

Weed Control in Corn with Tough

Trial ID: 19TOUGH Location: Trial Year: 2019  
Protocol ID: 19TOUGH Investigator: Dr. Mark M. Loux  
Project ID: Study Director:  
Sponsor Contact:

**General Trial Information**

**Investigator:** Dr. Mark M. Loux

**Trial Status:** E established

**ARM Trial Created On:** Apr-4-2019

**Trial Location**

**City:** South Charleston **Country:** USA United States  
**State/Prov.:** Ohio  
**Postal Code:** 45368 **Climate Zone:** USWARM US Warm Continental

**Latitude of LL Corner °:** 39.85699 N  
**Longitude of LL Corner °:** 83.67014 W  
**Altitude of LL Corner:** 1185.00 FT

**Conducted Under GLP:** No  
**Conducted Under GEP:** No

**Investigator:** Dr. Mark M. Loux

**Crop Description**

**Crop 1:** C ZEAMX Zea mays Corn  
**Entry Date:** Apr-15-2019  
**Variety:** Pioneer P1197AM  
**Attributes:** RR/LL  
**Planting Date:** Apr-12-2019 **Planting Rate:** 32097 S/A  
**Depth:** 1.5 IN  
**Rows per Plot:** 4 **Planting Method:** SEEDED seeded  
**Row Spacing:** 30 IN **Planting Equipment:** FPP finger pickup planter  
**Seed Bed:** SMOOTH smooth  
**Soil Temperature:** 58 F **Soil Moisture:** SLIDRY slightly dry  
**Emergence Date:** May-3-2019

**Pest Description**

**Pest 1 Type:** W **Code:** AMBTR Ambrosia trifida  
**Common Name:** Giant ragweed **Entry Date:** May-29-2019  
**Pest 2 Type:** W **Code:** CHEAL Chenopodium album  
**Common Name:** common lambsquarters **Entry Date:** May-29-2019  
**Pest 3 Type:** W **Code:** ABUTH Abutilon theophrasti  
**Common Name:** velvetleaf **Entry Date:** May-29-2019  
**Pest 4 Type:** W **Code:** IPOHE Ipomoea hederacea  
**Common Name:** ivy-leaf morning glory **Entry Date:** May-29-2019  
**Pest 5 Type:** W **Code:** AMARE Amaranthus retroflexus  
**Common Name:** Redroot pigweed **Entry Date:** Jun-7-2019

**Site and Design**

**Treated Plot Width:** 10 FT **Site Type:** FIELD field  
**Treated Plot Length:** 30 FT **Experimental Unit:** 1 PLOT plot  
**Treated Plot Area:** 300 FT2 **Treatments:** 8 **Tillage Type:** CONTIL conventional-till  
**Replications:** 4 **Study Design:** RACOB� Randomized Complete Block (RCB)

**Trial Initiation Comments:**

**Previous**

**No. Crop Year**  
1. SOYBEAN 2018

**Maintenance**

No.	Date	Type	Product Name	Conc	Unit	Form	Form	Rate	Tank
1.	Apr-13-2019	HERB	Dual II Magnum	7.674	LBA/GAL	EC	1.6	PT/A	no

**Field Prep./Maintenance:**

Fall chisel, spring finishing tool and cultipacker

Soil Description

Description Name: Big E  
 % Sand: 44      % OM: 3.1      Texture: L loam  
 % Silt: 45      pH: 6.6      Soil Name: Kokomo  
 % Clay: 11      CEC: 15.2      Fert. Level: G good  
 Soil Drainage: G good

Application Description

**A**

Application Date            May-29-2019  
 Appl. Start Time            8:15 AM  
 Appl. Stop Time            8:45 AM  
 Application Method        SPRAY  
 Application Timing        POEMCR  
 Application Placement     BANFOL  
 Applied By                 kiley  
 Appl. Entry Date          May-29-2019  
 Air Temperature Start, Stop 72 73 F  
 % Relative Humidity Start, Stop 82 83  
 Wind Velocity+Dir. Start   11 MPH SW  
 Wind Velocity+Dir. Stop    12 MPH SW  
 Wind Velocity+Dir. Max    11 MPH SW  
 Wet Leaves (Y/N)          N no  
 Soil Temperature          69 F  
 Soil Moisture              SLIWET  
 Soil Surface Condition    SMOOTH  
 % Cloud Cover             80  
 Next Moisture Occurred On May-29-2019  
 Time to Next Moisture     30 MIN  
 Moisture 6 Hours after Appl. 0 IN  
 Moisture 1 Week after Appl. 0.66 IN

Crop Stage At Each Application

**A**

Crop 1 Code, BBCH Scale    ZEAMX BCOR  
 Days after Emergence      26  
 Stage Scale Used            VR  
 Stage Majority, Percent    V4 100  
 Height Average              10 IN  
 Height Minimum, Maximum 10 11

