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Crops: Improving Nitrogen Use Efficiency Lessens Environmental Impact

Most agricultural crops require large quantities of nitrate-rich fertilizer to realize optimal yields. The dilemma for growers is finding ways to balance the amount of nitrogen needed for production while minimizing potentially harmful nitrates that can leach into ground and surface waters. Increased interest in environmentally beneficial “low-input” approaches is challenging researchers to identify genotypes that have a characteristic called “high nutrient use efficiency,” or NUE.

Using vegetable types with high NUE could help growers lessen environmental impacts while, maintaining high crop yields. A new study reported on improved NUE traits that resulted from grafting melon plants onto commercial rootstocks.

Scientist Giuseppe Colla from the University of Tuscia and colleagues published the research in HortScience. The researchers evaluated a “rapid and economical” methodology for screening melon rootstocks for NUE using two experiments. In the first experiment melon plants, either ungrafted or grafted onto four commercial rootstocks grown in hydroponics, were compared. The second experiment was designed to confirm, whether the use of a selected rootstock with high NUE could improve crop performance and NUE of grafted melon plants under field conditions.

The researchers observed that NUE traits were improved by grafting melon plants onto commercial rootstocks;

grafted plants needed less nitrate in the nutrient solution to reach half maximum shoot dry weight. “In addition, the higher nitrate reductase activity of grafted plants under low nitrate conditions confirms that certain rootstocks have the potential to improve the NUE of grafted plants,” they noted. In the second experiment, carried out under open field conditions, increasing the fertilization rates increased the total and marketable yields of melon plants, while decreasing NUE. When averaged over nitrogen levels, the marketable yield, NUE, and N uptake efficiency were higher by 9%, 11.8%, and 16.3%, respectively, in grafted plants than in ungrafted plants.

“We found that the use of melon grafted on selected rootstock represents a potential strategy for increasing yield and NUE and coping with soil fertility problems under low-input conditions,” the authors concluded.

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