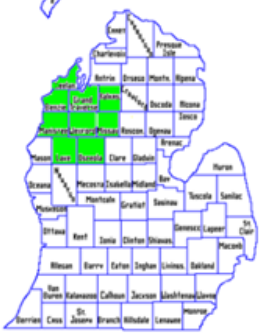


# MSU Extension Crops Newsletter for Northwest Michigan


**Jerry L. Lindquist**
MSU Extension Grazing
and Field Crop Educator
lindquis@anr.msu.edu

**OSCEOLA COUNTY**
**MSU EXTENSION**
301 West Upton
Reed City, MI 49677
231-832-6139

www.msue.msu.edu/osceola
e-mail - msue67@msu.edu

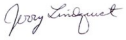



Dear Northwest Michigan Crop Producer, **May 2015**

The month of May has treated us well with not too much rain, not too much frost and not too much heat. Let's hope for a summer also with some moderation of everything. This is a quickly put together newsletter to let wheat growers know of an important event tomorrow in the Mt. Pleasant area. See details on the following pages. Sorry for the short notice!

Here is hoping your summer is safe and productive.

Jerry Lindquist



Northwest Michigan Field Crop Educator

## Custom Machine Work Rate Estimates Available

2015 farm machine work rates for Michigan summary is now available.
***Dennis Stein**, Michigan State University Extension*

Farmers continue to utilize the practice of exchanging machine work between farms which has and will continue be a useful management tool. The Michigan "Farm Machine Work Rate for 2015" summary report has been posted on the FIRM – farm management web page Michigan State University Extension. This annual report provides Michigan farms a reference tool to assist them in the process of establishing a value for farm machine work being exchanged between farms. This report is not the real cost of any one farm, but is a summary of custom rate values taken from several sources. The report has been compiled and published to be a reference or starting point for farms to use in identifying their own farms actual numbers.

In this report you will find that the overall cost of farm equipment continues to increase along with the cost of labor and overhead pushing most reported costs higher. The one bright spot is the price of fuel which is lower than the last report providing some relief in the operational costs.

For farms looking back you can still find a copy of the past couple years Farm Machine Work Rate reports still posted on our web page.

Link to Custom Machine Work Rate Estimates:

www.msu.edu/user/steind/May%202015%20Cust_MachineWrkrate.pdf

## Inside this issue:

## Chesapeake Energy Ordered to Pay Michigan Landowner/Mineral Owners Disputed Oil and Gas Lease Bonus

Affected Landowners and Mineral Owners that have not yet come forward have 120 days to file a claim

***Curtis Talley**, Michigan State University Extension*

In 2010, Chesapeake Energy refused to pay lease bonuses on signed oil and gas leases. These bonuses were up to $3,500 per acre. This was devastating to many landowner/mineral owners, many of which had negotiated this payment as part of lease negotiation, or had an oil and gas attorney negotiate on their behalf.

During the summer of 2010, Michigan State University Extension and the State of Michigan Office of Oil, Gas and Mineralsheld nine public oil and gas leasing and oil and gas industry educational workshops in Northern Michigan. Total attendance was 2,179. Landowners and mineral owners were being contacted by representatives of oil and gas companies and were being offered an oil and gas lease to sign. For many, this was the first time they had an opportunity to lease their oil and gas rights. They wanted information to educate them on oil and gas production and the leasing process.

Workshop Topics included:

1. Unconventional Shale Gas Development
2. The Department of Oil, Gas and Minerals role in oil and gas production and regulation of the industry
3. Understanding the oil and gas lease
4. Bringing it all together in a negotiated win-win lease.

Susan Topp of Topp Law frequently volunteered her time to speak at these workshops, discussing the oil and gas lease contract and negotiating the lease.

During the summer of 2010, many landowners signed leases with representatives of Chesapeake Energy Corporation. Not long after signing, the oil and gas leasing market collapsed. Chesapeake in their review of the signed leases disqualified them and refused to make payment for various reasons that some experts, including Susan Topp felt were not legitimate.

On October 21, 2010 Michigan State University Extension, along with attorney Susan Topp, held an informational meeting at the Emmett County Community Building. The title of the meeting was “Duties and Obligations of an Oil and Gas Company under the Lease and Order for Payment.” The goal of the workshop was to help landowner/mineral owners understand the issues and inform them of their legal options going forward.

Over one hundred thirty people joined together and hired Susan and filed civil actions against Chesapeake. Over the years many settled with Chesapeake for a total of $19 million, which was less than the contracted bonus. Encana, USA honored their leases and paid the lease bonus.

The Michigan Attorney General’s Office felt laws were broken and filed criminal complaints against Chesapeake and Encana, USA. In May of 2014, Encana, USA settled for $5 million with the state. Chesapeake chose to go to trial and during the trial, has agreed to pay a settlement of $25 million. The $25 million will bring total compensation to $44 million and all qualifying landowner/mineral owners that signed leases with Chesapeake may be eligible to be compensated 100 percent for their losses. The victims named in the criminal complaints filed by the Attorney General’s Office are the only mineral owners that can have their attorney fees reimbursed due to criminal law limitations.
It is estimated there are more than 700 landowner victims. Victims that have not yet come forward in the last four years will have 120 more days to file a claim. If victims that had their oil and gas lease cancelled in 2010 need help filing their claims, it is recommended they contact Susan Topp at 989-731-4014 for assistance or to get additional information.

This article was published by **Michigan State University Extension**. For more information, visit http://www.msue.msu.edu. To have a digest of information delivered straight to your email inbox, visit http://bit.ly/MSUENews. To contact an expert in your area, visit http://expert.msue.msu.edu, or call 888-MSUE4MI (888-678-3464).

# WHEAT FIELD DAY

## May 27, 2015
## 10:00 AM to 12:30 PM
## Hauck Seed Farm

## AGENDA ITEMS INCLUDE:

- Managing for High Yields
- Weed Control
- Disease Management Strategies
- Wheat Market Update
- Crop Health Imaging/Drones

**Speakers:**

Brown Milling/Superior Fertilizer Inc.
MSU Extension Wheat Specialist
Mark Varner, Bayer
Loren Wernette, BASF

****2 RUP Credits****

**HOST:**
**Hauck Seed Farm**
**Mike and Gary Hauck**

**LOCATION:**
**498 W. Weidman Road**
**Mt. Pleasant, MI 48858**

(1/2 mile West of Meridian Rd on Weidman Rd)

Isabella County MSU Extension
200 N. Main St.
Mt. Pleasant, MI 48858
Phone: (989) 317-4079



*Accommodations for persons with disabilities may be requested by contacting the MSU Extension office at (989) 317-4079 at least 5 days prior to the scheduled event to ensure sufficient time to make arrangements. Requests received after this time will be met when possible.*

# Wheat Field Meetings, 2015

The following is a listing of informal wheat field meetings. They take place at the site of MSU's variety performance locations. The resource folk will include individuals of the MSU Wheat Breeding team, MSU Extension, MI Wheat Program and attendees (you). For more information, contact Martin Nagelkirk, nagelkir@msu.edu; 810.404.3400. The gatherings will last about an hour. There is no preregistration.

