

Whole plant morphology data collection and photographs:

Equipment needed:

- Two laptops and accessories, including lock if laptop will be left in the work area during breaks.
- Extension cord and outlet strip
- Photography kit: Nikon D70 camera with both macro and wide-angle lenses and all its accessories including spare battery and USB cable; light kit (SP Studio Systems Home Studio Kit with 2 SP100 strobes and 1 SP72 strobe) including soft box, tripod, background velvet, photography stand (12" high plastic box), and marking chalk
- plastic rosette measuring tool
- forceps for picking out stray seedlings, etc.
- magnifying glass
- 12"x12" pot tray to hold pots waiting to be photographed
- Two barcode scanners, set to tab after each scan
- A copy of "*photography studio dimensions*"

NOTE: Be sure the work area is clean, especially in A66 PSS, where we may pick up pests from unclean previous users.

Set up:

1. Set up photography kit: see file "[*photography studio dimensions*](#)" for exact measurements.
2. Attach one strobe to the camera (the others operate as "slaves" and do not need to be attached). Plug in the strobes. The clip strobe is used for illuminating the whole flat picture only and can be put somewhere out of the way until needed.
3. Spread out the background velvet on the stand and mark the location with chalk where the pot should sit for the picture. The pot, when photographed, should fill the screen completely, with the top and bottom edges of the pot just out of the frame, and the left and right sides of the pot visible. The two visible sides are important as a size marker.
Note: always shoot one "practice" picture of a plant and compare it to an image file from a previous session to check that the studio set up is correct.
4. Set up the camera for file capture:
 - a. Put camera into PTP mode by pressing Menu, scrolling down to the 'wrench' menu, and changing the 'USB' option from 'M' (mass storage) to 'P' (PTP)
 - b. The camera should be in M (manual) mode, set at aperture F/16 and shutter speed 1000. Be sure that the White Balance (WB) is set on Flash (looks like a little lightning bolt).
 - c. Connect camera to computer B with 10ft USB cord.
5. Set up computers:
 - Computer A should have a scanner, mouse, and internet connection. It should be in a well lit area nearby the photo setup, with enough room for the operator and a flat of plants, and one other person in charge of scoring the plants. This computer should be open to the Morphology database at genomics.msu.edu/cgi-bin/morphology/index.cgi
 - Computer B should be set up on a low table adjacent to the photographers' chair, within easy sight range and reach of the photographer. This computer

should be connected to the camera and a scanner, and have the Nikon Capture Control software.

- Create folders:
 1. One folder per flat, named with the flat code
 2. One folder to hold the flat code folders
 3. One folder to store temporary photo files
- Open Nikon Capture Control; select “*download options*”
- Change the “*folder for images to be downloaded to the camera*” to the temporary folder you created
- Change “*when a new image is received from the camera*” to “*show it with multi-image window*,” then press “OK.”
- Select “*Show camera controls*,” check that exposure settings and storage settings are correct.

Protocol:

1. Switch camera lens to wide angle lens. Set the whole flat on the ground to photograph and stand over it. Hold the clip strobe ~4 feet off the ground directly over the flat (but out of the way of the camera). Photograph the whole flat with the wide angle lens. Switch the lens back to the macro lens and place camera back onto tripod.
2. Photograph of flat will display on Computer B. Save picture file as file name = the flat barcode, in the folder of the same name. When the “*save progress*” window appears check the “*close when done*” box.
3. Using Computer A, scan the flat to begin analysis.
4. Scan the pot code of first pot to score with controlled vocabulary. Follow planting order: start at upper left as the flat code and pot codes face you (be sure the insert has not been rotated and that the pot codes and flat codes face the same direction). Work through rows left to right. The database guide will track progress through the flat just as it does during planting.
 - a. The same pot cannot be scanned twice.
 - b. A pot may not be scanned which has not been previously entered into the database
5. Score the plant (see protocol and definitions), filling in the web form and submitting data.
6. After the final pot has been finished, scan the flat code to close.
7. After each plant has been scored, it is handed off to the plant to the person doing photography.
8. After shooting the picture, the plant photograph will display on the monitor of computer B. Save the image in the appropriate flat folder as file name = the pot barcode by scanning the pot. *Do not type in pot barcodes by hand.*
9. When all photos are completed, save each flat folder to a secure drive or CD. Empty temporary folder.