



Comparison of Three Soybean Herbicide Tolerant Systems in Iowa and Minnesota

Trial Objective

- This trial was designed to evaluate the benefits of three competitive soybean systems: Roundup Ready® Xtend Crop System, LibertyLink® GT27™ System and Enlist™, Weed Control System with Enlist E3® Soybeans.
- Field observations collected were: yield (bu/acre) and weed control (%).

Research Site Details

Location	Soil Type	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield (bu/acre)	Seeding Rate (seeds/acre)
Huxley, IA	Clay loam	Corn	Strip tillage	6/3/19	10/25/19	65	140K
Manchester, IA	Silty clay loam	Corn	Conventional	5/16/19	10/16/19	65	140K
Mapleton, MN	Silty clay loam	Corn	Conventional	6/3/19	10/25/19	60	140K
Geneva, MN	Clay loam	Corn	Conventional	5/16/19	10/25/19	60	140K

- For each research location, three locally adapted soybean products were selected for each herbicide-tolerant system.
- The 10 ft x 200 ft plots were planted, sprayed, and harvested as strip trials.

Table 1. Herbicide systems and soybean product relative maturities used at each of the testing locations.

	Roundup Ready® Xtend Crop System	LibertyLink® GT27™ System	Enlist™ Weed Control System with Enlist E3® Soybeans	Location and Application Dates
	Herbicide Program	Herbicide Program	Herbicide Program	
PRE Application (at planting)	22 fl oz/acre XtendiMax® herbicide with VaporGrip® Technology + 48 oz/acre Warrant® Herbicide + 8 fl oz/acre Mauler® Herbicide	5 fl oz/acre Verdict® Powered by Kixor® herbicide	24 oz/acre Enlist One® Herbicide with Colex-D® Technology + 4 oz/acre Sonic® Herbicide	Huxley 5-7-19 Manchester 5-17-19 Mapleton 6-5-19 Geneva 5-16-19
POST Application (V3-V5)	22 fl oz/acre XtendiMax with VaporGrip Technology + 32 fl oz/acre Roundup PowerMAX® Herbicide* + 48 oz/acre Warrant Herbicide	32 fl oz/acre Liberty® 280 SL Herbicide + 36 oz/acre Durango® DMA® Herbicide + 12 fl oz/acre Outlook® Herbicide	56 oz/acre Enlist Duo® Herbicide with Colex-D Technology + 16 oz/acre Dual II Magnum® Herbicide + 32 fl oz/acre Liberty 280 SL Herbicide	Huxley 6-25-19 Manchester 6-30-19 Mapleton 6-19-19 Geneva 6-25-19
Late POST Application (if necessary)	N/A	N/A	32 fl oz/acre Liberty 280 SL Herbicide	Huxley N/A Manchester 7-8-19 Mapleton 7-8-19 Geneva N/A
Location	Roundup Ready® Xtend Crop System	LibertyLink® GT27™ System	Enlist™ Weed Control System with Enlist E3® Soybeans	Planting Dates
Huxley, IA	2.2, 2.5, 2.9	1.8, 2.0, 2.5	1.9, 2.4, 2.7	6-3-19
Manchester, IA	1.8, 2.2, 2.4	1.8, 2.0, 2.5	1.9, 2.4, 2.7	5-16-19
Mapleton, MN	1.4, 1.7, 2.1	1.5, 1.7, 2.0	1.3, 1.4, 1.9	6-3-19
Geneva, MN	1.4, 1.7, 2.1	1.5, 1.7, 2.0	1.3, 1.4, 1.9	5-16-19

*All tank mixes of XtendiMax with VaporGrip Technology + Roundup PowerMAX included Drift Reducing Adjuvant (0.5% v/v).



