

Herbaceous Unrooted Cutting Husbandry



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**One Truth:
If there is no
viable URC there
is no liner**



URC are like Frogs....



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Going to the Next Level With URC

- 1995 Birth of the vegetative business
- 2000's Off-shore production
- 2005 Rapid expansion of varieties that work
- 2010 Chemicals to enhance rooting
- 2015 Shrink management
- 2020 Uniform liner development

Growing is like going to school,
if you are 90+% right you get an 'A',
90% Tasks + 90% Of the time + 90% On Time



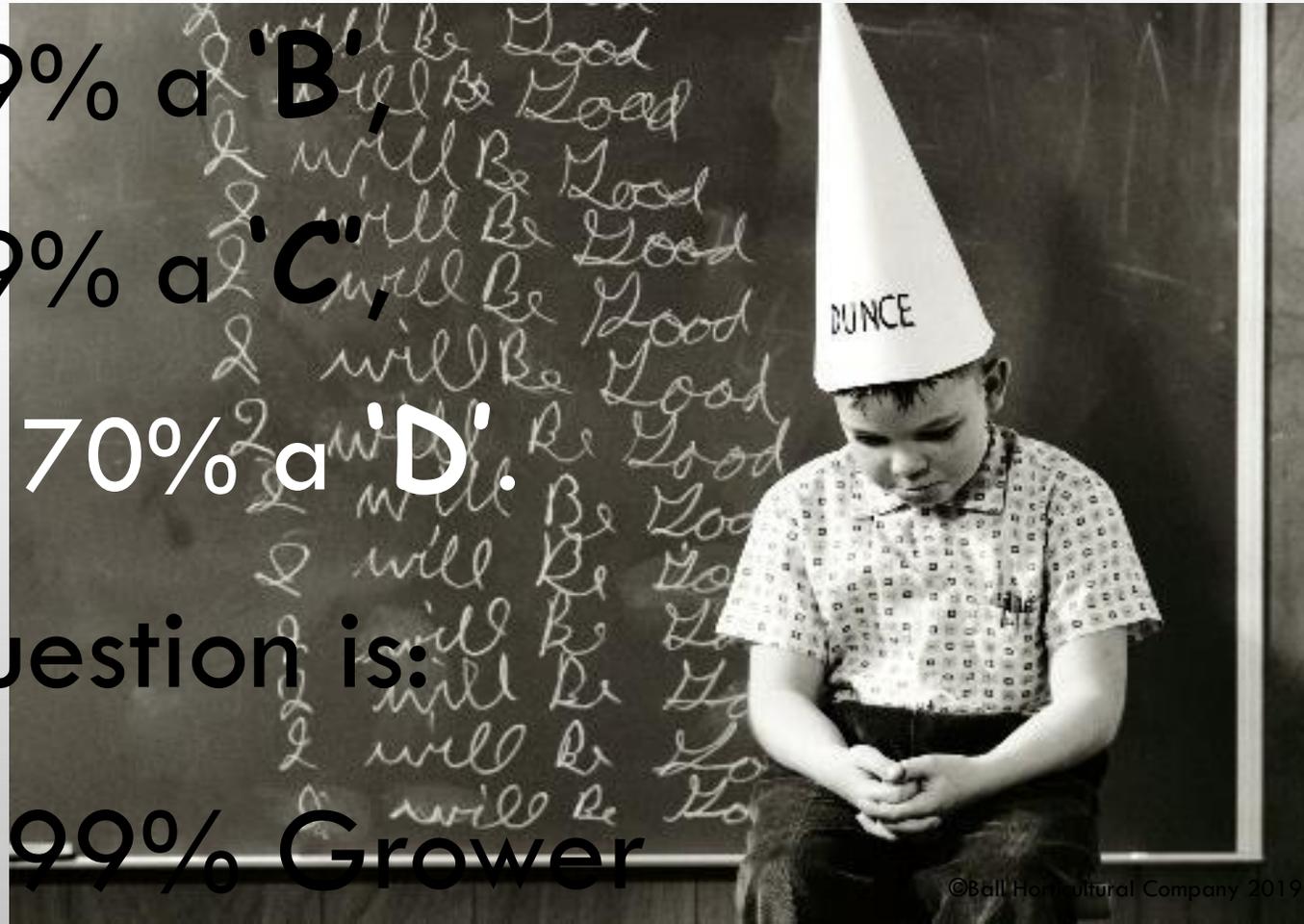
80-89% a 'B',