Pest Stage At Each Application

**A**

Pest 1 Code, Type, Scale    AMBTR W  
 Stage Majority, Percent    19 80  
 Stage Minimum, Percent    18 10  
 Stage Maximum, Percent    19 80  
 Height Average              12 IN  
 Height Minimum, Maximum 6 14  
 Density Average             9 PLA/m2  
 Density Min, Max            4 12  
 Pest 2 Code, Type, Scale    CHEAL W  
 Stage Majority, Percent    15 80  
 Stage Minimum, Percent    14 10  
 Stage Maximum, Percent    16 10  
 Height Average              2.5 IN  
 Height Minimum, Maximum 2 3  
 Density Average             14 PLA/m2  
 Density Min, Max            4 32  
 Pest 3 Code, Type, Scale    ABUTH W  
 Stage Majority, Percent    12 80  
 Stage Minimum, Percent    12 80  
 Stage Maximum, Percent    14 20  
 Height Average              2 IN  
 Height Minimum, Maximum 2 3  
 Density Average             4 PLA/m2  
 Density Min, Max            4 12

**Application Equipment**

**Appl. Equipment** 6' BACKPACK  
**Equipment Type** BACCAI  
**Operation Pressure** 44 PSI  
**Nozzle Type** AIXR  
**Nozzle Size** 11015  
**Nozzle Spacing** 18 IN  
**Nozzles/Row** 4  
**Boom Length** 6.67 FT  
**Boom Height** 20 IN  
**Ground Speed** 3 MPH  
**Carrier** WATER  
**Application Amount** 15 gal/ac  
**Mix Size** 2 liters  
**Propellant** COMCO2

**Date** **By** **Context** **Notes**  
 Apr-4-2019 Dr. Mark M. Loux STATUS Automatically added by ARM: Trial Status updated to 'S' during trial creation.  
 Jun-5-2019 Dr. Mark M. Loux STATUS Automatically added by ARM: Trial Status updated to 'E' when Rating Date entered.

**SE Definitions**

**Crop Type, Code C**

Pest Type	W Weed	W Weed	W Weed	W Weed	W Weed
Pest Code	CHEAL	AMBTR	AMBTR	CHEAL	AMBTR
Pest Name	common lambsqu>	Giant ragweed	Giant ragweed	common lambsqu>	Giant ragweed
Crop Type, Code	C ZEAMX	C -	C -	C -	C -
Crop Name	Corn				
Rating Date	Jun-5-2019	Jun-11-2019	Jun-11-2019	Jun-11-2019	Jun-25-2019
Part Rated		old -	new em -		old -
Rating Type	PHYCHL	CONTRO	CONTRO	CONTRO	CONTRO
Rating Unit	%	%	%	%	%
Number of Subsamples	1	1	1	1	1
Data Entry Date	Jun-5-2019	Jun-11-2019	Jun-11-2019	Jun-11-2019	Jun-25-2019
Days After First/Last Applic.	7 7	13 13	13 13	13 13	27 27
Trt-Eval Interval	7 DA-A	13 DA-A	13 DA-A	13 DA-A	27 DA-A
Days After Emergence	33 DE-1	39 DE-1	39 DE-1	39 DE-1	53 DE-1
Number of Decimals	0	0	0	0	0

Trt No.	Treatment Name	Rate	Other Rate	Other Unit	Appl Unit Code	1*	2*	3*	4*	5*	6*
1	Atrazine	1.5 lb ai/a	3 pt/a		A	0 -	93 ab	81 b	92 ab	87 ab	84 -
1	COC	1 % v/v	1 % v/v		A						
2	Atrazine	1.5 lb ai/a	3 pt/a		A	0 -	78	85 ab	84 ab	100 a	83 -
2	Tough	0.313 lb ai/a	8 oz/a		A						
2	COC	1 % v/v	1 % v/v		A						
2	N Pak AMS	2.5 % v/v	2.5 % v/v		A						
3	Liberty	0.585 lb ai/a	32 oz/a		A	0 -	65 c	95 ab	78 b	70 b	88 -
3	N Pak AMS	2.5 % v/v	2.5 % v/v		A						
4	Liberty	0.585 lb ai/a	32 oz/a		A	0 -	80 b	100 a	85 ab	93 a	94 -
4	Tough	0.313 lb ai/a	8 oz/a		A						
4	N Pak AMS	2.5 % v/v	2.5 % v/v		A						
5	Callisto	0.094 lb ai/a	3 oz/a		A	3 -	100 a	93 ab	87 ab	100 a	96 -
5	Atrazine	0.5 lb ai/a	1 pt/a		A						
5	COC	1 % v/v	1 % v/v		A						
5	N Pak AMS	2.5 % v/v	2.5 % v/v		A						
6	Callisto	0.094 lb ai/a	3 oz/a		A	1 -	100 a	96 ab	95 a	100 a	91 -
6	Atrazine	0.5 lb ai/a	1 pt/a		A						
6	Tough	0.313 lb ai/a	8 oz/a		A						
6	COC	1 % v/v	1 % v/v		A						
6	N Pak AMS	2.5 % v/v	2.5 % v/v		A						
7	BCP 1312	0.035 lb ai/a	1.35 oz/a		A	0 -	100 a	99 a	90 ab	100 a	93 -
7	Atrazine	0.5 lb ai/a	1 pt/a		A						
7	HC MSO	0.5 % v/v	0.5 % v/v		A						
7	N Pak AMS	2.5 % v/v	2.5 % v/v		A						

