**Computer vision system materials and methods (As adopted from Donis-Gonzalez et al. 2020)**

A custom calibration algorithm created in FIJI software (Schindelin *et al.* 2012) was created in order to calibrate the computer vision system. A colorimeter, Konica Minolta Model CR-400, (Konica Minolta, Ramsey, NJ) fitted with light emission port size of 8mm, was connected to a computer loaded with SpectraMagic NX Color Data software CM-S100w v2.6 (Konica Minolta, Ramsey, NJ) for data capture which was then utilized with a white reference, according to the manufacturer’s instruction, and to obtain L\* a\* b\*, and XYZ (CIE) color space values, from an X-Rite Color checker Digital SG (X-Rite, Grand Rapids, MI).

The computer vision system (CVS) design had a 5.5 megapixel camera Basler acA2040-25gc (Ahrensburg, Germany) with a 12.5 mm focal length C-mount LM12HC lens (Kowa American Corporation, Torrance, CA), fixed 22.5 cm directly above the sample tray within a dome, 69.85 cm diameter, encircled with four (D65) light emitted diodes (LED) tubes of 18W (Phillips, Amsterdam, Netherlands) which provided consistent illumination set at Direct Current (DC) Amps: 3000mA, 24V. The dome was enclosed with four, black polypropylene twin walls (Mulford Plastics, Auckland, New Zealand) to eliminate light interception. A matte black sliding platform with bolted tray guides was used to center the sample tray directly under the camera and walnut kernels were placed in a 100 celled tray (DFA, Sacramento, CA) coated with matte black paint (Rust-Oluem, Vernon Hills, IL) for use in high throughput imaging. The CVS sits on a frame, measurements 60 mm x 60 mm of T-Slotted Aluminum Profiles (80/20 Inc., Columbia City, IN). The camera was attached via USB port to a PC computer and Pylon viewer software v5.0.10. 64-bit (Basler, Ahrensburg, Germany) was used for calibration and image acquisition. For each day of image acquisition, light and camera settings in a features file: lens aperture = *f* /1.4 andexposure time = 1/10000, were loaded, and a calibration was performed with a white balance (WB) Sintra Light Gray PVC Sheet, to correct for non-uniform illumination, and an X-rite Color checker palette Digital SG (X-Rite, Grand Rapids, MI). The calibration macro (**File S2**) split the WB image into three color channels RGB and subtracts the maximum value of each channel according to the color checker standard. JPEG stored images were then batch run through a custom FIJI 1.52 (Schindelin *et al.* 2012) (**File S3**). The data outputs yield measurements of color in *L\** (lightness), *a\** (red/green color), and *b\** (yellow/blue color).

For each image, the tray was divided into 100 regions of interest using Image J’s Particle Analyzer plugin where broken images could be combined and size measurements (perimeter, area, numbering) were taken. Each pellicle was segmented with color thresholding, background subtraction, and morphological operations (i.e., dilation, masking, erosion). In order for pellicle images to be translated into L\* a\* b\* scores, the method adopted by Leon 2006 was implemented. For each image, pixels in RGB were fit in a linear model to CIELAB values and transformed to estimate L\* a\* b\* values utilizing a color space transformer plugin (Barilla 2014). The L\* a\* b\* images were then multiplied by the linear equations generated during the calibration and descriptive statistics (mean, median, standard deviation) were calculated.

Barilla, M.E., 2014. Color Transformer 2 - version 2.02. Digital Systems & Vision Processing Group

Schindelin, J., I. Arganda-Carreras, E. Frise, V. Kaynig, M. Longair *et al.*, 2012 Fiji: an open-source platform for biological-image analysis. Nature Methods 2012 9:7 9: 676–682.