**Richville** - **Mon, June 15 (6:30 p.m.)**
Host farm: Jason Bierlein
Topic: MSU Wheat Performance Trials and development of the 2015 crop
Field location: Van Buren Rd, 0.5 mi north of Wilder Rd (43°25'39.4"N; 83°40'47.5"W)

**Britton - Thurs, June 18 (1:30 p.m.)**
Host farm: Jason Woods
Topic: MSU Wheat Performance Trial and development of the 2015 crop
Field location: Hoagland Hwy x Holloway Rd. (41°56'12.5"N; 83°48'35.2"W)

**Sebewaing - Tues, June 30 (9:30 a.m.)**
Host farm: Darin Sneller
Topic: MSU Wheat Performance Trial and development of the 2015 crop
Field location: Canboro Rd., 0.75 mi east of Bay Port Rd. (43°44'31.4"N; 83°20'30.9"W)

**Deckerville - Tues., June 30 (6:30 p.m.)**
Host farm: McConnachie Farms
Topic: MSU Wheat Performance Trial; several acres of management trials
Field location: Downington Rd., 0.5 mi east of Banner Rd. (43°30'36.3"N; 82°48'23.4"W)

*Thanks to Lee Siler, MSU Research Assistant, for managing and prepping sites*

MICHIGAN STATE UNIVERSITY | Extension

MICHIGAN STATE UNIVERSITY | AgBioResearch

# Michigan Wheat Program—Continued Evaluation of Oil Seed Radish Added to Wheat to Increase Wheat Yields in Michigan 2014 Project Report

*Dean Baas, Michigan State University Extension*

**Summary**

This project is investigating reports of increased wheat yield resulting from interseeding low levels (3.0 lbs/A) of oilseed radish (OSR) with wheat. Over the past two years, on-farm and plot trials have been establish to quantify the impact of this practice on yield and economics. After two years of study, the interseeding of OSR with wheat continues to show promise for increasing wheat yields. Conclusions to date include:

- Year one (2012 – 2013) of the study, all three on-farm locations showed an increase in wheat yield and increased profit ranging from $6.67/A – $26.56/A. On average across all three farms, the 3.6 bu/A yield increase produced a $17.65/A increase to profit.
- Year two (2013 – 2014) of the study, two out of four farm locations showed an economic increase to profit of $9.29/A and $11.10/A. Two farms had an economic decrease to profit of $27.02/A and $4.63/A. Small plot research was inconclusive with both increases and decreases to profits.
- For the farms that were in the study for both years, the two-year average over the three farms showed a positive contribution to profit of $8.72/A.
- The OSR seeding rate study performed on one farm showed increasing wheat yield (1.0, 3.0 and 6.1 bu/A) for increasing OSR seeding rates (2.0, 3.0 and 4.5 lbs/A) and increasing contributions to profit ($1.35/A, $11.10/A and $26.33/A). The small plot rate study was inconclusive with both increases and decreases.
- The small plot planting date study was inconclusive with both increases and decreases to wheat yield across planting dates.
- Multiple years of this study are necessary to identify the long-term impact on yields and profits of interseeding OSR with wheat.

This project is continuing for the 2014 – 2015 wheat season to further identify the yield and economic impacts and the potential long-term benefits of this practice to wheat growers in Michigan.

**Background**

Over the last few years several farmers from Michigan and Ohio have added low rates of OSR to their wheat at planting. Many of these farmers have claimed yield increases from this practice. Our proposal was funded in 2012 to investigate these claims through on farm trials with wheat farmers in Michigan. We had three farmers' plant strips throughout the field of both OSR + wheat and wheat alone. The project was repeated with funding in 2013 on four farms and at the W.K. Kellogg Biological Station (KBS). We compared sites, locations, soil types, planting dates etc. with this statewide project. The treatments were (1) OSR 3lbs/acre plus wheat (at farmers rate), (2) wheat alone (at farmers rate), (3) OSR 1.5 and 4.5 lbs/acre on one farm and at KBS and (4) Three planting dates at KBS.

 Continued on Page 6...

**2012 – 2013 and 2013 - 2014 wheat and OSR trial locations**

The wheat and OSR trials were performed in three locations in 2012 - 2013 and five locations in 2013-2014 (Figure 1):

- John Burk
  - Bay City, MI
- Dean Kantola
  - Ravenna, MI
- Henry Miller
  - Centreville, MI
- Gerald Heck
  - Monroe, MI
- Kellogg Biological Station
  - Hickory Corners, MI

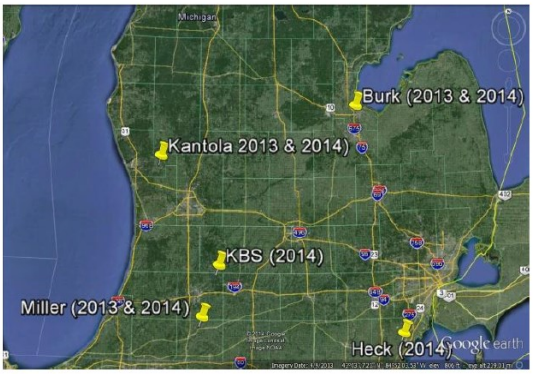



Figure 1. Wheat and OSR trial locations.

Wheat was harvested using a plot combine to determine yields for the wheat interseeded with and without OSR (Figure 2).

Figure 2. Wheat harvest at Kantola farm.

**Results and Discussion**

*2012 - 2013*

On all three farms, wheat yields increased (Figure 3) with OSR at the 3 lbs/A OSR planting rate. The increases ranged from 2.0 bu/A on the Miller farm to 4.9 bu/A on the Kantola farm. On average across all farms the wheat yield increased by 3.6 bu/A with OSR. Wheat yields with and without OSR appear to be dependent on planting dates with the earlier planted farms (Burk and Kantola) producing the greatest increase due to OSR.

With 2013 wheat prices averaging $6.86/bu[1] and OSR seed cost of $2.35/lb[2] the yield increases result in increased profit ranging from $6.67/A – $26.56/A. On average across all three farms, the 3.6 bu/A increase produced a $17.65/A increase to profit.

*2013 – 2014*

Results for the Miller, Burk, Kantola and Heck farms, and the Kellogg Biological Station for the 3 lbs/A OSR seeding rate are given in Figure 4. The 2014 results were mixed for the impact

---

[1]Wheat prices source: http://www.ers.usda.gov/datafiles/Wheat_Wheat_Data/Yearbook_Tables/Domestic_and_International_Prices/WheatYearbookTable18.xls

[2]Oilseed radish seed cost source: Scott's Cover Crops

 **Continued on Page 7...**

of OSR interseeded with wheat on wheat yield. Results ranged from a decrease of 3.7 bu/A for the KBS early planting to an increase of 3.0 bu/acre for Miller. The severe winter, cool wet spring and delayed harvest may have impacted the study. In particular, the climate conditions may have influence the small plot study at KBS. This variability also supports performing this experiment over multiple years to determine the longer term impact that interseeding OSR in wheat may have on yields and economics.

