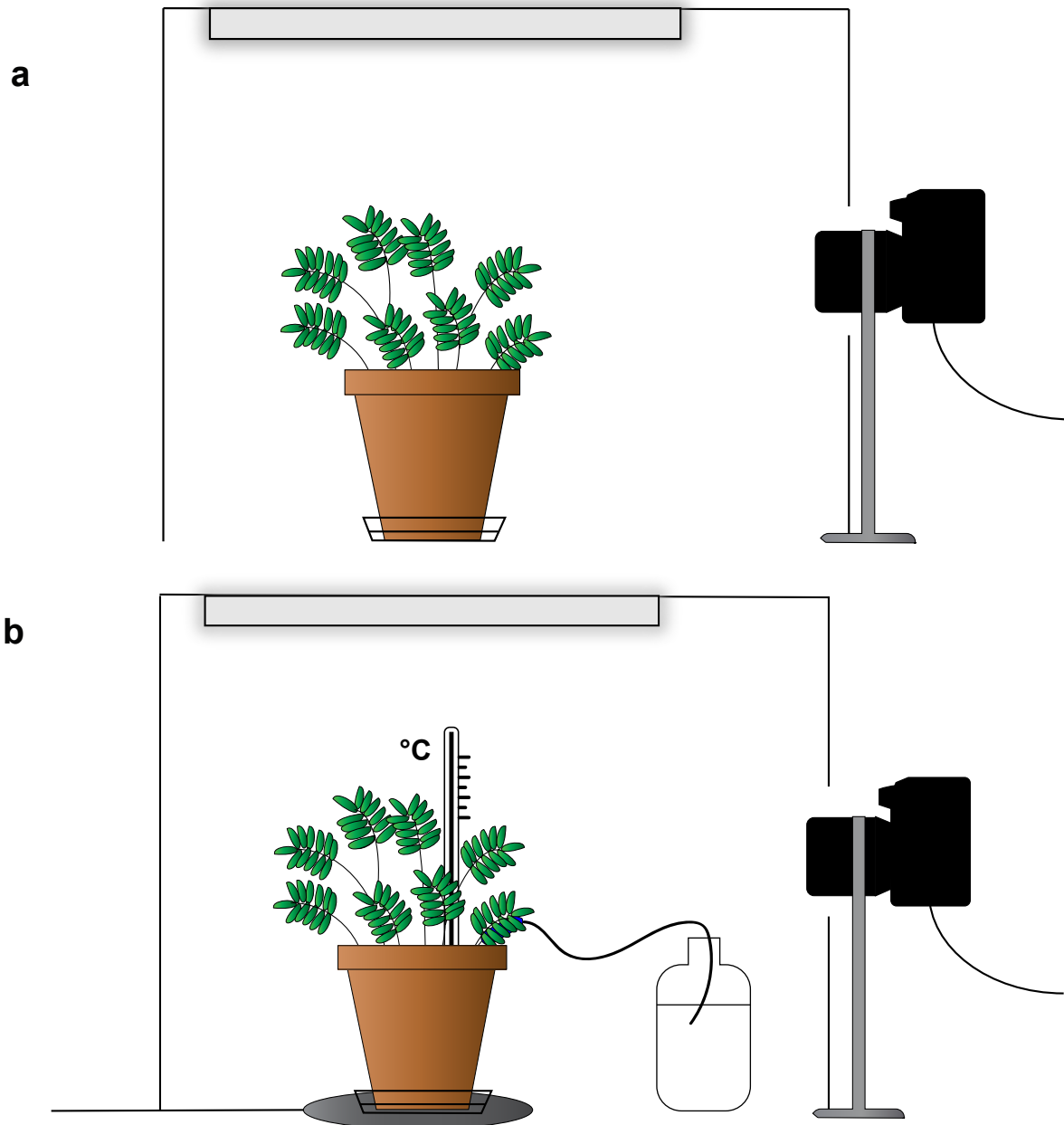# Figure 1 : Experimental device for studying the circadian cycle of the Mimosa Pudica.

An experiment was designed in order to test the circadian cycle of the mimosa pudica. **Figure a**,The original device was composed of the mimosa pudica, a LED light which spectrum is similar to the solar spectrum (not harmful), and the camera directly connected to the computer. Photographs are taken every 120 seconds. Each experiment lasts one week. The mimosa Pudica was watered every three days with approximately twenty centiliters. A cristallizor placed under the plant was used as a water reservoir.