Comparison of Three Soybean Herbicide Tolerant Systems in Iowa and Minnesota

Understanding the Results

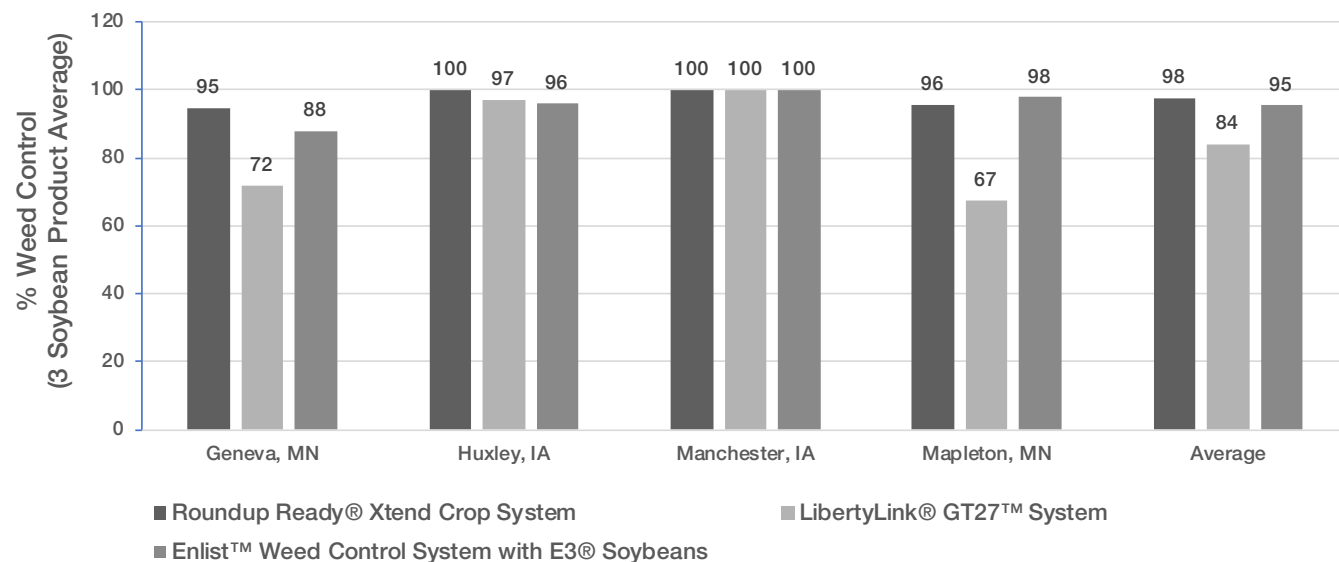


Figure 1. Percent weed control at crop canopy for the four locations. Data represent the average of the three soybean products used in each system and combine the control of the most prevalent broadleaf and grass weeds (velvetleaf (*Abutilon theophrasti*), waterhemp (*Amaranthus rudis*), lambsquarter (*Chenopodium album*), giant foxtail (*Setaria faberi*), and green foxtail (*Setaria viridis*)) at each location.