With 2014 wheat prices averaging $6.05/bu[1] and OSR seed cost of $2.35/lb[2] the yield changes result in an impact on profit ranging from a decrease of $29.44/A to an increase of $11.10/A. On average across all four locations, the 0.3 bu/A decrease produced an $8.87/A decrease to profit.

*Two-year results*

The yield results can be combined for three of the locations (Miller, Burk and Kantola farms) that have been in the study for two years. The two year average for each farm is given in Figure 5. Both the Burk and Miller farms had a large enough yield increases to produce a $14.09/A and $8.93/A increase to profit, respectively. The two-year yield average increase of 0.8 bu/A for the Kantola farm resulted in a decrease in profit of $0.17/A when the cost of OSR

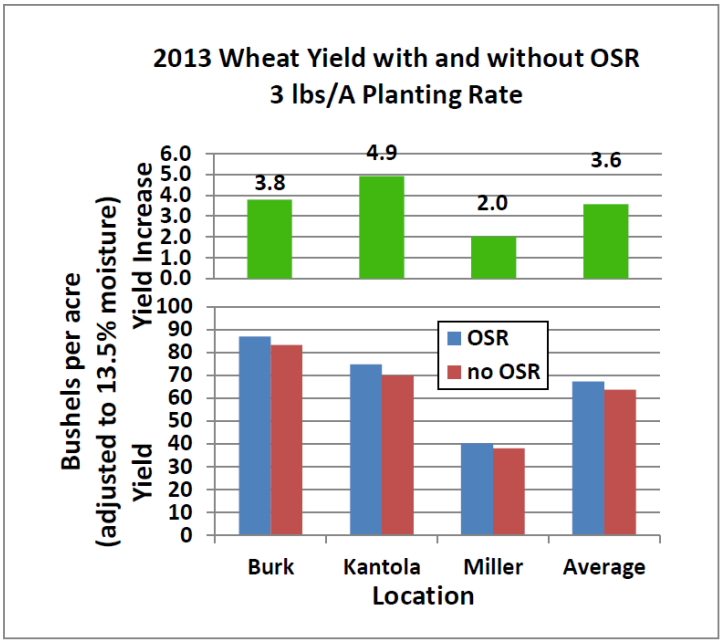



Figure 3. 2013 wheat yield and yield increase with and without OSR at 3 lbs/A seeding rate.

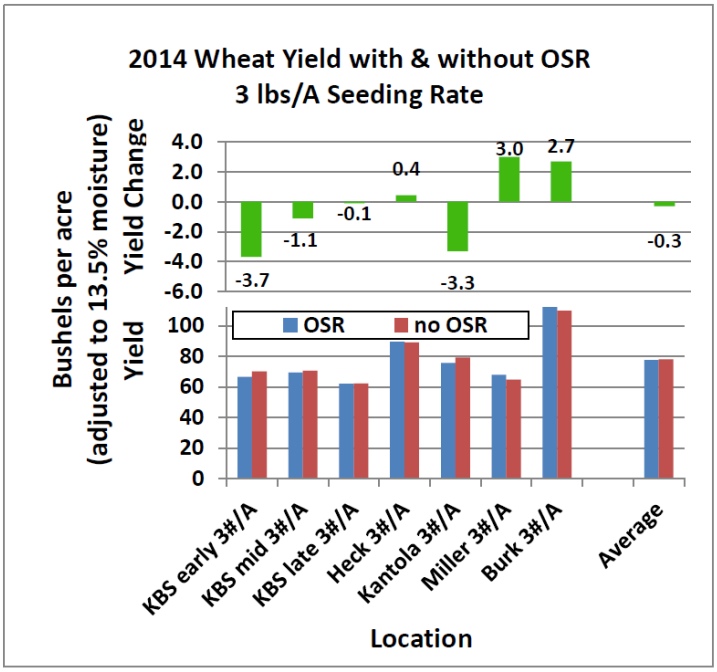



Figure 4. 2014 wheat yield and yield increase with and without OSR at 3 lbs/A seeding rate.

 **Continued on Page 8...**

seed is included. On average for two-years for the three farms, a positive contribution to profit of $8.72/A resulted from interseeding 3.0 lb of OSR with wheat.

*2013 – 2014 Rate Study*

In the 2013 – 2014 growing season, a rate study was performed at the Miller farm and KBS. Results from this study are given in Figure 6.

On the Millar farm, OSR was seeded at 2.0, 3.0 and 4.5 lbs/A and yields increased 1.0, 3.0 and 6.1 bu/A, respectively. The Miller results exhibit increased yield with increased OSR seeding rate. This corresponds to an increase to profit of $1.35/A, $11.10/A and $26.33/A for OSR seeding rates of 2.0, 3.0 and 4.5 lbs/A, respectively.

OSR was seeded at 1.5, 3.0 and 4.5 lbs/A at KBS on three planting dates: early (September 23), mid (October 11) and late (October 28). When the three rates are averaged across planting dates, no pattern emerges with an increase of 1.4 bu/A for 1.5 lbs/A of OSR, a decrease of 1.6 bu/A for 3.0 lbs/A of OSR and an increase of 0.9 bu/A for 4.5 lbs/A of OSR. This results in a contribution to profit of a decrease of $16.73/A for 3.0 lbs/A of OSR, a decrease of $5.13/A for 4.5 lbs/A of OSR and an increase of $3.60/A for 1.5 lbs/A of OSR.

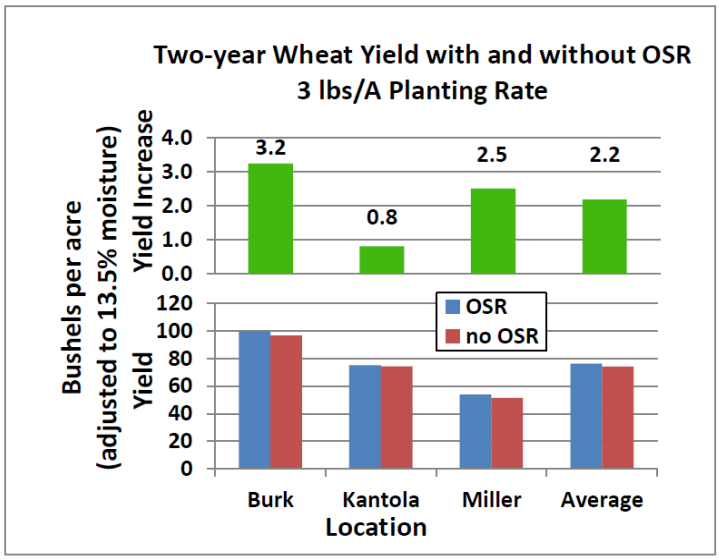



Figure 5. Two-year wheat yield and yield increase with and without OSR at 3 lbs/A seeding rate.