70-79% a 'C',

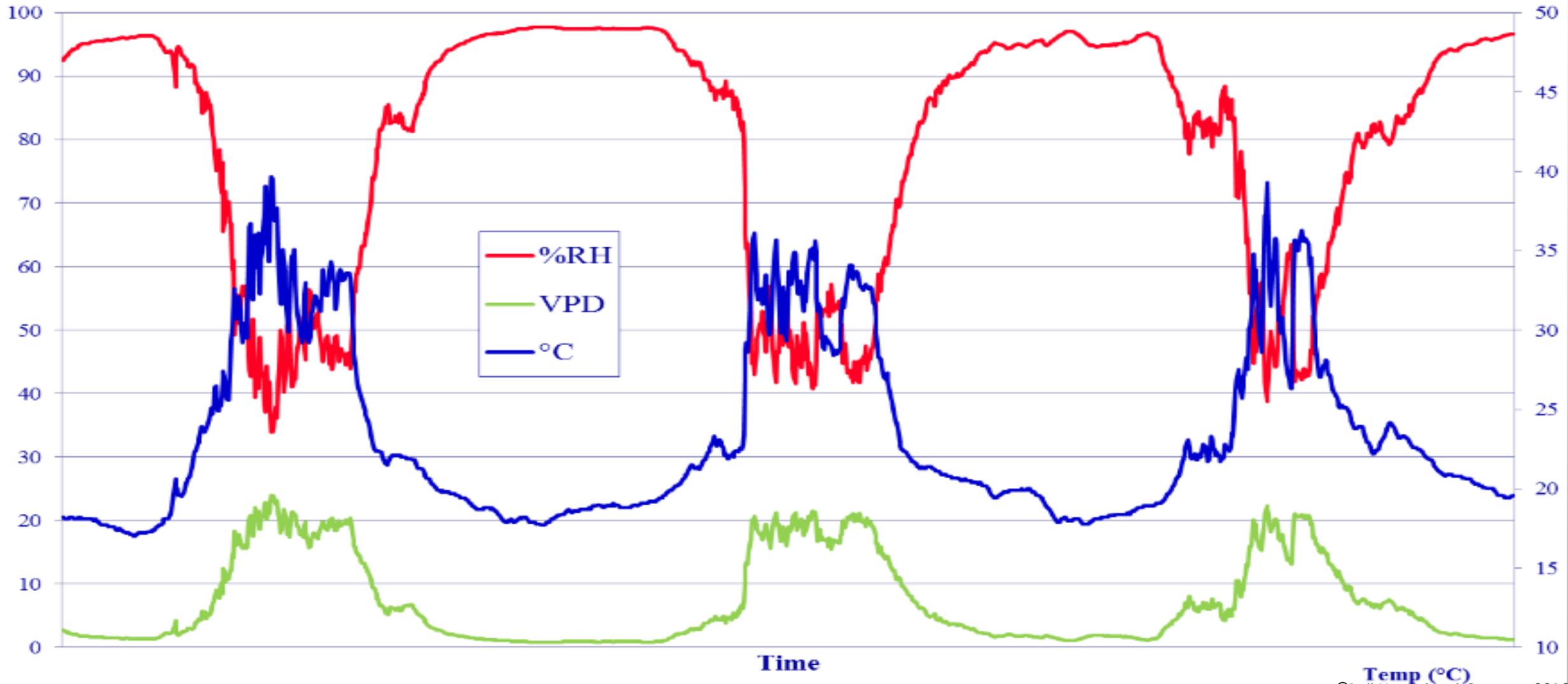
less than 70% a 'D'.

The question is:

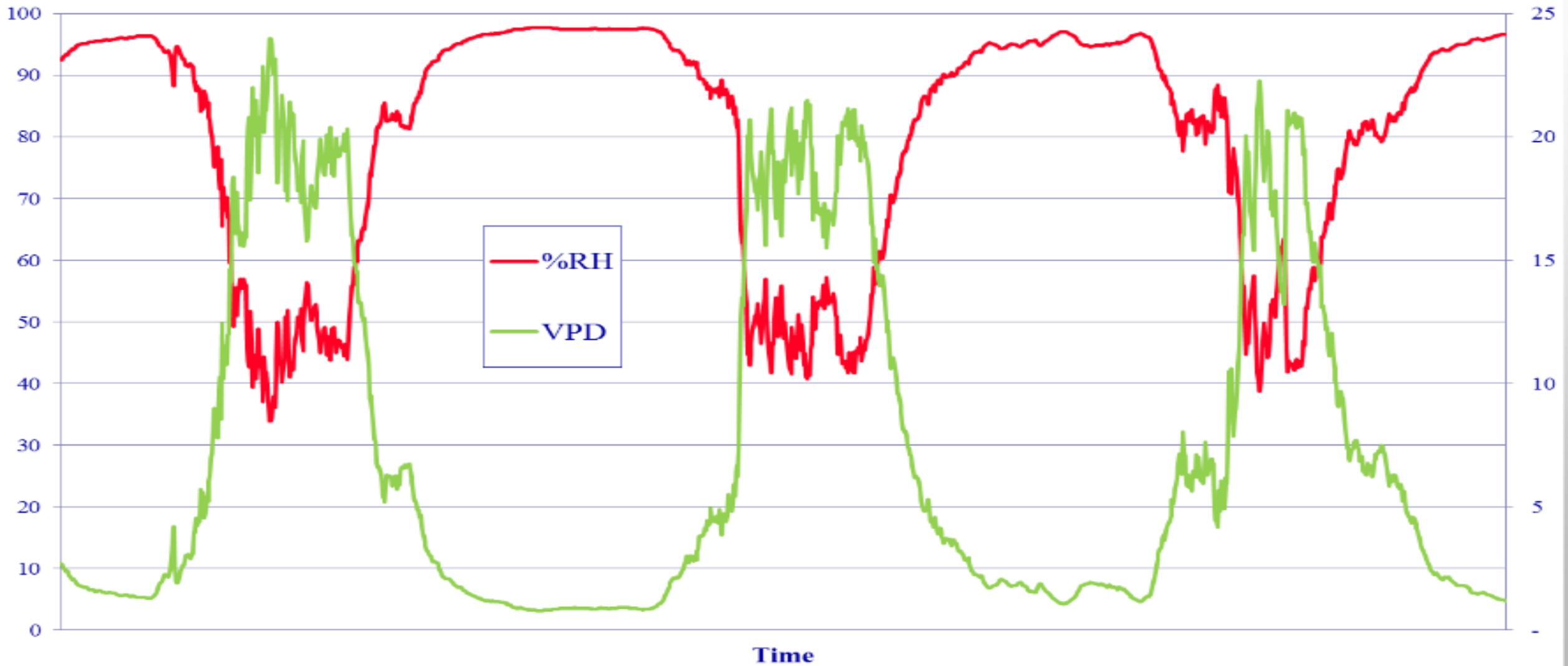
Are you a 99% Grower



RH + Temp \Rightarrow VPD



VPD = Drying



Clarifying VPD & RH

Table 1 shows the VPD in millibars at various air temperatures and relative humidity. Most cultivated plants grow well at VPDs between 8 and 10, so this is the green shaded area. Please note that the ideal VPD range varies for different types of plants and the stage of growth. The blue shaded area on the right indicates humidification is needed where the red shaded area on the left indicates dehumidification is needed.

