Part 2.

MAXIMISE PRODUCTION, MINIMISE LOSSES

Choosing More Productive Crops

Some crops give better yields in hydroponics than others and have a high market demand. Lettuces, tomatoes, cucumbers, capsicums, roses, gerberas, carnations and chrysanthemums have proven to be highly productive in many commercial hydroponic operations around the world.

'Mini Brite' Rose

In particular localities, other specialised crops give better yields in hydroponics compared to outdoor production. For example, hothouse orchids can be grown in midwinter in Europe in heated hydroponic greenhouses. Similarly, niche or luxury crops such as strawberries, which typically have specialised growing requirements and a short shelf life, can be grown hydroponically in many different areas.

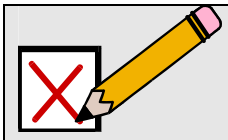
Commercial operators are advised to run a crop trial (described in Chapter 16, *Commercial Hydroponics*) to find out what crops are likely to yield well in their locality. In particular, operators should find out which *varieties* respond well to hydroponic production.

Avoiding Plant Losses

Large-scale plant losses are particularly catastrophic in hydroponics because of the high setup and operational costs. Fortunately, most problems occur on a small scale because the growing environment is carefully monitored and problems can be quickly detected and acted upon. Most losses are due to nutrients or the growing environment. For more information see Chapter 17, 'Troubleshooting' in *Commercial Hydroponics*.

SET READING

Read the following chapters in *Commercial Hydroponics* before attempting Self-Assessment Test 3:
- Chapter 9, Equipment
- Chapter 10, Greenhouse Operation
- Chapter 17, Troubleshooting



SELF ASSESSMENT
Perform the self-assessment test titled 'Test 3'.
If you find yourself getting the answers wrong, go over the notes from this lesson again and then repeat this test until your answers are correct.

MAXIMISING GROWTH RATES

Getting the most from your hydroponic space means maximising the crop's growth rate. Growers must understand each crop's growing requirements, in particular optimum temperatures, water requirements and nutrition. The grower should also know specific cultural practices such as carbon dioxide enrichment and pruning that will improve the crop's productivity.

Specific cultural practices used to improve growth rates are described below.

Stopping

There is often a requirement in some greenhouse-grown species to temporarily stop shoot elongation and to promote lateral branching. Many ornamental plants are stopped to improve their shape.

Mathiola incana (stock)

Longer-term vegetable crops such as tomatoes, cucumbers and capsicums are typically stopped as they reach the end of their productive life. This allows any fruit left on the plant to mature through to harvest, while vegetative growth is terminated at the top. Stopping speeds up the rate of fruit development and ripening and is a useful tool in hydroponic vegetable production. For edible crops, stopping must be carried out manually by removing the growing point as most plant growth regulator compounds are typically not permitted for use on food plants.

Trimming

All plants grow foliage that can be removed without detriment to the health of the plant. In forced growing conditions, removal of unwanted growth is required to maximise plant energies to producing a saleable product. With tomatoes, all foliage below the first truss (fruit) is often trimmed off by growers in the mistaken belief that this will allow faster ripening on the fruit. However these leaves directly surrounding the truss – both above and below – are the principle producers and supplies of sugars to that fruit and removal not

only reduces final fruit size but also sugar levels and flavour quality. It is preferable to leave at least two leaves below the bottom truss until all fruit are harvested from that truss for this reason. Tomato plants are typically heavy croppers and are source, rather than sink limited (source being the leaves, sinks being the fruits), thus removal of `excess' leaves is not beneficial to the plant.

The only excess growth that should be removed from tomato plants are the lateral growths that develop in the axils of each leaf. Tomatoes are typically grown as a single leader with no side branching and regular removal of lateral growth is required.

Carbon Dioxide Enrichment

Carbon dioxide (CO_2) and oxygen (O_2) are vital for crop growth and deficiencies in either of these will result in yield reductions. CO_2 in the atmosphere is around 360ppm, however enrichment up to 1000–1200ppm in the greenhouse will give yield increases and decrease the time to harvest of many crops. CO_2 enrichment of the greenhouse may be used to simply replace the CO_2 taken up by the plants, thus preventing CO_2 deficiencies (enriching up to ambient levels inside a relatively closed greenhouse) or boosted to levels of over 1000ppm depending on factors such as the requirement for venting, where high CO_2 levels can be lost and the cost of enrichment.

CO_2 deficiency is common in winter greenhouses, usually in the few hours after dawn, when the vents remain closed to retain heat, but the crop begins active photosynthesis, thus rapidly lowing the CO_2 contained in the limited greenhouse environment. Growers should be aware of the need to draw in fresh CO_2 supplies, even if this means a loss in greenhouse heat.

Oxygen Supply

African violets

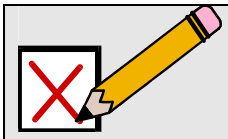
Oxygen is required for the process of respiration and while plant leaves have access to more than sufficient O_2, plant roots may become deficient in many growing situations. While hydroponics does offer the opportunity for better oxygenation of the root system than soil-based systems, root suffocation due to a lack of O_2 is common in many densely grown hydroponic crops.

Oxygen is only slightly soluble in water or nutrient solution with maximum rates of only 12–13 ppm of O_2 held at around 10°C, this can be rapidly taken up by an active root system to the point where suffocation and root cell death starts to occur. Hydroponic growing media needs to be porous to allow oxygen penetration and methods used to enrich nutrient solutions with as much dissolved oxygen as possible.

SET READING

Read the following chapters in *Commercial Hydroponics* before attempting Self-Assessment Test 4:

- Chapter 4, Nutrition
- Chapter 11, Plant Culture in Hydroponics



SELF ASSESSMENT

Perform the self-assessment test titled ‘Test 4’.

If you find yourself getting the answers wrong, go over the notes from this lesson again and then repeat this test until your answers are correct.

SET TASK

Use the Internet and any other available resources (eg. library books, specialist hydroponic magazines) to research two crops that you would like to grow in hydroponics and that you think have good commercial potential.