Germination Rooms

Introduction

In order to obtain the very best results from production lighting it is essential to ensure that uniform material (seedling and cuttings) are used. Any lack of uniformity either in the environment or in the development of the material prior to lighting (uneven rooting, germination etc.) will be, to a greater or lesser extent reflected in the subsequent growth development.

For plants grown from seed, either in trays or high density modules, the germination phase demands particular attention in this respect. Properly prepared substrates, uniform watering and the use of 'primed' seed are all important factors helping to ensure uniform germination, optimum growth and uniformity of subsequent plant development. In addition, however, there is the essential consideration of the overall germination environment. This is particularly relevant with the traditional seed germination method: on and under greenhouse staging using a paper, polystyrene or polythene film cover placed over the trays. Although germination by this method offers the advantage of not requiring any special equipment it has the following inherent disadvantages:

1. Very wasteful in space and heating.
2. Localised temperature variations often lead to uneven germination.
3. Unless particular care is taken, localised drying out of the substrate can occur.

A much more certain method of achieving a uniform germination environment is to use a purpose-designed germination room. Such rooms should be capable of providing a stable temperature and high humidity.

These structures offer the following advantages:

1. Close control over environmental temperature, and RH for germination.
2. A highly uniform environment.
3. Elimination of the substrate material tending to dry out.
4. Reduced handling.
5. Reduced heating costs.

Construction

A germination room can be constructed within an existing building or as a stand alone unit. However the following points are worth detailed consideration before commencing work:

- insulation
- vapour barrier/seal

Insulation

The room should have an insulation value of 0.4W/m/°C or better, roughly equivalent to 85mm of expanded polystyrene board or 60mm of polyurethane foam. Although economies can be made with the selection of different types and amounts of insulation these can have a significant effect on the costs of acheiving a satisfactory vapour barrier/seal. In addition the performance of the finished room may be compromised due to unstable temperature/humidity conditions and increased running costs. In most cases the insulation should be fitted after the equipment, particularly if access to ambient air is required.

Vapour barrier/seal

Due to the high humidities required in a germination room the ceiling and walls should be water proof. Not only does this reduce the

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requirement for humidification equipment, it also protects the fabric of the building from damage/ deterioration due to moisture build up. If the insulating material is a board type material then all joints should be sealed using either an approved sealant or tape. Depending upon the type of board used this may be sufficient, however a water proof paint or lacquer may also be required. Another alternative is to line the building with polythene sheet, however in this case great care would need to be taken with the joints and fixing method. Spray on polyurethane foam would normally require a coating of a compatible water proof paint/lacquer to make it completely water proof.

Equipment

In order to maintain the required environmental conditions within the room the following pieces of equipment may be required:

- humidifier
- heater
- air conditioning unit
- air mixing/distribution system
- control system

Humidifier

There are two methods of providing high humidity conditions:

1. pneumatic fogging system
2. evaporative pad humidifier

Pneumatic fogging systems consist of a small compressor and water pump. The water and air are then mixed in a special nozzle to produce a very fine mist. In order to acheive an even distribution throughout the room several of these nozzles will be required. This is a relatively inexpensive system, it does however have some drawbacks. Control of the pumps is usually via a time switch because sensing humidity at such high levels is very difficult. The result is that the optimum amount of humidification will hardly ever be acheived, too little and the substrate will dry out, too much and it will become water logged. It ultimately relies on experience and good management.

The evaporative pad humidifier consists of a matrix over which water is pumped. Air is then drawn across the matrix and water evaporates from the large wet surface area. The advantage of this over fogging systems is that it is self regulating. If the air is saturated it will not pick up any more moisture from the matrix. In addition to this they usually come as a packaged unit including a fan which can be used to give air mixing/distribution.

Heater

Most types of heater can potentially be used as long as they are tolerant to the high humidities.

For most situations a self contained electric fan heater will be suitable. However bare wire heater elements should not be used. The best type of heater is one which uses a black bar heater element and one which keeps the fan running even when the heater element is not turned on, this avoids the build up of moisture on the unit. Trace heating cable, although more expensive to install, has several benefits over a fan heater. Once installed it requires little or no maintenance, if properly installed it is very tolerant of damp conditions and it gives a much more even spread of heat around the room. If it is fitted around the bottom of the walls it also reduces the amount of moisture deposited on the walls as the warm air currents rising from it will pick up any such moisture.

