To what extents do abiotic factors affect the rate of photosynthesis??

Biotic factors will also have to be taken into consideration; these include things like food, plants, animals, and their interactions among one another and the biotic environment. One factor that may need to be taken into consideration could be how vulnerable the ivy leaves are to human or animal interference, for example trampling. Human activities produce a wide variety of pollutants of land, air and water. The closeness and intensity of any human activities will be considered as well. All these biotic factors will need to taken into account while carrying out the experiment in both the regions in the woodlands.

Biotic environment includes such factors as soil, water, atmosphere, and radiation. The biotic environment is made up of many objects and forces that influence one another and influence the surrounding community of living things. Other biotic factors include the amount of living space and certain nutrients (nourishing substances) available to an organism. All organisms need a certain amount of space in which to live and carry on community relationships. They also must have nonliving nutrients, such as phosphorus, to maintain such body activities as circulation and digestion. Ecology is the study of the relationships between organisms and their environment.

· Light intensity – As light is the ultimate source of energy for all ecosystems. This is the variable that is being investigated in my experiment. I will be expecting to see a significant difference in the surface area of a leaf in a shaded (low light intensity) and in an unshaded region (high light intensity). Where in the shaded region the surface area of the ivy leaves will tend to be greater than those that grow in an unshaded region.

· Air humidity – An increase in humidity causes a direct increase in transpiration, this is due to the rate of water movement from inside of the leaf to the outside surrounding area of the leaf. The greater the difference in humidity the faster water moves. Water vapours move from an area of high relative humidity to an area of low relative humidity.

· Wind Speed – This factor is linked to humidity, and will also often results in an increase in transpiration as well. This is due to the fact that once the water vapour has diffuses out of the leaf into the surrounding air, if wind is present, it will move away these humidity bubbles. As a result this will cause a new desirable diffusion gradient for more water vapour to rush out when the stomata opens, causing a transpiration to occur at a faster rate.

· pH of soil – This is another important factor as it is affected by the availability and absorption of several elements needed for plant growth. Maximum absorption of these elements is found at pH readings 5.5 to 6.5. The pH of a soil influences its physical properties and the availability of certain minerals to plants. If the pH of the soil falls below the given range it results in less availability of the elements N, P, K, and the absorption of the micronutrients can reach toxic levels. Moreover enzymes have an optimum pH at which they work at, if the soil is too acidic or to alkaline, this will denature the enzymes, which will affect the rate of photosynthesis and affect the size of the leaf.

· NPK-nutrient concentration of soil

Ø Nitrogen – this element is a constituent of amino acids, proteins, coenzymes, nucleic acids and chlorophyll. Nitrogen has a great effect on plant growth. If missing, then plant will be underdeveloped and old leaves would turn yellow.

Ø Phosphate – the element is involved in photosynthesis, and needed in the light independent stage to be more precise. If this element is not available the young leaves will turn purple and roots will struggle to grow.

Ø Potassium – this element is needed by enzymes which are involved in photosynthesis and respiration. A shortage of potassium would result in leaves turning yellow and developing dead spots.

· Temperature of air and soil – All chemical and biological activities of a soil are influenced by temperature. The temperature of a soil may be from that of the air above it. Evaporation of water from soil may cool it to below that of the air, whereas solar radiation may raise it above air temperature. Soil temperature affects plant growth indirectly by affecting water and nutrient uptake as well as root growth.

Reliability, Measurements and Accuracy

In this investigation, 60 ivy leaves from a shaded region and another 60 leaves from an unshaded region from the same woodland will be measured. The abiotic factors in both areas will be measured too.

Two 10m tape measures will be placed at right angles to each other. The square quadrat will then be placed using random co-ordinates. This method seems to be the most efficient and reliable way to locate and

measure ivy leaves randomly, in each region. The square quadrat is a better option than the point quadrat because due to the lack of time the square quadrat is a quicker and more appropriate way to collect my sample of ivy leaves. Moreover, the ivy leaves that are going to be used in the sample will all be from within the square quadrat, so they are all likely to be in the same environmental condition as each other; this adds a sense of fair testing to my experiment.

Enzyme activity is also influenced by pH, if the pH is too acidic or alkaline, then the enzyme is likely to denature, resulting in it not being able to bind with its specific substrate molecule. The pH in the shaded region was slightly acidic compared to the unshaded habitat. The pH in the shaded region was 6.5 and in the unshaded region it was 7.5. However, the ivy plants are known to be capable of living in adverse soil conditions

I thought that the method of collecting my data was quite reliable and appropriate for this experiment. However for future experiments I should look to collect a much larger sample size. Due to time restraints, I was able to collect 60 leaves from each region; this is too small a sample size to base a conclusion on. Nevertheless we are able to see a clear observation that the size of the ivy leaves tends to be smaller in unshaded areas, and larger in shaded areas. Moreover a greater section of each area may have been taken into consideration, to help make the results more reflective and reliable. The ivy leaves themselves were measured to mm2, which I believe was fairly accurate, yet mistakes may have been made when trying to trace around the ivy leaves. This is another method which would need to be improved on for future experiments, to help give a more accurate result.

As light intensity was the main abiotic factor being investigated, three light intensities were measured in each area at different distances from the ground (50cm, 100cm and 150cm above ground level). This way the best possible value for light intensity in the area overall can be measured. When light intensity was measured using the light probe, the probe was directed towards a clipboard from each height. This was to ensure a consistent, reliable and reflection is detected by the light meter. Whilst light intensity is the only abiotic factor which was being investigated, it would have been ideal if all other abiotic factors remained the same in both areas, throughout the experiment. However this was not the case as we cannot control them, but any differences were be taken into account. To minimise the effect of each variable, the investigation took place on the same day, to ensure a certain degree of fair testing.

There were no anomalous results, but if there had been any anomalous results they would have been most likely due to human error more than anything else. All precautions were taken while carrying out this experiment. Safety Goggles and gloves were worn when carrying out the pH and NPK test, the equipment was used in an orderly and responsible manner and any spillage was cleaned up quickly and disposed of.