



**ACTIVE**<sup>TM</sup>  
AgriScience  
[activeagriscience.com](http://activeagriscience.com)

TECHNOLOGY  
PAST THE POINT  
OF NUTRITION<sup>TM</sup>

• 2020 •

**ARM U<sup>TM</sup>**

**ARM U<sup>TM</sup> ADVANCED**

**● INTELLIGENT NITROGEN STABILIZERS**



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### TECHNOLOGY PAST THE POINT OF NUTRITION<sup>™</sup>

Active AgriScience Inc. supports the farming community by providing innovative, effective, and economical products that increase yields. A leader in plant nutrient and bioactive compound research and technology, Active AgriScience uses rigorous scientific methods to develop and enhance products to improve farm production and profits.



## INTRODUCTION

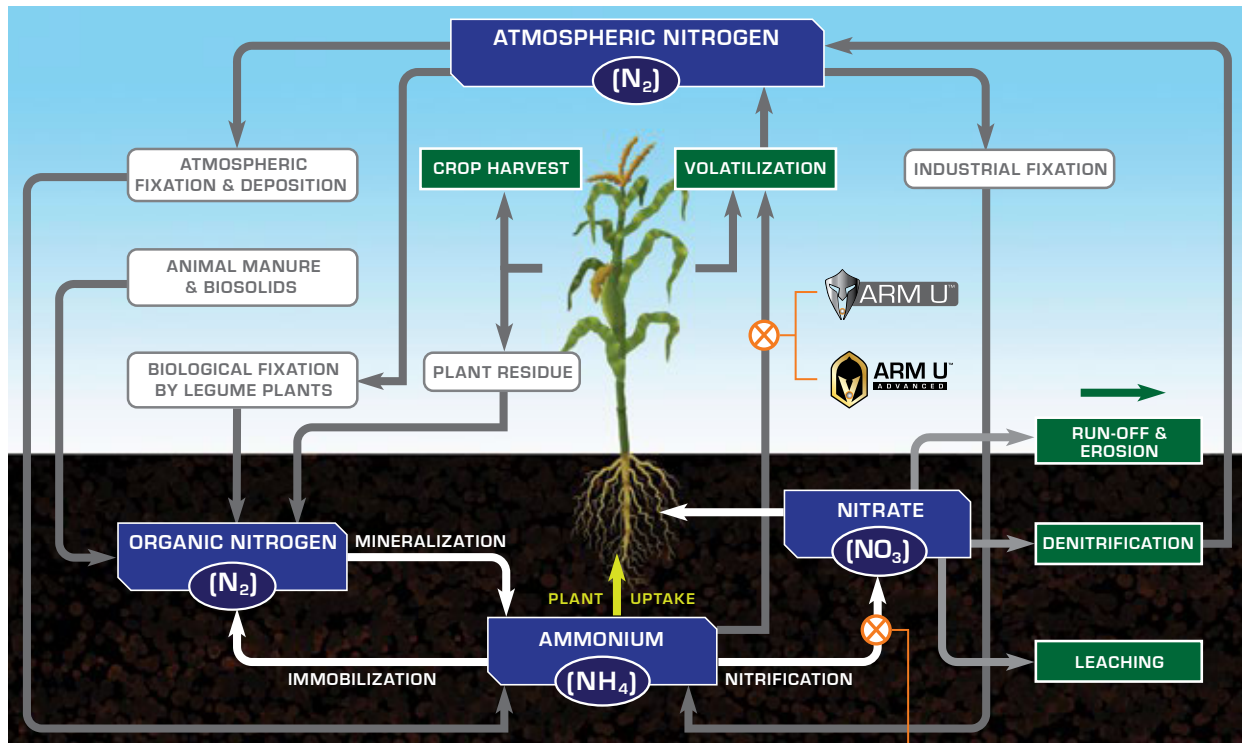
Nitrogen is essential for plant life and growth and is therefore a component of many fertilizers. Nitrogen loss is a challenge facing every grower when applying Urea or UAN in the spring or fall, regardless of the application method.