Pest Type		W Weed	W Weed	W Weed	W Weed	W Weed
Pest Code		CHEAL	AMBTR	AMBTR	CHEAL	AMBTR
Pest Name		common lambsqu>	Giant ragweed	Giant ragweed	common lambsqu>	Giant ragweed
Crop Type, Code	C ZEAMX	C -	C -	C -	C -	C -
Crop Name	Corn					
Rating Date	Jun-5-2019	Jun-11-2019	Jun-11-2019	Jun-11-2019	Jun-25-2019	Jun-25-2019
Part Rated			old -	new em -		old -
Rating Type	PHYCHL	CONTRO	CONTRO	CONTRO	CONTRO	CONTRO
Rating Unit	%	%	%	%	%	%
Number of Subsamples	1	1	1	1	1	1
Data Entry Date	Jun-5-2019	Jun-11-2019	Jun-11-2019	Jun-11-2019	Jun-25-2019	Jun-25-2019
Days After First/Last Applic.	7 7	13 13	13 13	13 13	27 27	27 27
Trt-Eval Interval	7 DA-A	13 DA-A	13 DA-A	13 DA-A	27 DA-A	27 DA-A
Days After Emergence	33 DE-1	39 DE-1	39 DE-1	39 DE-1	53 DE-1	53 DE-1
Number of Decimals	0	0	0	0	0	0

Trt Treatment	Rate	Other	Other	Appl								
No. Name	Rate	Unit	Rate	Rate	Unit	Code	1*	2*	3*	4*	5*	6*
8 BCP 1312	0.035 lb ai/a		1.35 oz/a			A	0 -	100 a	99 a	86 ab	100 a	99 -
8 Atrazine	0.5 lb ai/a		1 pt/a			A						
8 Tough	0.313 lb ai/a		8 oz/a			A						
8 HC MSO	0.5 % v/v		0.5 % v/v			A						
8 N Pak AMS	2.5 % v/v		2.5 % v/v			A						
LSD P=.05							2.1	12.9	10.3	7.9 - 10.4	17.9	10.9
Standard Deviation							1.4	8.7	7.0	5.5t	10.2	7.4
CV							299.56	9.56	7.5	7.92t	10.89	8.14
Levene's F							4.429	1.109	1.349	1.326	1.943	0.73
Levene's Prob(F)							0.003*	0.39	0.272	0.281	0.128	0.649
Skewness							2.9265*	-1.344*	-0.7965	0.4861	-2.2759*	-0.3368
Kurtosis							6.9987*	0.1534	-1.1326	4.109*	4.5653*	-1.3056
Replicate F							0.396	1.806	0.398	0.236	2.280	3.788
Replicate Prob(F)							0.7571	0.1821	0.7560	0.8706	0.1389	0.0257
Treatment F							1.755	9.880	3.822	2.934	3.331	2.449
Treatment Prob(F)							0.1503	0.0001	0.0079	0.0263	0.0264	0.0530

Pest Type	W Weed	W Weed	W Weed
Pest Code	AMBTR	CHEAL	AMBTR
Pest Name	Giant common lambsqu> Giant ragweed		
Crop Type, Code	C -	C -	C -
Crop Name			
Rating Date	Jun-25-2019	Jul-9-2019	Jul-9-2019
Part Rated	new em -		
Rating Type	CONTRO	CONTRO	CONTRO
Rating Unit	%	%	%
Number of Subsamples	1	1	1
Data Entry Date	Jun-25-2019	Jul-9-2019	Jul-9-2019
Days After First/Last Applic.	27 27	41 41	41 41
Trt-Eval Interval	27 DA-A	41 DA-A	41 DA-A
Days After Emergence	53 DE-1	67 DE-1	67 DE-1
Number of Decimals	0	0	0

