

Name: _____

Planting Science

Mr. Willis

Biology: _____

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PS

Rdg 19 – Requirements for Plant Growth

Hydroponic systems will not compensate for poor growing conditions such as improper temperature, inadequate light, or pest problems. Hydroponically grown plants have the same general requirements for good growth as field-grown plants. The major difference is the method by which the plants are supported and the inorganic elements necessary for growth and development are supplied.

Plants grow well only within a limited temperature range. Temperatures that are too high or too low will result in abnormal development and reduced production. Warm-season vegetables and most flowers grow best between 60° and 75° or 80° F. Cool-season vegetables such as lettuce and spinach should be grown between 50° and 70° F.

All vegetable plants and many flowers require large amounts of sunlight. Hydroponically grown vegetables like those grown in a garden, need at least 8 to 10 hours of direct sunlight each day to produce well. Artificial lighting is a poor substitute for sunshine, as most indoor lights do not provide enough intensity to produce a crop. Incandescent lamps supplemented with sunshine or special plant-growth lamps can be used to grow transplants but are not adequate to grow the crop to maturity. High intensity lamps such as high-pressure sodium lamps can provide more than 1,000 foot-candles of light. The serious hobbyist can use these lamps successfully in areas where sunlight is inadequate. The fixtures and lamps, however, are very expensive and thus not feasible for a commercial operation.

Adequate spacing between plants will ensure that each plant receives sufficient light in the greenhouse. Tomato plants pruned to a single stem should be allowed 4 square feet per plant. European seedless cucumbers should be allowed 7 to 9 square feet, and seeded cucumbers need about 7 square feet. Leaf lettuce plants should be spaced 7 to 9 inches apart within the row and 9 inches between rows. Most other vegetables and flowers should be grown at the same spacing as recommended for a garden.

Greenhouse vegetables, whether grown in soil or in a hydroponic system, will not do as well during the winter as in the summer. Shorter days and cloudy weather reduce the light intensity and thus limit production. Most vegetables will do better if grown from January to June or from July to December than if they are started in the fall and grown through the midwinter months.

Providing the plants with an adequate amount of water is not difficult in the water culture system, but it can be a problem with the aggregate culture method. During the hot summer months a large tomato plant may use one-half gallon of water per day. If the aggregate is not kept sufficiently moist, the plant roots will dry out and some will die. Even after the proper moisture level has been restored, the plants will recover slowly and production will be reduced.

Water quality can be a problem in hydroponic systems. Water with excessive alkalinity or salt content can result in a nutrient imbalance and poor plant growth. Softened water may contain harmful amounts of sodium. Water that tests high in total salts should not be used. Salt levels greater than 0.5 millions or 320 parts per million are likely to cause an imbalance of nutrients. The amateur chemist may be able to overcome this problem by custom mixing the nutrient solutions to compensate for the salts in the water.

Plants require oxygen for respiration to carry out their functions of water and nutrient uptake. In soil

adequate oxygen is usually available, but plant roots growing in water will quickly exhaust the supply of dissolved oxygen and can be damaged or killed unless additional air is provided. A common method of supplying oxygen is to bubble air through the solution. It is not usually necessary to provide supplementary oxygen in aeroponic or continuous flow systems.

Green plants must absorb certain minerals through their roots to survive. In the garden these minerals are supplied by the soil and by the addition of fertilizers such as manure, compost, and fertilizer salts. The essential elements needed in large quantities are nitrogen, phosphorus, potassium, calcium, magnesium, and sulfur. Micronutrients - iron, manganese, boron, zinc, copper, molybdenum, and chlorine are also needed but in very small amounts.

In a garden the plant roots are surrounded by soil that supports the growing plant. A hydroponically grown plant must be artificially supported, usually with string or stakes.