

Greenhouse Lighting Systems Comparison

PAR Outputs & Spectral Content



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Abstract

This test is performed to assess the light distribution and Photosynthetically Active Radiation (PAR) output of the FarmTek lights as compared to other lights in the market. We measured the PAR light output for four different light systems per the test plan TP001_DL_2016.

Discussion

PAR light can be defined as the spectral range (wave band) of solar radiation from 400 to 700 nanometers that photosynthetic organisms are able to use in the process of photosynthesis. The Apogee MQ-520 quantum light meter was utilized due to its precise response curve along the PAR envelope and therefore its minimal requirements for measurement corrections (readings have an error of +2.2% for HPS, -1% Mixed LED and +1.9% for Ceramic Metal Halide.)

Units under Test

- 1- **FarmTek Double Ended 1000W HID** fixture with FarmTek High Pressure Sodium bulb
 - a. Agro1000-220V HPS Bulb
- 2- **Gavita Double Ended 1000W HID** fixture with Gavita High Pressure Sodium bulb

Equipment

- 1- Light measurements were taken with the Apogee MQ-520 USB Quantum Light meter.
- 2- 4' x 4' Measuring Grid composed of an 8 x 8 grid with blocks 6" square.
- 3- Data acquisition was performed by the Apogee ApogeeConnect Software

Procedures

Lights were tested per the test plan TP001_DL_2016. The units were mounted in our Controlled Environment Agriculture (CEA) room on adjustable mounting cable. The fixtures were allowed to stabilize for a minimum of 20 minutes prior to readings being recorded. PAR measurements were taken at each point on the 8 x 8 grid. Care was taken to orient the sensor's wiring in the northern direction to minimize azimuth error (typically < 1%.) Also temperature was relatively constant in the CEA room to avoid sensor temperature errors (typically < 1%.)

Results

The FarmTek and Gavita fixtures showed superior performance to the other lights tested. The FarmTek light had a greater PAR value directly below the light than the other 1000W unit under test. The Gavita unit had a lower overall average PAR output than the FarmTek unit and showed an even light distribution across the test grid. Review of the spectral distribution revealed very similar spectral content.

FarmTek 1000W DE HPS

Average PAR over 4' x 4' area is 371 μmols (adj)

