

# Getting the climate under control

*"Now there is still time for it"*

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# Introduction

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Senior consultant at   
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- Chrysanthemum



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- Chrysanthemum
- Cutflowers
- Cannabis



# Short recap 13th of April

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**In Cannabis the diversity  
is (still) high**

# Short recap 13th of April

Cannabis is just an ordinary crop/plant  
There is a lot to learn from other horticultural crops!

Therefore we mentioned for instance on the 13th of April:  
Pick and produce your cuttings like it is done in the common  
horticultural industry

And therefore we prefer to look for the climate control at other  
crops like tomato, chrysanthemum

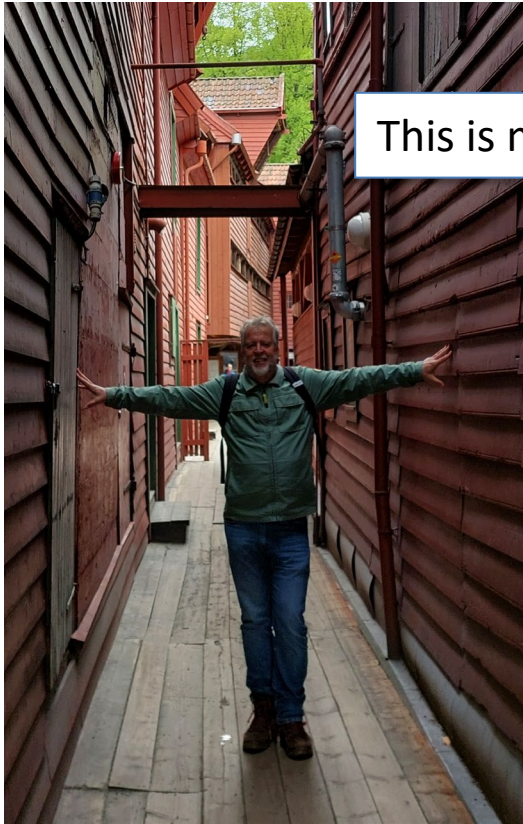
# Why cannabis is just a plant like other plants



This is me



# Why cannabis is just a plant like other plants

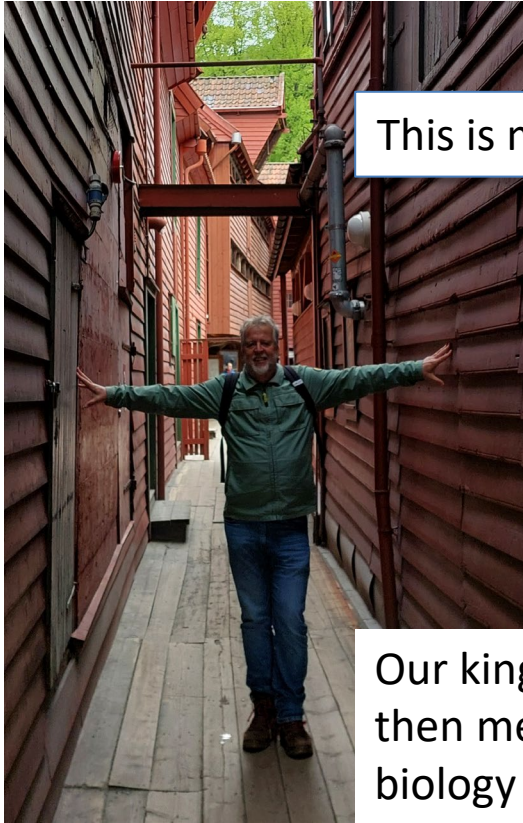


This is me



And this is our King

# Why cannabis is just a plant like other plants



This is me



And this is our King

Our king Willem Alexander is much more special than me, but we both have more or less the same biology

# The same for cannabis compared to other crops

More or less the same biology

Special about cannabis is the post-harvest  
&

The fact that the plant can be used for a lot  
of purposes



What can / must we learn from other horticultural crops in optimizing the climate strategy of growing cannabis?



