Radical Radishes Lab; SB2 b,d

Like all seeds, each radish seed contains a plant embryo. Each seed also contains starch, fats and proteins that provide energy and building materials for the growing seedling. When a seed first absorbs water, somatic cells in the plant embryo begin to divide by mitosis and the plant begins to grow. The young stem and leaves grow upward, and the roots grow downward. This is a plant adaptation known as gravitropism. The radish seeds you will use in this investigation have been exposed to the mutagen cobalt-60, a radioactive isotope of the element cobalt. Cobalt-60 gives off gamma rays, a short wavelength form of electromagnetic energy with more energy than x-rays. The units for this type of radiation are known as rads (rds). In this lab you will be using irradiated radish seeds that have been exposed to levels of radiation ranging from 50,000 to 4,000,000 rads. Exposure to gamma rays does not make the seeds themselves radioactive, but many molecules in the seeds can be affected. Gamma rays can break covalent bonds in molecules such as DNA. As a result, DNA in cells exposed to mutagens like radiation can have many nicks and breaks in their sequence. Genetic mutations can occur if DNA is not repaired correctly. For example, deletions, substitutions and insertions can occur if a small part of the DNA sequence is lost or misplaced when broken ends are rejoined. When the mutated genes are replicated, transcribed and translated, they may produce proteins that do not work properly. When the cell divides, these mutant genes can be passed on to the new cells. Because the seeds used in this lab were exposed to a mutagenic factor, changes may have occurred that will be passed on as the embryo cells divide in the growing seedlings. The purpose of this lab is to understand the effects of mutagenic factors on the potential alteration of DNA and protein synthesis.

Pre-lab: You will need to complete pages 126-127 in your laboratory manuals. Alternatively, these pages can be viewed and printed from our classroom website. Bring pages 126-127 to class as your ticket into the lab.

Procedures: You will need to collect quantitative and qualitative data on a daily basis to monitor the effects of the radiation on the radishes. Record your hypothesis and data on the data table provided to you. You may also choose to record additional data that is not specified on the data table.

Post Lab:

1. Describe the results of the experiment and implications of the data. Be sure to restate your hypothesis and identify the variables in the experimental design. Also discuss any potential sources of error and possible experimental flaws in methodology.

2. Create a graph to represent the percent germinated and the average height for all five groups of plants. Your graph should represent data collected on the final day of the lab.

3. In addition to high energy radiation, what are some other mutagenic factors?

4. Are all mutations harmful? Please justify your response.

5. Design and describe an alternative experiment that would test the effects of another mutagenic factor.

6. Create a stained wet mount of the root tip of a radish on the last day. Sketch the root as done in previous labs. Compare and describe your results with other groups, as you will all examine different plant groups.

7. Identify three types of chromosomal mutations and compare the potential effects of chromosomal mutations to smaller DNA mutations (e.g., insertions, substitutions, deletions).

Hypothesis:

Radish Group	Date	% germinated	Average Height (mm)	Descriptions and Observations
Control				
Control				
Control				
50,000 rads				
50,000 rads				
50,000 rads				
150,000 rads				
150,000 rads				
150,000 rads				
500,000 rads				
500,000 rads				
500,000 rads				
4,000,000 rads				
4,000,000 rads				
4,000,000 rads				

Initial number planted: Control _____ 50,000_____150,000_____500,000_____4,000,000_____