Research charts a course for increasing edamame acreage in the Midwest

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While consumer demand for edamame or vegetable soybean remains on the rise in the United States, it's not widely grown in this country. Nearly 85 million acres of grain-type soybean were grown in the U.S. in 2014, yet edamame imported from Asia appears to dominate what we eat in this country, said a University of Illinois crop scientist.

There have been limitations to growing edamame in the U.S. Midwest, including little research on the cultivars that could be used here and how to grow the crop sustainably, explained Marty Williams, who is also an ecologist with USDA-Agricultural Research Service.

But interest among U.S. vegetable processors in edamame prompted Williams and his team to take a closer look at the differences in growth and development between grain-type soybean and edamame, with the intent to identify specific improvements needed to grow more edamame in the Midwest.

Edamame seeds contain all the essential amino acids, which is unique to a vegetable crop. It is high in dietary fiber and most of the fats in edamame are unsaturated. Often marketed as a healthy snack food, edamame requires minimal processing and preparation.

"Vegetable growers are largely borrowing practices used in grain-type soybean production. We were curious how edamame plants compare to soybean in terms of field performance metrics such as emergence, growth, and development," Williams said.

"Also, in order to sustain edamame production on a commercial scale, certain downstream criteria must be met. For instance, consumers demand large, tasty seeds. The last few years, we've assembled a diverse collection of edamame germplasm available for use in the U.S., so we decided to identify which lines met criteria essential for domestic, commercial production," he added.

During three years of field trials using 136 edamame lines from 22 different commercial and private sources, Williams observed that seed germination and emergence of edamame is poorer than that of grain-type soybean. "That's a real challenge," Williams said. "What makes a seed delicious to eat can make for a miserable seed to produce a plant."

Interestingly, the researchers found that seedlings of edamame, once or "if" emerged, tend to grow quicker than grain-type soybean. "This is also good to know as it may have implications related to weeds," Williams said. "We know from previous research that larger seeds of grain-type soybean tend to be more competitive with weeds. While in recent years we've made progress on broadening the suite of weed management tools available to vegetable growers, crop interference with weeds is a valuable component of multi-tactic weed management systems."

The edamame crop is harvested near the "full seed" stage, when the plant is still completely green and the seeds fill the pods to capacity. By that point in time, compared to grain-type soybean, Williams said edamame plants tend to be smaller. This is beneficial for commercial production because shorter plants are needed for mechanical harvest.

Soybean is photoperiod sensitive, meaning that day length influences development time and plant size. In Illinois, some cultivars produce too large and bushy of a plant for effective machine harvest, Williams explained.

Along with emergence, plant size, and seed traits, the edamame lines also underwent a basic "sensory evaluation." This included characteristics essential to keeping the discriminating consumer happy: two to three seeds per pod, green pods and seeds, no blemishes, a smooth seed texture, and seeds with a sweet, nutty flavor.

Of the 136 lines tested, twelve lines from eight different sources passed all criteria: above-average field emergence, suitable plant size for mechanical harvest, large seeds, and passing the sensory evaluation. "This process identified edamame lines that might be most promising for use in the Midwest," Williams said.

Williams said his team will continue to work on the emergence issue. "Emergence must be improved," he said. "Some of that may require efforts in plant breeding, but it may also mean we need to grow the crop a bit differently than grain-type soybean, too."

"Phenomorphological characterization of vegetable soybean germplasm lines for commercial production" was recently published in *Crop Science*.

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