AGREE



Okay

**LET'S  
GO!!**

# Some facts on flower formation -1-

When the night is longer than 7 hours the plant starts on the flower formation

The size of the flower is decided in the vegetative stage & the first 2 weeks of the generative stage

A negative DIF (lower night temperature – higher day temperature) resultst in a bigger flower

# Some facts on flower formation -2-

A lower 24 hour temperature with the same light level gives a higher yield

And vice versa – a higher light level with the same 24 hour temperature gives a higher yield (so this is not like in tomato, but like in chrysanthemum)

A low RH or a high in and output of energy in the generative stage gives a smaller flower (with a response time a few days shorter)

And again vice versa – so a high RH and little in and output of energy gives a bigger flower with a slower response time



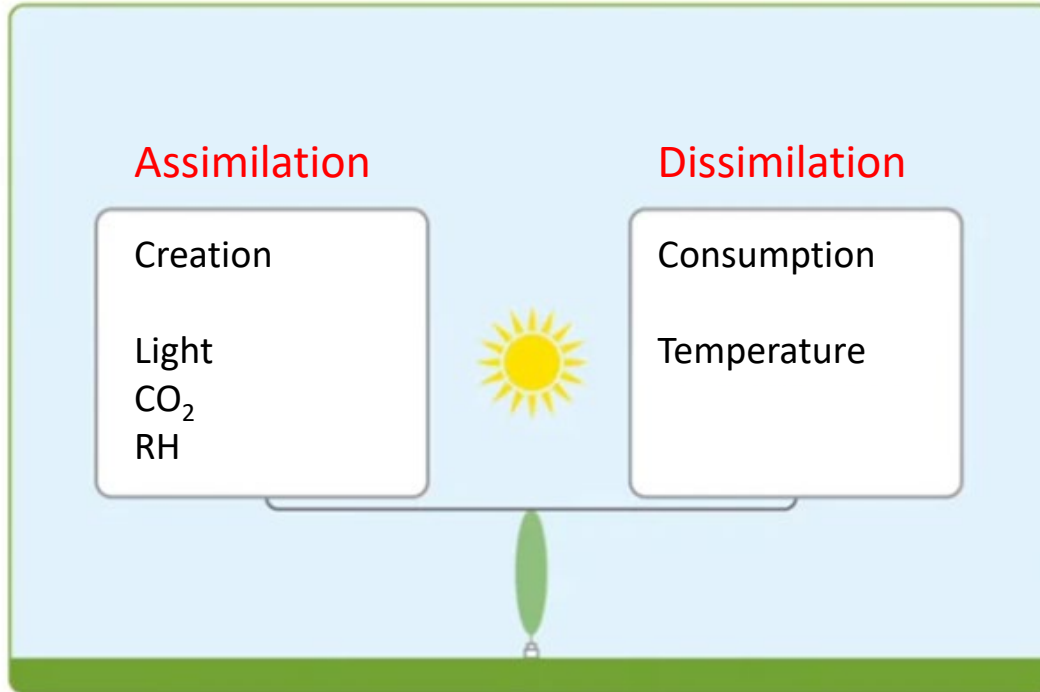
# Some facts on flower formation -3-

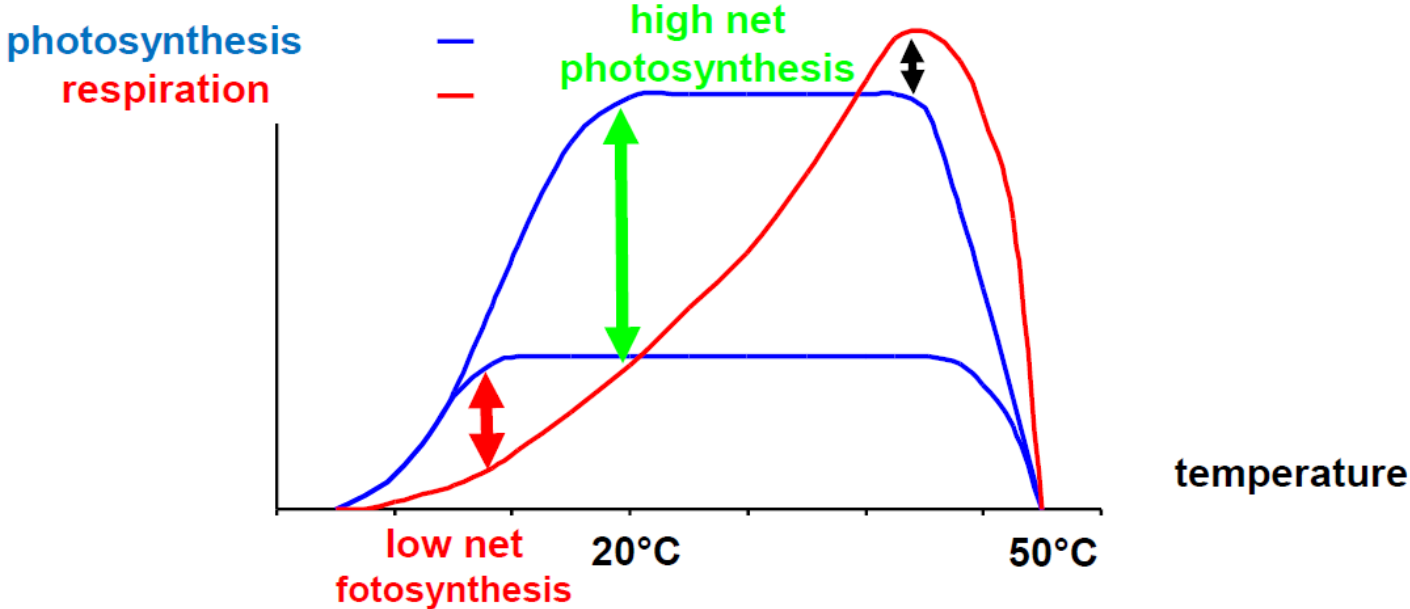
How resilient the flowers are against Botrytis is also mostly decided in the first 2 weeks of the generative stage – Calcium has to be build in when cells are just formed

In the end stage of the generative stage the flower is not very sensitive for environmental conditions (so giving more hours a day light is an option)

