

UW – Madison Weed Science Renz Lab

Bayer Alfalfa Injury

Dr. Mark Renz, Professor and Extension Weed Specialist

mrenz@wisc.edu – 357 Moore Hall, 1575 Linden Drive, Madison, WI, 53706

Leo Roth, Research Specialist

nlroth2@wisc.edu – 236 Moore Hall, 1575 Linden Drive, Madison, WI, 53706

Objective:

Evaluate if a new formulation of Warrant (MON 301668) has any phytotoxicity to established alfalfa when applied alone or tank-mixed with other common herbicides.

Summary:

The new formulation of Warrant (MON 301668) did display higher injury than the old formulation, but only in specific tank mixtures just prior to the first harvest (May 12th, 26 DAT). Mixing MON 301668 with Roundup PowerMax3 and Raptor resulted in higher injury to the alfalfa than the current Warrant formulation. However, mixing MON 301668 with select Max displayed reduced injury compared to the current Warrant formulation and Pursuit did not display a significant difference. While differences were detected when comparing tank mix partners with these different formulations the difference was never more than 1.5% and visual injury rating never exceeded 10% at any time in this study. Results suggest that injury potential from the new formulation, while low, can exceed the old formulation if tank mixed. The tank mix partner appears to be important in determining the level of injury. Future research should quantify if the injury results in differences in forage quantity or quality.



Notes

Herbicide Treatments		
Treatment Number	Treatment	Rate
1	Untreated Control	-
2	Warrant	48 fluid ounces per acre (fl oz/A)
3	MON 301668	30 fl oz/A
4	Warrant	64 fl oz/A
5	MON 301668	42 fl oz/A
6	Warrant Roundup PowerMax 3	64 fl oz/A 30 fl oz/A
7	MON 301668 Roundup PowerMax 3	42 fl oz/A 30 fl oz/A
8	Warrant Select Max	48 fl oz/A 16 fl oz/A
9	MON 301668 Select Max	30 fl oz/A 16 fl oz/A
10	Warrant Raptor	48 fl oz/A 6 fl oz/A
11	MON 301668 Raptor	30 fl oz/A 6 fl oz/A
12	Warrant Pursuit	48 fl oz/A 6 fl oz/A
13	MON 301668 Pursuit	30 fl oz/A 6 fl oz/A

Herbicide Application	
Date	April 16 th , 2021, 12:40pm-1:50pm
Equipment	CO ₂ pressurized 10-foot boom sprayer (20 GPA)
Nozzles & spacing	Eight TeeJet 11002VS nozzles with 15-inch spacing
Regulator PSI	38



Weather Data	
Weather Station	KWIARLIN2
Temperature	43.9°F - 45.1 °F
Wind Speed and Direction	11.7 mph NNW – 8.5 mph NW
Relative Humidity	72% - 70%
Cloud Cover	50%
When ≥ 0.25 inches of precipitation occurred after treatment	May 3 rd , 2021, 3:00pm – 0.58 inches

Research Plot Information	
Plot Dimensions	10 feet by 25 feet (250 ft ²)
Design	Randomized Complete Block, 3 blocks
Soil Type	Plano silt loam
Soil Characteristics	21% clay, 0.9% organic matter, 7.1 pH, 2-6% slope

Plants Present at Application – Developmental Stage		
Species	Average Height (in)	Phenological Stage
Alfalfa	5.4	vegetative
Dandelion (adult)	1.7	25% vegetative, 75% flowering
Dandelion (seedling)	0.39	vegetative
Barnyardgrass	8	vegetative

Index of Ratings and Results

Alfalfa Injury at End of Season.....	5
Pre-Application Data – April 16 th , 2021	6
6 DAT – April 22 nd , 2021	7
17 DAT – May 3 rd , 2021	8
26 DAT – May 12 th , 2021	9