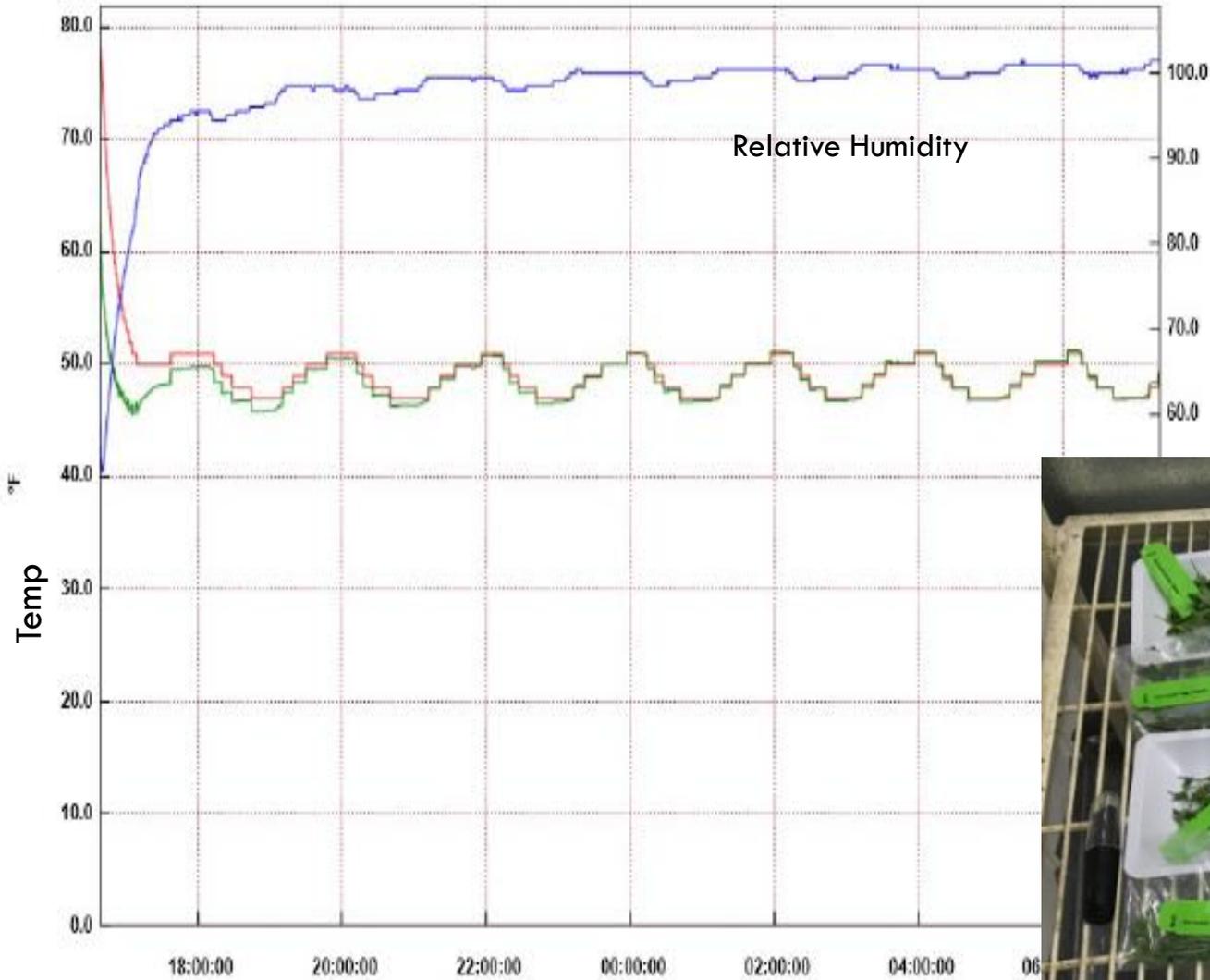
TEMP		RELATIVE HUMIDITY													
C	F	100%	95%	90%	85%	80%	75%	70%	65%	60%	55%	50%	45%	40%	35%
15	59	0.0	0.8	1.7	2.5	3.4	4.2	5.1	5.9	6.8	7.6	8.5	9.4	10.2	11.1
16	61	0.0	0.9	1.8	2.8	3.7	4.6	5.5	6.4	7.3	8.2	9.1	10.0	10.9	11.8
17	63	0.0	1.0	2.0	2.9	3.9	4.9	5.8	6.8	7.8	8.8	9.7	10.6	11.6	12.6
18	64	0.0	1.0	2.0	3.1	4.1	5.1	6.2	7.2	8.2	9.3	10.3	11.3	12.4	13.4
19	66	0.0	1.1	2.2	3.3	4.4	5.5	6.6	7.7	8.8	9.9	11.0	12.1	13.2	14.3
20	68	0.0	1.2	2.4	3.5	4.7	5.9	7.0	8.2	9.4	10.6	11.7	12.8	14.0	15.2
21	70	0.0	1.2	2.4	3.7	4.9	6.2	7.4	8.6	9.9	11.1	12.4	13.7	14.9	16.1
22	72	0.0	1.3	2.6	3.9	5.3	6.6	7.9	9.2	10.5	11.9	13.2	14.5	15.8	17.2
23	73	0.0	1.4	2.8	4.2	5.6	7.0	8.5	9.9	11.3	12.7	14.1	15.4	16.8	18.2
24	75	0.0	1.5	3.0	4.5	5.9	7.4	8.9	10.4	11.9	13.4	14.9	16.4	17.9	19.4
25	77	0.0	1.6	3.2	4.8	6.4	8.0	9.5	11.1	12.7	14.3	15.9	17.4	19.0	20.5
26	79	0.0	1.7	3.4	5.1	6.7	8.4	10.1	11.8	13.4	15.1	16.8	18.4	20.1	21.8
27	81	0.0	1.8	3.5	5.3	7.1	8.9	10.7	12.4	14.2	16.0	17.8	19.6	21.3	23.1
28	82	0.0	1.9	3.8	5.7	7.6	9.5	11.4	13.3	15.1	17.0	18.9	20.7	22.6	24.5
29	84	0.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.1	24.1	26.1
30	86	0.0	2.1	4.2	6.4	8.5	10.6	12.7	14.8	17.0	19.1	21.2	23.3	25.4	27.5
31	88	0.0	2.2	4.5	6.7	9.0	11.2	13.4	15.7	17.9	20.2	22.4	24.6	26.9	29.1
32	90	0.0	2.4	4.7	7.1	9.5	11.9	14.2	16.6	19.0	21.3	23.7	26.1	28.4	30.8
33	91	0.0	2.5	5.0	7.5	10.0	12.5	15.0	17.6	20.1	22.6	25.1	27.6	30.1	32.6
34	93	0.0	2.7	5.3	8.0	10.6	13.3	15.9	18.6	21.2	23.9	26.5	29.2	31.8	34.5
35	95	0.0	2.8	5.6	8.4	11.2	14.0	16.8	19.6	22.4	25.2	28.0	30.8	33.6	36.4

Is your cooler **de-hydrating** or **hydrating** Your URC?

