

SENIOR SCIENCE LABORATORY REPORT

NAME: Your name

TITLE: The title of the experiment from the textbook / laboratory manual

DATE: The date the experiment was conducted

AIM / INTRODUCTION :

The Aim should be a sentence about the purpose of the experiment either taken directly from the text or reworded from information in the text.

The Introduction should be a *short statement* about the purpose of the experiment, written in hypothesis format, followed by a paragraph stating what results are expected. It should be specific, detailed and give reasons for each prediction.

APPARATUS / MATERIALS:

Materials used should be listed, stating sizes and amounts.

PROCEDURE / METHOD:

This should be written in brief note form (numbered steps), in past tense and plural, and say how the experiment was actually done, including changes from the original text procedure. It should be stressed that you are *not* to copy the procedure directly from the textbook. Writing 'Refer to pages' in the laboratory manual is *not* acceptable.

RESULTS:

Collected data, either qualitative or quantitative, should be presented in tables with appropriate headings. All appropriate units should be written.

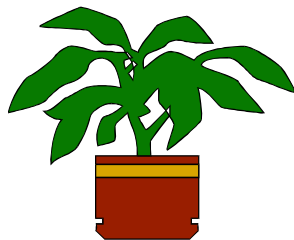
QUESTIONS / DISCUSSION:

Questions from the text / manual are to be numbered and answered completely. The questions do not have to be rewritten.

The Discussion involves putting all the observations / data together into a paragraph stating what has been learned from the experiment, with any inferences and interpretations that can be made from the observations and results. You should refer to graphs and show all calculations. The questions in the text / laboratory manual should be used as a guide to help organise information into the discussion and do not have to be answered individually.

CONCLUSION:

The Conclusion is the *final summation* of the questions / discussion information. It usually involves a restatement of the hypothesis in terms of the discussion and indicates what has been learned. It may not always be necessary to separate the conclusion from the discussion, and there may be more than one conclusion.



EXAMPLE OF A BIOLOGY LABORATORY REPORT

NAME: Melinda Kingaby (printed with her permission)

DATE: 9th November 1999

TITLE: The Effect of Air Movement on a Plant's Rate of Transpiration

INTRODUCTION: Transpiration is the evaporation and diffusion of water from the leaves of plants due to heat from the sun. It causes suction which draws water up xylem vessels from the roots. Transpiration is driven by energy from the sun, therefore transpiration occurs due to passive transport. The water drawn up the xylem vessels contains vital nutrients which are absorbed by the plant. Although in this experiment, a shoot (without roots) is used, transpiration still occurs.

The factors which affect the rate of transpiration include:

1. *Light Intensity*: Plants transpire more rapidly in the light than in the dark. The light stimulates the opening of stomata as well as speeding up movement by warming the leaf surface.
2. *Temperature*: Plants transpire more rapidly at higher temperatures. This is because the water evaporates more rapidly at higher temperatures.
3. *Humidity*: When the surrounding air is dry, the diffusion out of the leaf is more rapid.
4. *Air Movement*: If there is no breeze, the surrounding air is more humid, limiting diffusion out of the leaf.
5. *Soil Water (Water Availability)*: The plant cannot transpire effectively if the water lost through transpiration is not replaced.
6. *Altitude*: At high altitudes, the air pressure is much lower, causing more rapid evaporation.
7. *Time of Day*: Plants' stomata are not open all day. They are generally closed at night time. Closure of the stomata means that much less water is lost.
8. *Leaf Surface Area*: The greater the surface area of the leaf, the greater the number of stomata which results in higher water loss through stomatal openings.

The water uptake and the water loss of a plant are roughly the same. Approximately 99% of the water absorbed from the soil is lost through transpiration. This means that, instead of measuring water loss, the water uptake by the plant can be measured. The use of an adapted potometer setup clearly shows the amount of water taken up by the plant.

The first plant is to placed under a fan, while the second (the *control*) is beyond the range of the fan. It can be hypothesised that the plant under the fan will transpire much more rapidly. All of the other *variables* e.g. light intensity, temperature etc. will be controlled as much as possible. This will be achieved by keeping both plants in the same room, equidistant from lights.

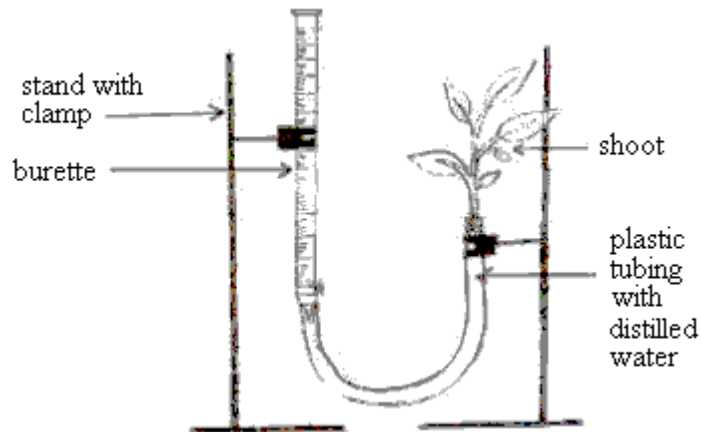
APPARATUS:

