Review Article
SGVU Journal of Pharmaceutical Research & Education

ISSN: 2456-4508

Journal homepage: http://www.gyanvihar.org/researchjournals/

JPRE

PLANT TISSUE CULTURE- A REVIEW

Asmita V. Gaikwad*, Dr. S. K. Singh & Dr. Ritu Gilhotra
School of Pharmacy, SGVU

ABSTRACT:
Plant tissue culture refers to growing and multiplication of cells, tissues and organs of plants on defined solid or liquid media under aseptic and controlled environment. The commercial technology is primarily based on micro propagation, in which rapid proliferation is achieved from in system cuttings, axillary buds, and to a limited extent from somatic embryos, cell clumps in suspension cultures and bioreactors.

Introduction:

A whole plant can be regenerated from a small tissue or plant cells in a suitable culture medium under controlled environment. The plantlets so produced are called tissue-culture raised plants. Plant tissue culture is the technique of growing plant cells, Tissue and organism the artificial prepared nutrient medium static or liquid under aseptic conditions." Tissue culture plants are characterized by disease free growth, a more fibrous, healthier root system ,a bushier branching habit ,and a higher survival rate.

History:

Plant tissue culture was first proposed by the German Botanist Golliob Haberlandt in 1902 .He is regarded as the father of plant tissues culture. He mainly worked on palisade tissue and grew them on knob's salt solution with sucrose and observed the growth of cells. Hanning (1904) excised matured embryos of crthe ucifers and successfully grew them on the mineral salt and sugar solution. The embryo culture was further developed by over back (1941).
This proved to be a turning point in plant tissue culture. In 1972, Carlson and other produced the first somatic hybrid between Nicotiana gluca and N.langschorffii by fusing their protoplast. Tissue culture of first used on large scale by the orchid industry in 1950s.

IMPORTANCE:

- A single explants can be multiple into several thousand plant
- Plant cultures in approved media are easier to export than are soil- grown plants.

- Tissue culture allows fast selection for crop improvement.
- Virus free ex plant scan be frozen.
- Tissue culture clones are true or type as compared with seedlings.

Stages of Tissue Culture Process

1. **Preparation of nutrient medium**: A semi-solid medium is prepared in double distilled water containing macro elements, micro elements, amino acids, vitamins, iron source, carbon source like sucrose and phyto-hormones.

2. **Establishment of aseptic culture**: The starting material for the process is normally an actively growing shoot tip of axiliary or terminal bud or shoot tip of a plant.

3. **Inoculation:** Inoculation is carried out under aseptic conditions. In this process explants or micro shoots are transferred on to the sterilized nutrient medium

4. **Development of plant in growth room:** After the inoculation of the plant tissue, the bottles are sealed and transfer red into growth room to trigger developmental process under diffused light (fluorescent light of 1000-2000 lux) at 25 ± 2 o Cand 50 to 60% relative humidity.

5. **Hardening of micro plants**: Due to very high humidity inside the culture vessel and artificial conditions of development, the plantlets re tender and are therefore are not ready for coping up with the field conditions

Types of Plant Tissue Culture:

1. Apical meristem culture
2. Axillary bud culture
3. Callus culture
4. Cell culture
5. Suspension culture
6. Protoplast culture
7. Embryo culture

Principle:

The technique developed around the concept that a cell is totipotent and so has the capacity and ability to develop into whole organism.

Growing the plants:

1. The tubes containing plant sections may be placed in a well-lit area of the classroom although not in direct sunlight. The shoots will probably grow more quickly if the explants are placed under fluorescent or grow lights to provide at least 12 hours of light per day. The aquarium can be used as a growth chamber with the lighting about 8-10" overhead. This will also

help maintain a more regular and warm temperature. Ensure that the temperature does not go over 28o C. New shoots should develop within 2 weeks, and should be well advanced in 3 to 4 weeks. Check the tubes daily and discard any that show signs of infection (before discarding first sterilize in the pressure cooker or add bleach into the tube).

2. Roots can appear within 6 weeks on cauliflowers. The roses, African violet and other cuttings will need to be moved into rooting media for roots to properly develop. This transfer to the second, rooting media must be conducted under the same sterile conditions as at the initiation of the culture. All necessary equipment and the aquarium should be set up as before and properly sterilized.

3. Working inside the sterile aquarium chamber, remove the cap from the culture tube. There will usually be several shoots that have arisen from each explant. These shoots should be carefully separated by gently removing the whole explant from the media with sterile forceps and then separating the shoots by gently pulling them apart using two pairs of forceps. Each shoot should then be placed into a tube of rooting media and the bottom of the shoot pushed into the media so that good contact is made. The cap is replaced and the shoots are then allowed to grow as in step 1 until roots are formed, usually within 2-3 weeks.

Potting the clones:

Once roots are well formed the plants are ready to be transferred into soil

Figure 2: Roots are fully developed prior to moving plants to pots of soil.

1. Each plant should be carefully removed from its tube of media and planted into a small pot containing a clean light potting mix. Gently wash off the entire agar medium prior to planting. The plants will still need to be protected at this stage since they are not accustomed to the drier air of the classroom when compared to the moist environment of the tube of media.

2. Place all of the pots onto a tray and cover lightly with a plastic dome or tent. Place the plants in an area with 12-16 hours of light (either natural or artificial) but not direct sunlight.

3. After a week the cover can be gradually removed and the plants acclimated to stronger light and drier atmospheric conditions.

4. You now have a collection of plants in your classroom that are genetically exactly the same. You could use these plants to carry out other experimental tests knowing that one of the main variables in the experiment has been eliminated. Some of these tests could include looking at plant responses to low light levels, to drought or to saline soil conditions.

Conclusion:

Tissue culture is one of the most important part of applied biotechnology. In the coming decades the world's population will increases more and accommodation space, agricultural lands will decrease significantly global climate change is also another consideration .keeping these in mind we have to ensure a peaceful, healthy and hunger free greener world for our next generation. For doing this there is no alternate of plant tissue culture.

REFERENCE:

1. From: Methods in molecular biology, vol. 318: plant cell culture protocols, second edition Edited by: V. M. Loyola – vargas and F. Vazquez- FlotaHumana press Inc., totowa, N**.**
2. Tissue Culture Hartmann and Kester's Plant Propagation, Principles and Practices 8th ed. Hudson Hartmann, Dale Kester, Fred Davies, Jr. and Robert Geneve 1 Plantlets Seedlings Callus Somatic Embryogenesis the types of tissue culture can be grouped by the structures formed in culture.
3. Harshal A. Bhoite, Gautam S. Palshikar, JSPM's Jayawantrao sawant College of Pharmacy & Research, Hadapsar, Pune.
4. http://pdf.usaid.gov/pdf_docs/PNABD686.pdf
5. http://www.apsnet.org/edcenter/K12/TeachersGuide/PlantBiotechnology/Documents/PlntTissueCulture.pdf.