# Nett assimilation / Assimilate balance = Base for growth

Assimilatenbalans

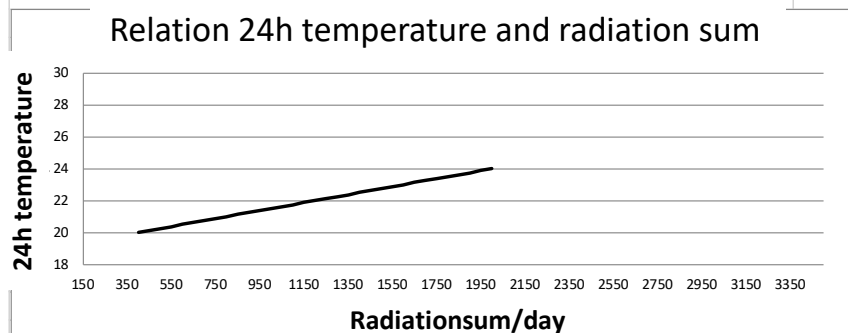




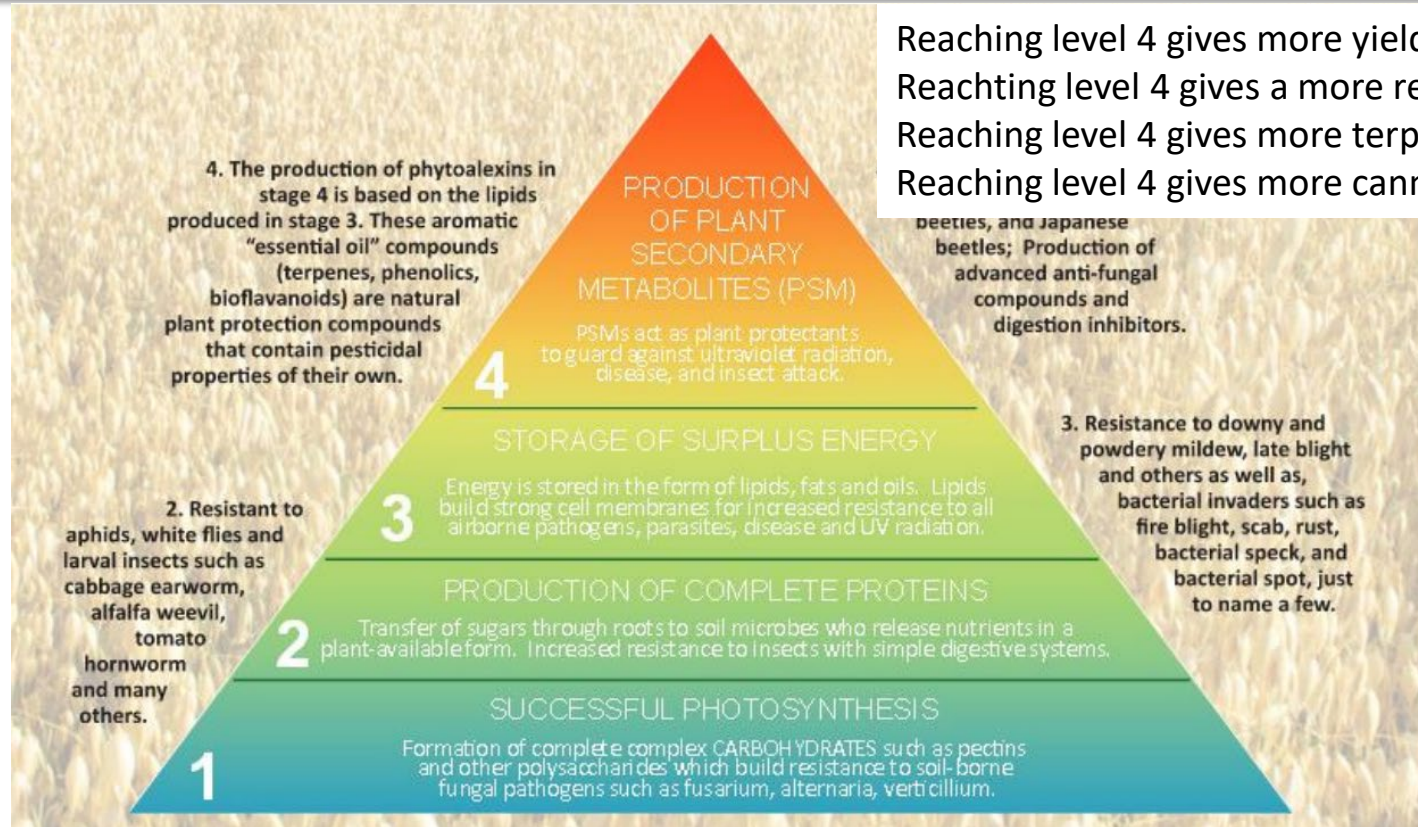
## Relation temperature radiationsum

week	day	24hour temp department	radiation sum outside	radiation level inside	hours	Total mol/m <sup>2</sup>	joules/cm <sup>2</sup>	Optimal 24hour temp
9	1							
9	2							
9	3	A very sunny day in a greenhouse Generative	3000			45,2	3000	26,5
9	4	A winter day in a greenhouse with 400 umol LED Generative	600	400	12	26,3	1748	23,4
9	5							
