

The Effects of Electromagnetic Waves Emitted by Cellular Devices on Germination, Root Growth, and Root Tip Cell Division

Read, annotate, and complete each section.

The environment is exposed to electromagnetic radiations as a result of widespread use of wireless communication. This yields a massive increase in electromagnetic pollution. There is a concern of possible adverse effects of cellular phone radiation as a result of the enormous increase in the use of these phones throughout the world. The potential risks of electromagnetic field (EMF) emitted by cellular phones on living systems has been intensely studied. Many studies were conducted on the genetic and biological effects of cellular phones and the effects of these on plants.

1. (RST.9-10.4.) Explain the meaning of these words using context clues and prefixes/suffixes.

- yields: _____
- adverse: _____
- emitted: _____

An experiment was conducted to explore the effects of EMF radiated by cellular phones on the germination, root growth, and division of root cells in lentil seeds. 10 lentil seeds were each planted on filter paper in 3 separate petri dishes. Seed samples in the first petri dish were exposed to electromagnetic waves while in a dormant state for 48 hours, then germinated in a controlled laboratory. Seed samples in the second petri dish were germinated in a controlled laboratory prior to being exposed to electromagnetic waves for 48 hours. The third petri dish was not subjected to electromagnetic waves beyond the natural background. Seeds were harvested immediately after exposure.

2. (SIN 402) According to the passage, what is the independent variable in this experiment?

- a. temperature
- b. root growth
- c. type of seeds
- d. electromagnetic field (EMF)

3. (SIN 403) What was the purpose of the third petri dish?

- a. It was the dependent variable.
- b. It was the experimental group.
- c. It was the control group.
- d. It was the independent variable.

4. (EMI 401) Which of the following conclusions is supported by the data in Figure 1?

- a. The differences in root growth suggests that EMF have an adverse effect on seeds exposed during dormancy.
- b. The differences in root growth suggests that EMF do not impact seeds.
- c. The differences in root growth suggests that EMF have an adverse effect on seeds during division.
- d. The differences in root growth suggests that seeds exposed to EMF in dormancy were positively affected.

The Effect of Electromagnetic Waves on Root Growth

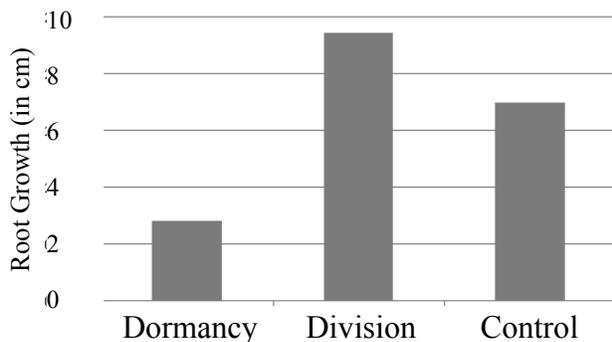


Figure 1

Experimental results of cell division, or mitosis, in the root tips of lentil seeds have been given in Table 1. The mitotic index refers to number of cells completing cell division.

Experiment	Divided Cells		Mitotic Index (%)	Germination increase compared to control (%)	Abnormal division increase compared to control (%)
	Normal	Abnormal			
Electromagnetic waves applied to seeds during dormancy	177	12	8.85	-12.50	52.38
Electromagnetic waves applied to seeds during division	281	12	14.05	35.65	-1.71
Control	207	9	10.35	-	-

Table 1

5. (IOD 301) Which experimental group showed an increase in germination?
 - a. Electromagnetic waves applied to seeds during dormancy.
 - b. Electromagnetic waves applied to seeds during division.
 - c. Control
 - d. None of the above

6. (IOD 301) Which of the following is true?
 - a. The control group had the greatest number of abnormally divided cells.
 - b. The control group had the greatest number of normally divided cells.
 - c. The seeds exposed to electromagnetic waves during division had the least number of normally divided cells.
 - d. The seeds exposed to electromagnetic waves during division had the greatest number of normally divided cells.

7. (EMI 401) Which of the following conclusions is supported by the mitotic index?
 - a. The mitotic index indicates that seeds in the control group were more adversely affected than the seeds in both of the experimental groups.
 - b. The mitotic index indicates that electromagnetic waves had no effect on seeds in dormancy or division.
 - c. The mitotic index indicates that seeds exposed to electromagnetic waves in a state of dormancy were more adversely affected than the seeds exposed to electromagnetic waves during a state of division.
 - d. The mitotic index indicates that seeds exposed to electromagnetic waves during division were more adversely affected than the seeds exposed to electromagnetic waves during dormancy.

 Data Representations and Research Summary adapted from:

Akbal, A. (2010). Effects of Electromagnetic Waves Emitted by Mobile Phones on Germination, Root Growth, and Root Tip Cell Mitotic Division of *Lens culinaris*. *Polish Journal of Environmental Studies*. Vol. 21, No.1, 23-29.