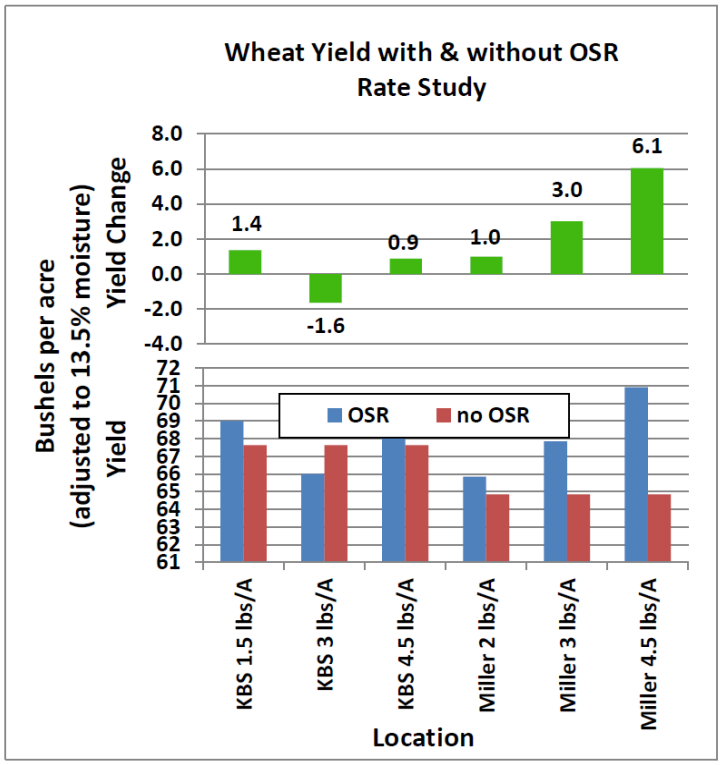



Figure 6. Wheat yield and yield increase with and without OSR at three seeding rates.



**Continued from Page 9...**

*2013 – 2014 Planting Date Study*

At KBS, a planting date study was performed for three planting dates: early (September 23), mid (October 11) and late (October 28) with three OSR seeding rates on each date (Figure 7). The yield data was highly variable across seeding dates and seeding rates ranging from an increase of 2.7 bu/A for early planting at 1.5 lbs/A of OSR to a decrease of 3.7 bu/A for early planting 3.0 lbs/A of OSR.

When yield results for each seeding rate are averaged by seeding date, the early and late planting dates averaged similar yield with no difference between wheat with and without oilseed radish. The mid planting date showed an increase in wheat yield of 0.7 bu/A with oilseed radish compared to no oilseed radish.

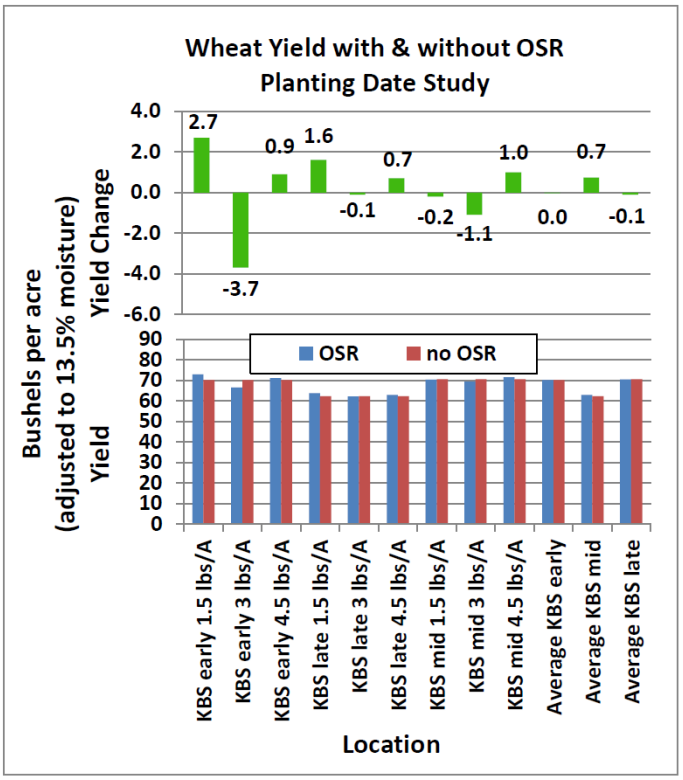



Figure 7. Wheat yield and yield increase with and without OSR for three planting dates at KBS.

The severe winter may have affected the yield results from the small plot studies at KBS in 2014 and the planting date study results are inconclusive.

**Conclusions**

- After two years of study, the interseeding of OSR with wheat continues to show promise for increasing wheat yields
- Year one (2012 – 2013) of the study, all three farm locations showed an increase in wheat yield from interseeding OSR in wheat with increased profit ranging from $6.67/A – $26.56/A. On average across all three farms, the 3.6 bu/A increase produced a $17.65/A increase to profit.
- In year two (2013 – 2014) of the study, two out of four farm locations (Miller and Burk) showed an economic increase to profits ($9.29/A and $11.10/A, respectively) from interseeding OSR with wheat. The Kantola and Heck farms had an economic decrease to profit of $27.02/A and $4.63/A from interseeding OSR with wheat. KBS small plot research was inconclusive with both increases and decreases to profits.

MWP Project – Evaluation of Oilseed Radish added to Wheat to Increase Wheat Yields in MI **...Continued on Page 10**

- For the farms that were in the study for both years (Burk, Miller and Kantola), the two-year average over the three farms showed a positive contribution to profit of $8.72/A resulting from interseeding 3.0 lb of OSR with wheat.
- The OSR seeding rate study on the Miller farm showed increasing wheat yield (1.0, 3.0 and 6.1 bu/A) for increasing OSR seeding rates (2.0, 3.0 and 4.5 lbs/A) and increasing contributions to profit ($1.35/A, $11.10/A and $26.33/A). The KBS small plot rate study was inconclusive with both increases and decreases.
- The planting date study at KBS was inconclusive with both increases and decreases to wheat yield across planting dates.
- Multiple years of this study are necessary to identify the long-term impact on yields and profits of interseeding OSR with wheat.

**Acknowledgements**

We would like to thank the Michigan Wheat Program for funding this research and the farmers who contributed their time and land to participate in this study.

