

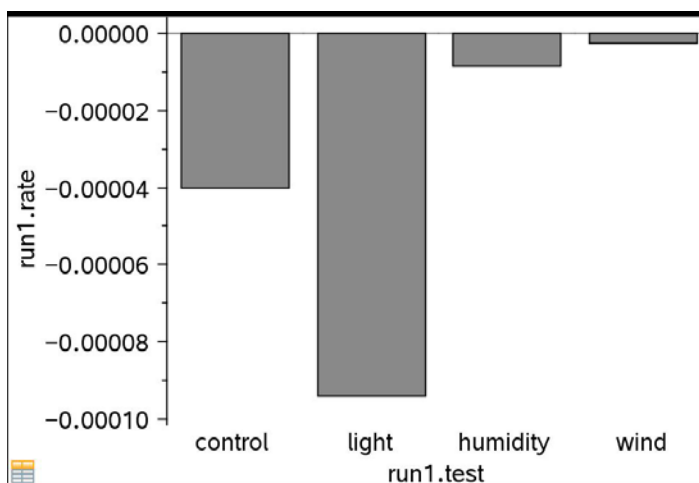
TEACHER INFORMATION

Transpiration

1. Editable Microsoft Word versions of the student pages and pre-configured TI-Nspire files can be found on the CD that accompanies this book. See *Appendix A* for more information.
2. You should leave water out overnight in a beaker or cup to allow any excess dissolved air to escape. This will ensure that no air bubbles form in the tube at the cut end of the stem. If air bubbles form, it may be necessary to restart your experiment. If bubbles do form, remove the plant and tubing from the two utility clamps and allow the plant to hang towards the ground with the other end of the tubing pointing up. Carefully tap on the sides of the tubing to loosen any bubbles—they will float to the water's surface at the other end. Once all bubbles are removed, check the plant's seal at the tube. Secure your plant in the tubing and restart the data collection.
3. There is not always an immediate change in the transpiration rate. Allow the plant to spend a few extra minutes under a particular condition before initiating data collection. This will give the plant the necessary time to adjust. When the transpiration rate changes drastically, the stomata will close, decreasing the transpiration rate. If the length of data collection is extended, you will be able to see on the graph when the stomata have closed and the rate slows down.
4. Many plants work well for this experiment. Plants that have been used include tomato, strawberry, bean, geranium, cyclamen, and even honeysuckle. For best results, we recommend using plants with numerous leaves. Tomato plants work very well and have been used to collect the sample data for this activity. One possible extension of this experiment would be to have the students use different plant species under similar conditions and evaluate how different plants have adapted to prevent water loss.
5. The thick-wall plastic tubing that comes with the Gas Pressure Sensor is well suited for this lab. The inner diameter of the tubing is 3 mm and may be too small for some plant specimens. Science supply companies carry thick-wall plastic tubing, with a larger inner diameter, that will work well on larger plant stems. They also sell tubing connectors that will allow you to connect the larger tubing to the tubing provided with the Gas Pressure Sensor.
6. Emphasize to your students the importance of providing an airtight fit with all plastic-tubing connections.
7. The plastic tubing clamps (order code PTC) used in the student procedure may be purchased in packages of 100 from Vernier Software & Technology.

SAMPLE RESULTS

Test	Adjusted rate (kPa/s/cm ²)
Control	-4.0×10^{-5}
Light	-9.4×10^{-5}
Humidity	$-.87 \times 10^{-5}$
Wind	$-.27 \times 10^{-5}$



ANSWERS TO QUESTIONS

- It is typically predicted that the light and wind will increase the rate of transpiration. This may not be apparent until after correction for surface area differences. Sometimes the wind, if too strong, may cause the leaves to droop or fold up, and in this case they may transpire less. Stomates may close to counter the dehydration. If this happens, discuss the nature of science experimentation, e.g., the expected may not always be the result. Usually, after correction for surface area, the high humidity plant will transpire less than a control. A student may question whether the light increased the temperature of the leaf. If the light was too close to the plant, temperature may indeed be a variable without a control.
- Answers will vary—usually the light will produce the greatest rate of water loss. High light intensity increases water loss due to increased photosynthesis. Wind removes water vapor from the surface of the leaf more rapidly. It may increase the evaporation rate by increasing the gradient between water in the leaf air spaces and water vapor in the air.
- Plants can increase or decrease water loss by
 - closing the stomata during water stress.
 - reducing the number of stomata.
 - waxy cuticles.
 - fleshy, thick leaves.
 - hairy surfaces.
 - reducing the overall leaf surface area.