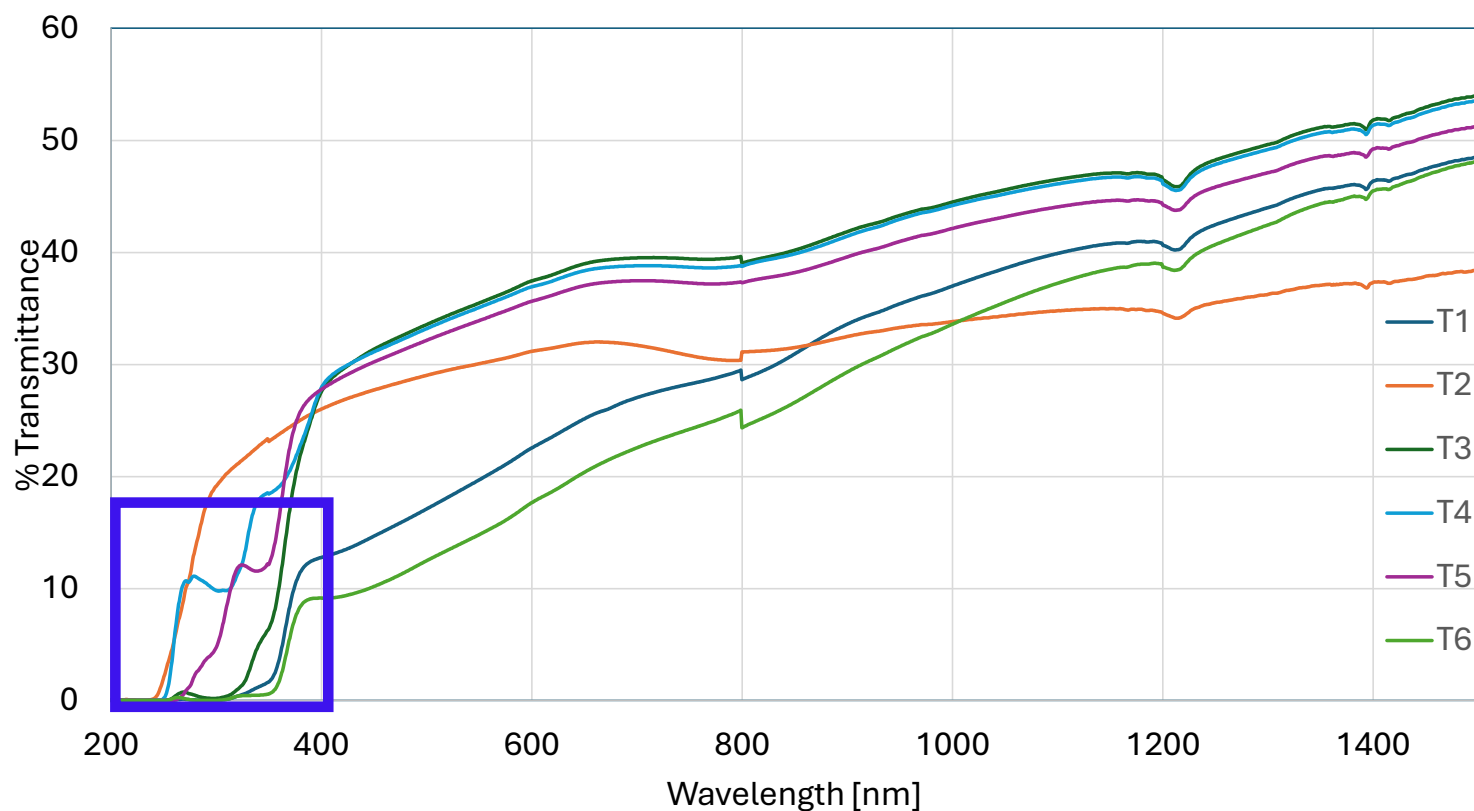


## THERMAL CORRELATION BETWEEN THE TEMPERATURE OF CANOPY AND EXTERNAL TEMPERATURE - DAYTIME



# ORIGINS OF THE THERMAL DIFFERENCES

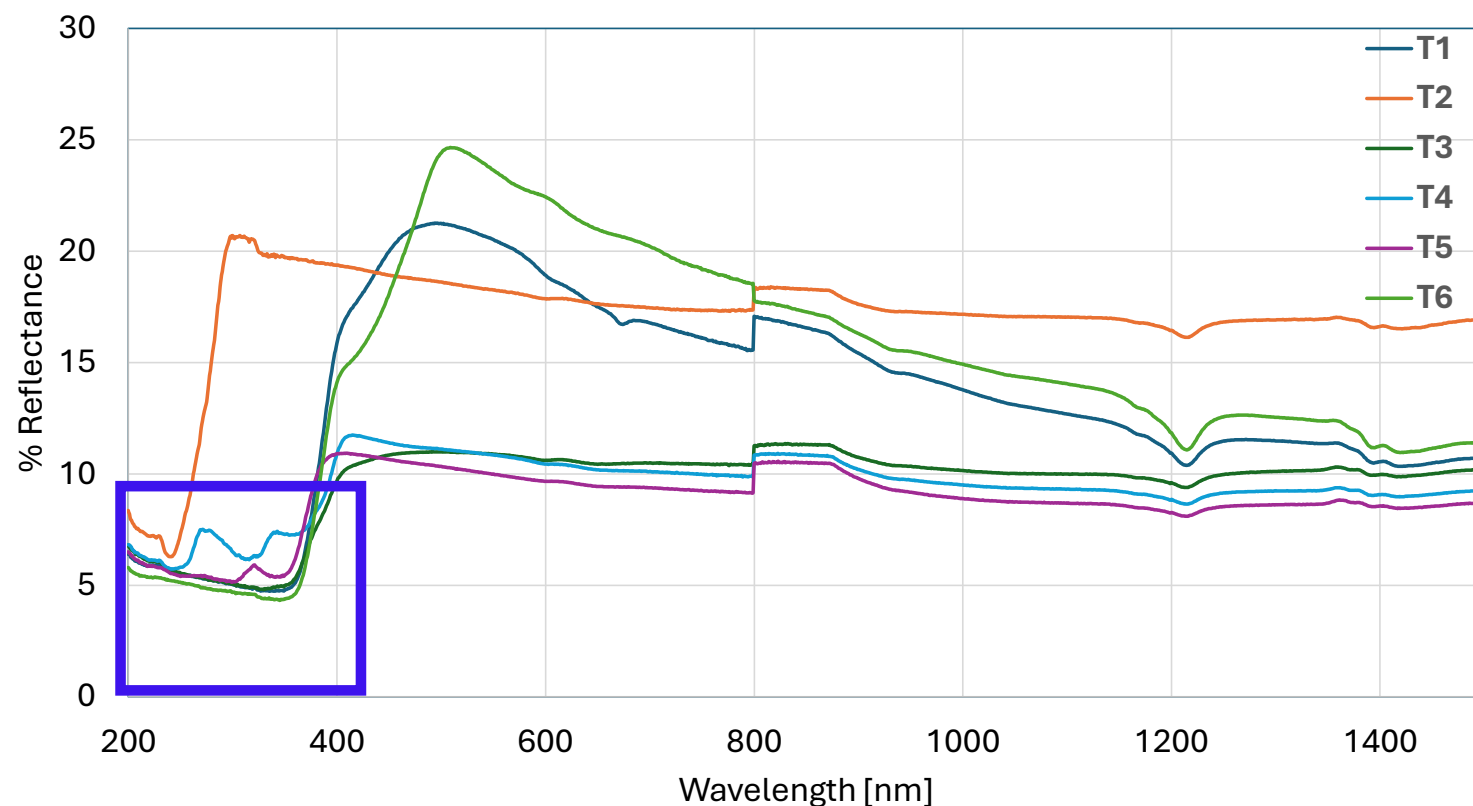
## TRANSMITTANCE



### ➤ Transmittance

**Measure of transmitting radiant energy** and represent the fraction of incident electromagnetic power that is transmitted through a sample.

## REFLECTANCE



### ➤ Reflectance

**Measure of the reflected part of the incident light on a given surface or material.** It is the ratio between the intensity of the reflected radiant flux and the intensity of the incident radiant flux.

