Supplementary Material S5.1

An efficient method to measure water loss in arthropods: desiccation adaptation hypothesis re-examined

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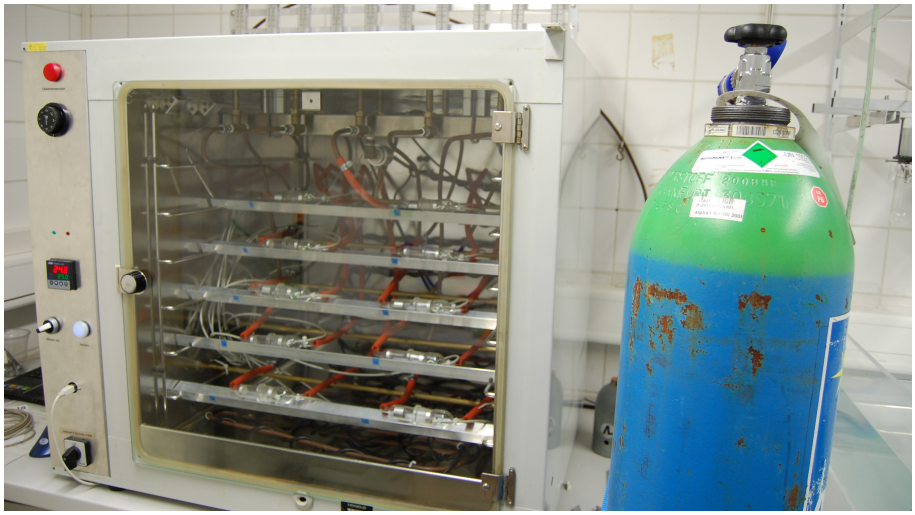
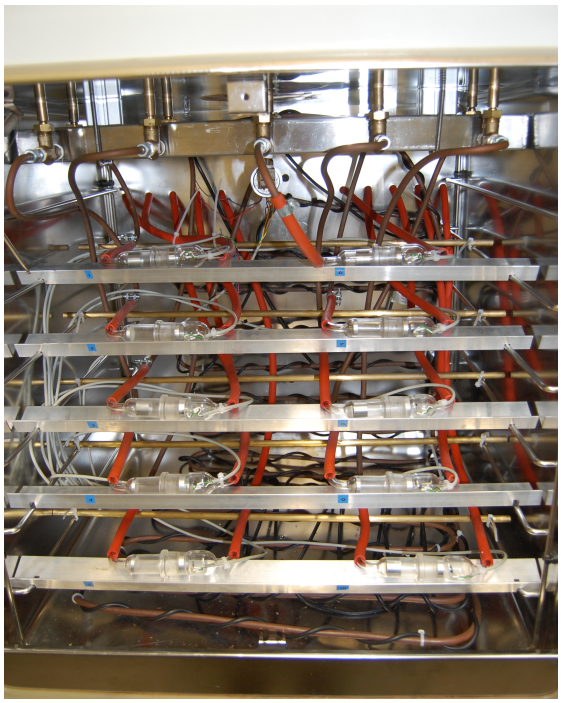
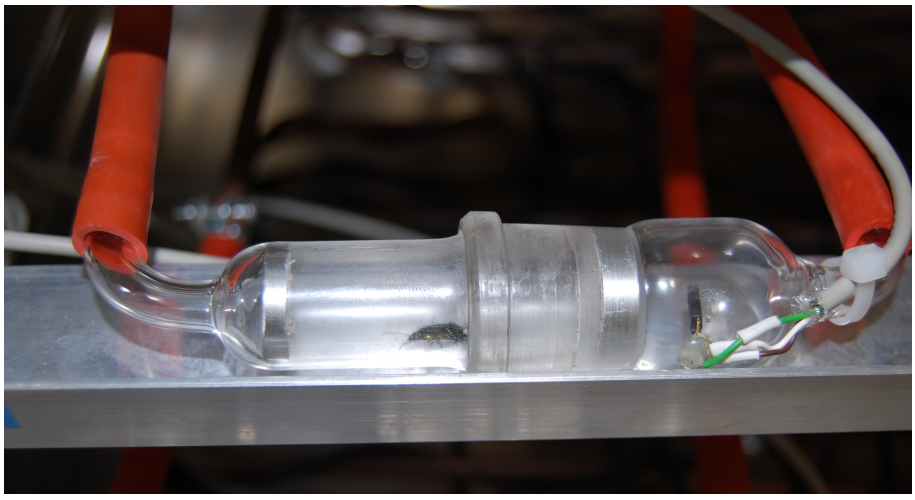
Pictures S5.1.1: Evaporimeter



