BioChambers
PROVIDING GROWTH TO RESEARCH.

FREQUENTLY ASKED QUESTIONS

FAQ QUESTION #6

Do I need far-red in my light source?

It depends on your plant growth goals. Far-red (701-750nm) photons synergistically increase photosynthesis when added to PAR (Photosynthetically Active Radiation (400-700nm)); however, they do little to drive photosynthesis on their own (McCree 1972, Zhen & Bugbee 2020, Zhen & van Iersel 2017). Through the effects of phytochrome photoreceptors, having appreciable far-red (701-780nm, in those plants whose tissues actually absorb up to 780nm) in your light source will likely stimulate stem elongation to some degree (Demotes-Mainard et al 2016, Morgan et al 1980, Park & Runkle 2017). In long-day plants, including appreciable far-red will invariably shorten the time to flower compared to growth under the same light source without far-red (Demotes-Mainard et al 2016, Runkle & Heins 2001). This far-red stimulation of flowering has also been reported for some short-day and day-neutral plants as well (Craig & Runkle 2013, Izawa et al 2000, Reid et al 1967, Schwend et al 2015). While adding some far-red may stimulate growth and promote timely flowering, at some point additional far-red may cause tall spindly plants with reduced leaf investment that flower pre-maturely, reducing overall growth and seed quality/yield (Holmes & Smith 1975, Keiller & Smith 1989, Maliakal et al 1999). This effect is called the shade avoidance syndrome and is most pronounced in obligate sun plants (shade avoiders) at lower overall PPFD (Franklin 2008, Hersch et al 2014, Hitz et al 2019, Figure 1). Because of the almost universal effects of far-red on growth and morphology, and its ubiquitous effects on flowering time, we offer far-red standard on the majority of our equipment. For the majority of our LED options, far-red is independently dimmable, allowing you to optimize the amount and proportion of far-red for your plant growth goals.

For a more detailed discussion of how far-red affects plant growth, and how to adjust the amount and proportion of far-red inside your growth chamber, please read: How far-red photons affect plant growth and development: a guide to optimize the amount and proportion of far-red under sole-source electric lights. https://www.biochambers.com/pdfs/far_red.pdf

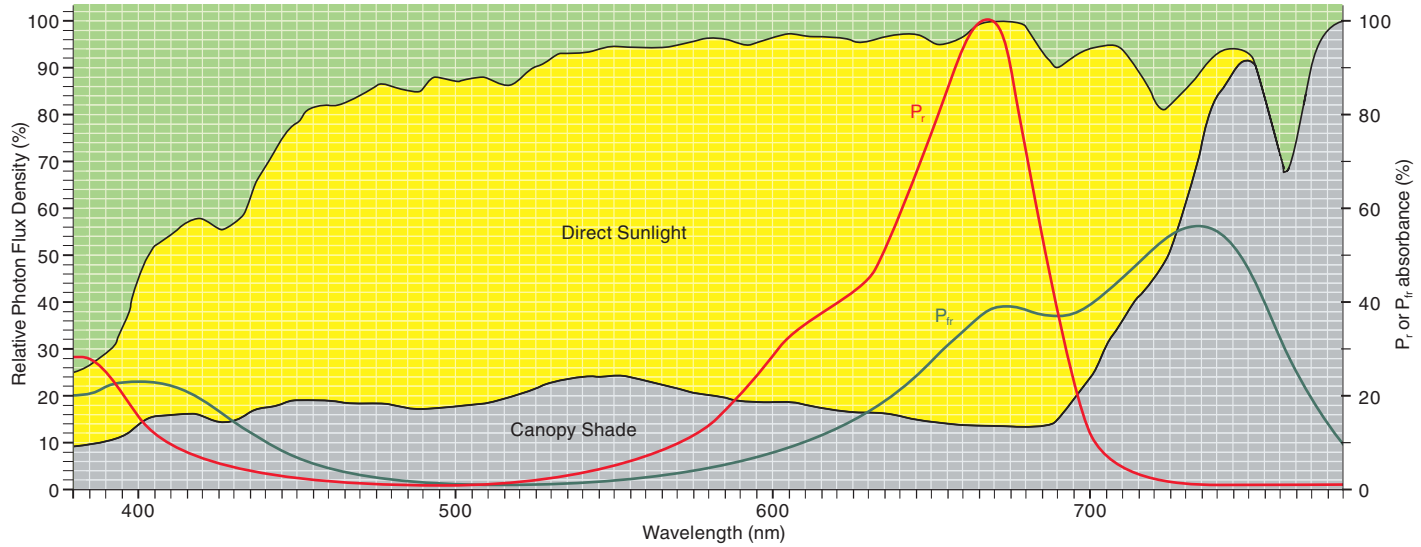

FIGURE 1: Spectral comparison of direct sunlight and canopy shade with red (P_r) and far-red (P_{fr}) absorbing phytochrome forms (from Sager et al 1988). The proportion of photosynthetically active radiation (PAR, 400-700nm) is reduced under canopy shade, while far-red is enriched. The reduction in red (600-700nm, P_r peak) under canopy shade reduces the Red:Far-Red ratio and increases the far-red fraction (Kusuma & Bugbee 2021). An increased far-red fraction combined with a reduction in photosynthetic photon flux density (PPFD) enhances far-red phytochrome effects toward the shade avoidance syndrome in plants growing outside or under electric lights (Friesen 2020).

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