## Yield/Organoleptic Analysis/**Rheology**/Colour/Morphology

### Harvest

|                  | Plastic Film                |  |                            |  |                           |  |                             |  |                            |  |                             |  |         |
|------------------|-----------------------------|--|----------------------------|--|---------------------------|--|-----------------------------|--|----------------------------|--|-----------------------------|--|---------|
|                  | T1                          |  | T2                         |  | T3                        |  | T4                          |  | T5                         |  | T6                          |  | p level |
| Texture          |                             |  |                            |  |                           |  |                             |  |                            |  |                             |  |         |
| Springiness (mm) | 3.08 (0.28) <sup>a</sup>    |  | 3.05 (0.19) <sup>a</sup>   |  | 3.01 (0.31) <sup>ab</sup> |  | 2.98 (0.18) <sup>ab</sup>   |  | 3.08 (0.27) <sup>a</sup>   |  | 2.91 (0.25) <sup>b</sup>    |  | *       |
| Gumminess (N)    | 14.82 (4.87) <sup>a</sup>   |  | 12.94 (2.80) <sup>b</sup>  |  | 12.80 (2.45) <sup>b</sup> |  | 14.40 (3.80) <sup>ab</sup>  |  | 12.91 (4.29) <sup>b</sup>  |  | 14.92 (3.79) <sup>a</sup>   |  | *       |
| Chewiness (mJ)   | 46.03 (16.09) <sup>a</sup>  |  | 39.38 (8.34) <sup>b</sup>  |  | 38.88 (9.72) <sup>b</sup> |  | 42.94 (10.90) <sup>ab</sup> |  | 39.54 (12.46) <sup>b</sup> |  | 43.59 (11.39) <sup>ab</sup> |  | * *     |
| Cohesiveness (-) | 0.44 (0.08) <sup>a</sup>    |  | 0.40 (0.05) <sup>b</sup>   |  | 0.42 (0.07) <sup>ab</sup> |  | 0.43 (0.06) <sup>a</sup>    |  | 0.42 (0.06) <sup>ab</sup>  |  | 0.42 (0.05) <sup>ab</sup>   |  | *       |
| Hardness (N)     | 34.12 (10.31) <sup>ab</sup> |  | 31.05 (9.60) <sup>bc</sup> |  | 30.26 (5.60) <sup>c</sup> |  | 33.04 (7.26) <sup>abc</sup> |  | 29.78 (7.27) <sup>c</sup>  |  | 35.28 (7.84) <sup>a</sup>   |  | **      |
| Resilience       | 0.27 (0.04) <sup>c</sup>    |  | 0.30 (0.06) <sup>ab</sup>  |  | 0.34 (0.10) <sup>a</sup>  |  | 0.29 (0.07) <sup>bc</sup>   |  | 0.26 (0.04) <sup>c</sup>   |  | 0.31 (0.07) <sup>ab</sup>   |  | ***     |



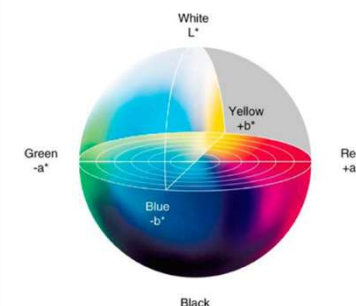
## Yield/ **Organoleptic Analysis**/ Rheology/ Colour /Morphology

| Harvest                 |                |                |               |               |              |               |         |  |
|-------------------------|----------------|----------------|---------------|---------------|--------------|---------------|---------|--|
|                         | Plastic Films  |                |               |               |              |               |         |  |
|                         | T1             | T2             | T3            | T4            | T5           | T6            | p level |  |
| Organoleptic parameters |                |                |               |               |              |               |         |  |
| TSS (°Brix)             | 15.95 (1.57)ab | 15.65 (0.17)ab | 16.9 (0.98)a  | 16.87 (0.45)a | 15 (1.38)b   | 15.6 (0.28)ab | *       |  |
| TA (g/L)                | 3.88 (0.10)b   | 4.15 (0.25)b   | 4.75 (00.74)b | 4.94 (0.74)b  | 5.02 (0.75)a | 4.93 (0.92)b  | *       |  |
| pH                      | 3.91 (0.14)    | 3.91 (0.07)    | 3.87 (0.07)   | 3.97 (0.10)   | 3.91 (0.18)  | 3.90 (0.04)   | n.s.    |  |

