

# Biology Extended Essay

[To investigate the growth enhancing effect of Aloe vera gel on germinating seeds]

## Abstract

### *gel affect their rate of germination?*

My essay aims to investigate the growth enhancing effect of Aloe vera gel on germinating seeds. The idea of carrying out this investigation came to me after going through a research paper in which the effect of cactus extracts on seed germination were studied. Since I could not find any previously done research on the growth enhancing effect of Aloe vera gel, all the data collected and the investigation is first hand. In my investigation I used 5 different species of seeds; each seed was taken in two batches. One of the batches was treated with Aloe vera gel and the other batch was used as a control to observe any distinction in the type of growth. These seeds were then left to germinate and observed for a period of 6 days. The observations showed that the seeds treated with Aloe vera gel showed rigor in growth and hence to explain this growth enhancing effect of the gel it is further put to test for various parameters moisture content, carbohydrates, proteins, nitrates). The results of the analysis justified the observation that I obtained in the latter part of the experiment. Therefore based on the results I concluded that treatment with Aloe vera gel caused most of the seeds to germinate faster either because of the great moisture retaining ability or because it helps the seeds to overcome dormancy. The growth enhancing effect of the gel can be beneficial to the agricultural industries since they can coat the seed with the gel before selling them, this will cause the seeds not only to germinate faster but also decrease the wastage of seeds incapable of early germination.

## Introduction

"Germination is the growth of an embryonic plant contained within a seed"[1], in simple words germination is the process in which a seedling starts to grow from its state of dormancy. In its state of dormancy there are no metabolic activities taking place in the cell. When the cell is finally exposed to favorable conditions the metabolic processes resume and it germinates. For a seed to germinate some factors that need to be favorable include:

a) Water: seeds are generally dry and therefore need plenty of water to initiate the metabolic processes in the seed. Seeds need this water to moisten and to swell up and break the seed coat to grow into plants. The seeds also use water to activate the hydraulic enzymes. These enzymes then go on to breakdown the reserved food into useful chemical energy.

b) Oxygen: oxygen helps the seed to respire since the seed requires some energy before it finally starts photosynthesizing. The seed initially gets this oxygen from the pores in the soil where air is trapped.

c) Temperature: temperature is the main factor affecting the activation process. This is because temperature plays a key role in the activity of enzymes. Enzymes are temperature specific and therefore under extremely low conditions they are deactivated and under extremely high temperatures they denature due to alteration in their active sites[2]. Therefore the seed needs an optimum temperature to start germinating. However, many seeds do not germinate, because they are killed by external factors such as unfavorable environmental conditions, animals or pathogens or they are quiescent[3]. Sometimes failure to germinate is termed as dormancy. Dormancy does not have a specific definition but is measured by the absence of germination, a condition in which a seed is not allowed to germinate. This condition is controlled by many factors, water, temperature, gases, hormones, enzymes, etc. these conditions block germination not letting the seeds to grow. This is what causes the seeds to survive harsh conditions until finally under favorable conditions they germinate. Dormancy is incorrectly associated with the absence of germination, whereas it defines the factors that are actually necessary for germination. The factors that are favorable for germination are indeed the factors that terminate seed dormancy and induce germination. There are many types of seed dormancies:[4]

1) Psychological dormancy: is the most abundant form, found in most gymnosperms and all major angiosperms. There are three levels to this kind of dormancy deep, intermediate and non-deep. In deep dormancy they either don't grow or produce abnormal seedlings, in intermediate dormancy the seeds produce normal seedlings. GA

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## **Table of Contents Maxpapers Biology Extended 2013 31**

1. Understanding the eBook Maxpapers Biology Extended 2013 31
  - The Rise of Digital Reading Maxpapers Biology Extended 2013 31
  - Advantages of eBooks Over Traditional Books
2. Identifying Maxpapers Biology Extended 2013 31
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Maxpapers Biology Extended 2013 31
  - User-Friendly Interface
4. Exploring eBook Recommendations from Maxpapers Biology Extended 2013 31
  - Personalized Recommendations
  - Maxpapers Biology Extended 2013 31 User Reviews and Ratings
  - Maxpapers Biology Extended 2013 31 and Bestseller Lists
5. Accessing Maxpapers Biology Extended 2013 31 Free and Paid eBooks
  - Maxpapers Biology Extended 2013 31 Public Domain eBooks
  - Maxpapers Biology Extended 2013 31 eBook Subscription Services

- Maxpapers Biology Extended 2013 31 Budget-Friendly Options
- 6. Navigating Maxpapers Biology Extended 2013 31 eBook Formats
  - ePub, PDF, MOBI, and More
  - Maxpapers Biology Extended 2013 31 Compatibility with Devices
  - Maxpapers Biology Extended 2013 31 Enhanced eBook Features
- 7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of Maxpapers Biology Extended 2013 31
  - Highlighting and Note-Taking Maxpapers Biology Extended 2013 31
  - Interactive Elements Maxpapers Biology Extended 2013 31
- 8. Staying Engaged with Maxpapers Biology Extended 2013 31
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Maxpapers Biology Extended 2013 31
- 9. Balancing eBooks and Physical Books Maxpapers Biology Extended 2013 31
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection Maxpapers Biology Extended 2013 31
- 10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
- 11. Cultivating a Reading Routine Maxpapers Biology Extended 2013 31
  - Setting Reading Goals Maxpapers Biology Extended 2013 31
  - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Maxpapers Biology Extended 2013 31
  - Fact-Checking eBook Content of Maxpapers Biology Extended 2013 31
  - Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
  - Utilizing eBooks for Skill Development
  - Exploring Educational eBooks
- 14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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