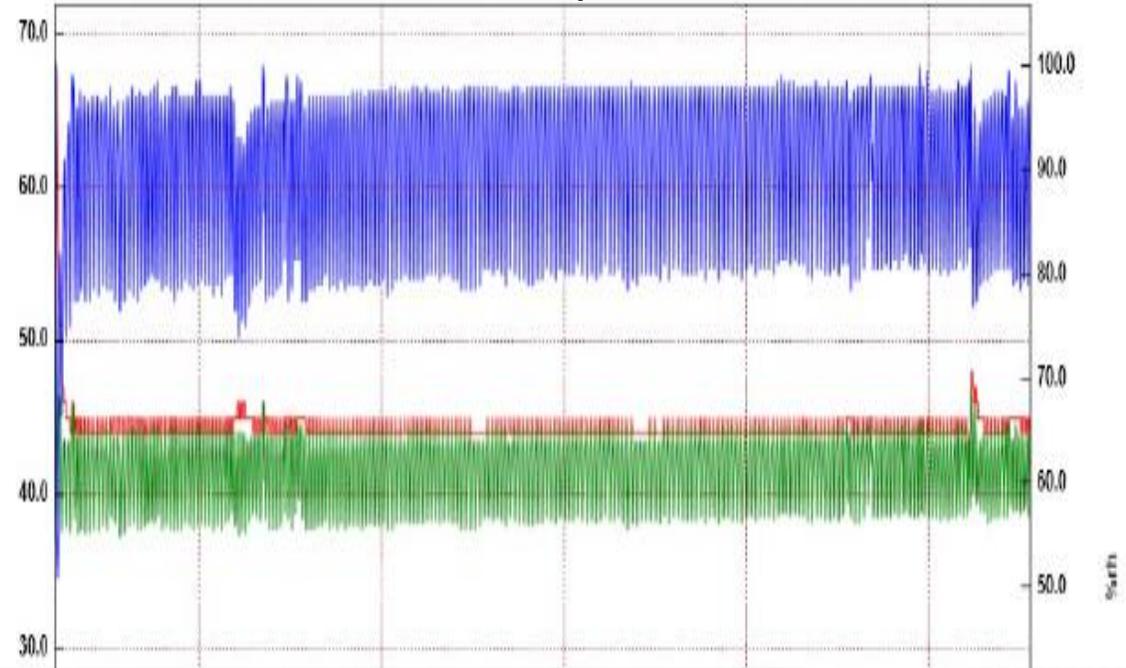


Humid vs Dry Chamber

Humidity Chamber



Dry Cooler



Bag vs No Bag study

URC Weight Loss/Gain in Cooler

Figure 1.