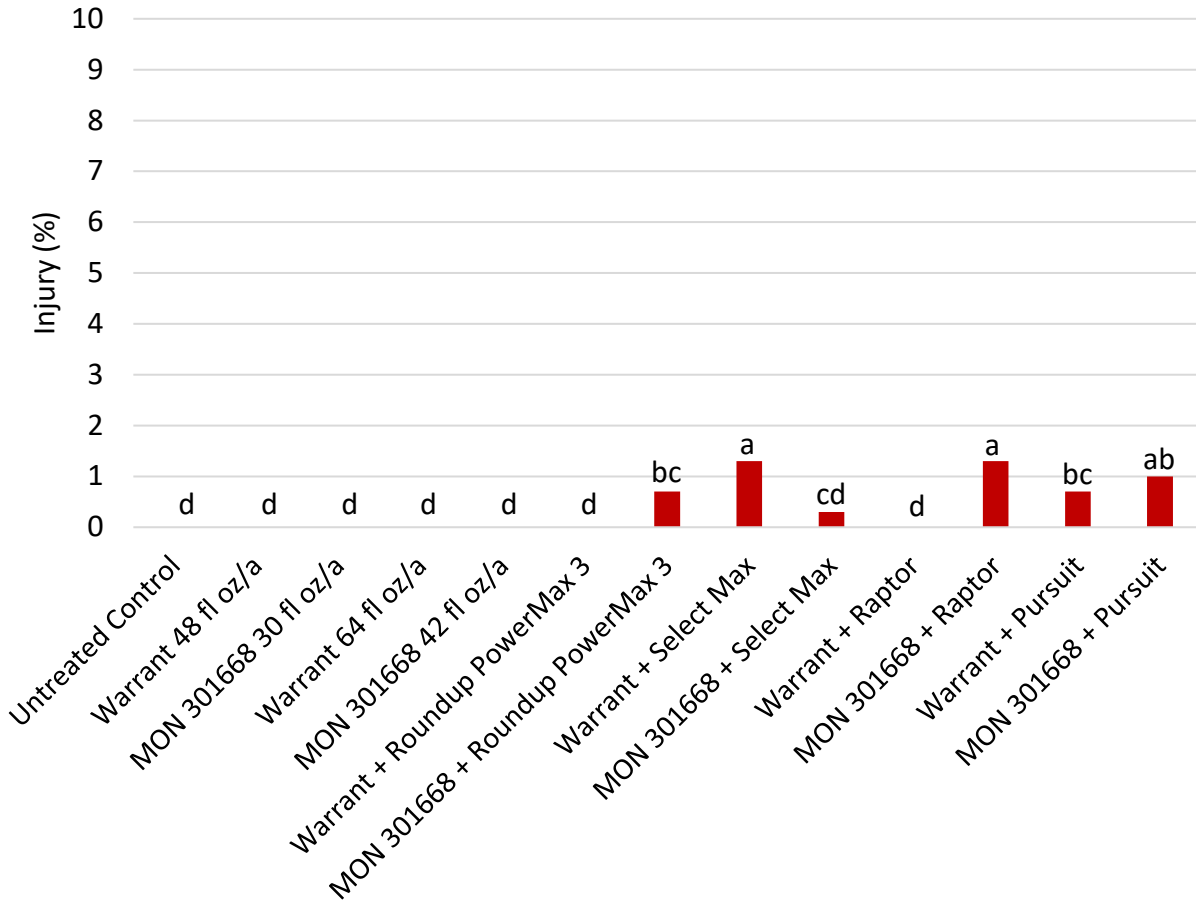
Untreated alfalfa.



Closeup of alfalfa injury at 26 DAT. Leaves chlorotic and cupping.



Alfalfa Injury at End of Season, 26 DAT - May 12th, 2021



Bars labeled with the same letter do not significantly differ (P=0.05, LSD)

Results:

Pre-Application Data – April 16th, 2021

Trt. No.	Treatment	Rate	Alfalfa Cover (%)	Other Broadleaf Weeds Cover (%)	Grass Cover (%)	Bareground / Litter Cover (%)
1	Untreated Control	-	93-	1.3-	0-	5-
2	Warrant	48 fluid ounces per acre (fl oz/A)	93-	0.3-	0-	6-
3	MON 301668	30 fl oz/A	93-	0.3-	0-	6-
4	Warrant	64 fl oz/A	95-	0.3	0-	5-
5	MON 301668	42 fl oz/A	95-	1.3-	0.3-	3-
6	Warrant Roundup PowerMax 3	64 fl oz/A 30 fl oz/A	93-	0.3-	0-	6-
7	MON 301668 Roundup PowerMax 3	42 fl oz/A 30 fl oz/A	92-	1.3-	0-	7-
8	Warrant Select Max	48 fl oz/A 16 fl oz/A	95-	0.7-	0-	4-
9	MON 301668 Select Max	30 fl oz/A 16 fl oz/A	93-	0.3-	0-	6-
10	Warrant Raptor	48 fl oz/A 6 fl oz/A	92-	0-	0-	8-
11	MON 301668 Raptor	30 fl oz/A 6 fl oz/A	93-	1-	0-	6-
12	Warrant Pursuit	48 fl oz/A 6 fl oz/A	93-	0.7-	0.3-	6-
13	MON 301668 Pursuit	30 fl oz/A 6 fl oz/A	95-	0-	0-	5-

Statistics¹

Least Significant Difference (LSD) P=.05	3.97	1.49	0.39	4.19
Standard Deviation	2.36	0.89	0.23	2.49
Coefficient of Variation (CV)	2.52	143.9	450.69	43.33
Treatment Prob(F)	0.7261	0.5512	0.577	0.6637

Note: Means followed by same letter or symbol do not significantly differ (P=.05, LSD).

¹ All statistical analyses were conducted in ARM software and assumptions of ANOVA were not evaluated.