9	6	Indoor growing with 600 umol LED Generative		600	12	25,9	1722	23,3
9	7	Indoor growing with 1000 umol LED Generative		1000	12	43,2	2870	26,2
10	1							
10	2	Indoor growing with 600 umol LED Vegetative		600	18	38,9	2583	25,5
10	3	Indoor growing with 1000 umol LED Vegetative		1000	18	64,8	4306	29,8

radiation influence	C per 1000 Joules	2,5
basic-temp	C	19



# This is why your RTR must be **okay!**

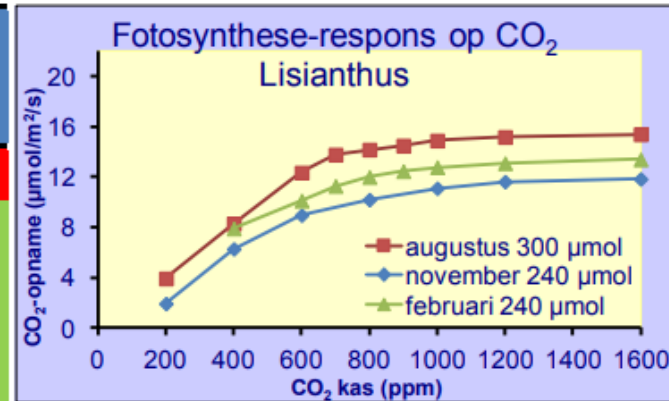


Reaching level 4 gives more yield  
Reaching level 4 gives a more resilient plant  
Reaching level 4 gives more terpenes!  
Reaching level 4 gives more cannabinoids?

