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FEATURES

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The Highwire Act

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Contrary to popular belief, there's a large amount of scientific research regarding peppers and their interaction with supplemental lighting. Peppers are very receptive to lighting and spectrum. Growers should be aware of supplemental lighting's potential as an integral tool for crop-steering, increased production, fruit size, workplace ergonomics and more.

In this article, we'll examine the kinds of questions that pepper growers should be asking themselves and then we'll discuss the best available solutions—based on the current data—for each need or pain point.

Grower challenges with peppers

Peppers, like tomatoes and cucumbers, are highwire-vine crops; this means their fruits set along the vine as they ripen, growing upwards. Many growers will lower the fruits by hand to provide ideal spacing or height. However, unlike tomatoes and cucumbers, peppers are a slow-growing crop. With pepper plants, the vine doesn't become as tall or as long, which leads to fruit crowding and "blocky fruit" on the vine—as opposed to the "ideal consumer shape." In other words, lacking the necessary elbow room translates to lower commercial value harvests.

For many pepper cultivators, their objective is to create more space on the vine for improved fruit morphology and growth. Lighting is one of the best ways to impact fruit spacing. Spectrum optimization is a fantastic—but oft unknown or underutilized—tool for crop steering and crop development. In light of the bottom line, spectral optimization can fall to the wayside. This is especially true in regions where financial incentives or environmental considerations reduce the growers' feasible lighting options or freedom to choose ideal spectra.

Pictured: The most-cited pain points among pepper cultivators are fruit morphology (i.e. blocky fruit from overcrowding) and slow growth of the vine.

For instance, in the Netherlands, there's a subsidy program for lighting fixtures with a minimum of 5% green photons, along with a substantial rebate. This program encourages energy efficiency and sustainability, but doesn't necessarily encourage the best spectral options for peppers. In this case, financial incentives are the main driver for decisions on lighting solutions. A suboptimal spectrum makes sense for Dutch farmers because of peripheral factors, but growers not subject to those restrictions—such as those in Leamington, Canada, and in the United States—should consider the following value propositions.

Are we concerned with vine elongation?

If yes, then we want to consider a higher proportion of far-red photons in our spectrum.

Why far-red photons? When plants receive higher proportions of far-red light, they perceive themselves as "in the shade" of other plants, whose competing leaves or canopies are absorbing a majority of the visible spectrum. Therefore, far-red photons trigger a response in plants to stretch, elongate or otherwise grow out of the shade and into more direct sunlight. In this way, by adding more far-red, we can induce vine stretching and elongation—thereby reducing or eliminating fruit crowding and (ultimately) producing more commercially viable peppers.

To note, some modern pepper cultivars naturally exhibit more vine elongations, but traditional cultivars display scrunched architecture. Far-red could be the simple solution to combat blocky fruits and overcrowding in both newer and older cultivars.

Does the "flushness" of the crop have any value impact?

When we use "flush" here, we mean the phenomenon of fruits ripening all at once. Following the first flush (or mass ripening), there may be a period of dearth when there's no fruiting of flowers, then another sudden large flush. For many growers, high flushness means higher costs and greater difficulty of harvest due to more labor requirements in a shorter duration.

The opposite of high flushness is a steadier production through staggered ripening periods. Growers can influence the ripening process and regularity under a broader spectrum of white light. Studies show a significant reduction in yield variability under white light (i.e. decreasing flushness and decreasing labor costs). Therefore, if labor costs and yield management are critical for our success, then we want to consider a broader spectrum option for peppers.

Do we care deeply about cumulative yield and/or fruit size?

Particularly during the winter months when the natural daily light integral (DLI) is low, growers are compelled to use supplemental lighting to ensure steady and optimal plant growth and fruit development. Indeed, growers can influence fruit size (in the exact same pepper cultivar) with spectral differences while maintaining an equal cumulative yield.

For those growers who want larger, but fewer, fruits, then a BW4 Broad White Spectrum would work best. For those who want smaller fruits, but more numerous fruit (thus achieving comparable total yield), then a BW8 (pink) spectrum would be preferred.

How important is it to have an ergonomic grow space?

The human eye prefers a broad-spectrum white light. This is true not only for ease and comfort, but also for spotting pests and problems in the greenhouse. Broad-spectrum lighting is typically the best option for workers and workability, but—ultimately—the plants produce the peppers. Therefore, growers must consider the balance between what's best for workers and what's best for crops, yields and the bottom line.

This is a simple case of "visibility" vs. "viability" in the workplace. To this end, Fluence VYPR's BP9 spectral option is a great spectrum for peppers, achieving total yield comparable to BW4 Broad White or BP8. It is also cheaper to operate due to its greater efficiency, which affects the bottom line.

Pictured: Lighting is one of the best ways to impact fruit spacing. Spectrum optimization is a fantastic—but oft unknown or underutilized—tool for crop steering and crop development.

Growing based on bias vs. science?

How willing are we, as growers, to sacrifice our personal preferences and biases for the sake of our peppers and published science?

There's a lot of valuable information and empirical data behind pepper research. Whether or not we choose to use this data and knowledge is our prerogative. It's understandable that many growers maintain their "tried-and-true" methods that have worked well enough for them in the past. Traditions can be comforting, but traditions can be stifling as well—especially for overcrowded fruits.

Peppers are receptive to lighting. This is good news. The most successful growers will be equally receptive to advances in our scientific understanding of plants and advances in lighting solutions, such as spectral optimization based on the plant cultivar and the grower's needs and business goals.

The most-cited pain points among pepper cultivators are fruit morphology (i.e. blocky fruit from overcrowding) and slow growth of the vine, which is—metaphorically speaking—the root of the problem. Still, these pains can be lessened or removed altogether with spectrum optimization through advanced LEDs.

Fluence's Crop Sciences team is comprised of passionate growers and scientists, like me, who are more than willing to help growers achieve their cultivation goals. It's not an exaggeration to say we're eager to answer your questions and provide support that ranges from fact finding to in-depth spectral analysis and

beyond. Growers shouldn't feel alone on their journey—there's an entire world of research and support at our fingertips.

Reach out to our team of experts at Fluence for a whole host of resources and information.

Dr. David Hawley leads the scientific research initiative at Fluence as the company's principal scientist. His experience in controlled environment systems, horticultural lighting and cannabis metabolome naturally underpins Fluence's mission to drive industry-leading lighting research to explore the interaction between light and life. Find out more at fluence-led.com.