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A

PROJECT REPORT

ON

"Effect of Diode Laser on Maize Seed"

Guided by

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Submitted to

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Introduction

Maize is important cereal in many developing countries of the world. In our country maize is widely used for animal feed as well as industrial raw material. Because of its worldwide distribution and relatively lower price maize has wider range of user.

The amazing characteristics of the laser radiation such as monochromatism polarization, coherence & high intensity , can be used not only in all spheres of engineering but also in biology and plant growing seed can absorb photons concentrated sunlight, transform light quantum energy into chemical energy, store and use it during further growth & development of plants. The additionally absorbed light energy accelerates plant growth and increase their productivity. Seed quality is affected by many parameter, such as environment factors, genetic, fertility of soil and etc. Which limits their growth and productivity. These factors include drought and salinity. Seed germination is an important stage in the life of plant.

Light plays a critical role in plant growth process and its widely used accepted that germination process is sensitive to irradiation with various wavelengths of visible and infrared light. The laser bio stimulation is a physical phenomenon based on the absorption of light energy by grain. The energy supply increase the energy potential of seed, with in turn impact the physiology process in germinating seeds. The beneficial effect of the presowing laser bio stimulation of seed on germination, initial growth and development and yield has been proven by numerous studies on some cereals.



Abstract

Seeds of maize were (indian corn) were treated in diode laser. An experimental study on the effect of low intensity laser irradiation on field performance of the maize seed. The treatment on seed germination rate & growth of leaf is increasing rapidly . Similarly growth of same seeds without any laser treatment carried out. The result of experimental study suggested that some intensities of laser improved growth of plant. This method is useful for crop production.



Materials

- Pots
- Diode laser
- Maize Seed
- Soil
- Water



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What is a laser?

LASER stands for Light Amplification by Stimulated emission of Radiation. A laser is a device which produces highly directional light. It emits light through a process called stimulated emission of radiation which increases the intensity of light.

A laser is different from conventional light source in four ways.



Characteristics of laser

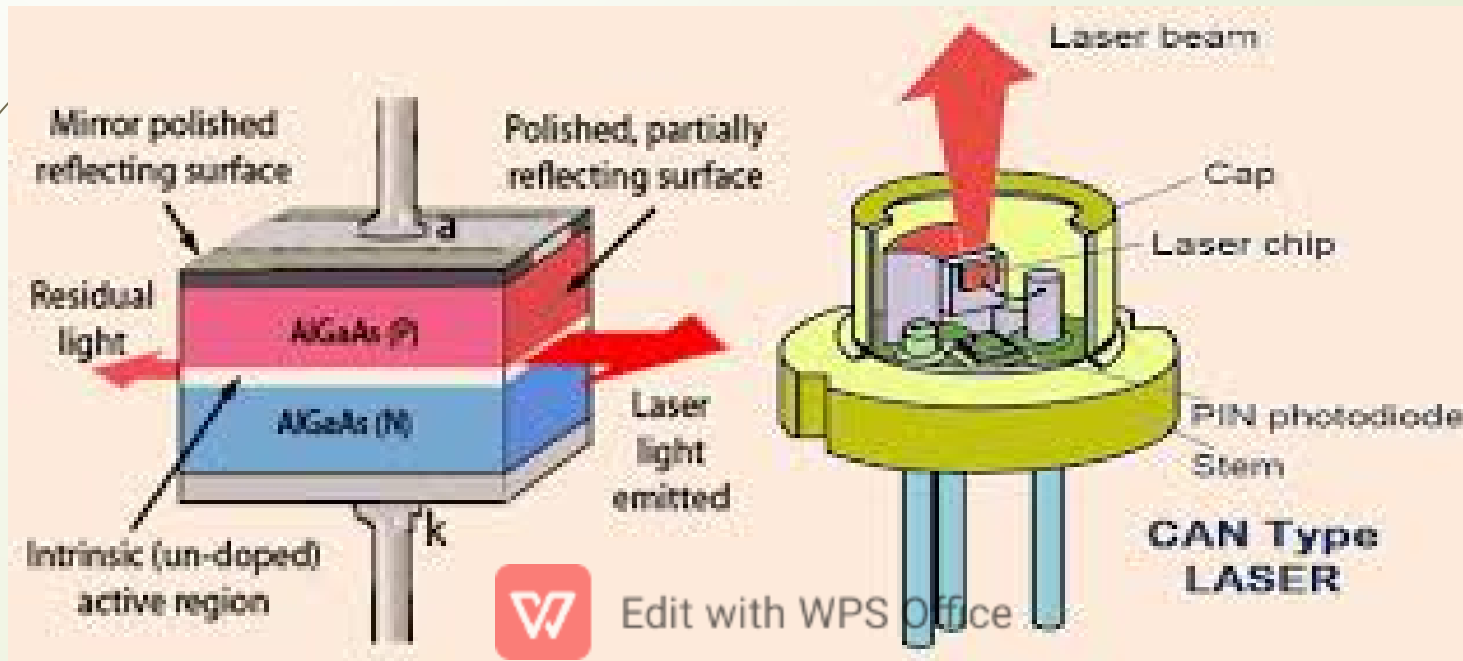
1. Directionality
2. Monochromaticity
3. Coherence
4. Intensity