Figure b, The final evolved device was also composed of the plant, the light, the camera and the cristallizor. A continuous water device was first added to control more precisely the hydratation of the plant. A thermometer was secondly added to control the temperature inside the box, especially when winter began. Finally a heating device made for reptiles was placed under the plant to maintain a constant temperature in the box.
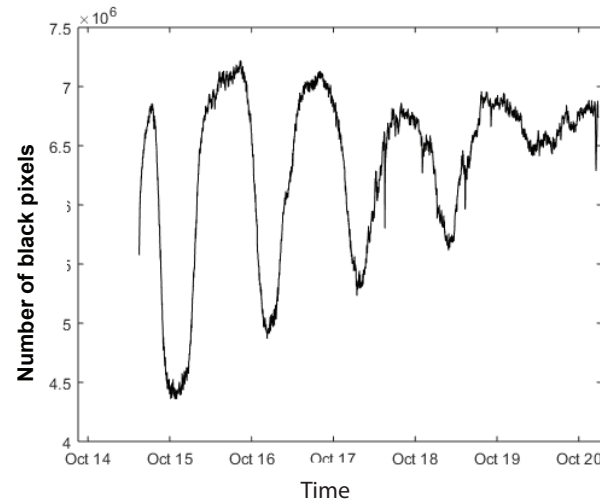
Figure 2 : Methods of image processing with Matlab and ImageJ

a

a-1

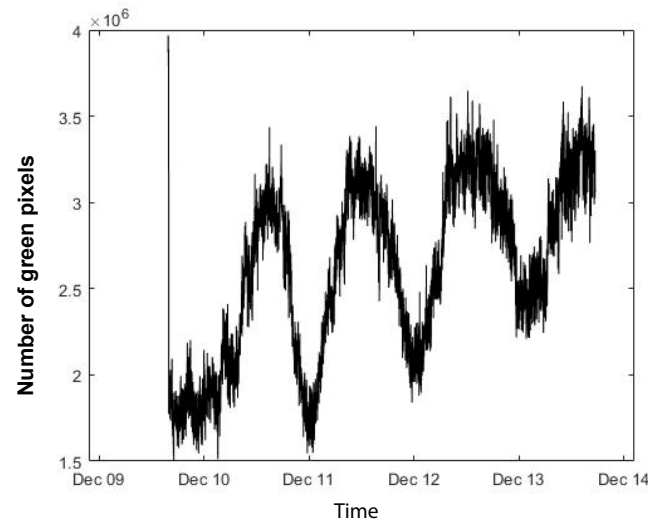

a-2

b

b-1

b-2

Two different methods were necessary to process our series of photographs because of the color and the luminosity of the box.

Figure a, Method for colored pictures: the first step is to use image J to realize a binarization of the photographs. This is realized thanks to the function Color Threshold of Image J, our values are 50/133 ; 0/255 saturation ; 0/255 brightness. Then a Matlab program was written and used to plot the number of black pixels on each photograph with the date of these photographs (see a-2).

Figure b, Method for black background pictures: the first image processing that had been used to process colored images was the counting of green pixels but the different colors of the box were interfering with it. In order to get rid of those colors, the background was painted black (see b-1). With those pictures, a Matlab program which counts the number of green pixels (threshold is 16 in the RGB code) and plots it with the date of the photograph suits (see b-2).

Be careful, the binarization with Image J followed by the Matlab program (a) does not work for the black background pictures as the luminosities of the photographs are all differents.