Pic. S5.1.1.1: Overall view of the Evaporimeter

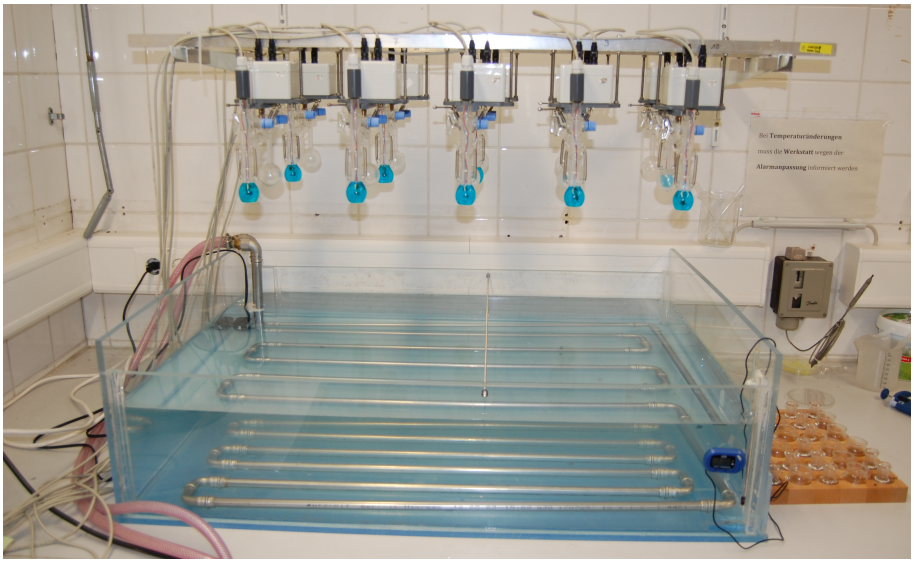


Pic. S5.1.1.2: Inside view of the incubator



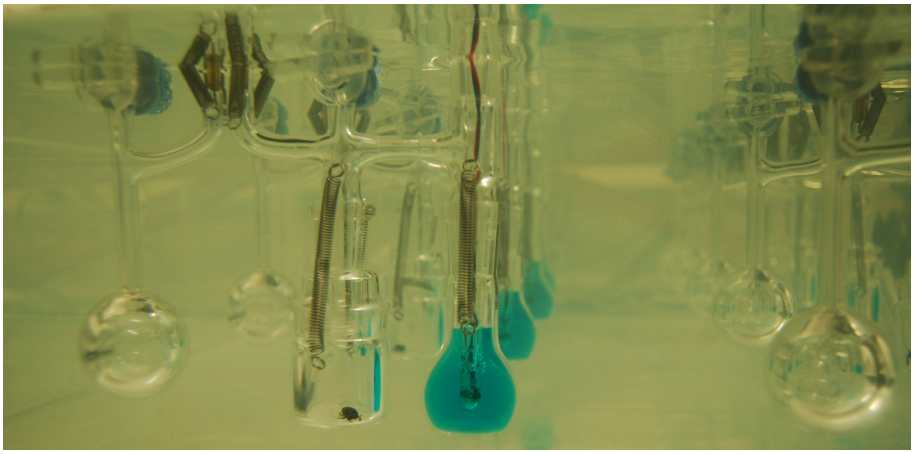
Pic. S5.1.1.3: Chamber including a sample

Pictures S5.1.2: Respirometer



Pic. S5.1.2.1: Overview of the Respirometer

Pic. S5.1.2.2: Details of the electrolytic chamber, the chamber including the sample and the control chamber



Pic. S5.1.2.3: chambers during a measurement including a sample

Supplementary Data S5.1.1: Calibrating the evaporimeter

To calibrate the evaporimeter, we used leaves of several plants, e.g. *Rubus fruticosus*, *Fatsia japonica*, *Spathiphyllum floribundum*, *Ficus benjamini*, *Chlorophytum comosum*, *Beaucarnea recurvata*. The measurements in the evaporimeter last for 60 minutes and we weighted the samples before and after they were measured (Mettler Toledo XS3DU; accuracy ±0.001 mg). With this method, we could compare the weight loss after one hour determined by the weight with water loss per hour determined by the evaporimeter (see Fig. S1). The correlation between both factors was highly significant ($R = 0.965$, $p < 0.0001$). This result suggests the accuracy of the evaporimeter.

