

# Protein power for Jack and the beanstalk

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Plant geneticists are on a determined quest -- to control auxin, a powerful plant growth hormone. Auxin tells plants how to grow, where to lay down roots, how to make tissues, and how to respond to light and gravity. Knowing how to manipulate auxin could thus have enormous implications for the production of biofuel, making plants grow faster and better.

A recent publication in the journal *PLoS Biology* from the laboratory of Prof. Shaul Yalovsky of Tel Aviv University's [Molecular Biology](#) and Ecology of Plants Department describes a special [protein](#), the ICR1, found to control the way [auxin](#) moves throughout a plant affecting its development. When this protein is genetically engineered into valuable biofuel crops such as corn, [sugarcane](#) or experimentals like switchgrass, farmers can expect to get a far larger yield than what they harvest today, Prof. Yalovsky has found.

In short, much more biofuel for the buck.

"We've found a mechanism that helps the shoot and root talk to each other," says Prof. Yalovsky. "Somehow both parts of the plant need to speak to each other to say: 'Hey down there, I'm up here and there's lots of sun,' or 'I'm down here in the roots and it's too dry.' The plant's shoots need to respond to its environment. We've discovered the mechanism that helps auxin do its job."

## Putting energy into sugar

Auxin is considered the most important [plant hormone](#) for plant growth and root growth. Prof. Yalovsky explains that knowing how to manipulate it can lead to much bigger yields of non-food crops, like those needed for biofuel. Efficiency is now a limiting factor in biofuel production, and scientists are looking for anything that can produce biofuel in the same amounts as the production of traditional fossil-based fuels.

The ICR1 protein that Prof. Yalovsky has isolated works together with a group of proteins called ROPs, which his lab also isolated in previous research. Together, this system of work in harmony to manipulate the composition and vascular tissues of plant cell walls. The researchers found specifically that ICR1 can be manipulated and, as a consequence, influence auxin distribution in plants. Plant scientists now have a tool that allows breeders to grow certain plant organs of choice, with the possibility of manipulating plant cell wall composition -- the kinds of tissues needed in making biofuel.

In the [PLoS Biology](#) report published recently, the researchers spell out the links between the mechanisms that regulate cell structure and the development of the whole plant. The ICR1, they explain, influences the way the hormone auxin moves around the plant.

## **Breaking down the walls**

Plant tissue is made of cells engulfed in a tough cell wall that helps it retain shape and rigidity. It's composed of cellulose, a polysaccharide, and lignin, which is the woody material in a plant. Current methods for removing the unwanted lignin in the cell wall — which must be removed to produce biofuel — amounts to about a 50% loss cellulosic material which could be used for biofuel.

Ideally crop growers want to maximize the amount of cellulose in the

plant, which can be broken down to make sugar for ethanol. The new system found in proteins and developed at Tel Aviv University has the potential to increase crop yield and make fuel production more cost-effective. His approach could mean less lignin, more cellulose and ultimately more biofuel, says Prof. Yalovsky.

Provided by Tel Aviv University

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