

GROWERTALKS

Features

11/1/2019

Moving from Flowers to Food

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Consumer interest in sustainable, locally produced food is driving small markets, local restaurants, and both regional and national grocery chains to source greenhouse-produced crops. A review of the restaurant menus and a walk through grocery store aisles proves this out: locally sourced produce is heavily marketed and carries a stronger, perceived value. Griffin works with many controlled environment agriculture (CEA) growers producing lettuce and herbs in greenhouses around the country. This is definitely a growing market.

Odds are good that most flower growers can name a couple of growers that have expanded into food in the last two or three years. Are you thinking of growing your business into this rapidly expanding arena, too? If so, let's look at how production of lettuce and herbs will differ from what you know in flower production.

Production systems

Lettuce, leafy greens and herbs can be produced in several ways, with the most common approach using hydroponics. Deep water culture (DWC) involves supporting the crop with a raft that floats on the top of a shallow pond in the greenhouse. The pond contains a nutrient solution that feeds the crop. The roots are the only part of the crop that contact the solution. DWC is most commonly used for head lettuce, though it can be adapted to leafy greens production, too.



Pictured: For new growers converting existing greenhouse space, the easiest approach will be to retrofit the production space with an NFT system. • Inset: NFT herb production.

For new growers converting existing greenhouse space, the easiest approach will be to retrofit the production space with a nutrient film technique (NFT) system. NFT systems are highly efficient, recirculating systems in which a thin stream of water runs through food-grade gutters or channels. The gutters support the crop so that the roots are bathed in the nutrient solution.

Head lettuce, leaf lettuce, leafy greens and herbs are all commonly grown in NFT systems.

Climate control

Year-round production of food crops requires good environmental control through the summer and winter to maintain crop quality and to ensure a consistent supply of product. No single environment will serve all greens and

herbs. For example, while basil likes warmer temperatures, lettuce requires cooler temperatures.

All flower growers know what it means to heat a greenhouse; maintaining cool conditions in the warmer months is something that fewer growers have needed to address. For most locations, lettuce crops will require active cooling during the warmer months. This is one reason that greenhouse lettuce production is more common in northern states than southern states.

In lettuce production, it's not uncommon to cool the nutrient solution in addition to cooling the production space. In some cases, cooling the space may be achieved with traditional fan/pad systems. Larger growers will often turn to advanced chiller technology to support predictable, year-round production.

Lettuce, especially head lettuce, can develop tip burn due to lack of calcium in the growing tips. Calcium is one of the few nutrients that moves from roots to leaves through active transpiration. Even if calcium supply to the roots is adequate, low transpiration will prevent calcium from being drawn to the growing tips and marginal necrosis of the new leaves will develop.

Experienced growers recognize that a combination of low light and high humidity strongly discourages transpiration within plants. Use of horizontal air flow fans (HAF) mitigates this problem for most crops by gently moving the air over the crop. Head lettuce is particularly prone to transpiration problems because a microclimate develops at the dense, protected growing tip.

As in flower production, HAF fans are important in maintaining a constant environment across the production space. However, lettuce needs a little extra help on this front, as HAF fans won't break down this microclimate. The best way to prevent tip burn in lettuce is to direct air straight down to the crop using large, paddle fans. As with all crops, the goal isn't to create a windstorm at crop level—the air flow should be gentle at crop level.

Lights

Growing in a northern climate can help with temperature control, but it creates a need for supplemental lighting. According to Dr. Neil Mattson, lettuce requires a daily light integral (DLI) of 17 mol/m²/day. Beaman et al. reports that optimal light intensity for basil production is 500 μmol/m²/s, which would equate to nearly 29 mol/m²/day under their suggested 16-hour photoperiod. Assuming a 65% light transmission rate, the natural light level outside the greenhouse would need to be 25 mol/m²/day to hit 17 mol/m²/day in the greenhouse. This seems fine until you study the Clemson DLI maps and realize that most growers in the U.S. don't come anywhere near 25 mol/m²/day outside from November to January, and northern growers don't reliably hit his level until sometime in March.

One option is to grow the crop slower and longer. The problem with this approach is two-fold: lower quality and lower revenue. Grower reports indicate that crop quality increases dramatically with supplemental lighting in winter months. Conversely, your winter crop will be of lower quality when it's not lit (lower weight, thinner leaves, etc.). Additionally, growing a longer crop means that you turn fewer crops, so your revenue per square foot goes down. The impact amplifies when one considers that winter is a time when supply and demand greatly favor a grower that can consistently produce a high-quality crop.

Are some lights better than others for lettuce and herb production? Basil can easily be lit with either HPS or LED lights. However, there are several reasons to turn to LED lights for lettuce crops. First, HPS lights generate a fair amount of heat. Remember that lettuce is a crop that prefers to be grown cool, so adding heat to the crop can be problematic. LEDs add far less heat to the production space than HPS. Additionally, LEDs generally contain light from the blue end of the spectrum. Blue light increases anthocyanin production in lettuce, which means your red leaf lettuce will have better color.

Media

While many flower growers probably produce some herbs in peat-based media for garden center sales, most commercial greenhouse production of lettuce and herbs occurs in inert media, such as Grodan rockwool and Oasis foam. Use of these products keeps the system free of debris while allowing good porosity around the roots.

Stabilized media products can also work, but they should be evaluated to ensure that they will maintain their integrity in the hydroponic system. Sleeved products, such as Jiffy-70 and Ellepots, are gaining in popularity and can support a more organic approach. Traditional peat-based media can also be used with net pots.

Fertility

Flower growers know a great deal about fertilizers and managing media pH. This knowledge will be put to good use when growing food, though things change a bit when it comes to lettuce and herbs. Remember that inert media doesn't provide the same buffering that a peat-based mix affords, so the fertility needs to be more tightly managed. Recirculating systems generally include monitoring for both pH and EC, and many will make automatic adjustments to control both.

Speaking of EC, the fertility level needed for basil is similar to many flower crops, at 200 ppm. However, GGSPRO recommends lower fertility rates for lettuce, at only 150 ppm. For lettuce, this is about half the rate you're used to using for your spreading petunias.

The balance of nutrients needed is a little different, too. Both lettuce and herbs require a relatively high amount of calcium. Since the inert media commonly used for production has very low cation exchange capacity (CEC), it's very important to deliver a consistent source of calcium in the fertilizer solution. There are some very good hydroponic formulations available that will help you do this, though it's not uncommon to supplement these formulations with some calcium nitrate. Before implementing any fertility program, it's critical to understand your water quality. There's less room to manage the root zone pH with fertilizer alone and the need for pH adjustments should be understood before production begins.

Pests

The most common pests that create problems in lettuce and leafy greens crops are well known to flower growers: aphids top the list for insects, with Botrytis and powdery mildew topping the list for diseases. Sclerotinia can also be a problem in lettuce, though it's less commonly encountered. Expect to stock your chemical cabinet differently to prevent and control these pests—chemicals must be labeled for greenhouse use on the specific crops you're growing.

Basil is highly susceptible to downy mildew, which can be devastating to the crop. Preventing downy mildew in basil starts at sowing with preventative treatments and should continue through shipping. Fortunately, there are several very good products to help prevent the disease from developing and a couple of effective options that can be used if the disease appears.

We all know that sales in the ornamental market are relatively flat. Unlike ornamentals, the market for greenhouse-grown vegetables is rapidly expanding, bringing opportunities for growers around the country to expand their businesses. Once you've identified your path to market and demand in your town, city or region, it's just a matter of removing some benches and adding some NFT equipment and lights to bring a new, year-round revenue stream to your business. **GT**

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