

RESEARCH UPDATE CORN TRIALS 2022

Benefit of Adding TOUGH® 5EC In Drought Conditions



Mode of Action:

- Photosynthesis II inhibitor
- Targets unique pathway within the PSII group of herbicides (Groups 5, 6 & 7)
- WSSA Classification: Group 6
- No known cross-resistance to other PSII's

ACTIVE INGREDIENT:

Pyridate (Carbonothioic acid, O-(6-chloro-3-phenyl-4-pyridizynyl) S-octyl ester):..... 56.1%

OTHER INGREDIENTS: 43.9%

TOTAL: 100.00%

* Contains 5 lbs of pyridate per gallon of product

QUICK FACTS:

- Postemergence, contact activity only
- Rainfast within 1 hour
- No residual or rotation restrictions
- Controls key broadleaf weeds such as but not limited to: Common Waterhemp, Palmer amaranth, Kochia, Common Lambsquarters
- Tank-mixed: 8 oz/ac with other products active on the key weeds

Observing an increase in herbicide resistance across the USA, Belchim Crop Protection revitalized a valuable chemistry, **TOUGH® 5EC**, (pyridate) in effort to preserve the long-term use of the valuable class of HPPD herbicides in corn.

Beginning in 2017, Belchim Crop Protection USA coordinated with key universities across the corn belt, implementing trials to evaluate the effectiveness of **TOUGH 5EC** in numerous research trials (>150 trials).

Preliminary research showed an evident synergy* with Callisto®, and the HPPD class of herbicides. In 2020 and 2021, trials expanded to include other HPPD herbicides such as ShieldEx® and Impact® in addition to dicamba based products such as Status.® Research continued in 2022, in other states and evaluation performance on some additional weeds.

Enhancement of atrazine is also evident and the ability to increase the use of PSII class of chemistry while maintaining crop safety.

In 2022 **TOUGH 5EC** was evaluated in very hot and dry conditions, which reduce herbicide effectiveness. As seen in this summary, adding **TOUGH 5EC** to the mix, even in these conditions, provides improved control of weeds.

Glyphosate Resistant Palmer Amaranth			
Kansas State University	% Percent Control		
Treatment	7 DAA	14 DAA	28 DAA
Roundup PowerMAX 3 20 oz	0	0	0
Roundup PowerMAX 3 20 oz + Callisto 3 oz	59	69	61
Roundup PowerMAX 3 20 oz + Callisto 3 oz + TOUGH 5EC 8 oz	81	84	78
Soil Moisture: Very Dry			

Glyphosate Resistant Palmer Amaranth (.5-11" tall)				
Purdue University	% Percent Control			
Treatment	7 DAA	14 DAA	28 DAA	42 DAA
Roundup PowerMAX 3 20 oz	60	53	53	53
Roundup PowerMAX 3 20 oz + Callisto 3 oz	71	77	79	79
Roundup PowerMAX 3 20 oz + Callisto 3 oz + TOUGH 5EC 8 oz	97	97	97	95
Soil Moisture: Fair				

Glyphosate Resistant Palmer Amaranth (1 -5" tall)				
University of Illinois	% Percent Control			
Treatment	7 DAA	14 DAA	28 DAA	42 DAA
Roundup PowerMAX 3 20 oz	30	40	40	40
Roundup PowerMAX 3 20 oz + Callisto 3 oz	43	37	33	33
Roundup PowerMAX 3 20 oz + Callisto 3 oz + TOUGH 5EC 8 oz	67	83	87	86
Soil Moisture: Very Dry				

Glyphosate Resistant Palmer Amaranth (1-11" tall)				
Purdue University	% Percent Control			
Treatment	7 DAA	14 DAA	28 DAA	42 DAA
Roundup PowerMAX 3 20 oz	60	51	50	46
Roundup PowerMAX 3 20 oz + Callisto 3 oz	71	74	80	79
Roundup PowerMAX 3 20 oz + Callisto 3 oz + TOUGH 5EC 8 oz	93	97	97	97
Soil Moisture: Fair				