Trt No.	Treatment Name	Rate	Other Rate	Other Unit	Appl Unit Code	7*	8*	9*
1	Atrazine	1.5 lb ai/a	3 pt/a		A	88 -	100 a	79 b
1	COC	1 % v/v	1 % v/v		A			
2	Atrazine	1.5 lb ai/a	3 pt/a		A	89 -	100 a	81 b
2	Tough	0.313 lb ai/a	8 oz/a		A			
2	COC	1 % v/v	1 % v/v		A			
2	N Pak AMS	2.5 % v/v	2.5 % v/v		A			
3	Liberty	0.585 lb ai/a	32 oz/a		A	76 -	78 c	78 b
3	N Pak AMS	2.5 % v/v	2.5 % v/v		A			
4	Liberty	0.585 lb ai/a	32 oz/a		A	83 -	91 b	86 ab
4	Tough	0.313 lb ai/a	8 oz/a		A			
4	N Pak AMS	2.5 % v/v	2.5 % v/v		A			
5	Callisto	0.094 lb ai/a	3 oz/a		A	95 -	100 a	96 ab
5	Atrazine	0.5 lb ai/a	1 pt/a		A			
5	COC	1 % v/v	1 % v/v		A			
5	N Pak AMS	2.5 % v/v	2.5 % v/v		A			
6	Callisto	0.094 lb ai/a	3 oz/a		A	93 -	100 a	100 a
6	Atrazine	0.5 lb ai/a	1 pt/a		A			
6	Tough	0.313 lb ai/a	8 oz/a		A			
6	COC	1 % v/v	1 % v/v		A			
6	N Pak AMS	2.5 % v/v	2.5 % v/v		A			
7	BCP 1312	0.035 lb ai/a	1.35 oz/a		A	84 -	100 a	89 ab
7	Atrazine	0.5 lb ai/a	1 pt/a		A			
7	HC MSO	0.5 % v/v	0.5 % v/v		A			
7	N Pak AMS	2.5 % v/v	2.5 % v/v		A			

Pest Type	W Weed	W Weed	W Weed
Pest Code	AMBTR	CHEAL	AMBTR
Pest Name	Giant common lambsqu> Giant ragweed		
Crop Type, Code	ragweed		
Crop Name	C -	C -	C -
Rating Date	Jun-25-2019	Jul-9-2019	Jul-9-2019
Part Rated	new em -		
Rating Type	CONTRO	CONTRO	CONTRO
Rating Unit	%	%	%
Number of Subsamples	1	1	1
Data Entry Date	Jun-25-2019	Jul-9-2019	Jul-9-2019
Days After First/Last Applic.	27 27	41 41	41 41
Trt-Eval Interval	27 DA-A	41 DA-A	41 DA-A
Days After Emergence	53 DE-1	67 DE-1	67 DE-1
Number of Decimals	0	0	0

Trt No.	Treatment Name	Rate	Other Rate	Other Rate	Appl Unit Code	7*	8*	9*
8	BCP 1312	0.035 lb ai/a	1.35 oz/a		A	86 -	100 a	91 ab
8	Atrazine	0.5 lb ai/a	1 pt/a		A			
8	Tough	0.313 lb ai/a	8 oz/a		A			
8	HC MSO	0.5 % v/v	0.5 % v/v		A			
8	N Pak AMS	2.5 % v/v	2.5 % v/v		A			

LSD P=.05	14.0	5.6	12.2
Standard Deviation	9.5	3.8	8.3
CV	10.96	3.96	9.51
Levene's F	0.246	49.00	0.962
Levene's Prob(F)	0.968	0.001*	0.48
Skewness	-0.4295	-1.8058*	-0.522
Kurtosis	-0.0323	1.5525	-0.6278
Replicate F	1.331	0.918	3.010
Replicate Prob(F)	0.2911	0.4493	0.0531
Treatment F	1.542	18.193	3.779
Treatment Prob(F)	0.2075	0.0001	0.0083

(19TOUGH)

The Ohio State University

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Weed Control in Corn with Tough

Trial ID: 19TOUGH      Location:  
Protocol ID: 19TOUGH      Investigator: Dr. Mark M. Loux  
Project ID:      Study Director:  
Sponsor Contact:

Trial Year: 2019

Pest Type

W, Weed, G-BYRW7, G-WedStg = Weed or volunteer crop

Pest Code

CHEAL, Chenopodium album, common lambsquarters = US

AMBTR, Ambrosia trifida, Giant ragweed = US

Crop Type Code

C, G-ByrC7 = EPPO species (Bayer) codes

ZEAMX, BCOR, Zea mays, Corn = US

Rating Type

PHYCHL = phytotoxicity - chlorosis

CONTRO = control / burndown or knockdown

Rating Unit

% = percent