**6 April 2015**
Updates to this bulletin posted at www.msuent.com

# Handy Bt Trait Table

**With questions or for corrections, contact:**
**Chris DiFonzo, Field Crops Entomologist**
Michigan State University, East Lansing, MI

Most corn hybrids planted in the U.S. now contain one or more transgenic traits for weed or insect management. These traits are meant to increase flexibility and profitability for producers, but sometimes also lead to questions or cause confusion about their spectrum of control or refuge requirements to delay resistance. This bulletin provides a handy one-stop-guide to understand sales materials, bag tags, and the hybrids you purchase.

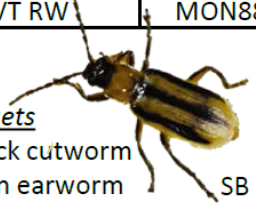
Table 1 lists the names of the important 'events' (transformations of one or more genes) in corn, their more familiar Trade Names, the protein(s) expressed, and their pest targets. Table 2 lists specific trait packages (combinations of events) sold by various seed companies, with their spectrum of control plus refuge % and location. In recent years, the pyramiding of Bt traits allowed for the reduction of some refuges from 20% to 10% or 5%, depending on the trait package. Some hybrids still require a structured refuge planted as a block or series of rows (within, adjacent to, or ~½ mile from the Bt field) , but many hybrids are now sold as a convenient refuge-in-the-bag (RIB). But it is still important to take the following steps:

*Understand the ***biology*** of each trait, the expected level of control, and refuge requirements;
*****Confirm that the seed you ordered the previous year*** is the seed delivered in the spring;
*Keep good ***planting records*** and save a representative sample of ***bags or bag tags;***
*For herbicide applications, ***Ask Twice-Spray Once***, especially if you hire a custom applicator;
*Most important, if you see **unexpected damage or poor performance** of a trait (especially damage from corn rootworm), contact your seed dealer and extension educator immediately so that the field can be visited while the problem is still fresh and samples can be taken. This is critical to **identify and manage cases of rootworm Bt resistance**.


This bulletin strives for completeness, but keeping track of Bt traits isn't easy. For a searchable, easy-to-use database of GM crop approvals, see the ISAAA web site at http://www.isaaa.org/gmapprovaldatabase

**Table 1. Event names for proteins expressed in Bt corn plants**

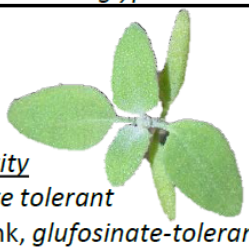
| Trade name | Event name | Protein(s) expressed | Insect Target or *Herbicide Activity* |
|---|---|---|---|
| Agrisure CB/LL | Bt11 | Cry1Ab+PAT | corn borer + *glufosinate tolerance* |
| Agrisure Duracade | 5307 | eCry3.1Ab | rootworm |
| Agrisure RW | MIR604 | mCry3A | rootworm |
| Agrisure Viptera | MIR162 | Vip3Aa | broad lep control |
| Herculex 1 or CB | TC1507 | Cry1F + PAT | corn borer + *glufosinate tolerance* |
| Herculex RW | DAS-59122-7 | Cry34Ab1/Cry35Ab1+PAT | rootworm + *glufosinate tolerance* |
| Roundup Ready 2 | NK603 | CP4 EPSPS | *glyphosate tolerance* |
| YieldGard CB | MON810 | Cry1Ab | corn borer |
| YieldGard VT Pro | MON89034 | Cry1A.105+Cry2Ab2 | broad lep control |
| YieldGard VT RW | MON88017 | Cry3Bb1+CP4 EPSPS | rootworm + *glyphosate tolerance* |



**Abbreviations used in Table 2 on page 2**

*Insect targets*

| | | | |
|---|---|---|---|
| BCW | black cutworm | | |
| CEW | corn earworm | SB | stalk borer |
| ECB | European corn borer | SWCB | southern corn borer |
| FAW | fall armyworm | TAW | true armyworm |
| RW | corn rootworm | WBC | western bean cutworm |



*Herbicide activity*

| | |
|---|---|
| GT | *glyphosate tolerant* |
| LL | Liberty Link, *glufosinate-tolerant* |
| RR2 | Roundup Ready 2, *glyphosate-tolerant* |