6 DAT – April 22 nd , 2021			
Trt. No.	Treatment	Rate	Alfalfa Injury (%)
1	Untreated Control	-	1.3-
2	Warrant	48 fluid ounces per acre (fl oz/A)	1-
3	MON 301668	30 fl oz/A	1-
4	Warrant	64 fl oz/A	0.7-
5	MON 301668	42 fl oz/A	1-
6	Warrant Roundup PowerMax 3	64 fl oz/A 30 fl oz/A	1-
7	MON 301668 Roundup PowerMax 3	42 fl oz/A 30 fl oz/A	1.3-
8	Warrant Select Max	48 fl oz/A 16 fl oz/A	1-
9	MON 301668 Select Max	30 fl oz/A 16 fl oz/A	1-
10	Warrant Raptor	48 fl oz/A 6 fl oz/A	1-
11	MON 301668 Raptor	30 fl oz/A 6 fl oz/A	1-
12	Warrant Pursuit	48 fl oz/A 6 fl oz/A	1-
13	MON 301668 Pursuit	30 fl oz/A 6 fl oz/A	1.3-
Statistics			
Least Significant Difference (LSD) P=.05			0.52
Standard Deviation			0.31
Coefficient of Variation (CV)			29.5
Treatment Prob(F)			0.4271

Note: Means followed by same letter or symbol do not significantly differ (P=.05, LSD).



17 DAT – May 3 rd , 2021				
Trt. No.	Treatment	Rate	Alfalfa Leaf Cupping (%)	Alfalfa Leaf Chlorosis (%)
1	Untreated Control	-	1-	0.3 e
2	Warrant	48 fluid ounces per acre (fl oz/A)	2.3-	0.7 de
3	MON 301668	30 fl oz/A	0.7-	0.7 de
4	Warrant	64 fl oz/A	1.3-	1 de
5	MON 301668	42 fl oz/A	1.7-	1 de
6	Warrant Roundup PowerMax 3	64 fl oz/A 30 fl oz/A	1.3-	2.3 cde
7	MON 301668 Roundup PowerMax 3	42 fl oz/A 30 fl oz/A	1.3-	3.3 bcd
8	Warrant Select Max	48 fl oz/A 16 fl oz/A	1-	8 a
9	MON 301668 Select Max	30 fl oz/A 16 fl oz/A	1-	5 bc
10	Warrant Raptor	48 fl oz/A 6 fl oz/A	0.7-	2.7 cde
11	MON 301668 Raptor	30 fl oz/A 6 fl oz/A	1.3-	5 bc
12	Warrant Pursuit	48 fl oz/A 6 fl oz/A	1-	6 ab
13	MON 301668 Pursuit	30 fl oz/A 6 fl oz/A	1.3-	4.3 bc
Statistics				
LSD P=0.05			1.17	2.71
Standard Deviation			0.69	1.61
CV			56.34	51.8
Treatment Prob(F)			0.3377	0.0001

Note: Means followed by same letter or symbol do not significantly differ (P=.05, LSD).

26 DAT – May 12th, 2021

Trt. No.	Treatment	Rate	Alfalfa Injury (%)	Alfalfa Cover (%)	Other Broadleaf Weeds Cover (%)	Grass Cover (%)	Bareground/ Litter Cover (%)
1	Untreated Control	-	0 d	98 -	1.3 a	0 -	0.3 -
2	Warrant	48 fluid ounces per acre (fl oz/A)	0 d	99 -	0.3 bc	0.3 -	0.3 -
3	MON 301668	30 fl oz/A	0 d	99 -	0.7 abc	0 -	0 -
4	Warrant	64 fl oz/A	0 d	99 -	1 ab	0.3 -	0 -
5	MON 301668	42 fl oz/A	0 d	97 -	1.3 a	0.7 -	0.7 -
6	Warrant Roundup PowerMax 3	64 fl oz/A 30 fl oz/A	0 d	99 -	0 c	0 -	0.7 -
7	MON 301668 Roundup PowerMax 3	42 fl oz/A 30 fl oz/A	0.7 bc	98 -	0.3 bc	0 -	1.7 -
8	Warrant Select Max	48 fl oz/A 16 fl oz/A	1.3 a	98 -	1 ab	0 -	0.7 -
9	MON 301668 Select Max	30 fl oz/A 16 fl oz/A	0.3 cd	99 -	0.7 abc	0 -	0 -
10	Warrant Raptor	48 fl oz/A 6 fl oz/A	0 d	100 -	0 c	0 -	0 -
11	MON 301668 Raptor	30 fl oz/A 6 fl oz/A	1.3 a	99 -	0 c	0 -	0.3 -
12	Warrant Pursuit	48 fl oz/A 6 fl oz/A	0.7 bc	100 -	0 c	0 -	0 -
13	MON 301668 Pursuit	30 fl oz/A 6 fl oz/A	1 ab	99 -	0 c	0 -	0.7 -
Statistics							
LSD P=0.05			0.59	1.84	0.9	0.61	1.33
Standard Deviation			0.35	1.09	0.54	0.36	0.79
CV			85.81	1.11	104.34	354.88	192.54
Treatment Prob(F)			0.0001	0.1579	0.0143	0.4777	0.4159

Note: Means followed by same letter or symbol do not significantly differ (P=.05, LSD).