



Growing bulbs in water

takes root



A number of methods have been trialled including flowing water (top) and ebb and flood (above)

The Dutch are changing to growing bulbs in water culture systems. Claire Shaddick talked to flower crop researcher Hans Meester about the advantages of this method for cut flower forcing

The technique of forcing tulips in a hydroponic system has been adopted with some enthusiasm by Dutch growers over the last five years or so, with about half of the national forced crop now produced this way.

The system, which sees the peat traditionally used in trays replaced by just water, attracted growers mainly because of the prospects for saving labour. "The work is lighter and picking is faster," says Hans Meester, a flower researcher at Proeftuin Zwaagdijk research station in north-west Holland. Water filled trays are half the weight of peat filled trays, so are easier for workers to handle, while stems are quicker to pull at harvesting – the

International Flower Bulb Centre suggests harvesting is 35% faster.

There are environmental advantages, too. While growers' use of peat in the Netherlands has not been attacked as aggressively as in the UK, switching to water dispenses with the routine treatment with a *Pythium* fungicide that is needed in conventional systems, and with the problem of disposing of spent peat.

Various methods of supplying the bulbs with water have been tried but most growers are using what Meester describes as 'standing' water, where bulbs sit in a reservoir of water in special trays, topped up by drip lines or sprinklers. "Most growers already have a drip system from growing in peat," he says. "Some use sprinklers, but the whole plant gets wet which may lead to disease problems."

Research at Proeftuin Zwaagdijk has compared the standing water method with ebb and flood and with a recirculating system where the water flows continuously. "These produce better quality in terms of stem weight and length and less wastage, but are a big investment," he says. "The switch from peat to standing water is easier for growers to make."

Rooting conditions

Trials have compared rooting conditions to achieve the required root length of 3-4cm. Bulbs subjected to the same temperature regime as peat-grown bulbs threw longer roots which, although they led to a heavier stem weight, also tended to slow down harvesting and encourage bacterial infections. "It's a matter of time and temperature to produce sufficient roots," says Meester.

After rooting, the hydroponic crop can be grown a couple of degrees cooler than the conventional crop, at 16°C to 18°C. "In our experiments, when we forced hydroponic and peat-grown bulbs in the same glasshouse, the hydroponic bulbs flowered two to three days earlier so we recommend they are grown cooler," he says. "The reason for the faster growth is because the temperature of the water mirrors the glasshouse temperature, whereas peat always stays 2-3°C cooler."

Other work at the research station has assessed the value of nutrient feed and variations in EC which regulates water uptake. The standard feed is based on calcium nitrate and calcium chloride and results have found that



Lisianthus crops (above) and celosia (below) have been successfully produced using the same techniques



feeding is more important during rooting rather than growing on. "It is hard to prove a better programme for fertilisers but I think there is more to be gained," says Meester. "Next year we are starting a four-year project which will try to improve quality with feeding. Our work so far has looked at nitrogen and calcium while potassium and phosphate may be more important."

The main cultural hurdle to overcome with standing water has been the slime that can develop on roots. "This has been a big issue," says Meester. "It can be avoided by periodically replacing the water with fresh water."

Other snags have included the length of time bulbs are stored for cropping towards the end of the season. Bulbs forced in peat can be held planted-up in trays for long periods by manipulating temperatures. For forcing in water, bulbs have to be stored dry which, after five or six months, weakens the bulb and leads to reduced rooting and lightweight stems. Work at Proeftuin Zwaagdijk has looked at packing the bulbs in peat and vermiculite and storing below 0°C, and at holding planted trays in chilled

water as ways of reducing these problems.

Some tulip bulbs have a naturally thicker skin which can be a barrier to rooting. Using so-called hydrotrays, designed with pins to hold the bulbs in place, piercing the skin but without causing rotting, encourages rooting of thick-skinned varieties. Soaking bulbs in water before planting also helps.

Leaf cracking is another problem that can occur in water-forced tulips when humidity is high and plant activity is low. "The roots are still taking up water but the plant is not transpiring," explains Meester. Consequently the pressure in the leaves increases to the point where the cells burst and the leaf tissue ruptures. Plants produced from bigger sizes of bulbs are especially prone. Trials have investigated the effect of applying 'white' light from mercury lamps and blowing air through plants as ways of stimulating transpiration. Both treatments helped, and were particularly successful when combined.

Forcing other bulb crops in water has been trialled by the research station. Because lily roots are formed on the stem above the bulb, bulbs had to be immersed in a standing water system, which led to wholesale rotting. But spraying the bulbs with water for 30 seconds every 10 minutes through overhead sprinklers was found to work well. The cost of such a set-up, however, has yet to convince any lily grower to switch from peat.

Researchers are now looking at forcing lily bulbs in pots using small volumes of peat or coir and irrigation by ebb and flood or sprinklers which they believe, in the long term, would lend itself to mechanical harvesting.

Forcing irises

Irises could be forced in water during winter but not during summer, following tulips, which had been the target. "The greenhouse and water temperatures were just too high," says Meester. "We were able to produce sufficient stem length, but stems were weak and lacked weight."

The research has also investigated the potential to produce hydroponic crops of summer flowers. Lisianthus worked best on standing water while celosia and matricaria produced best results on flowing water. Trachelium, antirrhinum and matthiola were ruled out altogether because of poor flowering.