

GROWERTALKS

Paul's Pointers

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When It's Good to Be Negative

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Can you believe there's actually a time in the workplace when it's both appropriate and beneficial to be negative? Obviously, I'm not talking about a negative attitude in the workplace—I'm referring to using negative DIF as a height-management tool in the greenhouse.

I've been using negative DIF for many years and just started implementing it with crops again this spring. Before sharing how I use negative DIF, please allow me a moment to give a quick overview of this topic.

What is DIF?

DIF is the difference (DIF) between the day temperature (DT) and night temperature (NT) plants experience while they're growing: $DIF = DT - NT$.

Positive DIF (+DIF): Occurs when the day temperatures are warmer than the night temperatures.

- Example: $72F\ DT - 62F\ NT = +10\ +DIF$
- +DIF promotes stem elongation, resulting in taller, stretched plants.

Negative DIF (-DIF): Occurs when the day temperatures are cooler than the night temperatures.

- Example: $62F\ DT - 72F\ NT = -10\ -DIF$
- -DIF suppresses stem elongation, resulting in shorter, more compact plants.

Many, if not most, plants will respond to DIF. Every plant and even every cultivar may respond differently to DIF—some will have slight to moderate responses, while others will exhibit strong responses.

DROP method of creating -DIF

Perhaps my favorite variation of delivering -DIF is using the morning DROP method. Like its name implies, the morning DROP method involves lowering or dropping the temperature first thing in the morning. With most stem elongation occurring at the end of the night and at the beginning of the day, dropping the temperature at pre-dawn has been shown to effectively reduce this elongation.

DROP methods and considerations

- Achieved by lowering the air temperature prior to dawn by 5 to 15F or more.
- The temperature should reach the desired DROP temperature at least 30 minutes before sunrise.

- The DROP temperature should be maintained for at least three hours after sunrise.
- Growers often don't decrease temperatures low enough and maintain these temperatures for long enough periods to get the full benefits of the morning DROP.
- Run the DROP longer when it's cloudy or when the intended DROP target setting cannot be obtained (due to warm outside morning temperatures).
- Delivering the DROP after dawn or decreasing the duration of the DROP will both significantly decrease the effectiveness of this procedure.

Many growers don't like to go from higher night settings with the heaters possibly running to immediately opening the vents and dramatically lowering the greenhouse temperatures. Instead, they prefer to RAMP DOWN the temperatures by lowering the heat settings, but not actively venting, at least one hour before the onset of the DROP period. Similarly, at the end of the DROP period, many growers use a RAMP UP period to gradually increase temperatures by closing the vents and allowing solar gain to increase temperatures rather than immediately turning on the heaters.

In this example, at 5:00 a.m. the heat is turned off or reduced down to the desired DROP settings to allow the temperatures to gradually fall towards the desired DROP temperature. This is the RAMP DOWN period—there's no need to force the temperatures down yet. The vents don't need to open for most of this duration.

When sunrise is at 7:00 a.m., the DROP temperature must be reached 30 minutes prior to that; therefore, cooling must begin at 6:30 a.m. to lower the temperatures and remove the residual heat from the greenhouse. During the DROP period, reduce the heat settings to be at least five degrees lower than the intended DROP temperature, and utilize only the vents and cooling system to reach and maintain the desired DROP temperatures.

-DIF considerations

- Plants respond best to -DIF when the light levels are high (sunny conditions). It's beneficial to extend the duration of the DROP period longer to compensate for lower light levels during cloudy conditions.
- If the outside conditions don't allow you to reach your DROP settings, consider extending the DROP period longer to help get as much -DIF as possible.
- Not making adjustments during less-than-ideal conditions will result in less -DIF and consequently not provide the level of control you're looking for.
- The time for sunrise changes daily. The start times for DIF or DROP programs should be modified every week to compensate for the changing sunrise times.
- Consider the effects -DIF or DROP has on the 24-hour average temperatures, and adjust day and night temperature settings accordingly to keep the average temperatures where they need to be to keep crops growing and reaching the sales dates on time.

■ Plant growth regulators may not be necessary when using -DIF or DROP. Plants grown under -DIF conditions tend to respond better to PGRs. Use lower rates and less-frequent applications when using PGRs in conjunction with -DIF.

■ Many plants will appear flat across the top of the crop or have the leaves turn slightly downward as a response to -DIF conditions. Some will appear lighter green or even have a slightly chlorotic appearance.

Depending on the situation, these appearances often

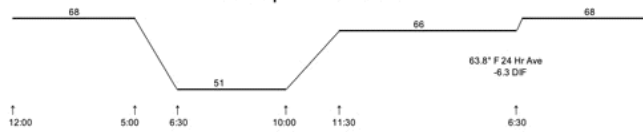
lessen or go away altogether shortly after the use of -DIF is stopped. If the plants respond strongly, consider reducing the amount of -DIF being provided, as well as increasing the fertility levels by 10% to 20%, including extra minors to lessen these symptoms.

Using the DROP method helps decrease stem elongation, dehumidifies the greenhouse during the time of day that plants are most susceptible to stretch, increases the effectiveness of PGR applications and improves the quality characteristics of the crops being produced while not delaying production times. Keep in mind that every plant responds differently to negative DIF. **GT**

Example DROP Method of -DIF with Sunrise at 7:00 AM

Time	Hrs	Ave Temp		AVE TEMP	24 HR AVE
6:30 PM to 5:00 AM	10.5	68			
5:00 AM to 6:30 AM	1.5	59.5	RAMP DOWN	NIGHT 66.9	
6:30 AM to 10:00 AM	3.5	51	DROP		63.8
10:00 AM to 11:30 AM	1.5	58.5	RAMP UP	DAY 60.7	
11:30 AM to 6:30 PM	7.0	66			
	24			-6.2 DIF	

Example DROP Method



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