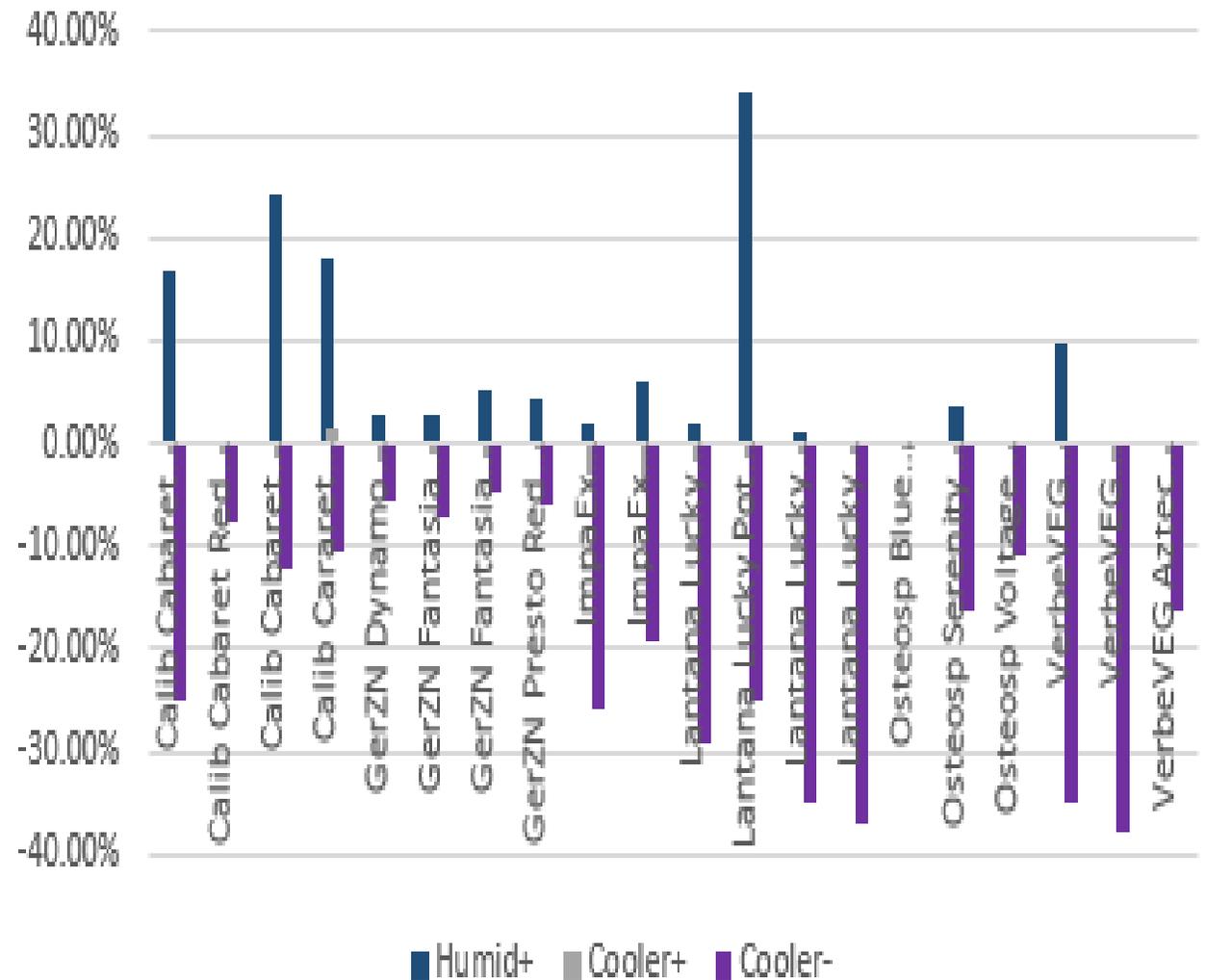
Humid vs. Non-Humid Storage



Humid+bag, Cooler only+bag, Cooler only-no bag

Figure 2.

Humid vs. Non-Humid Storage



Turgidity After 24 hr In Chamber “Limp Test”

Humid + Bag

Cooler + Bag

Humid - Bag

Cooler - Bag



Achieving Uniformity During The Rooting Process



VS.



Angelonia

A



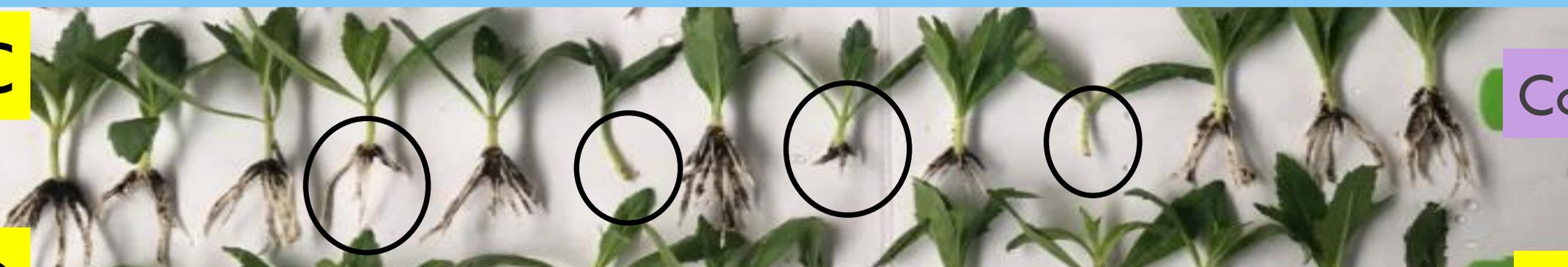
Humid+Bag

B



Humid-Bag

C



Cooler+Bag

D



Cooler-Bag

Salvia

A

Humid+Bag

B

Humid-Bag

C

Cooler+Bag

D

Cooler-Bag





A

Humid+Bag

B

Humid-Bag

C

Cooler+Bag

D

Cooler-Bag

Humidification in Processing cooler



Example of one of many different brands of humidifiers available in market

- Goal is to begin the rehydration process in the cooler
- Unpack boxes and loosely place bags in 1020 flats
- Install a humidification system which can maintain 90-95% RH in the chamber.
- Use VPD controller for triggering 'on' cycle and run long enough to fill chamber with fog.
- Make sure the temp-RH sensor is in an aspirated (fan pushing air across sensors) and not under fog nozzles to minimize condensation on the sensor.
- Check for adequate RH by weighing bags of soft URC (Impatiens, Vinca vine, coleus) to see if they increase in weight overnight.
- Avoid going to over 95% RH as slight temperature changes will cause the RH to spike to 100% causing condensation on bags, walls etc.

Is Your Sticking Operation Sucking the Life Out of Your URC & Increasing Variability??



