

GREENHOUSE TIPS AND ADVICE

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Ask the Experts

DIF in cool climates can quickly turn into DRIP unless you understand the relationship with temperature and relative humidity.

D.I.F. IN A GREENHOUSE

There is more to using D.I.F. or night setback than just dropping the temperature. There are other huge consequences that will be paid if one fails to realize this fact. If DIF (or as some simply call it ----night set back) isn't fully understood your **DIF** could quickly turn into **DRIP**

Here's a typical example,
We run into this one very often.

The grower is using simple heating thermostats or heck even some of those " programmable commercial/residential ones ". We generally ask the grower why he decided on this approach.

We get the usual answer .
" cause they are cheap ".

Well I guess that's okay
I suppose but lets continue.

We ask if they are like night set back or D.I.F. practices The grower responds, "yep every night at 5:00 PM I turn down the thermostat 5 deg. F I sure like saving money on the heating bills but I'm finding crop quality down and I'm spending a ton on chemical cures for pythium, botrytis and some fusarium outbreaks I'm not happy but I keep turning the t'stat down every night to save on heating ".

This is a typical case of not understanding what really happens during D.I.F. or night set back.

There is more to D.I.F. than temperature there's another equally important component this is relative humidity and its relationship with temperature. There I've said it and that's why a grower using simple thermostat is really holding a loaded gun to his head. Unless one realizes the importance of relative humidity and its' relationship with temperature.

Still not sold ...

Lets look at a typical late in the winter day for this grower. Night time temperatures still dip to 14 deg F (-10 deg. C), day time temperatures get up to 35 deg. F (2 deg. C), the sky's are clear, and the sun is providing a good solar load onto the building by 3 :00 PM. The house was just filled out with new seedlings and transplants a few days ago. On days like this the grower is rubbing his palms just couldn't be better the plants will love all this warmth and sun by 4:00 PM the house is 80 deg. F (26.6 deg. C) and his little humidistat on the wall tells him 75% R/H. At 5:00 PM happy with his days accomplishments he runs over to the heating thermostat and lowers the t'stat a measly 5 deg. F from 70 deg. F to 65 deg. F.

Let's review what is actually happening in the greenhouse.

At 80 deg. F with an RH level of 75%, the wet bulb temperature is 74 deg. F. ; at 75% R/H and at 80 deg. F each lb of air in the greenhouse can hold 118 grains of moisture per lb of air. At these conditions the dew point temperature is 72 deg. F

Now by virtue of the fact the heating thermostat turned down to 65 deg. F, as the sun sets, the solar load is no longer a load, the outdoor temperatures drop and the indoor temperatures begin to drop. Long before the heaters come on to start heating the greenhouse lets look at what is happening with the humidity levels.

The temperature drops to 78 deg. F well now the RH level is 80%

The temperature drops to 76 deg. F well now the RH level is 88%

The temperature drops to 72 deg. F well now the RH level is 94%

This is getting scary we've still got to go to 65 deg. F

Starting to get the picture we're still many degrees above the heating set point and you just have created a very hostile environment. You have basically created a massive condensation problem if the condensation off the greenhouse cladding systems isn't effectively controlled well you will have nothing but a perpetual rainfall on the crop. This condensation will be cool / cold Some cases just a few degrees above freezing almost as cold as the inside air film temperature of the cladding system .

Basically you have just created a perfect ecosystem for any type of pathogen to get a strangle hold on.

Now for you growers that get lower night time heating conditions i.e. -10, -20 or -30 deg F the problem will only be magnified.

How much moisture are we talking about ? If we use the above example and add the following information i.e.: The volume of the greenhouse is 10,000 cubic feet and during the growers 5 deg. F turndown to 65 deg. F at night and he still wishes to keep the humidity at 75% RH, it is quite easy to predict the amount of water in air that needs to be purged.

At 85 deg. F and 75 % RH the air holds 118 grains of moisture per lb. of air

At 65 deg. F and 75% RH the air holds 70 grains of moisture per lb. of air.

This is a difference of 48 grains per lb. of air. It takes about 13.3 cubic feet of air to equal one lb. (sea level). So, by simple math there is about 751 lb. of air in the greenhouse

or : 36,000 grains of moisture that need be removed.

which is : about 5.15 lb. of water.

Doesn't sound like much but the question to ask is at the night time temperature of 14 deg. F and with the inside space temperature being held at 65 deg. F, will the inside film layer temperature of the poly be warmer than the dew point temperature of 65 deg. F,

if not, then even at 75% relative humidity condensate could still be a problem.

I.e.: At 65 deg. F and 75% RH the dew point temperature is 68 deg. F. The question to ask is if it is 14 deg. F outside would the inside film temperature be higher than 68 deg. F. ? You are asking for a miracle. Chances are (depending on the U value of your cladding system), the inside film temperature maybe in the high 40 deg. F so just by virtue of the cool cladding surface at RH level of 75% at 65 deg. F may not be that desirable.

What to do ??????..... well if you are planning on taking advantage of what D.I.F. provides you need a controller that takes both temperature and relative humidity into account. Controllers such as the Growmate Plus, Procom or Growcom will provide you with these type of control. All of these controllers have the ability to accept both temperature and humidity sensors, which allow you to control both temperature and the humidity.

Basically ... in a nut shell in cool and cold climates ... it is imperative to do a dehumidification purge before going into night time DIF mode.

When to do the purge ?

Generally do the purge during or just after the high day time temperatures.

This will save you a ton of heating energy.

Take advantage of the warmer outdoor air if you have minimally sized heating equipment. This leads to one of the nice features that the Procom and Growcom or even the Smartstats have over the less expensive controllers. They all can provide up to four stages of DIF control and each stage (time period) can be user defined and both temperature and humidity set points for each stage of DIF are programmed by the grower.

How's that for versatility, flexibility and just plain common sense.

... always try to do the purge to get the RH level way down past your night set back ... cause once you go into DIF mode by virtue of decreased temperatures the RH ... well its only going to climb ... like a rocket.

Relative Humidity ?????

It's relative all right and it's always relative to temperature and ... you have to understand that.

As an example : Look at a couple conditions. Air temperature at 30 deg. F with an RH level of 90% and another at 70 deg. F with an RH level of 40%. Which has more water vapor in the air ?

This may surprise you. If you take a tightly sealed plastic bag full of that 30 deg. F air at RH level of 90% and sensibly heat it up to 70 deg. F, the resulting RH level will be around 20%. Or if you take a plastic bag full of that nice warm 70 deg. F air at 40% RH and cool it down to 30 deg. F ... well you'll have water in the bottom of the bag since the RH level will have reached saturation.

(Hey you just have created a rain storm in a bag .)

We've bored you enough.
Until then ... learn to control the drip
"it's an evil enemy" ...

... and it can be done with simple common sense, understanding of the relationship with temperature and relative humidity and decent control devices.....

If you have any questions please feel free to contact our office. The drip is only costing you money.

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