Max Par: 542.8 μmols σ : 94.9 μmols

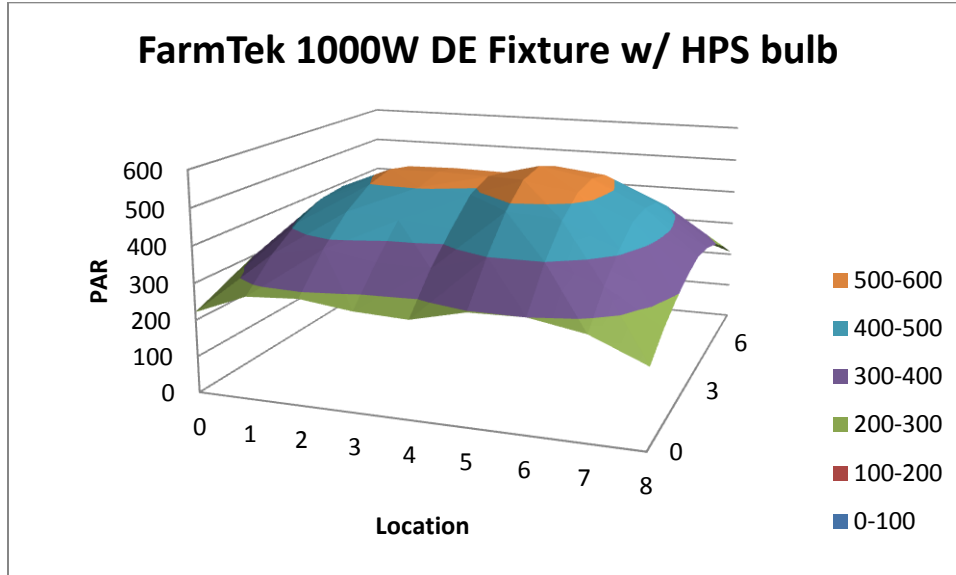


Figure 1 - FarmTek 1000W DE Light- HPS

Spectrum

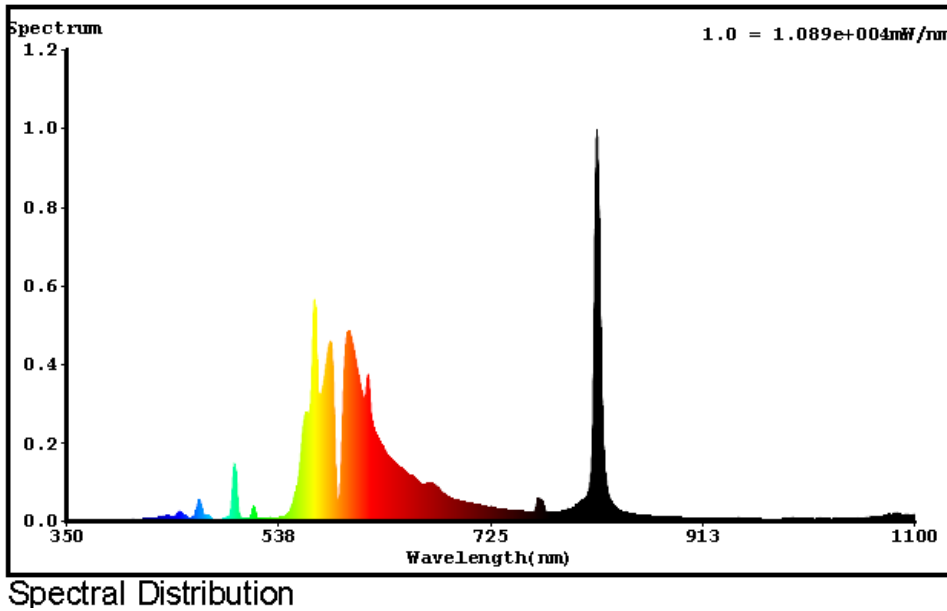


Figure 2 – Bulb Manufacturer Provided Sample Spectrum for 1000W HPS

Gavita 1000W DE HPS

Average PAR over 4' x 4' area is 370 $\mu\text{mol/s}$

Max Par 502 $\mu\text{mol/s}$

σ : 73.2 $\mu\text{mol/s}$

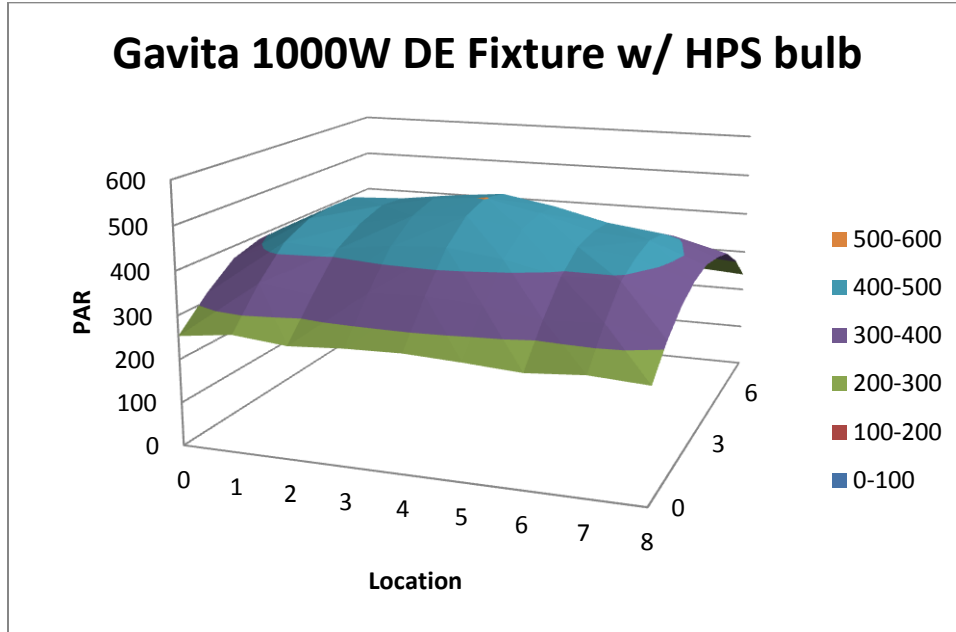


Figure 3 - Gavita 1000W DE Light – HPS

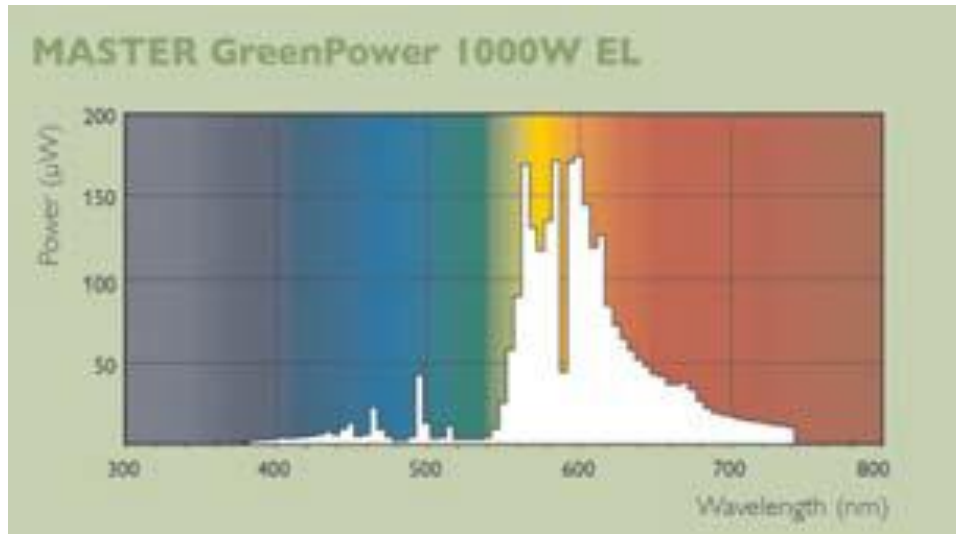


Figure 4 – Gavita Spectrum for 1000W HPS – from Gavita Website