



Investigating Impact of Steady Magnetic Field on Plant Development

Sakharam D Aghav*, Jyoti Kamble, Pooja Baba and J. Y. Yande

Physics Department, Baburaoji Gholap College, Sangvi, Pune (SPPU), MS, India
sdaghav@gmail.com

Available online at: www.isca.in, www.isca.me

Received 15th February 2016, revised 5th March 2016, accepted 14th April 2016

Abstract

Present study was planned to observe the consequence of steady magnetic field on development of plant especially germination and changes in shoot and root lengths. Wheat seeds (*Triticum spp.*) of type Lokvan were used for the investigation. The research work was carried in four ways. One group of wheat seeds was grown in absence of magnetic field (controlled condition). The other three groups were grown in presence of stress of 50 mT magnetic field for time of 15, 30, 45 minutes respectively. Plant development parameters such as seeds germinated, root length and shoot length were recorded. The results obtained indicated that magnetic field has a noteworthy impact on plant augmentation. In presence of the magnetic field, seed germination had increased. It has been observed that and these plants nurture more and better when seeds were treated by magnetic field.

Keywords: Magnetic field, Germination, Shoot length, Root length.

Introduction

Magnetic field exposure is one of the practices for therapeutic purchase in case of human being. The effects of exposure of a magnetic field on plant, mainly during initial stages of development of plants, have been reported by many investigators¹⁻³. In case of plant, the increase in growth is due to type of soil in which it is cultivated, nutrients available in soil, fertilizers used, climate condition, seed type and availability of water. It had been reported by investigators that magnetic field speed up germination process and plant growth also⁴. Increase in percentage germination causes increase in the yield of crop and beneficial to farmers. Unnecessary use of fertilizers and growth regulators are common practices adopted by farmers, decreases plant immunity. Indiscriminate use of such fertilizers and pesticides invites number of plant diseases in future. This is one of the reasons why peoples prefer naturally grown vegetables, fruits and grain.

It had been observed by scientist that when seeds were kept in magnetic field for a short time, germination of seed was faster⁵. The present investigation is intended to evaluate the consequence of static magnetic field of strength 50 mT on germination percentage in wheat and other development parameters.

Materials and Methods

In the present study “Lokvan” wheat seeds variety, easily available in market and having proper season for cultivation of plant were selected for study. The sample size for each case was 100 seeds. These seeds were germinated in the laboratory in agar jell and growth tests of the seed were carried out under

laboratory conditions. In the beginning seeds used in this study were presoaked with distilled water at temperature 25^oC for 24 hr. The seeds were then kept in glass test tube which later on kept in between a system of two permanent magnets.

The complete set up of magnetic system used is shown in Figure-1. There were strong electromagnets with power supply. The spacing between these magnets can be varied by screws. The magnetic field produced by them at centre can be recorded by Gauss meter and probe. The magnitude of magnetic field can be altered by changing value of current. For study magnetic field of 50 milli tesla was used in the experiment. The sample placed in test tube was kept for dissimilar exposure of time. All seeds in test tube except control were kept in between magnets for different period ranging from 15 minutes, 30 minutes, and 45 minutes respectively. The arrangement of magnet and position of sample was as shown in Figure-1. The surrounding conditions such as temperature, humidity of the wheat seeds, illumination of light and the medium in which they were germinated were maintained same. Later on seventh day seeds were taken out and for each wheat seed, measurement lengthwise, and root wise was recorded.

Results and Discussion

Table-1 shows change in root length and shoot length for 15, 30 and 45 minutes when seeds were kept in magnetic field 50mT.

Table-2 indicates percentages of germination for controlled and various stressed condition.

After seven days the wheat seeds were germinated with different percentage. It is maximum for magnetic field strength

for 15 and 30 minutes. The root length also varied. It varied from 5.3 cm to 10.5 cm and was 7.2cm for exposed seed. The effects on changes in the length of root, shoot length are as shown in Figure-2.