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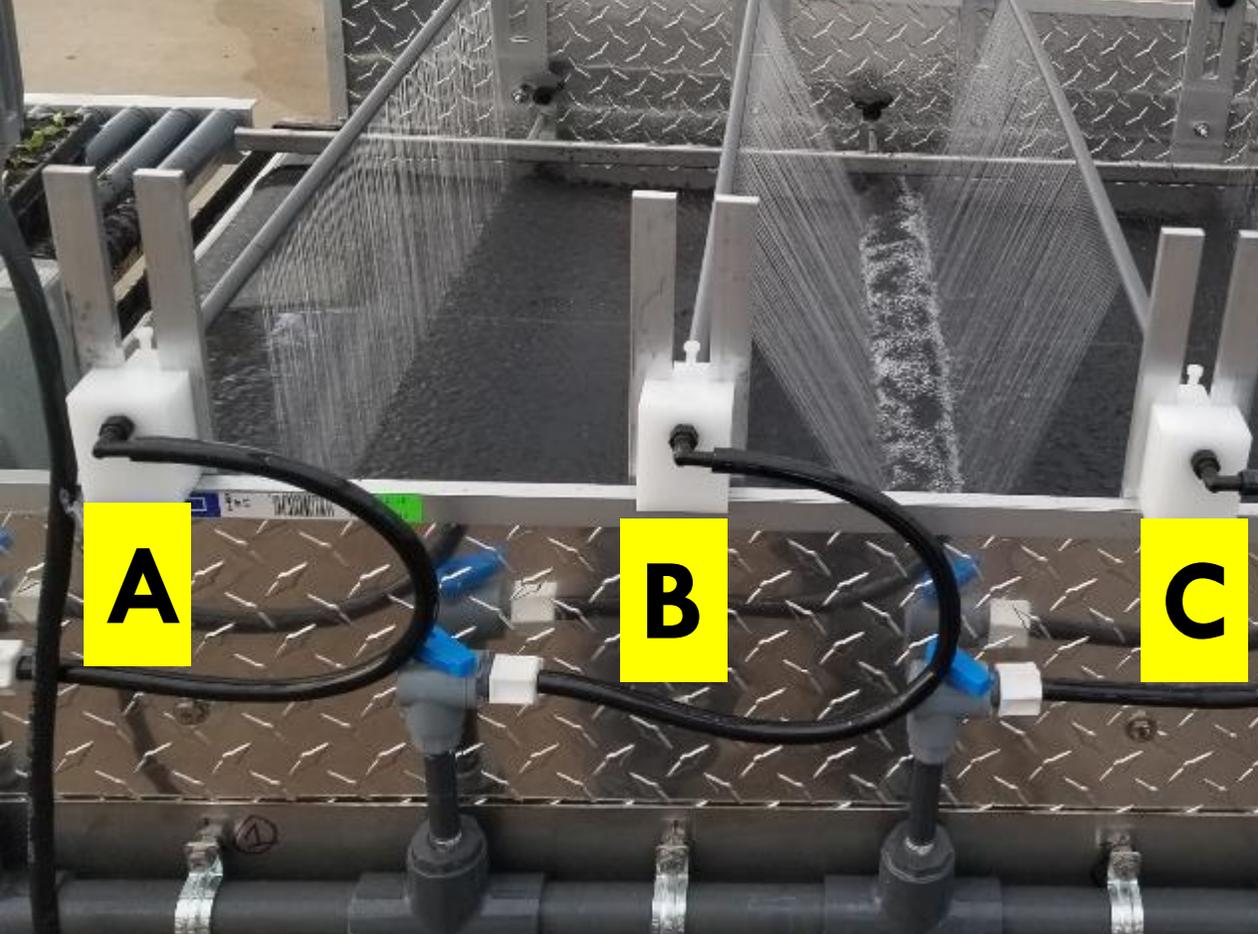
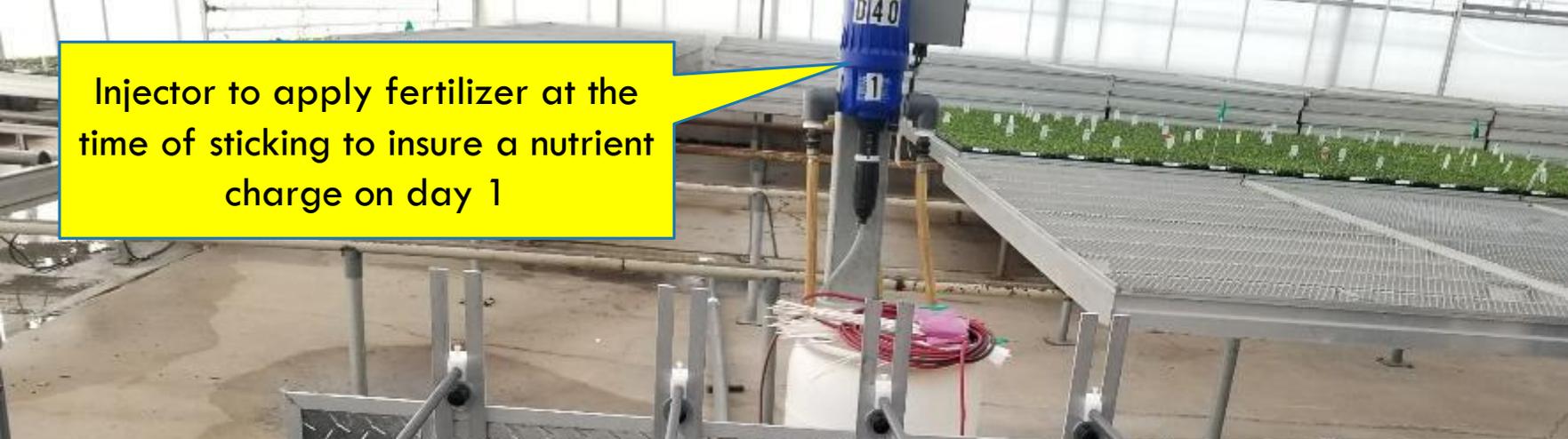