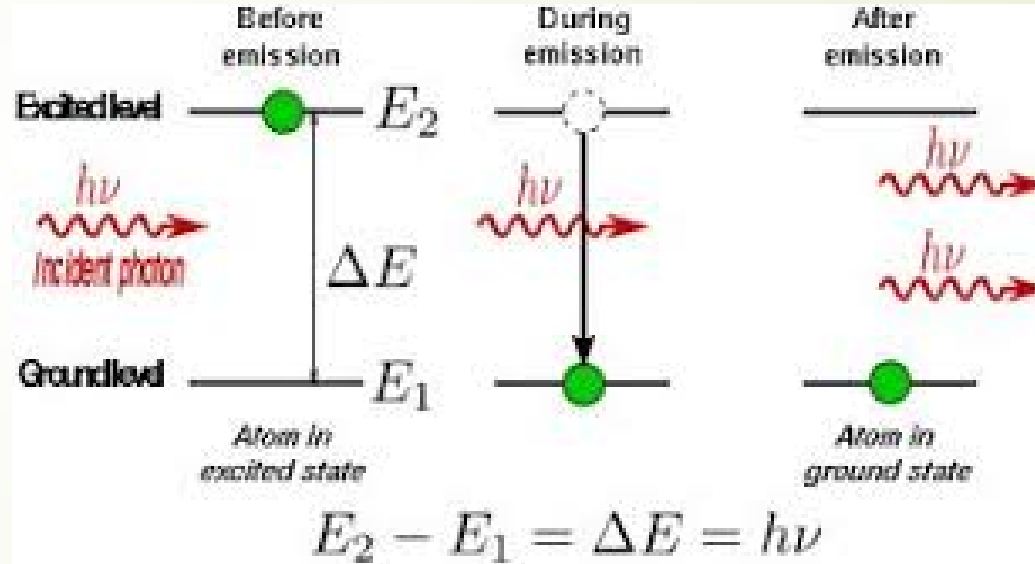


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Diode laser construction

Every atom according to the quantum theory, can energies only within a certain discrete energy level. Normally, the atoms are in the lowest energy state or ground state. When an energy source given to the atoms in the ground state can be excited to go one of the higher levels. This process is called absorption. After staying at that level for a very short duration, the atom returns to its initial ground state, emitting a photons in the process, this process is called spontaneous emission. These two processes, absorption and spontaneous emission, take place in a conventional light source.





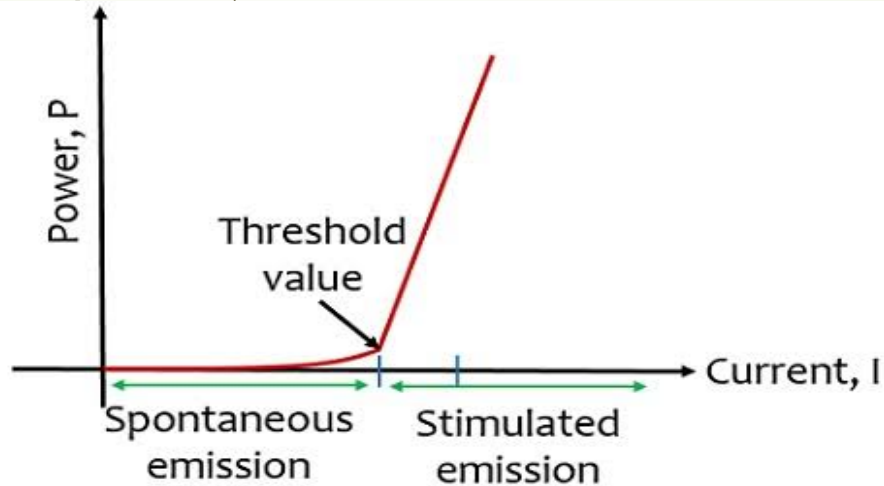
Principal of laser Action

In case the atom, still in an excited state, is struck by an output photon having precisely the energy necessary emission, the output photon is increased by the one given up by the excited atom, Moreover, both the photons are released from the same excited state in the same phase, this process, called stimulated emission, is fundamental for laser action (shown in above figure). In this process, the key is the photon having exacted the same wavelength as that of the light to be emitted.