**Table 2. Bt corn trait packages, with spectrum of control and refuge requirements.**
(Updated 6 April 2015)

| Trait Family<br>Product | Bt protein(s) | Insects controlled or *suppressed*<br>Above-ground----------In soil | | Herbicide tolerant? | Refuge %, placement (for the MIDWEST) |
|---|---|---|---|---|---|
| **AGRISURE** | | | | | |
| Agrisure GT/CB/LL, 3010A | Cry1Ab | ECB SWCB *CEW FAW SB* | --- | GT LL | 20% structured-½ mile |
| Agrisure 3000GT, 3011A | Cry1Ab mCry3A | ECB SWCB *CEW FAW SB* | RW | GT LL | 20% structured-w/in, adj |
| Agrisure Viptera 3110 | Cry1Ab Vip3A | BCW CEW ECB FAW SB SWCB TAW WBC | --- | GT LL | 20% structured-½ mile |
| Agrisure Viptera 3111 | Cry1Ab mCry3A Vip3A | BCW CEW ECB FAW SB SWCB TAW WBC | RW | GT LL | 20% structured-w/in, adj |
| Agrisure 3122<br>E-Z Refuge | Cry1Ab Cry1F mCry3A Cry34/35Ab1 | BCW ECB FAW SB SWCB WBC *CEW* | RW | GT | 5% in the bag (RIB) |
| Agrisure Viptera 3220<br>E-Z Refuge | Cry1Ab Cry1F Vip3A | BCW CEW ECB FAW SB SWCB TAW WBC | --- | GT | 5% in the bag (RIB) |
| Agrisure Duracade 5122<br>E-Z Refuge | Cry1Ab Cry1F mCry3A eCry3.1Ab | BCW ECB FAW SB SWCB WBC *CEW* | RW | GT | 5% in the bag (RIB) |
| Agrisure Duracade 5222<br>E-Z Refuge | Cry1Ab Cry1F Vip3A mCry3A eCry3.1Ab | BCW CEW ECB FAW SB SWCB TAW WBC | RW | GT | 5% in the bag (RIB) |
| **HERCULEX** | | | | | |
| Herculex 1 (HX1) | Cry1F | BCW ECB FAW SB SWCB WBC *CEW* | --- | LL | 20% structured-½ mile |
| Herculex RW (HXRW) | Cry34/35Ab1 | --- | RW | RR2 (most) | 20% structured-w/in, adj |
| Herculex XTRA (HXX) | Cry1F Cry34/35Ab1 | BCW ECB FAW SB SWCB WBC *CEW* | RW | | 20% structured-w/in, adj |
| **OPTIMUM** | | | | | |
| TRIsect | Cry1F mCry3A | BCW ECB FAW SB SWCB WBC *CEW* | RW | LL RR2 | 20% structured-w/in, adj |
| Intrasect | Cry1F Cry1Ab | BCW ECB FAW SB SWCB WBC *CEW* | --- | LL RR2 | 5% structured-½ mile |
| Intrasect Leptra | Cry1F Cry1Ab Vip3A | BCW CEW ECB FAW SB SWCB TAW WBC | --- | LL RR2 | 5% structured-w/in, adj |
| Intrasect XTra | Cry1F Cry1Ab Cry34/35Ab1 | BCW ECB FAW SB SWCB WBC *CEW* | RW | LL RR2 | 20% structured-w/in, adj |
| Intrasect XTreme | Cry1F Cry1Ab mCry3A Cry34/35Ab1 | BCW ECB FAW SB SWCB WBC *CEW* | RW | LL RR2 | 5% structured-w/in, adj |
| AcreMax (AM) | Cry1F Cry1Ab | BCW ECB FAW SB SWCB WBC *CEW* | --- | LL RR2 | 5% in the bag (RIB) |
| AcreMax RW (AMRW) | Cry34/35Ab1 | --- | RW | LL RR2 | 10% in the bag (RIB) |
| AcreMax1 (AM1) | Cry1F Cry34/35Ab1 | BCW ECB FAW SB SWCB WBC *CEW* | RW | LL RR2 | 10% in the bag *(RW)* &<br>20% structured-½ mile *(CB)* |
| AcreMax TRIsect (AMT) | Cry1F Cry1Ab mCry3A | BCW ECB FAW SB SWCB WBC *CEW* | RW | LL RR2 | 10% in the bag (RIB) |
| AcreMax Xtra (AMX) | Cry1F Cry1Ab Cry34/35Ab1 | BCW ECB FAW SB SWCB WBC *CEW* | RW | LL RR2 | 10% in the bag (RIB) |
| AcreMax XTrem (AMXT) | Cry1F Cry1Ab mCry3A Cry34/35Ab1 | BCW ECB FAW SB SWCB WBC *CEW* | RW | LL RR2 | 5% in the bag (RIB) |
| **YIELDGARD / GENUITY** | | | | | |
| YieldGard CB (YGCB) | Cry1Ab | ECB SWCB *CEW FAW SB* | --- | RR2 | 20% structured-½ mile |
| YieldGard VT Rootworm | Cry3Bb1 | --- | RW | RR2 | 20% structured-w/in, adj |
| YieldGard VT Triple | Cry1Ab Cry3Bb1 | ECB SWCB *CEW FAW SB* | RW | RR2 | 20% structured-w/in, adj |
| Genuity VT Double PRO<br>(or as RIB complete) | Cry1A.105 Cry2Ab2 | CEW ECB FAW SB SWCB | --- | RR2 | 5% structured-½ mile<br>(or 5% in the bag (RIB)) |
| Genuity VT Triple PRO<br>(or as RIB complete) | Cry1A.105 Cry2Ab2 Cry3Bb1 | CEW ECB FAW SB SWCB | RW | RR2 | 20% structured-w/in, adj<br>(or 10% in the bag (RIB)) |
| Genuity SmartStax<br>RIB Complete | Cry1A.105 Cry2Ab2 Cry1F Cry3Bb1 Cry34/35Ab1 | BCW CEW ECB FAW SB SWCB WBC | RW | LL RR2 | 5% in the bag (RIB) |
| **OTHERS** | | | | | |
| Smartstax<br>(or as Refuge Advanced) | Cry1A.105 Cry2Ab2 Cry1F Cry3Bb1 Cry34/35Ab1 | BCW CEW ECB FAW SB SWCB WBC | RW | LL RR2 | 5% structured-w/in, adj<br>(or 5% in the bag (RIB)) |