Air conditioning Unit

For some particular seeds the ideal germinating temperature is below ambient and some form of cooling may be required. For most installations a self contained air conditioning unit will be the most cost effective option as long as an adequate air mixing/distribution system is installed. It should be noted that an air conditioning unit needs access to ambient air and so a hole in the structure of the room will be required. A less effective and predictable but cheaper solution is to use the cooling effect of the evaporative pad humidifier. This is done by drawing ambient (dry) air over the pad, the process of evaporation actually cooling the air. Once again this would require access to ambient air and also a louvre to allow air to leave the room as it would then become pressurised.

Air mixing/distribution

The most accurate and cheapest way of ensuring uniform conditions within the room is to use a fan and perforated polythene tubing. If positioned correctly the fan in the evaporative pad humidifier can be used for this purpose.

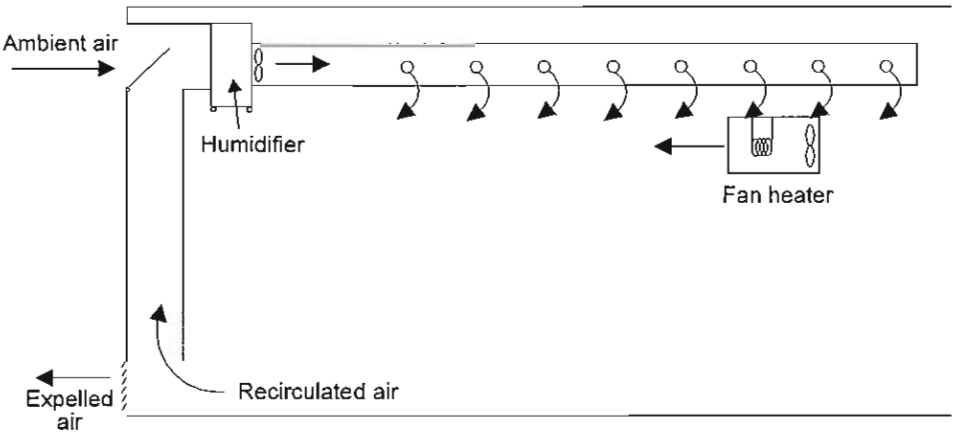
Control System

The finer details of the control system will depend on the choice and layout of the other equipment. However it will essentially be a thermostat ideally with interlocked heater and air conditioning control or interlocked heater and mixing flap actuator.

Suggested layouts

Figures 1 and 2 show two suggested layouts for a germination room.

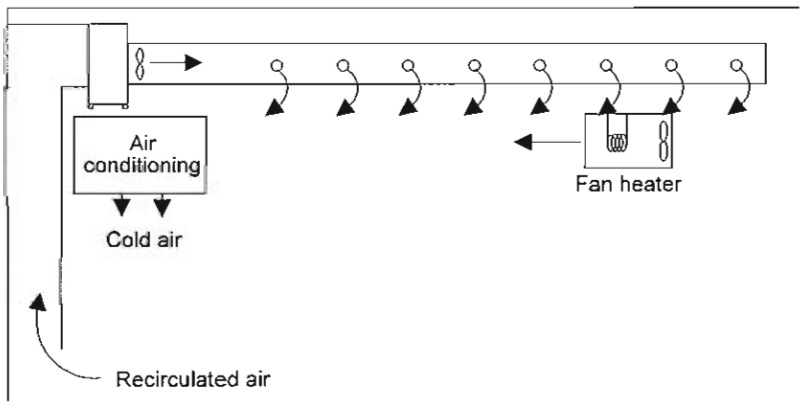
Figure 1 - Layout 1



Layout 1

This layout does not include an air conditioning unit and so relies on the cooling capacity of the humidifier. This requires an automatically controlled mixing chamber which will allow total recirculation of the air through to no recirculation at all. When anything other than total recirculation is being used the room will become pressurised so a louvre will be required to allow excess air to be expelled. By mounting the humidifier close to the ceiling the fan output is less restricted and can be connected directly to the polythene tubing. Ducting on the inlet to the humidifier should ensure that air is drawn from the bottom of the room to encourage better mixing and reduce temperature/relative humidity stratification. The fan heater should be mounted as close to the ceiling as possible without blowing hot air directly onto the tubing. This will ensure that the hot air mixes with cooler humid air almost immediately.

Figure 2 - Layout 2



Layout 2

This layout is essentially the same as Layout 1. The only difference being that an air-conditioning unit is used rather than relying on the cooling effect of the humidifier. The air conditioning unit should be positioned close to the duct air inlet so that as the cold air falls from it, it will be drawn through the humidifier and distributed along the room. This will reduce the drying effect of the air conditioning unit and reduce any temperature variations within the room.

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