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6 Way Resistant Waterhemp (1-5" tall)				
University of Illinois	% Percent Control			
Treatment	7 DAA	14 DAA	42 DAA	
Roundup PowerMAX 3 20 oz	30	40	40	
Roundup PowerMAX 3 20 oz + Callisto 3 oz	37	40	40	
Roundup PowerMAX 3 20 oz + Callisto 3 oz + TOUGH 5EC 8 oz	73	82	80	
Soil Moisture: Very Dry				

Ivy-Leaf Morningglory (6-8")				
Iowa State University	% Percent Control			
Treatment	7 DAA	14 DAA	28 DAA	42 DAA
Roundup PowerMAX 3 20 oz	60	70	60	55
Roundup PowerMAX 3 20 oz + Callisto 3 oz	72	77	62	57
Roundup PowerMAX 3 20 oz + Callisto 3 oz + TOUGH 5EC 8 oz	92	96	78	67
Soil Moisture: Good				

Glyphosate Resistant Waterhemp (3" tall)				
University of Missouri	% Percent Control			
Treatment	7 DAA	14 DAA	28 DAA	42 DAA
Roundup PowerMAX 3 20 oz	83	79	75	68
Roundup PowerMAX 3 20 oz + Callisto 3 oz	88	85	79	66
Roundup PowerMAX 3 20 oz + Callisto 3 oz + TOUGH 5EC 8 oz	98	98	96	91
Soil Moisture: Good				

Ivy-Leaf Morningglory (7-10")				
Iowa State University	% Percent Control			
Treatment	7 DAA	14 DAA	28 DAA	42 DAA
Roundup PowerMAX 3 20 oz + Callisto 3 oz	60	80	75	72
Roundup PowerMAX 3 20 oz + Callisto 3 oz + TOUGH 5EC 8 oz	90	96	86	85
Roundup PowerMAX 3 20 oz + Impact 2SC 1 oz	50	77	67	62
Roundup PowerMAX 3 20 oz + Impact 2SC 1 oz + TOUGH 5EC 8 oz	82	95	78	75
Soil Moisture: Good				

Glyphosate Resistant Waterhemp (3-10" tall)				
Iowa State University	% Percent Control			
Treatment	7 DAA	14 DAA	28 DAA	42 DAA
Roundup PowerMAX 3 20 oz	67	67	70	70
Roundup PowerMAX 3 20 oz + Callisto 3 oz	88	93	93	93
Roundup PowerMAX 3 20 oz + Callisto 3 oz + TOUGH 5EC 8 oz	98	99	99	99
Soil Moisture: Good				

Mixed Morningglory Population (1-2")		
University of Illinois	% Percent Control	
Treatment	7 DAA	14 DAA
Roundup PowerMAX 3 20 oz	77	78
Roundup PowerMAX 3 20 oz + Callisto 3 oz	77	86
Roundup PowerMAX 3 20 oz + Callisto 3 oz + TOUGH 5EC 8 oz	79	96
Soil Moisture: Very Dry		

Pitted Morningglory (2-6")		
University of Tennessee	% Percent Control	
Treatment	7 DAA	14 DAA
Roundup PowerMAX 3 20 oz	73	60
Roundup PowerMAX 3 20 oz + Callisto 3 oz	76	68
Roundup PowerMAX 3 20 oz + Callisto 3 oz + TOUGH 5EC 8 oz	86	82
Soil Moisture: Not Reported		

*This is a synopsis from research conducted in 2022.
For complete trial information, please contact your local
Belchim USA Representative.*

TOUGH 5EC is a registered trademark of Belchim Crop Protection. Roundup is a registered trademark of Bayer Crop Science, Callisto, are registered trademarks of Syngenta US. Impact is a registered trademark of Amvac.



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