IMPACT OF ELECTROMAGNETIC FIELD ON SEED GERMINATION

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ABSTRACT

Electromagnetic fields produced by permanent magnets, electrical appliances, power lines, electric wiring, as well as natural sources such as the sun and even living organisms are all around us. It is thought that any biological effects of the electromagnetic field are due to the magnetic component only. Interestingly, it was found that the growth of plants was inhibited by the presence of ELF antenna at Michigan. The electromagnetic field is supposed to increase the transportation of calcium across cell walls. The root growth of radish seeds is observed in presence of a static electromagnetic field. It was reported that when seed germination is stimulated by electromagnetic field, there is a very striking response. It has been observed that some seeds are capable of germination only few days after fertilization and long before the normal harvesting time; others are dormant and require an extended rest period or additional development before germination. The object of the present investigation is to examine the response of the root growth of Cicar arietium (gram) seeds in presence of magnetic and electric fields when applied separately.

The magnetic and electric field may provide a feasible non-chemical solution in agriculture. At the same time it offers advantages to protect environment and also safety for the applicator. The biological effect of high frequency portion of the electromagnetic spectrum has been reported in recent years but there is lack of data to explain the biological effects of low frequency fields. In the present work emphasis is given to investigate magnetic and electric field exposure effects on seed germination, in particular on gram seeds.

A series of experiments we conducted using gram seeds. The effects of magnetic and electric field on root growth of gram seeds after 4-days of germination were analyzed statistically. F-test was done to determine the significance of the differences of root length between the control and experimental groups. The results reveal that root lengths were increased more when the exposure time was 40 minute at field strength of 0.66 T compared with the other exposure times. At 0.88 T, the root lengths were increased when the exposure times were 40 min and 80 min and with increase of exposure time to 120 min the root length was found to decrease. In presence of magnetic field of 1.1 T the growth of root length was decreased with the increase of exposure time It was found that the root length was maximum at magnetic field of 0.88 T during 80 minutes exposures and it was 49% higher than control. By the application of electric field of 1.5 KV/cm on gram seeds for 20 min the root length was decreased 14% in compared to the control. With the increase of electric field strength the root growth was decreased further.

In the present investigation we found that the growth of root length becomes maximum during exposure of magnetic field strength of 0.88 T for 80 minutes. The intensity of this magnetic field thus stimulated the seed germination of gram seeds and it may be assumed that under this condition the three-cell water potential forces act in the same direction on germinated seeds.

From our investigation it was found that an exposure of magnetic field strength of 0.88 T for 80 minutes has maximum stimulating effect on germination of gram seeds. This field strength might provide a feasible non-chemical solution for seed germination. This non-chemical alternative has many advantages such as protecting environment and in turn to offer safety. From the present investigation it was clearly understood that the exposure of magnetic field strength of 0.66 T to 1.1 T with different time interval 0-120 minutes (0 as a control), changed the seedlings growth of gram seeds. The exposure effect of the ambient magnetic field strength of 0.88 T for 80 minutes exerts the best stimulating effect for germination of gram seeds. But in the case of high electric field the length of roots has negative effect with respect to control.