

Enzymes Act as 'Chemical Scissors' To Regulate Plant Growth

UNIVERSITY PARK — A Penn State biologist says plants may regulate certain aspects of their growth through enzymes that work like "chemical scissors."

Dr. Daniel J. Cosgrove, assistant professor of biology, said, "If we can eventually identify these enzymes, perhaps in the future, they can be used as chemical pruners, for example, to produce plants with optimal form, or as plant accelerators to produce food or fiber plants more rapidly."

He bases his conclusion on a discovery made in his research on the gravitropism or "heads up reaction" in cucumber seedlings. The "heads up" reaction occurs when a plant is placed on its side. Within an hour, the plant will have grown so that its crown or "head" is once again facing up and away from the downward pull of gravity.

Scientists used to think that turgor pressure, the internal water pressure of the plant, might be a factor in the process driving the "heads up" reorientation. However, using an instrument of his own design, Cosgrove has gathered the first direct evidence that turgor pressure is not

responsible for the "heads up" growth.

Cosgrove said, "We found that the initial response in gravitropism is a large burst of growth on the lower side and a complete cessation of growth on the upper side of the plant's stem. Measurements with our pressure probe show essentially no change in turgor pressure on the two sides of the stem, despite a 25 percent per hour growth rate differential."

He added, "The change in growth has to come about by changes in the cell wall."

The most likely explanation, according to Cosgrove, is that enzymes act like "scissors" to snip chemical bonds that connect the molecules making up each plant cell wall. The molecules can slide past one another when the chemical bonds are snipped enabling the cell wall to stretch and grow.

"No one yet has got hold of that pair of molecular scissors," he said. But Cosgrove and his research team are searching for them with the aid of a McKnight Foundation Individual Research Award and a National Science

Foundation Presidential Young Investigator Award.

Cosgrove said, "These results get us one step closer to identifying how gravity is influencing growth and also tells us a bit more about the normal controls that the plant has for regulating its own growth."

"Here is a plant that is about one and a half millimeters in diameter and growing just fine when you place it vertically. You put it on its side and in a few minutes that upper surface, that was growing at a good clip, stops growing and even starts contracting. And the lower surface doubles its growth rate. All within the distance of one and a half millimeters and in 10 minutes time. To me, that is a rapid response, in a short distance and when we fully elucidate what is going on, it is going to tell us a lot about normal control of growth."

Cosgrove has presented his research results in an abstract in the Journal of the American Physiological Society and, most recently, in October at a meeting of the American Society for Gravitational and Space Biology in Charlottesville, Va. He has been invited to present his results at the International Botanical Congress in Berlin in July, 1987.

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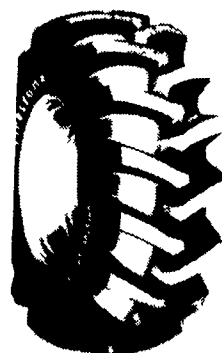
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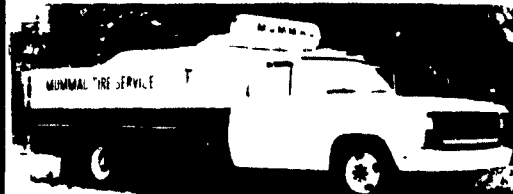
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Try Novelty Indoor Gardening For An Educational Winter Activity

FLEMINGTON, N.J. — Novelty indoor gardening projects can be entertaining, even educational, for children and adults. Here are some quick and easy ideas.

The simplest, great for children, is a miniature forest. Spread a layer of lentils in a shallow dish, add water so the seeds are not quite covered and place the dish in a bright location. In a day the roots will usually appear and in a few days a tiny green forest will be growing. Add water as needed. The "forest" won't last very long, but it's fun while it does.

Other fast germinating seeds that make a nice display for a few weeks in a container of potting mix are mustard, sesame (untoasted, of course) or grass seeds. Scatter the seeds over the damp mix (they could be sown in various patterns for fun) and cover lightly with more mix. Cover the container with plastic until shoots appear, then remove plastic and grow in a bright or sunny window.

Most beans sprout very quickly and impressively. They can simply be planted in small containers of potting mix, but the following technique, described in a 4-H manual, makes the entire sprouting visible. Large lima beans are excellent to use because of their size, but it could be fun to try a variety of beans and even other seeds.

Line the sides and bottom of a glass or jar with paper towel; add water to wet the towel and keep some water in the bottom at all times. Stuff the center of the lined container with more damp toweling to hold the lining firmly against the glass. Then "plant" the seeds by slipping them between the glass and the towel liner to about the middle of the container and place it in a bright warm spot and watch closely. Keep the towel moist (the container may or may not need to be covered) and in a few days things will start to Pop!



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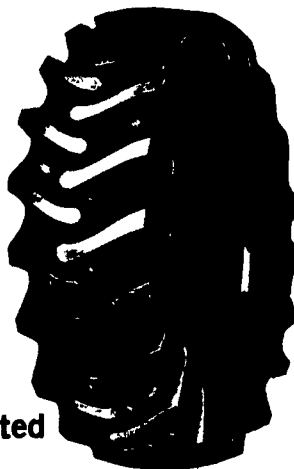
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