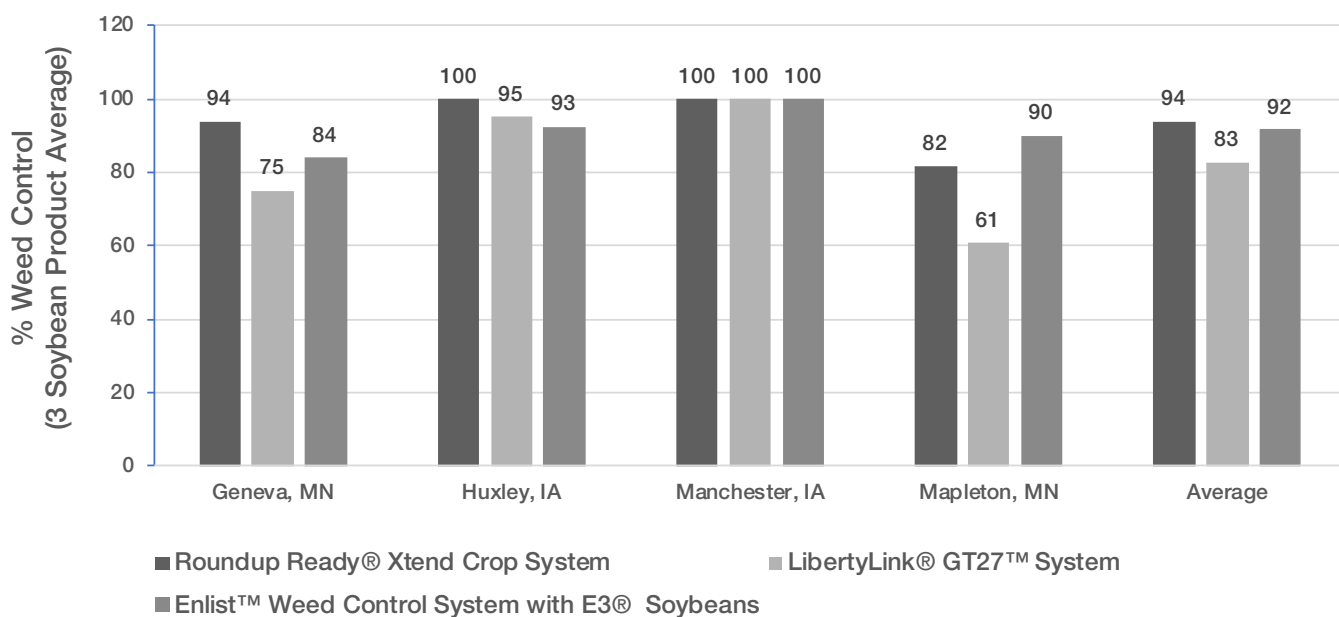


Figure 2. Percent weed control at crop harvest for the four locations. Data represent the average of the three soybean products used in each system and combine the control of the most prevalent broadleaf and grass weeds (velvetleaf, waterhemp, lambsquarter, giant foxtail, and green foxtail) at each location.



Comparison of Three Soybean Herbicide Tolerant Systems in Iowa and Minnesota



Figure 3. Harvest weed control at Huxley, IA for (left) Roundup Ready® Xtend Crop System, (middle) LibertyLink® GT27™ System, and (right) Enlist™ Weed Control System with Enlist E3® Soybeans.

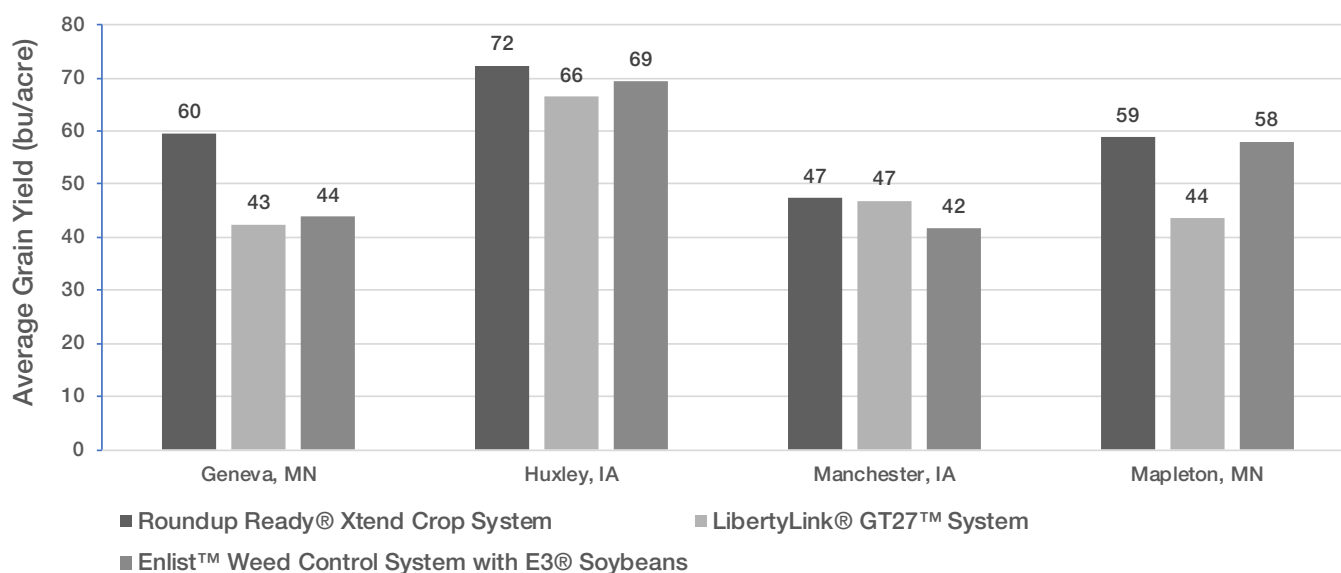


Figure 4. Average yield comparison of three soybean production systems in Iowa and Minnesota. Data represent the average yields of the three soybean products used in each system.

