

Growing Broccoli the Eco-Friendly Way

Whether it's stir-fried, creamed, steamed, raw, or in casseroles or soups, Americans are eating more broccoli. And Agricultural Research Service scientists are developing new ways to grow it using less chemicals, eliminating soil erosion, and conserving water.

In 1970, we each ate about 1-1/2 pounds of broccoli, and we upped that to almost 6 pounds in 1996. U.S.

broccoli growers have met this increased demand by producing 1.3 million pounds last year—four times the 325,000 pounds grown in 1970.

“We’re eating more broccoli because it’s high in vitamins and dietary fiber,” says Aref A. Abdul-Baki, a plant physiologist with the ARS Vegetable Laboratory in Beltsville, Maryland. “Although it’s not well-known, broccoli is also a rich source of sulforaphane, a compound

associated with reducing the risk of breast cancer.”

Abdul-Baki has been growing broccoli in soybean mulch rather than in bare soil, the conventional way. He says that the new, no-till system would allow more broccoli to be grown in the mid-Atlantic states of Pennsylvania, Maryland, West Virginia, Virginia, and North Carolina, where the soils are highly erodible and the terrain is often

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At the Beltsville (Maryland) Agricultural Research Center, broccoli and cabbage thrive in a soybean mulch. The thick thatch keeps down weeds, holds moisture, protects and enriches the soil with organic matter, and reduces erosion on sloping fields.

JOHN TEASDALE



Plant physiologist Aref Abdul-Baki stands in a forage soybean field that will be mowed to become mulch for a fall crop of broccoli or cabbage.

sloped. The no-till system is ideal for these areas, he says.

Fresh broccoli is highly perishable, and this system would also give growers and consumers the advantages of a locally grown crop.

In California, where about 88 percent of U.S. broccoli is grown, the crop is seeded directly in bare soil, followed by thinning and cultivation. Weeds cause the greatest crop losses to broccoli growers.

Therefore, cultivation and herbicide applications are standard—if costly—practices in broccoli-producing areas. Growers routinely apply chemical fertilizers two or three times during the growing season, according to Abdul-Baki.

Broccoli requires soils rich in organic matter and high rates of nitrogen. The new growing method provides lots of both.

Abdul-Baki and Ronald D. Morse, a vegetable researcher at the Virginia Polytechnic Institute and State University in Blacksburg, developed this unique growing method in a 3-year joint research effort.

John R. Teasdale, an ARS weed scientist, and Thomas E. Devine, an ARS plant breeder, collaborated on the project at Beltsville.

“We plant a forage soybean variety developed by Devine that’s high in nitrogen and grows to about 6 feet. Then we either cut the plants or roll them over to form a mulch to cover the soil. This thick thatch keeps down weeds, holds moisture, and protects and enriches the soil with organic matter,” report Abdul-Baki and Morse. “This no-till method has produced yields comparable to those from conventional planting in bare soil.”



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Facing page: The no-till planter that technicians Maria Ballesteros (left) and Christopher Wong are operating cuts through soybean mulch on the surface, opens a furrow in the soil, applies liquid fertilizer, drops the transplant, and then closes the furrow.

To ensure uniform plants and a full stand, Abdul-Baki and Morse start with broccoli seedlings. Morse designed a new multirow transplanter that has reduced costs, enhanced large-scale production from transplants, and produced uniform stands.

Steve Groff, who manages the Cedar Meadow Farm in Holtwood, Pennsylvania, has successfully used this no-till broccoli system.

Groff's farm is in Lancaster County, where the soil is considered highly fertile.

"Last year, I planted broccoli in soybean mulch and cut my use of chemicals in half while still maintaining production," he says.

"However, the soybean plants only reached about 4 feet because we had

a cool spring, and I didn't get them planted until May 10. So I had to plant the broccoli on July 10," says Groff.

"I just can't say enough about using this mulch to beat soil erosion on my land, which is moderately sloped. Hard-driving rain has a bigger impact on the soil surface than you'd imagine. In addition to preventing runoff, this soybean mulch cover also helps the soil absorb the water."—By **Doris Stanley**, ARS.

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Technician Joel Harner displays the uniformity of broccoli harvested from no-till, soybean-mulched test plots at the Beltsville (Maryland) Agricultural Research Center.