

# Electrical Aspects of Micropropagation

## Technique and Terminology

The technique of micropropagation has now become well established as a means of building up, very rapidly, large clonal stocks from single plants. It has an ever widening application and shows promise of becoming the principal means of plant propagation in the near future. (Ref: Royal Horticultural Society 'Garden' Journal Vol 106 Nos. 7 & 8 contain Dr Hussey's paper on micropropagation which was presented to the RHS describing the current state of technology).

The term micropropagation covers a number of specific techniques and the following glossary of terms will be useful in clarifying these:

### Callus Culture

The culture of cell masses on agar media and produced from an explant of a seedling or other plant source.

### Cell Culture

The culture of cells in liquid media in vessels which are usually aerated by agitation.

### Organ Culture

The aseptic culture on nutrient media of embryos, anthers (microspores), ovaries, roots, shoots or other plant organs.

### Meristem Culture and Morphogenesis

The aseptic culture of shoot meristems or other explant tissue on nutrient media for the purpose of growing complete plants.

### Protoplast Culture

The aseptic isolation and culture of plant protoplasts from cultured cells or plant tissue.

## Light for Micropropagation

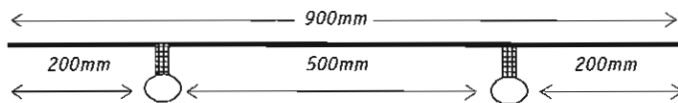
Micropropagation has some important implications for the use of electricity in that a modified growing room technique is required for rearing the plantlets produced. In the early stages of micropropagation light, although required, is not necessary for photosynthetic response as the plantlet is supported entirely by the nutrients contained in the agar jelly on which it is grown. In this particular case, the function of the light is first to stimulate the formation of chlorophyll in the plant tissue and second to avoid excessive elongation of the plant itself. Light at the 'blue' end of the visible spectrum is important for both these requirements. Later in its development, around a week before it is removed from its 'incubating' container, some photosynthetic activity will need to be stimulated in the plant in order to 'condition' it for a daylight environment.

An illuminance of 2000 lux is adequate for the first stage and the plants should then be moved to an area lit at 4000-5000 lux for the final conditioning stage. Lit periods of between 12-24 hours per day, according to species, are generally used. Environmental temperatures required normally lie within the range of 22-28°C.

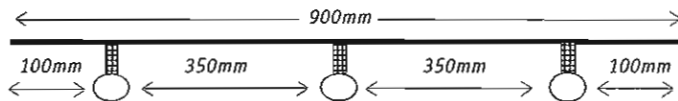
Most micropropagation units consist of tiered rack units similar in design to the original tiered bench growing rooms with a vertical distance of around 0.4m between racks. The containers are placed, close spaced, on the racks. Fluorescent lamps are normally suspended below each tier illuminating the containers beneath. Achieving the target illuminances precisely can be difficult as much depends upon the reflective index of the room and the bench structure - particularly the rack underside surfaces. It is generally recommended that these should be painted white or covered with light reflecting foil.

Ideally 'white' or 'warm-white' tubular fluorescent lamps should be mounted below each rack running along its length. Although the resulting illuminances can vary widely, the following suggested spacing between lamps on a 0.9m wide rack should provide suitable guidance:

a) for 2000 lux (min)



b) for 4000 - 5000 lux



## Other Electrical Equipment

Apart from the actual room itself, certain ancillary equipment and facilities, all with an electrical component, are required to make up a micropropagation unit. Such specific items are listed as follows:

- laminar air-flow sterile cabinets (used in the preparation of material)
- autoclave and dry sterilisation oven
- filter sterilisation equipment
- distillation apparatus or demineraliser for high purity water
- standard laboratory equipment including a refrigerator and microscope

When a large number of cultures must be routinely handled or when large culture equipment is used, walk-in transfer units are used. The rooms are fitted with a ventilator unit consisting of a fan and bacteria-proof filters which force in sterile air. Ultra-violet lighting for eliminating airborne pathogens and air conditioning will also be required.

Large scale micropropagating may also require deep freeze facilities for storing the agar medium and a microwave oven for rapid melting of the agar jelly.