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EFFECT OF HUMIDITY ON PLANT GROWTH AND USE OF DEHUMIDIFIERS INSIDE GREEN HOUSE

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INTRODUCTION

Generally humidity is defined as, the concentration of water vapour present in the air that is invisible to the human eyes and relative humidity is defined as the ratio of the amount of moisture present in the atmosphere to the amount of moisture required to saturate the atmosphere. So, the humidity plays a great role in the growth of the plants starting from the nursey bed to the storage optimum amount of moisture should be maintained to ensure proper yield of the crop. Humidity can be the most difficult environment factor to control especially in the greenhouses. Humidity levels fluctuate with change in air temperature and plants are constantly transpiring, which adds water vapour to the air.

Humid air directly contributes to problems such as foliar and root diseases, slow drying of the growing medium, plant

stress, loss of quality, loss in yields, etc. Therefore, more pesticides are needed for disease control and plants tend to have weak, stretched growth making the plant less desirable. If the humidity is too low, plant growth is often compromised as crops take much longer to obtain the saleable size. Also, lower leaves often drop off, growth is hard, and overall quality is not very good. Whether the humidity is too high or too low, the loss of quality reduces the selling price of crops and increases production costs, both of which reduce profits.



EFFECT OF HUMIDITY ON PLANT GROWTH:

Relative humidity (RH) directly influences the water relations of plant and it indirectly affects leaf growth, photosynthesis, pollination, pest incidence, reduction in grain yield and many more which overall affects the plant growth

LEAF GROWTH

The leaf growth not only depends upon the biochemical processes of the plant but also it depends physical processes like Cell enlargement occurs as a result of turgor pressure developed within the cells. Turgor pressure is high under RH due to less transpiration. Thus leaf enlargement is high in humid areas.



PHOTOSYNTHESIS

Photosynthesis is indirectly affected by RH. When RH is low, transpiration increases causing water deficits in the plant. Water deficits cause partial or full closure of stomata which results in the decrease in the rate of photosynthesis.

POLLINATION

Moderately low air humidity is favourable for seed set in many crops, provided soil moisture supply is adequate. For example, seed set in wheat was high at 60 per cent RH compared to 80 per cent when water availability in the soil was not limiting. At high RH pollen may not be dispersed from the anthers so in case of high RH the rate of pollination is low.

PESTS

The incidence of insect pests and diseases is high under high humidity conditions. High RH favours easy germination of fungal spores on plant leaves. For e.g the blight diseases of potato and tea spread more rapidly under humid conditions. Several insects such as aphids and jassids thrive better under moist conditions.

GRAIN YIELD

Very high or very low RH is not conducive for high grain yield. Under high humidity, RH is negatively correlated with grain yield of maize. The yield reduction was 144 kg/ha with an increase in one per cent of mean monthly RH. Similarly, wheat grain yield is reduced in high RH. It can be attributed to adverse effect of RH on pollination and high incidence of pests. On the contrary, increase in RH during panicle initiation to maturity increased grain yield of sorghum under low humidity conditions due to favourable influence of RH on water relations of plants and photosynthesis.

USE OF DEHUMIDIFIERS IN GREEN HOUSE:

Dehumidification is an essential part of greenhouse climate control. High humidity is a cause of diseases which ultimately reduce the quantity and quality of production. The risk of diseases affecting the crop increases when crops are wet. Dehumidification is an essential part of greenhouse climate control. High humidity is a cause of diseases which ultimately reduce the quantity and quality of production. The risk of diseases affecting the crop increases when crops are wet. The humidity surrounding the crop differs since the air temperature in the greenhouse is not homogenous.

This heterogeneity of the climate by the humidity should be minimised for this reason by a proper greenhouse climate management. Which can be done by the use of dehumidifiers by reducing the excess amount of moisture present in the microclimate of the plants and in the atmosphere of the green house. The dehumidifiers describes energy-saving measures to dehumidify a greenhouse where also the practical and economic feasibility are considered.