- ◆ 2 plant shoots (guava plant) of the same size and leaf arrangement
- ◆ 4 retort stands and clamps
- ◆ 2 100mL burettes
- ◆ 2 lengths of plastic tubing, of the same length
- ◆ 1 fan
- ◆ graph paper

PROCEDURE:

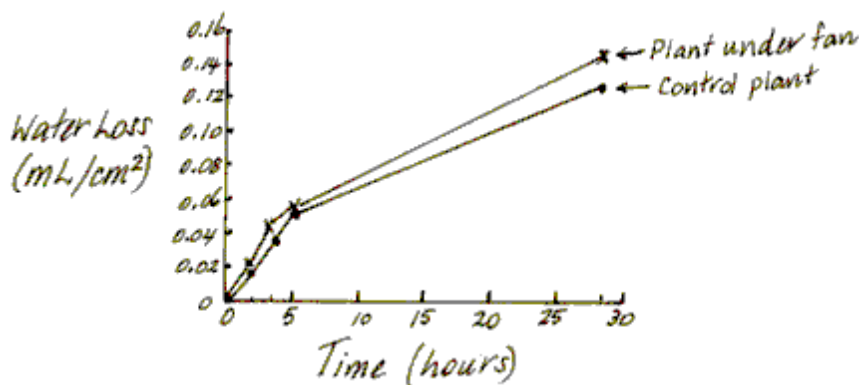
1. The potometers were set up as shown in the diagram, making sure that each plant is at the same height. The plants were placed into the tubing immediately after removal from water so as to prevent air bubbles from entering the stem.
2. One setup was placed under a ceiling fan, and the other was beyond the range of the fan.
3. The burettes were then filled with distilled water, with any air bubbles removed by tapping on the tubing.
4. Water loss / uptake was measured at different times in the day by reading the water level on the burettes. The experiment was left set up overnight to investigate the change in transpiration rate during night time.
5. During the experiment during the day, the temperature was monitored and stayed relatively constant at 21.5⁰C. Both plants were positioned at the same altitude and equidistant from lights.

6. After the experiment was completed, the surface area of the leaves was calculated by placing each leaf on millimetre graph paper and tracing around each.



RESULTS:

TIME	CONTROL PLANT			PLANT UNDER FAN		
	Total Water Loss (mL)	Total Surface Area (cm ²)	Water Loss (mL/cm ²)	Total Water Loss (mL)	Total Surface Area (cm ²)	Water Loss (mL/cm ²)
Day 1-10am	0	193	0	0	182	0
Day 1-11.30 am	3.2	193	0.0165	3.6	182	0.0198
Day 1-1pm	7.2	193	0.0373	7.6	182	0.0418
Day 1-3pm	9.6	193	0.0497	10.5	182	0.0577
Day 2-2pm	25.7	193	0.1332	27.1	182	0.1489



DISCUSSION:

It can be seen from this experiment that air movement does affect the rate of transpiration, speeding it up by limiting the humidity in the air surrounding the plant. The plant which was subjected to greater air movement did lose more water than the control plant. However, the difference was not great. The most probable reason for this was that the other variables which control the transpiration rate were not controlled sufficiently. For example, the control plant was placed near a doorway, so

experienced greater light intensity as well as air movement through the door. Adding to this, the other plant was not directly under the ceiling fan which may have influenced the result.

During the times 10am to 11.30am and 1pm to 3pm, the plant under the fan transpired noticeably more than the control plant. However at other times, the water loss per hour was almost constant for both plants. This shows that between 11am and 1pm and overnight, both plants would have been experiencing the same environmental conditions, resulting in similar water loss. This can be clearly seen in the graph where the higher gradient of the graph indicates greater water loss.

Other errors may have occurred because of air bubbles in the plant's stem. This would have happened because the plant was out of the water before being set up in the potometer. An air bubble in the stem would have resulted in limited water uptake by the plant.

The experiment demonstrated the relationship between transpiration rate and environmental conditions. It can be seen that a plant in a hot, dry environment would have less stomata than a rainforest plant, to reduce water loss. Other adaptations would include leaf size, root size and the height of the plant.

CONCLUSION:

It was seen from this experiment that air movement around a plant affects its transpiration rate. The experiment also showed that environmental factors such as temperature, light intensity and humidity, affect the rate of transpiration although the experiment was not designed to show that.

The experiment showed clearly the cycle of stomatal opening and closure and the conditions under which the stomata are open and closed. This was seen by the changes in the rate of transpiration due to the different environmental conditions experienced over the duration of the experiment.

BIBLIOGRAPHY:

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2. Alan, R. and Greenwood, T. 1999, Year 11 Biology Student Resource and Activity Manual, New Zealand, Biozone Learning Media Ltd
3. Evans, B., Ladiges, P. and McKenzie, J. 1990, Biology One, Melbourne, Heinemann Educational Australia
4. Australian Academy of Science 1973, Biological Science: the Web of Life (Second Edition), South Australia, Griffin Press
5. Cohen, D., Hill, J., McDonnell, K., Meyer, G. 1989, Biological Practicals for Senior Students, Heinemann Australia
6. Hanson, M., 1994, The Life of Plants, Malaysia, Longman Paul
7. www.blackstone.com/~jkimball/BiologyPages/T/Transpiration.html