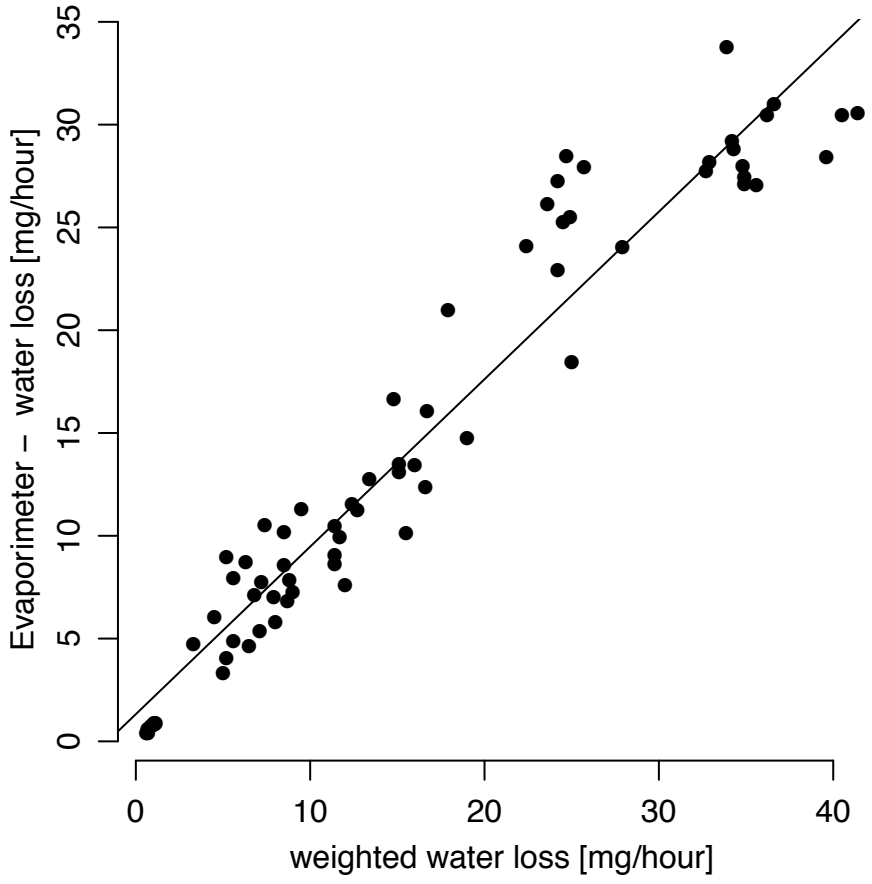


Fig. S5.1.1: Correlation between the loss of weight after one hour and the water loss per hour determined by the evaporimeter of several plant species.

Supplementary information S5.1.1: R-scripts for generating data

Before the R-Scripts can be used, it is necessary to create a folder with the txt-file generated by the program and a csv-table with supplementary information. The row names should be the same than in our example file to provide an accurate run of the code. If the row names vary, it is also possible to change the row names in the R-sripts (Evaporimeter: L 87; Respirometer: L 67) For the first run the rows "startH" and "StopH" can be empty. They will specify the beginning and the end of the data section that will be used for calculating the water loss and oxygen consumption. The script generates a pdf and a csv-table including all results. The pdf shows the results of each individual, which makes it possible to read the optimal period of each sample. After writing the chosen values in the table, a second run provides the result table.

Evaporimeter

Files: R Script_Evaporimeter.R

Example_E.tab (raw data of the measurement)

Example_E.txt (provides additional information of the samples)

The R-script calculates the humidity without sample (null probe) and including a sample and subtracts the water loss caused by the sample from the base air humidity of the null probe. For that step it is necessary to start the measurement before the sample is placed. After the first run, you can choose the start and the end time of the null probe in line 32 and 33 in the script. The water loss rate can vary by several factors, e.g. activity. It is possible to observe the activity during the measuring to choose the favoured timeslot.

Respirometer

File: R Script Respirometer.R

Example_R.tab (raw data of the measurement)

Example_R.txt (provides additional information of the samples)

Dependent by the oxygen consumption of the sample, it may take several hours before the program detects constant values. For this reason it is necessary to select the period, where the data are used.