BENEFITS OF GREENHOUSE DEHUMIDIFICATION

1. Humidity control
2. Energy savings
3. Optimal homogeneous climate conditions
4. Growing tool
5. Better yield- quality and quantity
6. Prevention of humidity diseases and reducing the need for pesticides
7. Less CO2 loss
8. Saving working hours
9. Greener environment and sustainability
10. Increases in density
11. Re-use of water in the green house

TYPES OF DEHUMIDIFIERS AVAILABLE IN MARKET

1. COMPACT DESSICANT DEHUMIDIFIERS

As the name suggests these are compact in size. They have the ease of placing it anywhere in the green house and do not acquire large space, many a times, completely eliminating the need for floor space.



Advantages:

1. Compact in size.
2. Lightweight with small footprint.
3. Lowest volume/ weight per CMH.
4. Incorporates high performance fluted metal silicate desiccant synthesized rotor.
5. Stainless steel construction (optional).
6. Place it anywhere – indoor/outdoor including mounting.
7. Largest capacity range in Compact Dehumidifiers – 170 CMH to 4500 CMH.

2. BRY AIR SMART SERIES DEHUMIDIFIERS:

The BBS (Bry air smart series) (the product of the specific company) desiccant dehumidifiers are designed for continuously optimizing Dynamic Specific Performance and incorporates High Performance rotor with special geometry and chemistry. Generally this type of dehumidifiers are denoted as smart because they are generally used in remote sensing and GIS applications the farmers or users of different industries which are a step ahead are seen very curious to use this type of dehumidifiers.



Advantages:

1. Upto 48% + additional 20% energy saving.
2. Faster return on investment (ROI)
3. Green technology with lowest cost of ownership.
4. Designed aesthetically for ruggedness and long life
5. Enhanced automation/ algorithms on real time – major leap in dehumidification technology
6. Remote Control & Monitoring.
7. Optional advance tool for predictive maintenance

3. TRAY DRYERS

Seed Dryers and Seed Storage Systems dry and preserve seeds without affecting their quality. And these type of dryers can be used after the harvest of the economic produce of the plant.

Seeds need to be preserved for short term and long term for future use. Seed



ageing and ultimately death occurs due to time. However, it is possible to ensure long survival of seeds by controlling temperature and relative humidity. Reduction in temperature and moisture content ensures increased seed life.

Seeds can be preserved for long period by lowering the moisture content of seeds to around 5%. This is achieved by drying the seeds. Conventionally or traditionally the seeds are dried at elevated temperatures which destroy their germination potential.



Advantages:

1. High Efficiency and Reliability
2. Necessary Control and Safety Features
3. Easy to Operate
4. Easy to Install
5. Easy to Maintain

5. MINI DEHUMIDIFIERS (MINIPAC BY BRY AIR)

The minipac is an ideal dehumidification solution for facilities in need of reliable humidity control or mould and mildew protection can be installed as a stand-alone unit or attached to any central air conditioning system to enhance the system's dehumidification capability. It is a small, yet powerful unit that combats the effects of moisture in up to 10,000 sq. ft but it depends upon the size of green house and also it is ideal for a wide variety of applications.



4. COOL AIR DESICCANT DEHUMIDIFIERS

This leads to substantial savings as no additional heat source is required to regenerate the desiccant rotor. Most of the times, it also helps avoiding installing additional air conditioning unit in the conditioned space as supply air is typically temperature neutral and make the temperature stable in the green house. Dry Cool operates very cost effectively because all the energy required for the operations of the desiccant dehumidifier cycle is coming from the integrated refrigeration unit which is cooling the inlet air.



Benefits of Minipac:

1. Suitable for continuous operation
2. Auto / manual selector switch
3. Power on, heater on, and fault status indication
4. Easy to Install
5. Several mounting and installation options
6. Small physical size – Easy to maintain
7. Quick and easy to service



- 8. Quick and easy to service
- 9. The Rotor is water washable
- 10. Very few moving parts fail

Not only bry air there are many companies that are producing dehumidifiers like pahwa group, TDS, Delair, DRI etc.

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DRI
delair

Bry-Air

TDS

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CONCLUSION

So, from the above article we have concluded that humidity or temperature plays a great role in the plants life and especially in the greenhouse conditions where the optimum conditions should be maintained to enrich the yield of the crops. By using the dehumidifiers we can reduce the amount of moisture in the greenhouse to the optimum condition to ensure proper growth of the plant and the use of dehumidifiers are generally low in case of India so we should aware the farmers those are doing polyhouse or green house farming can implement these dehumidifiers for better result.

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