# An optimal CO<sub>2</sub> level is also important! -1-

Tabel 4. Rendement CO<sub>2</sub>-dosering bij 240-300 μmol/m<sup>2</sup>/s PAR.

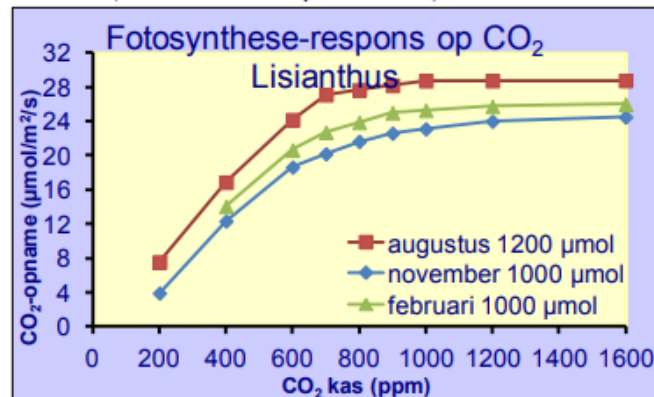
CO <sub>2</sub> kas	Augustus % t.o.v. 400ppm	November	Februari
200	47%	31%	
400	100%	100%	100%
600	149%	143%	128%
700	166%		143%
800	171%	162%	152%
900	175%		158%
1000	180%	177%	162%
1200	183%	185%	168%
1600	186%	189%	177%



# An optimal CO<sub>2</sub> level is also important! -2-

Tabel 5. Rendement CO<sub>2</sub>-dosering bij verzadigend lichtniveau (1000 en 1200 μmol/m<sup>2</sup>/s).

CO <sub>2</sub> kas	Augustus % t.o.v. 400ppm	November	Februari
200	45%	32%	
400	100%	100%	100%
600	143%	151%	147%
700	161%	164%	162%
800	164%	176%	170%
900	167%	183%	178%
1000	170%	187%	180%
1200	170%	195%	183%
1600	170%	199%	185%



Investing in 'a lot of light' and not Investing in CO<sub>2</sub> = a missed opportunity

**Light + CO<sub>2</sub> is like 1+1=3**

# Climate settings

At our clients we see a big variation in the climate settings – even within MCPIR there is discussion about this:

Daylength vegetative 18-20 hours  
generative 12 hours

Day : 22 – 27 °C. 80 – 55% RH

Night : 20 – 24 °C. 80 – 55% RH

CO<sub>2</sub> : not dosing – 800/1000 PPM



# Climate setting thru out the cycle

- ✦ Vegetative stage:
  - 18 hours 400 – 600  $\mu\text{mol}$
  - 24 hour temperature 24 – 27 °C
  - RH 70 – 80%

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- ✦ Generative stage 1st stage (week 1-3):
  - 12 hours 600 – 1000  $\mu\text{mol}$
  - 24 hour temperature 22 – 27 °C
  - Night temperature 2 – 4 °C lower than day temperature
  - RH 70 – 80%

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- ✦ Generative stage 2nd stage (week 4-8):
  - 12 hours 600 – 1000  $\mu\text{mol}$
  - 24 hour temperature 22 – 27 °C (drop in the last week can be an option)
  - Night temperature 2 – 4 °C lower than day temperature
  - RH 55 – 65%

# Climate settings MCPIR at the moment

## 1.1 Climate settings

The following tables depicts the climate chamber's settings from 13-05 until 19-05

<b>Parameter</b>	<b>Grow room 1 &amp; 2</b>		<b>Mother room</b>	
<b>Date</b>	20-05 until 26-05		20-05 until 26-05	
<b>Cultivation week</b>	<b>Flowering week 5</b>		<b>Vegetative week 16</b>	
	<b>Day</b>	<b>Night</b>	<b>Day</b>	<b>Night</b>
<b>Temperature (°C)</b>	27	25	27	24
<b>Relative humidity (%)</b>	70	65	80	75
<b>CO2 (ppm)</b>	800	350	600	350
<b>Photoperiod (h)</b>	12	0	18	0
<b>Light intensity (µmol/m2/s)</b>	800	0	450	0



MEDICAL CANNABIS PLATFORM FOR INNOVATION AND RESEARCH



# What can go wrong? -1-

- ✦ High temperatures with lower light levels can result in less production
- ✦ Low temperatures (especially in the vegetative stage) can result in less production
- ✦ Low RH and/or a high energy in- & output at night can result in less production (small flowers because to generative)
- ✦ High RH and/or little energy in- & output at night can result in more Botrytis problems