Understanding the Results

- Weed control at the time of both crop canopy (Figure 1) and harvest (Figures 2 and 3) was highest for the Roundup Ready® Xtend Crop System, then the Enlist™ Weed Control System, and lowest for the LibertyLink® GT27™ System.
- The Late POST application at Mapleton, MN did not substantially improve weed control in the LibertyLink® GT27™ System (Figures 1 and 2).
- The Roundup Ready® Xtend Crop System produced the highest average yield at all locations, followed by the Enlist™ Weed Control System with Enlist E3® Soybeans; except at Manchester, IA where the LibertyLink® GT27™ System out-yielded the Enlist™ Weed Control System (Figure 4).



Comparison of Three Soybean Herbicide Tolerant Systems in Iowa and Minnesota

Key Learnings

- Yield potential and weed control are two of the many factors to consider when deciding which soybean production system should be utilized on your farm.
- Farmers should make sure that their pre-emergence and post-emergence weed management programs include overlapping residual products for an effective season long control.
- Herbicide application timing and the environment have significant effects on weed control. Farmers should always endeavor to apply when weeds are less than 4 inches tall for the most effective control.

Legal Statements

The information discussed in this report is from a single site, replicated research demonstration. This informational piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.

Monsanto Company is a member of Excellence Through Stewardship® (ETS). Monsanto products are commercialized in accordance with ETS Product Launch Stewardship Guidance, and in compliance with Monsanto's Policy for Commercialization of Biotechnology-Derived Plant Products in Commodity Crops. This product has been approved for import into key export markets with functioning regulatory systems. Any crop or material produced from this product can only be exported to, or used, processed or sold in countries where all necessary regulatory approvals have been granted. It is a violation of national and international law to move material containing biotech traits across boundaries into nations where import is not permitted. Growers should talk to their grain handler or product purchaser to confirm their buying position for this product. Excellence Through Stewardship® is a registered trademark of Excellence Through Stewardship.

XtendiMax® herbicide with VaporGrip® Technology is part of the Roundup Ready® Xtend Crop System and is a restricted use pesticide. ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. It is a violation of federal and state law to use any pesticide product other than in accordance with its labeling. XtendiMax® herbicide with VaporGrip® Technology and products with XtendFlex® Technology may not be approved in all states and may be subject to use restrictions in some states. Check with your local product dealer or representative or U.S. EPA and your state pesticide regulatory agency for the product registration status and additional restrictions in your state. For approved tank-mix products and nozzles visit XtendiMaxApplicationRequirements.com.

NOT ALL formulations of dicamba or glyphosate are approved for in-crop use with Roundup Ready 2 Xtend® soybeans. ONLY USE FORMULATIONS THAT ARE SPECIFICALLY LABELED FOR SUCH USES AND APPROVED FOR SUCH USE IN THE STATE OF APPLICATION. Contact the U.S. EPA and your state pesticide regulatory agency with any questions about the approval status of dicamba herbicide products for in-crop use with Roundup Ready 2 Xtend® soybeans or cotton with XtendFlex® Technology.

Performance may vary, from location to location and from year to year, as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on the grower's fields.

Roundup Ready 2 Xtend® soybeans contain genes that confer tolerance to glyphosate and dicamba. Glyphosate will kill crops that are not tolerant to glyphosate. **Dicamba** will kill crops that are not tolerant to dicamba. Contact your seed brand dealer or refer to the Monsanto Technology Use Guide for recommended weed control programs.

Not all products are registered in all states and may be subject to use restrictions. The distribution, sale, or use of an unregistered pesticide is a violation of federal and/or state law and is strictly prohibited. Check with your local dealer or representative for the product registration status in your state. Roundup PowerMAX®, Roundup Ready 2 Xtend®, Roundup Ready®, VaporGrip®, Warrant® and XtendiMax® are registered trademarks of Bayer Group. All other trademarks are the property of their respective owners. ©2019 Bayer Group. All rights reserved. 1020_R2

