

# Artificial plant

## What is cloning?

If you have ever taken cuttings from a plant and used them to grow new plants, you have made clones. Potatoes are one of the most familiar crops routinely grown from clones, which are usually

described as genetically identical plants (but see later). Researchers and suppliers of rare or valuable plants use techniques that are rather more sophisticated than detaching a seed potato.

## How artificial plant cloning is done

- 1 Surface sterilise the plant tissue and, using aseptic technique (see Figure 1), cut out a small piece of tissue from the plant (an explant).
- 2 Place the explant on nutrient growth medium.
- 3 Cells in the explant will divide, forming an undifferentiated mass called a callus.
- 4 After a few weeks, remove groups of cells from the callus and place them on a growing medium containing specific growth factors that encourage shoot growth, in the light.

- 5 Place the growing shoots onto new growth medium containing specific growth factors that encourage root formation.
- 6 Transfer the plantlets to a greenhouse to acclimatise and harden them off (by slowly decreasing the humidity within the growth vessel).
- 7 Transfer the clones to compost or soil.

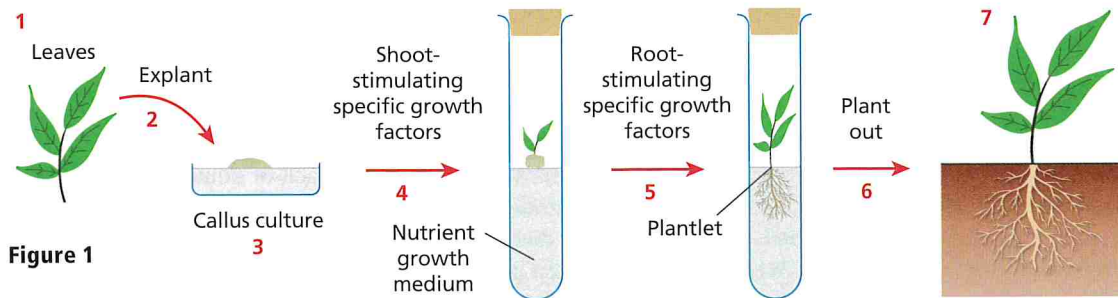
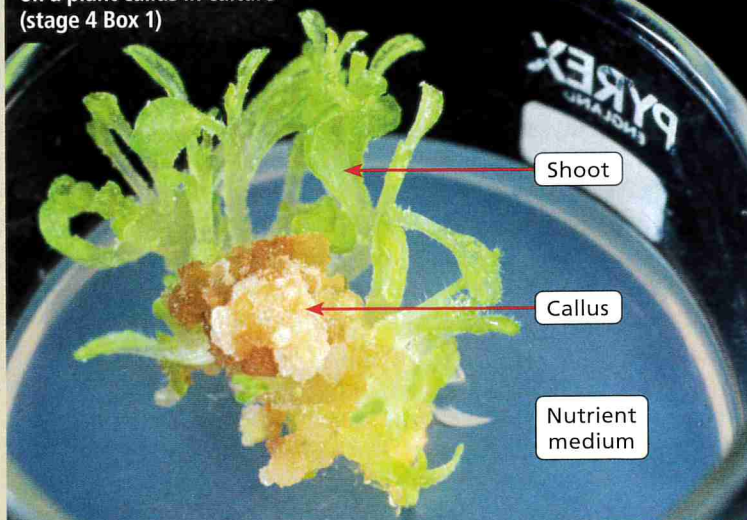


Figure 1

Shoots which have formed on a plant callus in culture (stage 4 Box 1)



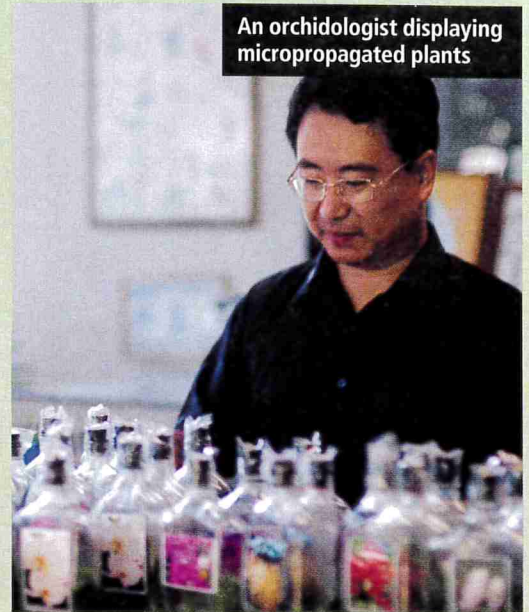
Researcher transferring callus with shoots to new medium containing growth factors which promote root formation (stage 5 Box 1)



# cloning



Researcher using aseptic technique while preparing plant tissue for cloning



An orchidologist displaying micropropagated plants



Commercially available plants that have been artificially cloned

## Advantages of artificial cloning techniques

- Huge numbers of new plants can be produced relatively quickly from a single individual with favourable characteristics.
- Cloning obviates the need for growing plants to reproductive maturity (which can be many decades for some valuable trees) and pollinators.
- The new plants will have all or the majority of the favourable characteristics of the parent plant (unlike plants grown from seed).
- Tissues capable of producing clones can be deep frozen then revived many years later (which does not work with seeds of many valuable plants).

## Disadvantages of artificial cloning techniques

- Laboratory equipment for ensuring the aseptic conditions required for the process is expensive.
- Contaminating microbes grow a great deal faster than plant material in tissue culture medium and can ruin entire stocks.
- As the clones are genetically very similar, they will all be susceptible to the same diseases or perturbations of environmental conditions (think potato famine).
- The clones will not be identical, as genetic mutations can happen at any point during their growth, so will need testing to check they have the desired favourable characteristics.
- The clones will potentially contain viruses or other pathogens that inhabited the parent plant.

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## RESOURCES

Effective way to replenish threatened plants: cloning techniques to give the threatened Hill's thistle a fighting chance, *ScienceDaily*:  
<https://tinyurl.com/y6yql43r>

Video explaining banana tissue culture:  
<https://youtube.com/watch?v=sLoZbDnAPIk>

Discussion of mutational changes in cloned plants, *ScienceDaily*: <https://tinyurl.com/y4zjrdhm>

Professor Liz Sheffield, University of Liverpool