Figure 3 : Results : the circadian cycle of the mimosa pudica ?
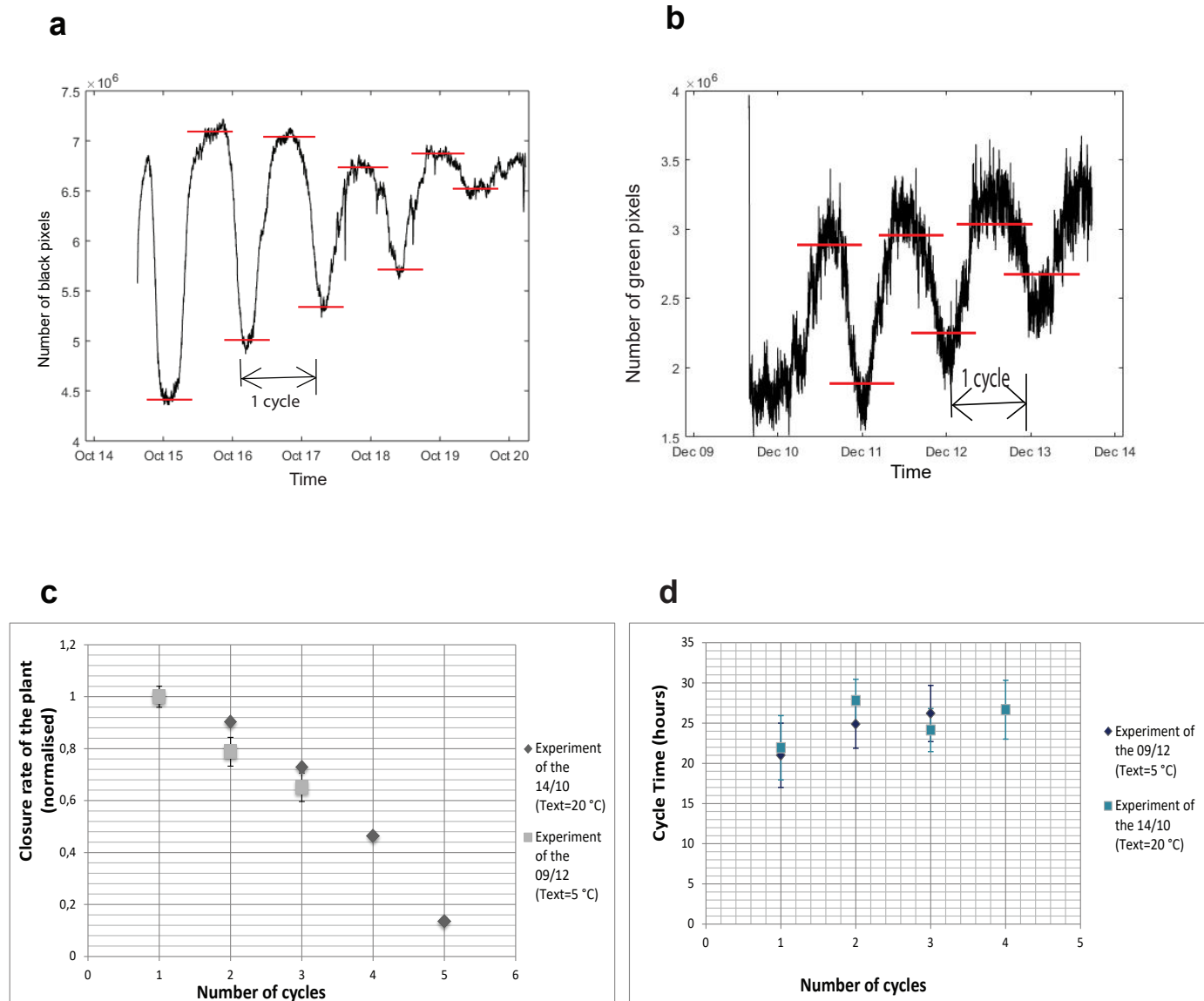
a

b

c

d

Figure a is the result of the first experiment (x-axis is the time and y-axis the number of black pixels which correspond to the aperture of the plant), realized with the original device from the 14th of october to the 20th of october 2016. The outdoor temperature was approximately 20°C. This result was obtained thanks to the image processing for colored images. The duration of a cycle was determined between two minimums in order to be more precise (maximums are much larger than minimums).

Figure b, is the result of the second experiment (same x-axis and y-axis is the number of pixels which green subpixels is greater than 16), realized with the evolved device from the 9th of december to the 16th of december 2016. The average outdoor temperature was around 5°C , so the evolved experimental device was used to maintain the box temperature at 25°C±2°C. This result was obtained thanks to the image processing for black background images.

Figure c, represents the normalized closure rate of the plant depending on the number of cycle (amplitude determined as shown by the red segments on fig a and b normalised by the amplitude of the first cycle). For both experiments, the closure rate decreases with the number of cycle. In the last cycles analyzed, the closing rate becomes non-significant.

Figure d, shows the cycle time depending on the number of cycle. Considering the uncertainty of measurement, the duration of the different cycles is constant (around 25 hours more or less 2 hours).