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| Henry and Rebecca Northen�s book Ingenious Kingdom says, �Some seeds depend on light... Bluegrass, lettuce, and many bromeliads and begonias must have light to germinate.  They have such tiny seeds that if they germinated at some depth the small shoot would not reach the surface soon enough to start making food for further growth.�  This special adaptation immediately interested me.    I could easily understand how this adaptation would facilitate survival in the species.  That seems to make sense, it is detrimental to the survival of a species for seeds to germinate that will soon die for lack of light.  This would seem an obvious evolutionary change, plants that could hold out until light was available would survive, others, which could not, would die.  The aspect of this adaptation that really interested me was how this impressive trait actually worked    So, how does the presence of light trigger the germination of a seed?  Is it related to the amount of heat that is generated by the presence of light, is that key to inducing germination?  The segment in the Northens� book would seem to refute that theory, as would the nature of evolution; the soil could be warm far down, inducing germination without the guarantee of exposure to light.    Another idea would be that light has a reaction with       a chemical present in the seed coat causing the seed coat to split and germination to occur.  Seed coats such as the hard waterproof coat of the locust seed are often the barrier to germination.  It seems feasible that an organism whose chemical composition uses light to create its food could also have a seed coat that uses light to trigger germination.    This brings-up another theory involving photosynthesis.  Perhaps the wavelengths of light are able to travel through the seed coat and trigger a photosynthetic reaction within the embryo.  In most plants photosynthesis does not occur until the embryo has sprouted and is somewhat mature.  But perhaps seeds that require light for germination are able to begin photosynthesis immediately and germinate when the presence of light allows for photosynthesis.    I decided to explore this possibility with my project.  Early in the AP Biology class we conducted a lab in which sections of a coleus leaf were covered with different colors of plastic wrap and their photosynthetic activity was monitored.  Different colors of plastic wrap transmitted different       wavelengths of light, affecting the rate of photosynthesis.  Thomas Engelmann conducted an experiment on different wavelengths of light and their importance to photosynthesis in 1883.  He exposed different regions of algae to different wavelengths of light. Engelmann then added bacteria that are attracted to oxygen sources to the algae.  He observed where the bacteria were most concentrated, and, by doing so, where the most photosynthesis was occurring.  Engelmann saw that the bacteria were most concentrated around those regions that were exposed to red and blue light (Campbell).    I reasoned that if the rate of photosynthesis differed by color for Coleus and for the algae the same is probably true for the plants I would experiment on.  So if photosynthesis was linked to germination, and the rate of photosynthesis was affected by the wavelengths of light, then the rate of germination would be linked to the wavelengths of light the seeds were exposed to.    I decided to explore this idea with two different seeds.  I selected two seeds that the Northens� book said needed light for germination: Kenblue Kentucky bluegrass, and Grand Rapids, Tipburn Resistant Lettuce.  These plants have several other interesting characteristics.  The bluegrass is a monocot and has a light colored seed coat, while the lettuce is a dicot and has a black seed coat.    The lettuce and bluegrass were both to be exposed to the same conditions and monitored to determine the special trigger involved in their germination.  Or rather to determine if that trigger was related to photosynthesis or if that possibility should be ruled out.    I placed thirty seeds each in nine trays covered with different colors of plastic wrap.  So, there was a tray filled with thirty Grand Rapids Lettuce seeds and covered with three layers of blue plastic wrap taped to the clear plastic cover, and their was also a blue tray filled with thirty Kenblue Kentucky bluegrass seeds.  The same was done with red, green, and clear plastic wrap, and there was also a tray that was painted, as to prevent any exposure to light.    The plastic wrap that was secured to each tray would regulate the wavelengths of light that the seeds would be exposed to.  Any light that entered each tray of thirty seeds would have to do so through the plastic wrap.  After the trays were set up they were to be checked each day for the number of seeds that had germinated.  The experiment would terminate after twenty-one days, which is the end of the germination period for the bluegrass and well past the seven to ten day germination period for the lettuce.  If the rate of germination in each tray is related to the color of the plastic wrap covering the tray it might be theorized that perhaps the germination trigger is related to photosynthesis.  Yet this is not the only conclusion that can be made.  There is a chance that different wavelengths of light could trigger seed chemicals that are unrelated to photosynthesis or that the different wavelengths create different temperatures for the seeds and affect germination in that way.  Or there is the possibility that the seed coats themselves regulate the wavelengths of light and the colors of the wrap will not be very important.  ([Intro1](http://docs.google.com/introduction.html))([Intro2](http://docs.google.com/intro2.html))([Intro3](http://docs.google.com/intro3.html))([Intro4](http://docs.google.com/intro4.html))  [[Home](http://docs.google.com/home.html)][[Introduction](http://docs.google.com/introduction.html)][[Hypothesis](http://docs.google.com/hypothesis.html)][[Procedure](http://docs.google.com/procedure.html)][[Data](http://docs.google.com/data.html)][[Conclusions](http://docs.google.com/conclusions.html)][[Bilio/Links](http://docs.google.com/biblio.html)]  [[2002 Projects](http://docs.google.com/AP2002/index.html)][[2001 Projects](http://docs.google.com/index.html)][[2000 Projects](http://docs.google.com/AP2000/index.html)][[1999 Projects](http://docs.google.com/AP99/index.html)][[1998 Projects](http://docs.google.com/AP98/index.html)] |