Root expertise puts MU in leadership position

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MU root research grows on global science stage

COLUMBIA, Mo. – As many Missouri farmers were reminded in 2005, there's not much you can do about drought except hope for rain.

A group of University of Missouri plant scientists want to give food producers a more concrete option in the future: crop varieties that are better equipped to handle extended periods of dry weather. Their on-going research on how plant root systems compensate for drought was presented at the Interdrought II Conference, which took place this fall in Rome, Italy.

"On a global basis, there is no question we will need to learn how to increase food crop production while using less water," said Henry Nguyen, MU endowed professor in plant biotechnology, who helped organize the international drought research symposium. "Recognizing that water is the major factor limiting crop yields, now and in the future, was the basis for this conference."

Interdrought II brought together 534 plant researchers, biotechnology experts, scientists from international research companies and others from 58 countries.

Nguyen, who also directs the National Center for Soybean Biotechnology on the MU campus, was involved in the first Interdrought conference in 1995. "The science of how plants respond to drought has come a long way since that first meeting," he said. "But we still have a lot to learn before we can successfully take what we've learned in the lab and make it successful in the farmers' fields.

"Drought research has become focused in several areas," Nguyen said after the conference. "There is a great deal of research on the plant reproduction system, learning what processes regulate seed production to determine how drought affects seed development.

"A second focus is whole-crop systems, research on how to best grow a particular crop for certain drought-prone areas.

"The third area is in root response. This is where MU is at the forefront," Nguyen said. Nguyen, MU plant sciences professor Robert Sharp, and a team of others who make up the MU Plant Root Genomics Consortium have several decades' worth of knowledge about root function.

"Roots, obviously, play a critical role in how plants tolerate drought," Nguyen said. "But roots have been one of the most difficult parts of the plant to study." New lab techniques, including Sharp's use of specially

designed clear Lexan growth tubes, have helped MU scientists observe root activity under various moisture conditions.

But the handiest new tool is biotechnology, Sharp said.

“By looking for the proteins expressed in the roots during water stress, we’re able to better understand both the changes we observe visually, and understand the changes one can’t see in the soil.”

Sharp and others are working to identify the genes that promote those drought-response proteins. They could then evaluate plant varieties at the genetic level for their potential to be drought tolerant.

MU’s leadership in the area of root research led to Nguyen’s work on Interdrought II.

Earlier in the year, Sharp coordinated a two-day symposium, in Bacelona, Spain, which discussed research in drought tolerance, growth, photosynthesis and reproductive development.

“MU has become well-recognized for the research base it has in roots, just as root research is becoming a critical area of interest globally,” Nguyen said.

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InterDrought-II Conference Conclusions and Recommendations report available at http://www.plantstress.com/id2/ID2-Report.pdf