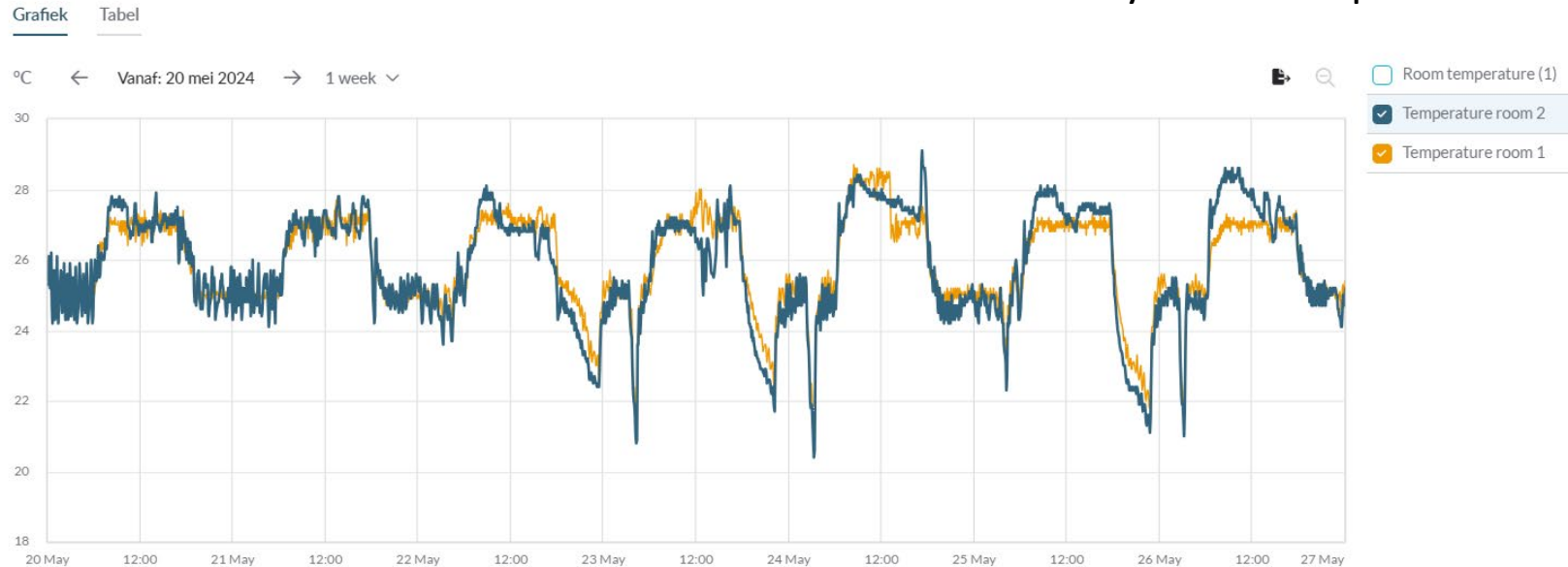
# What can go wrong? -2-

- ✦ An uneven climate can result in undesired differences in growth & extra problems with Botrytis and Powdery Mildew
- ✦ Going up in temperature from night to day temperature too fast can give because of condensation of the flowers extra problems with Botrytis (max 2 °C./hour)
- ✦ Opening the screen at a warm night with an open sky for more than 20% can give extra problems with Botrytis (radiation to the atmosphere)
- ✦ Also therefor: in wintertime – close the screen one hour before sunset and open not earlier than one hour after sunrise

# What can go wrong? -3-

## Room temperature (1)

Climate settings are often not the same as the achieved climate – so check often your technique



# What can go wrong? -4-

And many many other things – too much to mention, but we will do research and go on these topics in next sessions – for instance:

- ✦ Hermaphrodites
- ✦ Irrigation strategy
- ✦ Root aphids
- ✦ Hop latent viroid
- ✦ Substrate quality
- ✦ Drying Proces
- ✦ ..... etc.

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So, join MCPIR on our journey to further  
optimize cannabis cultivation and production



So, join MCPIR on our journey to further optimize cannabis cultivation and production

*Thank You...*

