

## Investigating the loss of water from leaves through transpiration

Aim of this experiment:

I am doing this experiment to investigate the loss of water from leaves through transpiration. I am going to use six privet stems with different amounts of leaves on them to see how the rate of transpiration is affected.

Background knowledge:

Transpiration is the loss of water from a plant. It is caused by evaporation of water from inside the leaves. Most of the action involves the stomata. This creates a slight shortage of water in the leaf, which draws more water up from the rest of the plant, which in turn draws more up from the roots.

It has two beneficial effects:

- It transports minerals from the soil around the plant
- It cools the plant

Four main things affect the rate of transpiration:

- Amount of light the plant gets
- Temperature of the atmosphere
- Amount of air movement
- Humidity of the surrounding area

The constant stream of water due to transpiration has the advantage of transporting vital minerals from the soil into the roots and then all around the plant.

The leaves of most plants have a waxy top layer to limit transpiration. As to be expected, plants living in drier and hotter conditions have a thicker layer of wax.

How and where transpiration occurs:

- Water at first evaporates from the spongy cells into the air spaces
- The air spaces become full of water vapour
- Water vapour diffuses through the stomata into the air
- The water lost from the spongy cell is replaced by more water from the xylem

### Prediction:

I predict that every privet stem except the control will lose water through transpiration. I think the more leaves the privet has the more water it will lose. There will be one major thing that may affect this experiment, and that is the amount of sunlight each privet gets. I will have to put all six privets in a windowsill to insure they all get the same amount of sunlight that is possible.

### Apparatus:

- 6 privet leaves (good amount to do a comparison from)
- 7 boiling tubes
- 35cm<sup>3</sup> of water in each tube
- Liquid paraffin
- Pipette
- Test tube holder

### Method:

At first I started to set up the apparatus to get ready for the experiment. I then prepared my privet stems. I did this by cutting each stem diagonal at the bottom to insure that the water will be evaporated into the plant easily. After I have done that I will place each stem into their test tubes and add 35cm<sup>3</sup> of water and a couple of drops of liquid paraffin to ensure the water will not evaporate into the air instead of through the plant like it is intended in this experiment. I will then weigh each test tube and record the results, put them into a test tube holder and place it onto the windowsill. (A window is the best place to put this kind of experiment, as there would be an even amount of sunlight on each test tube.)

I will weigh each test tube individually every six days and record the results.

### Results:

#### Results on the 18<sup>th</sup> April 2002

|          |       |
|----------|-------|
| Control  | 64.5g |
| Stem     | 64.8g |
| 1 Leaf   | 67.8g |
| 2 Leaves | 64.1g |
| 3 leaves | 67.5g |
| 4 Leaves | 65.5g |
| 5 leaves | 65.7g |

Results on the 24<sup>th</sup> April 2002

|          |       |
|----------|-------|
| Control  | 64.5g |
| Stem     | 62.9g |
| 1 Leaf   | 64.3g |
| 2 Leaves | 59.8g |
| 3 Leaves | 59.7g |
| 4 Leaves | 57.6g |
| 5 Leaves | 57.2g |

Results on the 30<sup>th</sup> April 2002

|          |       |
|----------|-------|
| Control  | 64.5g |
| Stem     | 61.7g |
| 1 Leaf   | 65.8g |
| 2 Leaves | 57.7g |
| 3 Leaves | 56.1g |
| 4 Leaves | 52.1g |
| 5 Leaves | 53.9g |

The amount of water lost through transpiration overall

|          |       |
|----------|-------|
| Control  | 0g    |
| Stem     | 3.1g  |
| 1 Leaf   | 2.0g  |
| 2 Leaves | 6.4g  |
| 3 Leaves | 11.4g |
| 4 Leaves | 13.4g |
| 5 Leaves | 11.8g |

This table shows the amount of water lost from each of the privets due to transpiration throughout the whole experiment. The 1 leaf privet only lost 2g of water, which is less than the stem lost. Also the 5 leaved privet lost 11.8g of water, which is less than the 4 leaved privet that lost 13.4g. These two results must be an experimental error that occurred possibly during the 24<sup>th</sup> and the 30<sup>th</sup> of April. This may be because of certain changes in the sunlight during that time.

This table shows that my prediction was more or less right. The higher the amount of leaves the privet has, the more water is to be lost through transpiration.

Evaluation:

I think to an extent this experiment was highly successful. Though it did prove to show that my prediction was right, it also showed that there could also be some experimental errors that sometimes cannot be helped. The method I had used worked and I collected a good range of results. The experimental errors could have been caused by things such as the sunlight, temperature in the room or air movement or the humidity of the air.

If I had a chance to do this experiment again I would use more privets to get a larger set of results, which then might help better if there were any experimental errors. It would be interesting to see if with using a larger group of privets would change any chance of having an experimental error. I would also leave my experiment for slightly longer than I did in this one and also record the results more frequently, to see whether this would affect the results and/or refrains from any experimental errors.