Table-1
Shows change in root length and shoot length

Parameter	Controlled condition	15 min	30 min	45 min
Average root length (cm)	7.2	10.5	6.1	5.3
Average shoot length (cm)	5.4	8.2	6.2	5.8
shoot length / root length	0.75	0.78.09	1.02	1.09

Table-2
Percentages of germination for controlled and various stressed condition

Condition	Percentage germination
Controlled condition	80
Stress of 50mT magnetic field (15mins)	90
Stress of 50mT magnetic field (30mins)	90
Stress of 50mT magnetic field (45mins)	80

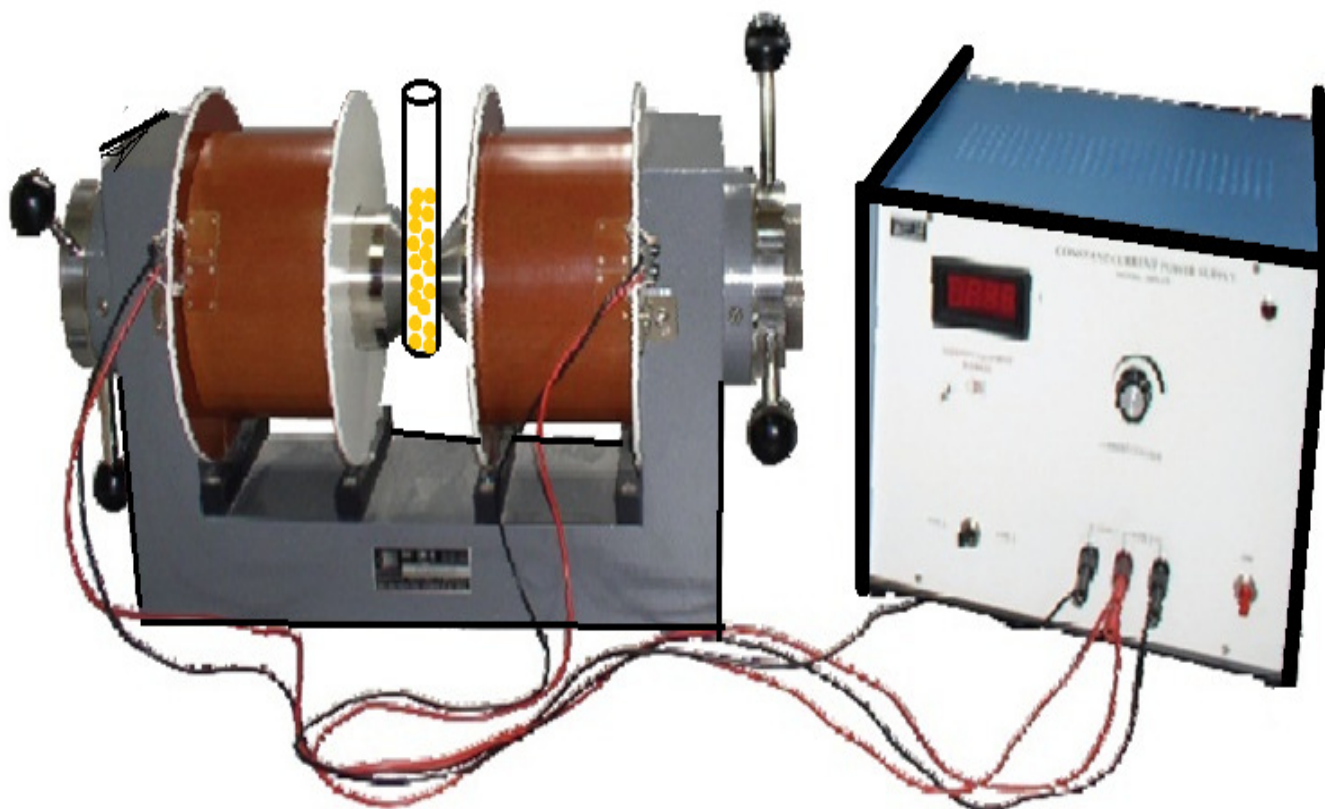


Figure-1
Experimental set up containing electromagnet

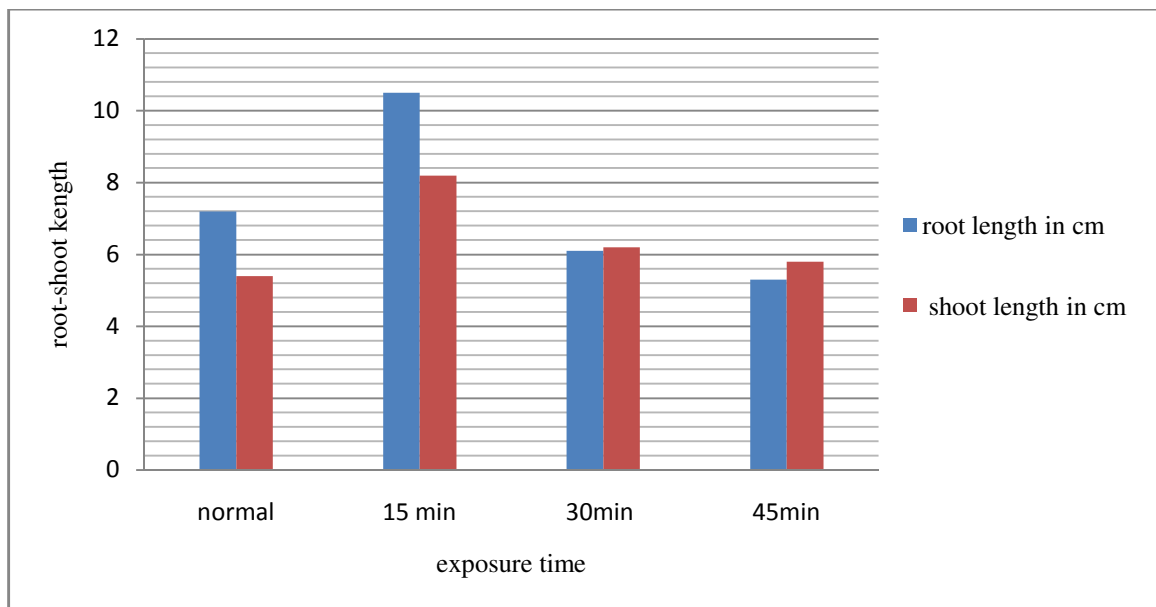


Figure-2
Change in root length and shoot length

It had been noticed that soaked wheat seeds germinated faster than dry seeds. The presoaking of water also increases amount of enzyme (amylase) in germination. These enzymes get affected in presence of magnetic fields. There are reports indicating that esterase enzymes increase during germination of wheat seeds in presence of magnetic fields⁶ which in due course quickly reduces the seeds dormancy. It is possible that magnetic field may provoke growth regulators. Present study indicated that the wheat seeds treated by 50mT magnetic field confirmed percentage of germination and improved development of the flora.

Conclusion