# TABLE 1A – Weed Response to Soil-Applied Herbicides in Corn*

| *Soil Applied* | SITE OF ACTION | CORN TOLERANCE** | ANNUAL BROADLEAVES | | | | | | | | | | | ANNUAL GRASSES | | | | | | | | PERENNIALS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | COCKLEBUR | JIMSONWEED | LAMBSQUARTERS | T-R LAMBSQUARTERSa | NIGHTSHADE (E. BLACK) | PIGWEED | RAGWEED (COMMON) | RAGWEED (GIANT) | SMARTWEED | VELVETLEAF | WILD MUSTARD | BARNYARDGRASS | CRABGRASS | GIANT FOXTAIL | GREEN FOXTAIL | YELLOW FOXTAIL | FALL PANICUM | WITCHGRASS | SANDBUR | CANADA THISTLE | QUACKGRASS | YELLOW NUTSEDGE | JOHNSONGRASS (seedling) | JOHNSONGRASS (Rhizome) |
| ATRAZINE | 5 | 1 | F | F | **E** | N | **E** | **G** | **E** | **G** | **G** | F | **E** | **G** | P | F | F | **G** | P | P | P | F | P | F | N | N |
| BALANCE FLEXX | 27 | 2 | P | **E** | **E** | **E** | **E** | **E** | **E** | F | **G** | **E** | **E** | **G** | F | **G** | **G** | F | P | P | F | P | P | P | **G** | F |
| BREAKFREE NXT/DEGREE/HARNESS/ SURPASS NXT | 15 | 2 | P | N | F | F | **G** | **G** | F | N | P | P | P | **E** | **E** | **E** | **E** | **E** | **E** | **E** | F | N | N | F | P | N |
| CALLISTO | 27 | 1 | P | **G** | **E** | **E** | **E** | **E** | F | F | **E** | **E** | **G** | N | P | N | N | N | N | N | N | P | N | N | N | N |
| DUAL II MAGNUM/ CINCH/PARALLEL | 15 | 1 | N | N | P | P | F | **G** | P | N | P | N | P | **E** | **E** | **E** | **E** | **E** | **E** | **E** | F | N | N | F | P | N |
| MICRO-TECH | 15 | 2 | N | N | P | P | **G** | **G** | P | N | P | N | P | **E** | **E** | **E** | **E** | **E** | **E** | **E** | F | N | N | P | P | N |
| OUTLOOK | 15 | 2 | N | N | P | P | **G** | **G** | P | N | P | N | P | **E** | **E** | **E** | **E** | **E** | **E** | **E** | F | N | N | P | P | N |
| PRINCEP | 5 | 1 | F | F | **E** | N | **E** | **G** | **E** | F | **G** | F | **E** | **G** | F | F | F | **G** | P | P | P | P | F | F | N | N |
| PROWL $H_2O$[b] **(PRE only)** | 3 | 3 | N | N | **G** | **G** | P | F | P | N | P | F | P | **G** | **G** | **G** | **G** | **G** | **G** | **G** | **G** | N | N | N | P | N |
| PYTHON/ACCOLADE | 2 | 3 | F | F | **E** | **E** | **G** | **E** | F | P | **G** | **G** | **E** | P | P | P | P | P | P | P | P | N | N | N | N | N |
| RESOLVE SG | 2 | 1 | **G** | F | F | F | P | **E** | F | P | F | F | **E** | **G** | F | **G** | **G** | **G** | F | F | P | P | P | P | P | P | P |
| SHARPEN | 14 | 1 | **G** | **G** | **G** | **G** | **G** | **E** | **G** | F | **G** | **G** | **G** | N | N | N | N | N | N | N | N | P | N | N | N | N |
| VALOR[c] **(7d EPP or more)** | 14 | 2 | P | F | **G** | **G** | **G** | **G** | **G** | F | F | F | **G** | P | P | P | P | P | P | P | P | N | N | P | P | N |
| ZIDUA | 15 | 1 | P | F | F | F | **G** | **E** | F | N | F | F | F | **E** | **E** | **E** | **E** | **E** | **E** | **E** | F | N | N | F | F | N |
| ***Premixes*** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ANTHEM | 15/14 | 1 | P | F | F | F | **G** | **E** | F | N | F | F | F | **E** | **E** | **E** | **E** | **E** | **E** | **E** | F | N | N | F | F | N |
| ANTHEM ATZ | 15/14/5 | 1 | P | F | **G** | F | **E** | **E** | **G** | F | F | F | **E** | **E** | **E** | **E** | **E** | **E** | **E** | **E** | F | N | N | F | F | N |
| BASIS BLEND | 2/2 | 1 | **G** | F | **G** | **G** | P | **E** | F | P | F | F | **E** | **G** | F | **G** | **G** | **G** | F | F | P | P | P | P | P | P | P |
| BICEP II LITE MAGNUM/ CINCH ATZ LITE | 5/15 | 1 | F | F | **G** | P | **E** | **G** | **G** | F | F | F | **E** | **E** | **E** | **E** | **E** | **E** | **E** | **E** | F | P | N | F | P | N |
| BICEP II MAGNUM/CINCH ATZ/ PARALLEL PLUS | 5/15 | 1 | F | F | **E** | P | **E** | **G** | **E** | **G** | **G** | F | **E** | **E** | **E** | **E** | **E** | **E** | **E** | **E** | F | F | P | F | P | N |
| BREAKFREE NXT LITE DEGREE XTRA/FULTIME NXT/ KEYSTONE LA NXT | 5/15 | 2 | F | F | **G** | F | **E** | **G** | **G** | F | F | F | **E** | **E** | **E** | **E** | **E** | **E** | **E** | **E** | F | P | N | F | P | N |
| BREAKFREE NXT ATZ HARNESS XTRA/KEYSTONE NXT | 5/15 | 2 | F | F | **E** | F | **E** | **G** | **E** | **G** | **G** | F | **E** | **E** | **E** | **E** | **E** | **E** | **E** | **E** | F | F | P | F | P | N |
| BULLET/LARIAT | 5/15 | 2 | F | F | **E** | P | **E** | **G** | **E** | F | **G** | F | **E** | **E** | **E** | **E** | **E** | **E** | **E** | **E** | F | F | P | P | P | N |
| CORVUS | 2/27 | 2 | **G** | **E** | **E** | **E** | **E** | **E** | **E** | **G** | **E** | **E** | **E** | **G** | **E** | **E** | **E** | **E** | **E** | **E** | **G** | P | F | P | **G** | F |
| FIERCE[c] **(7d EPP or more)** | 14/15 | 2 | P | F | **G** | **G** | **G** | **E** | **G** | F | F | F | **G** | **G** | **G** | **G** | **G** | **G** | **G** | **G** | F | N | N | F | F | N |
| HORNET WDG/STANZA | 2/4 | 3 | **G** | F | **E** | **E** | **G** | **E** | **E** | **G** | **G** | **G** | **E** | N | N | N | N | N | N | N | N | F | N | N | N | N |
| INSTIGATE | 2/27 | 1 | **G** | **G** | **E** | **E** | **E** | **E** | F | F | **E** | **E** | **E** | **G** | F | **G** | **G** | **G** | F | F | P | P | P | P | P | P | P |
| LEXAR EZ/LUMAX EZ | 5/27/15 | 1 | F | **G** | **E** | **E** | **E** | **E** | **E** | **G** | **E** | **E** | **E** | **E** | **E** | **E** | **E** | **E** | **E** | **E** | F | F | P | F | P | N |
| SURESTART II/TRIPLEFLEX II[d] | 2/4/15 | 3 | **G** | F | **E** | **E** | **G** | **E** | **G** | F | **G** | **G** | **E** | **E** | **E** | **E** | **E** | **E** | **E** | **E** | F | P | N | F | P | N |
| VERDICT[d] | 14/15 | 2 | **G** | **G** | **G** | **G** | **G** | **E** | **G** | F | **G** | **G** | **G** | **G** | **G** | **G** | **G** | **G** | **G** | **G** | F | P | N | P | P | N |
| ZEMAX | 27/15 | 1 | P | **G** | **E** | **E** | **E** | **E** | F | F | **E** | **E** | **G** | **E** | **E** | **E** | **E** | **E** | **E** | **E** | F | P | N | F | P | N |

# TABLE 1A – Weed Response to Soil-Applied Herbicides in Corn* *(continued)*

Herbicide Site of Action: The site of action key is located on pages 15-16.

Herbicide Effectiveness: P = Poor; F = Fair; **G** = Good; **E** = Excellent; N = None; – = Not enough information to rank

* *The above ratings are a relative comparison of herbicide effectiveness. Weather conditions greatly influence the herbicide's effectiveness, and weed control may be better under favorable conditions or poorer under unfavorable conditions.*

** Crop Tolerance: 1=Minimal risk of crop injury; 2=Crop injury can occur under certain conditions; 3=Severe crop injury can occur. Follow precautions under Remarks and Limitations and on the label; 4=Risk of severe crop injury is high.

[a] Triazine-resistant common lambsquarters.

[b] DO NOT incorporate Prowl $H_2O$ and corn should be planted a minimum of 1.5-inches deep.

[c] Valor or Fierce must be applied at least 7 day before planting, for use only in no-till corn.

[d] These herbicides are intended only for use only in planned preemergence followed by postemergence programs. Ratings only reflect early-season weed control, not full-season control.