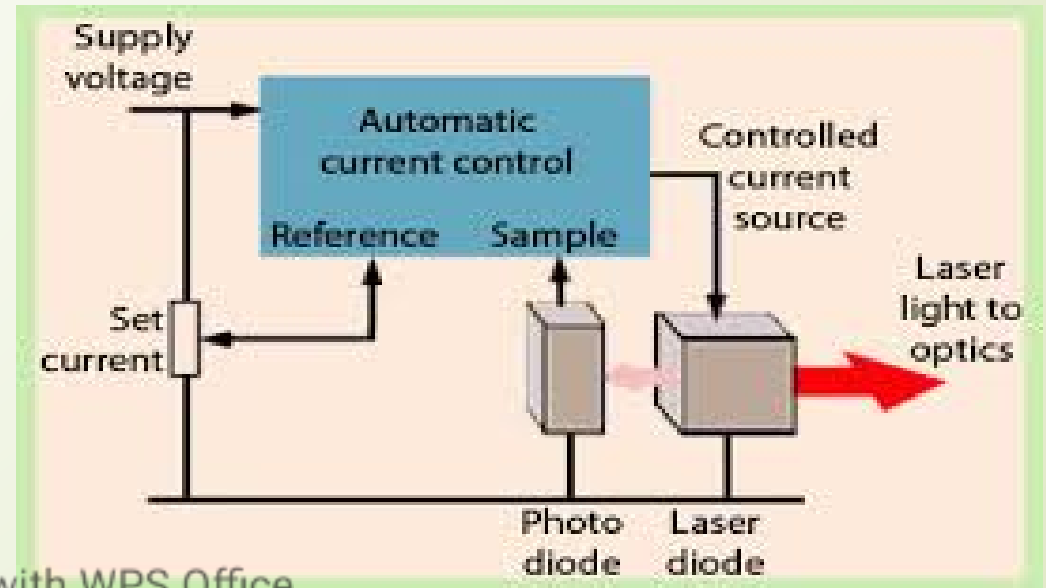


Controlling the Laser Diode:

The laser diode is operated at a much higher current, typically about 10 times greater than a normal LED. The below figure compares a graph of the light output of a normal LED and that of a laser diode. In a LED the light output increases steadily as the diode current is increased. In a laser diode, however laser light is not produced until the current level reaches the threshold level when stimulated emission starts to occur. The threshold current is normally more than 80% of the maximum current the device will pass before being destroyed! For this reason, the current through the laser diode must be carefully regulated.



Characteristic curve of laser diode





Advantages of Diode Lasers:-

Compared to most laser types, diode lasers are less expensive and more compact, making them ideal for small electronic devices, such as CD and DVD players, CD-ROMs, DVD-ROMs and other optical data storage devices. Laser printers, laser fax machines and supermarket bar code readers all use diode lasers. Using helium-neon lasers increases the size of these devices by as much as five times.

Disadvantages of Diode Lasers:-

Diode laser beams are highly divergent, meaning “wedge-shaped,” instead of straight and parallel, and have shorter coherent distances, which makes for inferior quality in optics performance. They are not as well-suited as helium-neon lasers for high-quality holography.



Application

Laser application in agriculture has beneficial effect of germination, vigor, growth stress resistance, health quality, yield crop etc. This review has an objective to make review of the scientific literature about the application of laser in agriculture & its potential to contribute in improving the quantity and quality of food production. Application of the project work may serve to refine growth technique currently being used in research and commerce.



Finally, it is important also to balance out temperatures along with the light. Higher and lower temperatures affect the rate of photosynthesis, thus affecting growth.



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conclusion

- 1) The laser induced bio-stimulation effect into germination and yield spring wheat.
- 2) Stimulation effect of laser light can be useful for improving wheat germination, yield in the regions where the high salinity occurs.
- 3) From this project we concluded that laser effect increases and growth of maize plant.



Reference

- 1) Maize-Wikipedia
- 2) Introduction to LASER and Characteristics of laser

Authors: Deepak Shakyavanshi

Updated: 14-April-2012

- 1) Effect of Various Radiant Source on plant Growth
(part 1)

Shinji Source Division, Iwasaki Electric Co., Ltd.
(Gyoda, Saitama, 361-0021 Japan)

- 1) Assessment of Diode Laser Pretreatments on Germination and Yield of Wheat (*Triticumaestivum* L.)
under Salinity Stress

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THANK YOU



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