It can be concluded that magnetic treatment improves germination rate of triticale seeds. The percentage of seed germinated under steady magnetic field seeds was higher than controlled seed. The magnetic stimulation of the seeds accelerates the process of germination.

Acknowledgement

Authors acknowledge Principal Dr. M.G. Chaskar for using facility available in Baburaoji Gholap College, Sangvi Pune 27.

References

1. Edward Fu (2012). The effects of magnetic fields on plant growth and health, *Young Scientists Journal*, 11, 38-42.
2. Fischer G., M. Kock and D. Grill (2004). Effect of Weak 16 HZ Magnetic Fields on Growth Parameters of Young Sunflower and Wheat Seedlings. *Bioelectromagnetics*. 25(8), 638-641.
3. Fetan Dhawi, Jameel M. Al-Khayri and Essam Hassan (2009). Static Magnetic Field Influence on Elements Composition in Date Palm (*Phoenix dactylifera L.*), *Research Journal of Agriculture and Biological Sciences*, 5(2),161-166.
4. Rostami zadeh E., Majd A. and Arbabian S (2014). Effects of electromagnetic fields on seed germination in *Urtica dioica L.*, *Int. Jr. of Scientific and Technological Research*, 3(4), 365-368.
5. Abdul R.H. Subber, Reyad Ch. Abul Hail, Waleed A. Jabail and Hussain F. Hussein. (2012). Effects of magnetic field on the growth development of *zea mays* seeds, *J. Nat. Prod. Plant Resour* 2(3), 456-459.
6. Florez M. Martinez Elvira and Victoria Carbonell. (2014). Germination and initial growth of triticale seeds under stationary magnetic treatment, *Bioelectromagnetics*, 6(3), 474-484.