## Yield/ Organoleptic Analysis/ Rheology/ **Colour** /Morphology

| Harvest |                |                            |               |                |               |                |         |  |
|---------|----------------|----------------------------|---------------|----------------|---------------|----------------|---------|--|
|         | Plastic Film   |                            |               |                |               |                |         |  |
| CIELAB  | T1             | T2                         | T3            | T4             | T5            | T6             | p level |  |
| L *     | 44.94 (2.61)a  | 43.83 (2.35)b              | 43.38 (2.64)b | 44.25 (1.90)a  | 43.87 (2.12)b | 43.73 (2.65)b  | *       |  |
| a *     | -3.43 (0.48)ab | -3.51 (0.38)a              | -3.23 (0.44)c | -3.45 (0.40)ab | -3.59 (0.44)a | -3.32 (0.37)bc | **      |  |
| b *     | 11.20 (1.69)ab | 10.92 (1.38)a <sub>b</sub> | 10.58 (1.78)b | 11.00 (1.90)ak | 11.54 (1.87)a | 10.64 (1.37)b  | *       |  |

Fig. 8 - Analisi di colore CIELAB



## Yield/ Organoleptic Analysis/ Rheology/ Colour /Morphology

### Harvest

|                          | Plastic Films                |  |                              |  |                              |  |                               |  |                               |  |                              |  |         |
|--------------------------|------------------------------|--|------------------------------|--|------------------------------|--|-------------------------------|--|-------------------------------|--|------------------------------|--|---------|
|                          | T1                           |  | T2                           |  | T3                           |  | T4                            |  | T5                            |  | T6                           |  | p level |
| Morphological parameters |                              |  |                              |  |                              |  |                               |  |                               |  |                              |  |         |
| Bunch weight (g)         | 732.06 (282.55) <sup>b</sup> |  | 930.99 (236.74) <sup>c</sup> |  | 787.68 (201.50) <sup>b</sup> |  | 845.07 (285.11) <sup>ab</sup> |  | 870.05 (294.22) <sup>ab</sup> |  | 753.48 (287.54) <sup>b</sup> |  | *       |
| Berry weight (g)         | 11.37 (11.28) <sup>a</sup>   |  | 11.51 (0.87) <sup>a</sup>    |  | 11.05 (1.54) <sup>a</sup>    |  | 9.70 (1.77) <sup>ab</sup>     |  | 10.78 (11.51) <sup>a</sup>    |  | 11.23 (11.66) <sup>a</sup>   |  | *       |
| Bunch width (g)          | 14.53 (2.69) <sup>b</sup>    |  | 15.79 (22.79) <sup>ab</sup>  |  | 15.81 (2.38) <sup>ab</sup>   |  | 16.33 (2.77) <sup>a</sup>     |  | 15.89 (2.78) <sup>ab</sup>    |  | 15.09 (3.16) <sup>ab</sup>   |  | *       |
| Rachis weight (g)        | 12.80 (6.06) <sup>b</sup>    |  | 14.68 (4.78) <sup>ab</sup>   |  | 13.46 (4.14) <sup>ab</sup>   |  | 15.81 (5.92) <sup>a</sup>     |  | 17.06 (5.63) <sup>a</sup>     |  | 13.71 (4.67) <sup>ab</sup>   |  | *       |



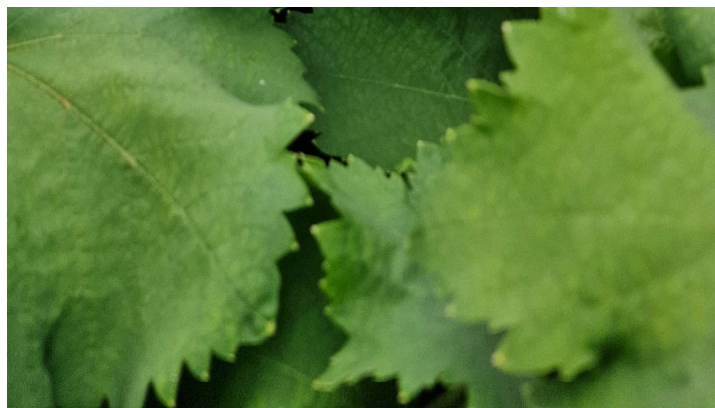
0.7

# NDVI - Satellite Sentinel2 (2024)



August

0.2



# FRUITFUL CONNECTIONS.

FRUIT  
LOGISTICA

Berlin 5|6|7 Feb 2025

