SUSTAINABLE MANAGEMENT OF GLYPHOSATE-RESISTANT WEEDS IN ROUNDUP READY® CROPPING SYSTEMS. David I Gustafson, R. Douglas Sammons and Brett H. Bussler, Senior Fellow, Chemical Regulatory Affairs, Senior Fellow, Global Bio-Evaluations, and Manager, Global Bio-Evaluations, Monsanto Company, St. Louis, MO 63167.

Roundup Ready® (glyphosate-resistant) cropping systems enable the use of glyphosate, a non-selective herbicide which offers growers several benefits, including superior weed control, crop safety, fuel savings with the use of reduced tillage, flexibility in weed control timing, and economic advantages. The rapid adoption of such crops in North America has resulted in greater glyphosate use and some concerns over the potential for weed resistance to erode the sustainability of its benefits and efficacy. Monsanto has a broad internal and external effort to develop and implement sustainable weed control practices to help limit the spread of existing glyphosate resistant biotypes and avoid selecting new ones. The internal program includes the use of computer modeling and field sustainability trials intended to directly measure the net economic return to the grower among multiple weed control options. The options include factors other than choice of herbicide, such as tillage and crop rotation. The field tests should also help strengthen the assumptions on which the computer models are based, thereby making projections of future resistance trends more robust. Empirical evaluations of published data show that glyphosate resistant weeds have an appearance rate of 0.007, defined as the number of newly resistant species per millions of acres treated in the US, which ranks low among all herbicides used in this country. An important practical recommendation emerging from the computer modeling and field trials is for growers to include other herbicides in glyphosate-resistant cropping systems, to further lower the potential for new resistance to occur.

One particular group of five field sustainability trials is highlighted in this presentation. They are located in Alabama, Georgia, Illinois, Mississippi, and North Carolina. Two of the five trials have been established in areas with populations of glyphosate-resistant *Amaranthus palmeri* present, while the remaining three do not currently have any known populations of glyphosate-resistant biotypes. Each of these trials is being planted with two glyphosate-resistant crops, either as a continuous crop or in a two-year rotation, and some include tillage as a factor. Standard weed control ratings, weed counts, and crop yields are being measured. The trials are intended to be kept in these cropping systems for several years, with four herbicide programs compared within each crop. This set of trials was initiated in 2006, and the first two years of results will be discussed. Not surprisingly, the three locations without any glyphosate-resistant weeds showed excellent weed control and crop yields, and no differences were observed among the various herbicide programs. The two sites with populations of glyphosate-resistant *A. palmeri* are showing significant differences in weed control and yields among the various treatments. The trial site in Georgia showed poor control of this weed in 2007, due to the severe drought experienced at that site, and the associated lack of activating rainfall for the pre-emergent residual soil herbicides included in the treatments. This result is not surprising, as it is well known that such herbicide treatments lose effectiveness under such extreme conditions, and it is not a unique finding. Modifications of the treatments are under consideration to effectively and consistently manage these weeds, even under such extremely dry conditions.

As further results of these field sustainability trials become available, the information will continue to be published and incorporated into updated grower recommendations. The data available today suggest that continuous Roundup Ready® cropping systems can be managed in a sustainable manner, largely through the prudent use of additional herbicides in such cropping systems.

2007 North Central Weed Science Society Proceedings 62:103.