## From the 2015 MSU Weed Control Guide for Field Crops

**For a complete copy of the 199 page guide go to**

**http://msuweeds.com/publications/weed-control-guide/**

# TABLE 1B – Weed Response to Postemergence Herbicides in Corn*

| Postemergence | SITE OF ACTION | CORN TOLERANCE** | ANNUAL BROADLEAVES | | | | | | | | | | | ANNUAL GRASSES | | | | | | | | PERENNIALS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | COCKLEBUR | JIMSONWEED | LAMBSQUARTERS | T-R LAMBSQUARTERSa | NIGHTSHADE (E. BLACK) | PIGWEED | RAGWEED (COMMON) | RAGWEED (GIANT) | SMARTWEED | VELVETLEAF | WILD MUSTARD | BARNYARDGRASS | CRABGRASS | GIANT FOXTAIL | GREEN FOXTAIL | YELLOW FOXTAIL | FALL PANICUM | WITCHGRASS | SANDBUR | CANADA THISTLE | QUACKGRASS | YELLOW NUTSEDGE | JOHNSONGRASS (seedling) | JOHNSONGRASS (Rhizome) |
| 2,4-D | 4 | 3 | G | F | G | G | G | G | G | G | P | F | G | N | N | N | N | N | N | N | N | F | N | N | N | N |
| ACCENT Q | 2 | 2 | F | G | F | F | P | E | P | N | G | F | P | E | P | E | E | E | E | E | G | F | G | F | E | G |
| AIM | 14 | 3 | P | F | F | F | G | G | P | P | P | E | F | N | N | N | N | N | N | N | N | N | N | N | N | N |
| ARMEZON/IMPACT | 27 | 1 | G | E | E | E | E | E | E | G | G | E | G | G | G | E | G | G | G | G | F | F | P | P | F | P |
| ATRAZINE | 5 | 1 | G | G | E | N | G | E | E | G | G | F | E | F | P | F | F | F | P | P | P | F | F | F | N | N |
| BANVEL/CLARITY | 4 | 3 | G | G | G | G | G | G | G | E | E | F | G | N | N | N | N | N | N | N | N | F | N | N | N | N |
| BASAGRAN/BROADLOOM | 6 | 1 | E | G | F | F | P | P | F | P | G | F | E | N | N | N | N | N | N | N | N | G | N | G | N | N |
| BEACON | 2 | 2 | E | G | F | F | G | E | E | E | G | G | F | P | P | F | F | F | G | G | F | F | G | F | G | F |
| BUCTRIL/MOXY | 6 | 2 | G | G | E | E | G | F | G | G | G | G | F | N | N | N | N | N | N | N | N | P | N | N | N | N |
| CADET | 14 | 2 | P | F | F | F | F | G | P | P | P | E | P | N | N | N | N | N | N | N | N | N | N | N | N | N |
| CALLISTO | 27 | 1 | F | E | E | E | E | G | G | G | E | E | E | N | Fb | N | N | N | N | N | N | P | N | P | N | N |
| LAUDIS | 27 | 1 | G | E | E | E | E | E | G | G | G | E | F | G | F | G | G | E | N | P | F | P | P | P | F | P |
| PERMIT | 2 | 1 | E | G | N | N | P | E | G | G | F | G | E | N | N | N | N | N | N | N | N | P | N | E | N | N |
| RESOURCE | 14 | 2 | P | P | F | F | P | P | P | P | P | E | P | N | N | N | N | N | N | N | N | N | N | N | N | N |
| STINGER | 4 | 1 | E | G | P | P | F | P | E | E | F | P | P | N | N | N | N | N | N | N | N | E | N | N | N | N |
| **Premixes** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ANTHEM | 15/14 | 2 | P | F | F | F | F | G | P | P | P | E | P | N | N | N | N | N | N | N | N | N | N | N | N | N |
| ANTHEM ATZ | 15/14/5 | 2 | G | G | E | F | G | E | E | G | G | E | E | F | P | F | F | F | P | P | P | F | F | F | N | N |
| CALLISTO XTRA | 5/27 | 1 | G | E | E | E | E | E | E | G | G | E | G | N | Fb | N | N | N | N | N | N | F | N | P | N | N |
| CAPRENO | 2/27 | 2 | G | E | G | G | E | E | G | G | G | E | G | G | G | G | G | E | G | G | F | P | F | P | E | G |
| HORNET WDG/STANZA | 2/4 | 2 | E | F | F | F | F | P | E | E | G | G | G | N | N | N | N | N | N | N | N | E | N | N | N | N |
| MARKSMAN | 4/5 | 3 | G | G | E | G | G | E | E | E | E | G | E | P | N | P | P | P | N | N | N | F | P | F | N | N |
| NORTHSTAR | 2/4 | 2 | E | G | G | G | G | E | E | E | G | F | G | P | P | F | F | F | G | G | F | F | G | F | G | F |
| REALM Q | 2/27 | 2 | G | E | E | E | E | E | G | F | E | E | E | G | F | G | G | G | G | G | P | F | F | P | F | N |
| REQUIRE Q | 2/4 | 2 | G | G | G | G | G | E | G | G | F | F | G | G | F | G | G | G | G | G | P | F | F | P | F | N |
| RESOLVE Q | 2/2 | 2 | G | P | G | G | F | E | F | P | G | F | E | G | F | G | G | G | G | G | P | F | F | P | F | N |
| SHOTGUN | 5/4 | 3 | G | G | E | G | G | E | E | G | E | F | E | N | N | N | N | N | N | N | N | F | N | N | N | N |
| SOLSTICE | 14/27 | 2 | F | E | E | E | E | E | G | G | E | E | E | N | Fb | N | N | N | N | N | N | P | N | P | N | N |
| STATUS | 4/19 | 2 | E | G | E | E | G | E | E | E | E | G | G | P | P | P | P | P | P | P | P | G | N | N | N | N |
| STEADFAST Q | 2/2 | 2 | F | G | F | F | P | E | P | N | G | F | G | E | F | E | E | E | E | E | G | F | G | F | E | G |
| YUKON | 2/4 | 2 | E | G | G | G | G | E | G | G | G | G | E | N | N | N | N | N | N | N | N | P | N | E | N | N |
| **Glyphosate-Resistant Corn** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GLYPHOSATE | 9 | 1 | E | E | G | G | G | E | G | G | G | G | E | E | E | E | E | E | E | E | E | G | E | F | E | E |
| CALLISTO GT | 9/27 | 1 | E | E | E | E | E | E | G | G | E | E | E | E | E | E | E | E | E | E | E | G | E | F | E | E |
| EXPERT | 5/9/15 | 2 | E | E | E | G | G | E | E | G | G | G | E | E | E | E | E | E | E | E | E | G | E | F | E | E |
| FIELD MASTER | 5/9/15 | 2 | E | E | E | G | G | E | G | F | F | F | E | E | E | E | E | E | E | E | E | F | G | F | E | G |
| HALEX GT | 9/15/27 | 1 | E | E | E | E | E | E | G | G | E | E | E | E | E | E | E | E | E | E | E | G | E | F | E | E |
| SEQUENCE | 9/15 | 1 | E | E | G | G | G | E | G | G | G | G | E | E | E | E | E | E | E | E | E | G | E | F | E | E |
| WARRANT + GLYPHOSATE | 9/15 | 1 | E | E | G | G | G | E | G | G | G | G | E | E | E | E | E | E | E | E | E | G | E | F | E | E |
| **LibertyLink Corn** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LIBERTY | 10 | 1 | E | G | F | F | G | G | E | G | G | G | E | F | F | G | G | F | F | F | P | P | P | P | G | F |

Herbicide Effectiveness: P = Poor; F = Fair; G = Good; E = Excellent; N = None; – = Not enough information to rank