Sticking Line Operations

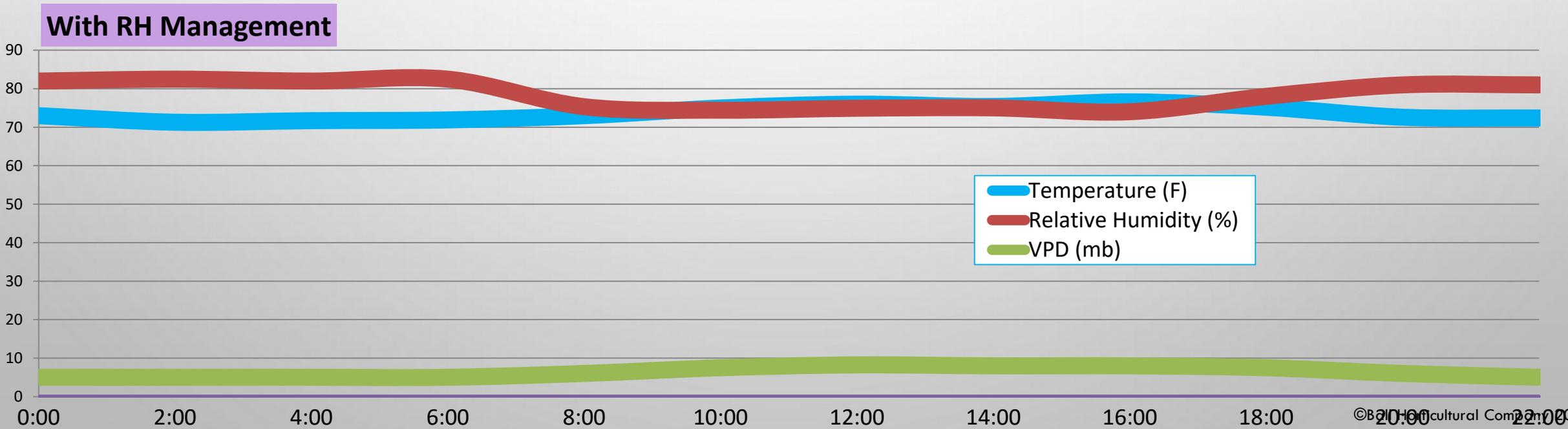
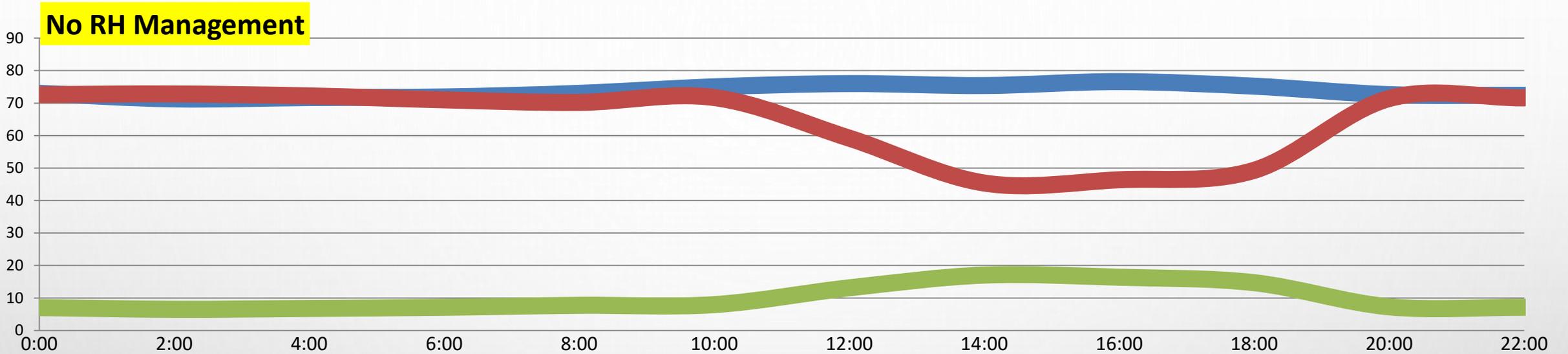


Injector to apply fertilizer at the time of sticking to insure a nutrient charge on day 1

Sticking Line Operations



Should You Manage RH with VPD Control?



Optimum VPD value *Static or Changing?*

❖ Hydration of URC

Static VPD = <1

❖ Callus formation

Progressive VPD = 1 to 4

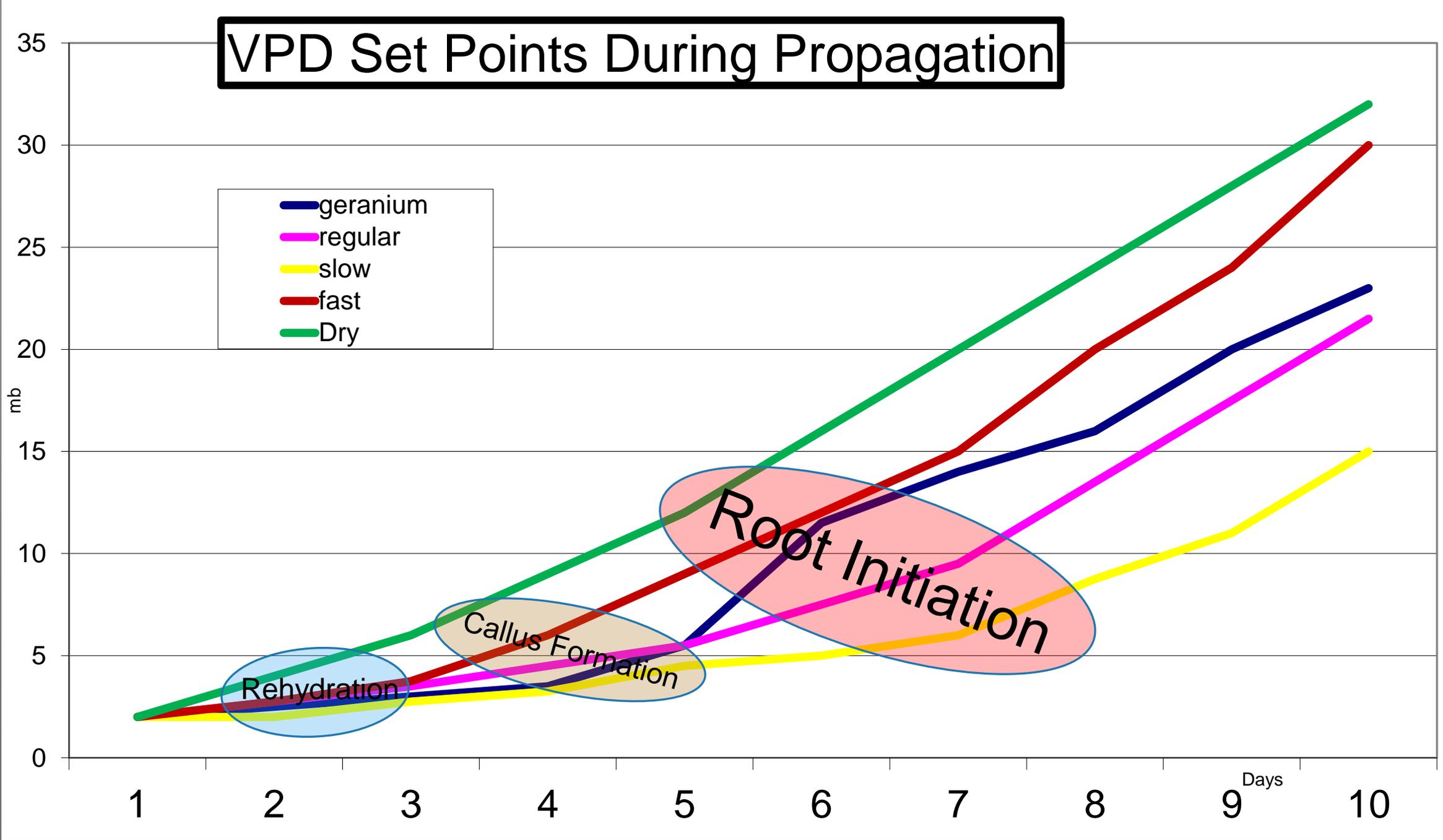
❖ Root development

Progressive VPD = 4 to 30

What is the strategy?

