10-31-2008

101 Ways to Try to Grow Arabidopsis: What Light Intensity Worked Best in This Study? Can High Intensity Discharge Lights Be Used?

Robert Eddy
Purdue University, robeddy@purdue.edu

Daniel T. Hahn
Purdue University, dhahn@purdue.edu

Laura Aschenbeck
Purdue University, laschenb@purdue.edu

Follow this and additional works at: http://docs.lib.purdue.edu/pmag

Part of the Horticulture Commons

Suggested Citation
http://docs.lib.purdue.edu/pmag/13

This document has been made available through Purdue e-Pubs, a service of the Purdue University Libraries. Please contact epubs@purdue.edu for additional information.
What light intensity worked best in this study? Can high intensity discharge lights be used?

Short answer:

200 μmol/m²/s. Yes, HID lighting is suitable.

Results:

In an earlier study using 24-hour lighting, we observed damage to plants growing at 300 μmol/m²/s but not at 100 μmol/m²/s. We followed this up with a study where we grew plants at 100, 200, 250 and 275 μmol/m²/s using a combination of fluorescent and incandescent lamps in a growth chamber. This time, though, the lights were on a more standard photoperiod of 16 hours.

Plants grown at 200 μmol/m²/s were larger and appeared greener than those at 100 μmol/m²/s. Higher light intensities than 200 resulted in death of some seedlings. It should be noted that in both experiments, no barrier was placed between the lamps and the plants, so the death could have been caused by high temperatures emitted from the lamps.

Next, we compared plants grown using a combination fluorescent and incandescent lighting with three other treatments using high-intensity discharge (HID) lamps as sole source of illumination: high pressure sodium at 180 μmol/m²/s; metal halide at 250 μmol/m²/s; and a mix of these two lamp types at both 125 and 200 μmol/m²/s. All produced satisfactory plants. The plants under HIDs appeared to have longer petioles and narrower leaves (data not taken). There was some observable twisting of petioles under these lights as well.

Discussion:

200 μmol/m²/s is a slightly higher intensity than suggested by the Arabidopsis Biological Resource Center at The Ohio State University, which recommends 130-150 μmol/m²/s for 16 hours per day. The Nottingham Arabidopsis Stock Centre which uses 122 μmol/m²/s for 24 hours per day in their greenhouses. We did not investigate intensities between 100-200 μmol/m²/s.

HID lamps of 400-1000 watts are common in research greenhouses in temperate climates. They are used for lengthening the natural photoperiod or for supplementing sunlight. This study proves that they can be used as sole source of illumination for this species. Warnings that Arabidopsis cannot grow using HIDs may have resulted from damage seen after moving plants from low-light environment of tissue culture rooms without acclimation.
Figure 1. Plants grown in 16-hour photoperiod under four fluorescent/incandescent light intensities (left to right): 100, 200, 250 and 275 μmol/m²/s.
Figure 2. Plants grown in 16-hour photoperiod under fluorescent/incandescent lighting (top row) at four light intensities (left to right): 100, 200, 250 and 275 μmol/m2/s; and under HID lighting. The HID lighting treatments are (left to right): 125 μmol/m2/s from metal halide/high pressure sodium; 200 μmol/m2/s from metal halide/high pressure sodium; 180 μmol/m2/s from high pressure sodium; and 250 μmol/m2/s from metal halide.