Big Saguaros From Little Seeds Grow

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Would you say that lettuce and saguaro cacti are much alike? We didn't think so, until we accidentally found that saguaros and some lettuce plants get their start in life in the same way.

Our interest in saguaro seeds began when we tried to germinate them. We put some saguaro seeds on moist soil, covered them with a thin layer of soil, and waited. Nothing happened! Then we put some seeds on the surface of moist soil. In five days these seeds sprouted. We thought of many reasons why the seeds sprouted when planted on the soil surface but not when covered with soil. Thanks to research on lettuce seeds by U. S. Department of Agriculture scientists at Beltsville, Maryland, we were able to guess the correct reason.

Need That Red Light

Most kinds of seeds sprout a few days after they are moistened; nothing else is needed. But the USDA plant physiologists found that seeds of some varieties of lettuce are different. The moistened seeds of lettuce sprout only after they have been exposed to red light. In other words, red light "triggers" the germination of lettuce seeds. Because of this work on lettuce seeds, we guessed that the sprouting of saguaro seeds also is triggered by red light. The results of the following simple experiment proved our guess to be correct:

We put paper in small petri dishes and moistened the paper. Then in darkness we sprinkled 100 saguaro seeds on the wet paper in each dish. Some dishes were immediately put inside empty coffee cans and the lids were sealed shut with tape. Some other dishes were exposed to daylight on a shelf in the laboratory. A third group of dishes was covered with red cellophane and placed on a shelf in the laboratory. This treatment exposed the seeds to red light.

Five days later we looked at the saguaro seeds and seedlings in each dish. Just as expected, the moist seeds kept in the dark inside coffee cans didn't germinate, but the seeds exposed to daylight and red light did germinate. So our guess was right. Saguaro and lettuce seeds do have one thing in common: they sprout only after they have been exposed to red light.

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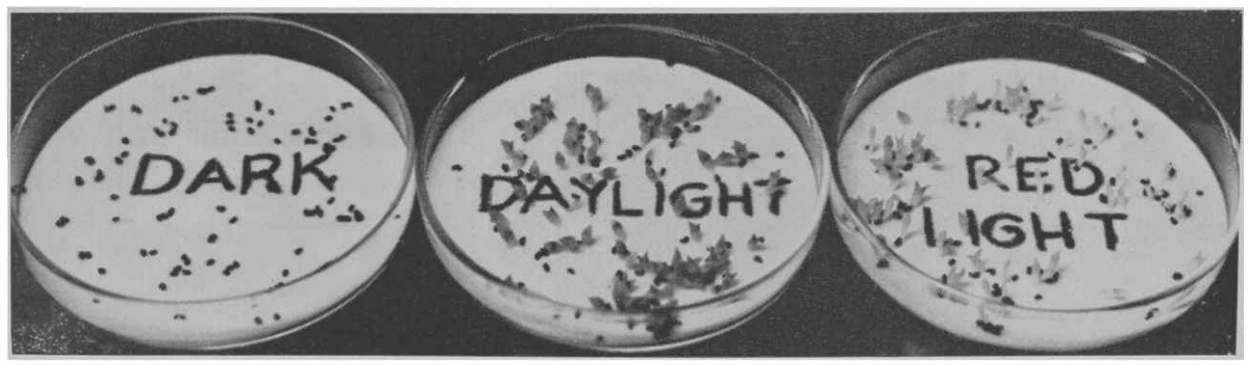

THE DISH OF saguaro seeds on the left was kept in total darkness; the dish in the middle was given daylight in the laboratory, and the dish on the right was given red light by covering the dish with red cellophane.

Can "Untrigger," Too

Saguaro and lettuce seeds have something else in common, too! After these seeds have been triggered to germinate by red light, they can be untriggered so they won't sprout. This untriggering is done by far-red light. The far-red light tells the seeds triggered by red light not to germinate after all.

Far-red light has a very deep red color when seen by the naked eye. It can be obtained easily by shining light from an incandescent filament bulb through two layers of blue and two layers of red cellophane. Apparently the far-red light undoes whatever red light does to start germination. For example, wet saguaro seeds exposed for a few minutes to red light will germinate, but if the same seeds are exposed to far-red light right after the dose of red light, they won't germinate.

But the far-red light doesn't harm the seeds. Sprouting can be triggered again by giving them a second dose of red light. In fact, by giving the seeds alternate doses of red and far-red light, sprouting can be triggered and untriggered as often as you like. Only the last kind of light given the seeds "tells" them to sprout or not to sprout.

May Aid Reforesting

We don't know all that these findings tell us about saguaro cacti growing in the desert, but they are already helping us to understand the problems of natural reforestation. An adult saguaro cactus is many millions of times larger than the seed from which it grew, but the tiny seed had to be "unlocked" first by red light so the saguaro plant inside it could emerge and grow. Now that the secret of unlocking the seed is known, the first phase of the reforestation program can begin.

Surprisingly the same kinds of light that control germination of lettuce and saguaro seeds also control the formation of color in apples, growth of stems in many plants, flowering of chrysanthemums, soybeans, sugar beets and many other plants, and a number of other plant responses.

Even a number of responses of certain animals, such as change of fur color in the fall and spring, migration of birds, and egg laying, may be controlled by kinds of light.

Germination of saguaro seeds can be triggered and untriggered. Dishes of moistened seeds were kept in the dark or given one or more alternating doses of red and far-red light. Each dose of red or far-red light was 30 minutes long. After the last dose of light was given to each dish, the dish was placed inside an empty coffee can for five days.

Treatment of Seeds	*Germination*
Dark; no light treatment	no
Red light	yes
Red light, then far-red light	no
Red light, then far-red light, then red light	yes
Red light, then far-red light, then red light, then far-red light	no
Red light, then far-red light, then red light, then far-red light, then red light	yes

Would you like to do experiments with saguaro seeds and grow your own saguaro cacti? If so, put your name and address on this coupon and send it to

E. B. Kurtz
Department of Botany
College of Agriculture
University of Arizona
Tucson, Arizona

A packet of saguaro cactus seeds and instructions for germination experiments and culture of plants will be mailed to you free of charge.

Name.....

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