Student 1.

Evaluation.

From the collected data of my practical horticultural investigation I have determined the effect of the number of leaves on the production of roots in stem cuttings. My data gathered on the Tahitian Bridal Veil has shown leaves are not necessary to produce stem cuttings, but that the greater quantity of leaves will produce a greater quantity of roots. Although I predicted that they would be required because leaves are necessary to the plant process of photosynthesis which enables the plant to propagate, and therefore grow leaves, I now understand that photosynthesis can also occur in the stem of the cutting, as this also contains chloroplasts. I also understand that all the biological processes can continue to function and produce roots without the presence of leaves, but by using the stem.

My method provided me with reliable data that was aimed directly at the purpose of my investigation, and therefore enabled me to make a valid conclusion on my investigation. I made it valid and reliable by carrying out a range of measurements on the root growth such as root:shoot ratio, root mass, length, diameter and health. This ensured that I got a larger variety of results from the dependent variable and therefore was able to compare them to conclude a more precise result of root growth theory to the amount of leaves present in stem cuttings. [1] The Dictionary of Plant Sciences (1998) states that "*the root:shoot ratio is the amount of plant tissue that have growth functions. Plants with a higher proportion of roots can complete more effectively for nutrients and water. Plants with a higher proportion of leaves can collect more light for photosynthesis*". Root mass is recommended as a final measurement as the plants must be removed from its growing medium in order to capture accurate data (http://www.sciencebuddies.org/science-fair-projects/project_ideas/PlantBio_measuring_growth.shtml). These measurements of plant growth have made my collected data and therefore the results more accurate and valid to conclude.

Photosynthesis is a biological process which involves the trapping of light by the chloroplast (molecule containing many chlorophyll which exchanges the energy from light to chemical – (glucose) in mainly the palisade mesophyll cells and able to be converted into energy that is more useful to the plant), with the presence of water and carbon dioxide to produce oxygen and glucose (taken from Correspondence School AGS203 notes). As photosynthesis requires the light form the sun, it can only occur during daylight / in sunlight (when in a natural environment). The process of photosynthesis can be simplified in the equation

$H_2O + CO_2$ (+ light) $\rightarrow O_2$ + glucose

In this experiment the fewer number of leaves (e.g. in the trials of 0 and 2 leaves) would produce the least quantities of O_2 and glucose. The greater number of leaves (in the trials of 8 leaves) would produce the greater quantities of O_2 and glucose. This differentiation in production of glucose alters the amount of root growth when in is used in the biological process to follow.

Respiration is a biological process which involves the breaking down of glucose produced in photosynthesis using oxygen, to produce water, energy and carbon dioxide [3]. This occurs in the leaves of the plant, in the stem, in every cell of the plant all the time. The process of respiration can be simplified in the equation below;

O_2 + glucose → H_2O + CO_2 + energy

Some of the energy produced from the respiration process is used to grow roots (backed up from the article from the Correspondence School AGS203 notes). This means that greater quantities of roots are produced by greater quantities of energy (produced in respiration) which are produced from greater quantities of glucose (produced in photosynthesis), which is produced from greater quantities of leaves. So the results and graphs indicate that the trials with 8 leaves average (6.6) a greater amount of roots than the average of the trials with 0 leaves (3.2). This is because of the biological processes which for example with fewer leaves, produce lower amounts of glucose in photosynthesis (as only a certain amount of light can be trapped to convert H_2O + CO_2 into glucose and O_2) which then can only provide that amount of glucose to be converted into small quantities of energy in respiration, which the plants uses to produce roots [3]. It is similar quantity of the required element that is passed through the biological processes to produce the roots. Therefore the production of roots is less with fewer amounts of leaves and is more with greater amounts of leaves. [2]

A greater quantity of root growth will have an effect to horticultural production in the commercial world. Plants which have more leaves are able to manufacture the glucose with oxygen in their leaves using the respiration process to produce energy which is used in the growth of the plant. More leaves mean more root development. More root mass allows the plant to grow more leaf material. The increase in leaves means that more energy is produced in photosynthesis providing more energy for respiration. This increases the size of the plant allowing harvesting earlier or higher sugar levels in fruit, bringing maturity on earlier. In root crops, when there is an excess of glucose it is converted into starch stored in the roots. So for root crops such as potato, kumara, and taro, they store a lot of starch in their roots ensuring a good harvest [3]. As from the results of my experiment the production of these roots of these crops could be increased with a greater quantity of leaves. My experiment has provided me with this conclusion because of the data I have collected which has shown that more root growth occurs with more leaves present. For example, the trails with 8 leaves produced by average over double the amount of roots.