Slowly increasing the VPD
to increase evapotranspiration from soil and plant
to promote root development

VPD Set Points During Propagation



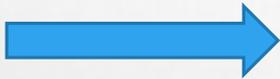
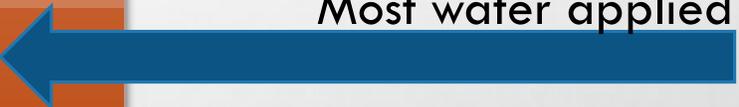
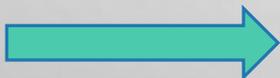
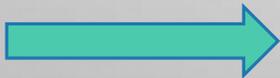
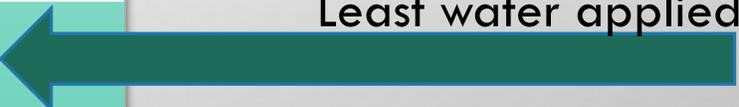
What is the 'Right' Mist Setting at Wet ($VPD=0.5$) vs Dry ($VPD=1.5$)
How do you keep the foliage turgid but soil at the optimum moisture?



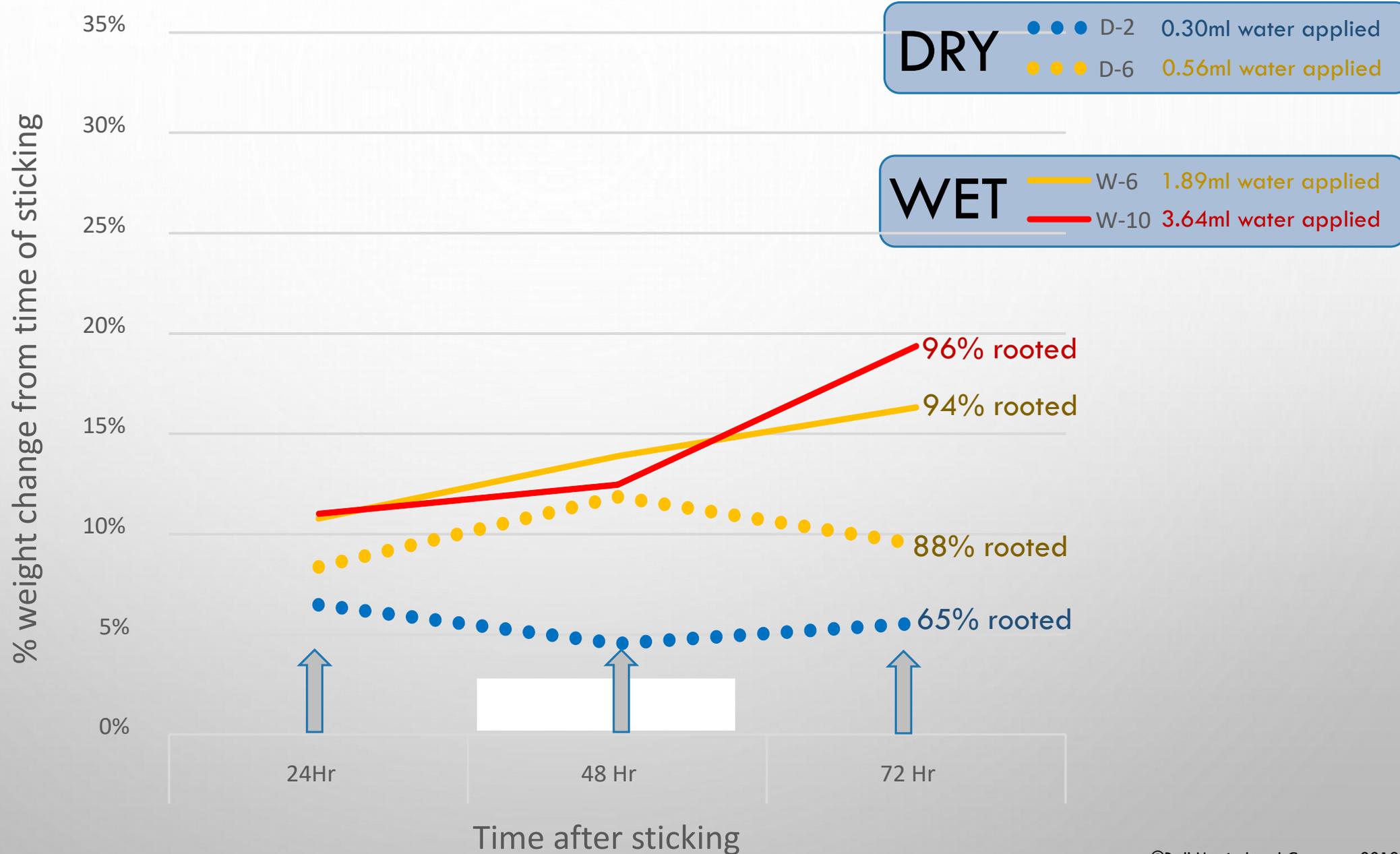
Fish grow in Water
Roots grow in Air



What is the 'Right' Mist Setting at Wet (VPD=0.5) vs Dry (VPD=1.5)

	<u>Wet VPD</u> more frequent mist events	Amount of water applied to one tray after 72 hours
	2 second mist duration	0.55ml
	6 second mist duration	1.89ml
	10 second mist duration	3.64ml
	14 second mist duration	3.80ml
		
		Most water applied
	<u>Dry VPD</u> less frequent mist events	Amount of water applied to one tray after 72 hours
	2 second mist duration	0.30ml
	6 second mist duration	0.56ml
	10 second mist duration	1.00ml
		
		Least water applied

How Does Mist Frequency and Duration During First 72 hours Affect Rooting?



Fog conditions
for hydration in
the greenhouse





**Netafog nozzles
to apply more
moisture**

Tents keep the
moisture high
during early
stages



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