The risk of this nitrogen loss varies with:

- the type of Nitrogen
- soil type
- temperature
- management practices

**Without any protective coating up to 50% of soil-applied Nitrogen is unavailable to the plant.** It may be converted quickly to ammonia gas and then released into the atmosphere or lost in the soil due to nitrification; the process of converted ammonium ions to less stable nitrate ions. Both of these processes contribute significantly to the loss of valuable nitrogen.

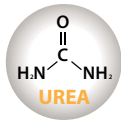
Understanding the Nitrogen cycle and the factors that can result in nitrogen loss is crucial to finding the right solution to this problem.



Volatilization and nitrification are two processes that are responsible for Nitrogen loss.

## VOLATILIZATION

Ammonia volatilization occurs during the hydrolysis of urea and is governed by the urease enzyme.



Coating urea with  
**ARM U™**  
or  
**ARM U™ ADVANCED**  
reduces ammonia volatilization  
by 95%  
by inhibiting urease  
enzyme activity.



## NITRIFICATION

Nitrate is formed by the oxidation of ammonium in the presence of Nitrosomonas & Nitrobacter bacteria.

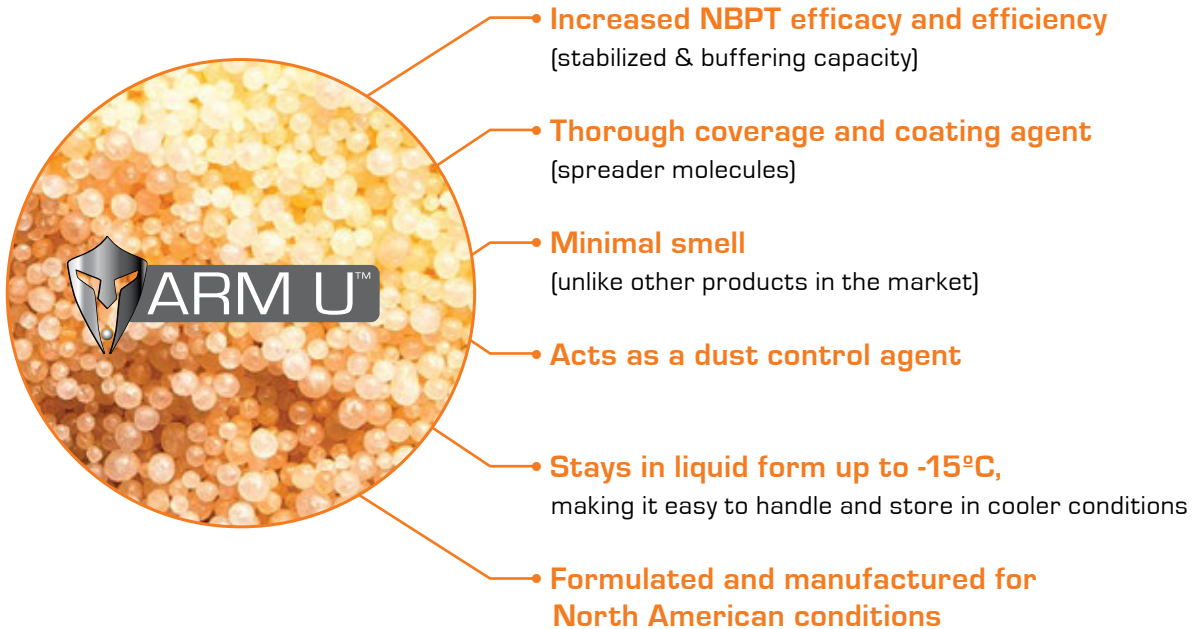


Coating urea with  
**ARM U™ ADVANCED**  
inhibits nitrification  
by inhibiting  
Nitrosomonas and  
Nitrobacter bacterial  
activity.



## BENEFITS of ARM U™

The patented ARM U™ formula makes our products one of the most advanced Nitrogen management technologies on the market.



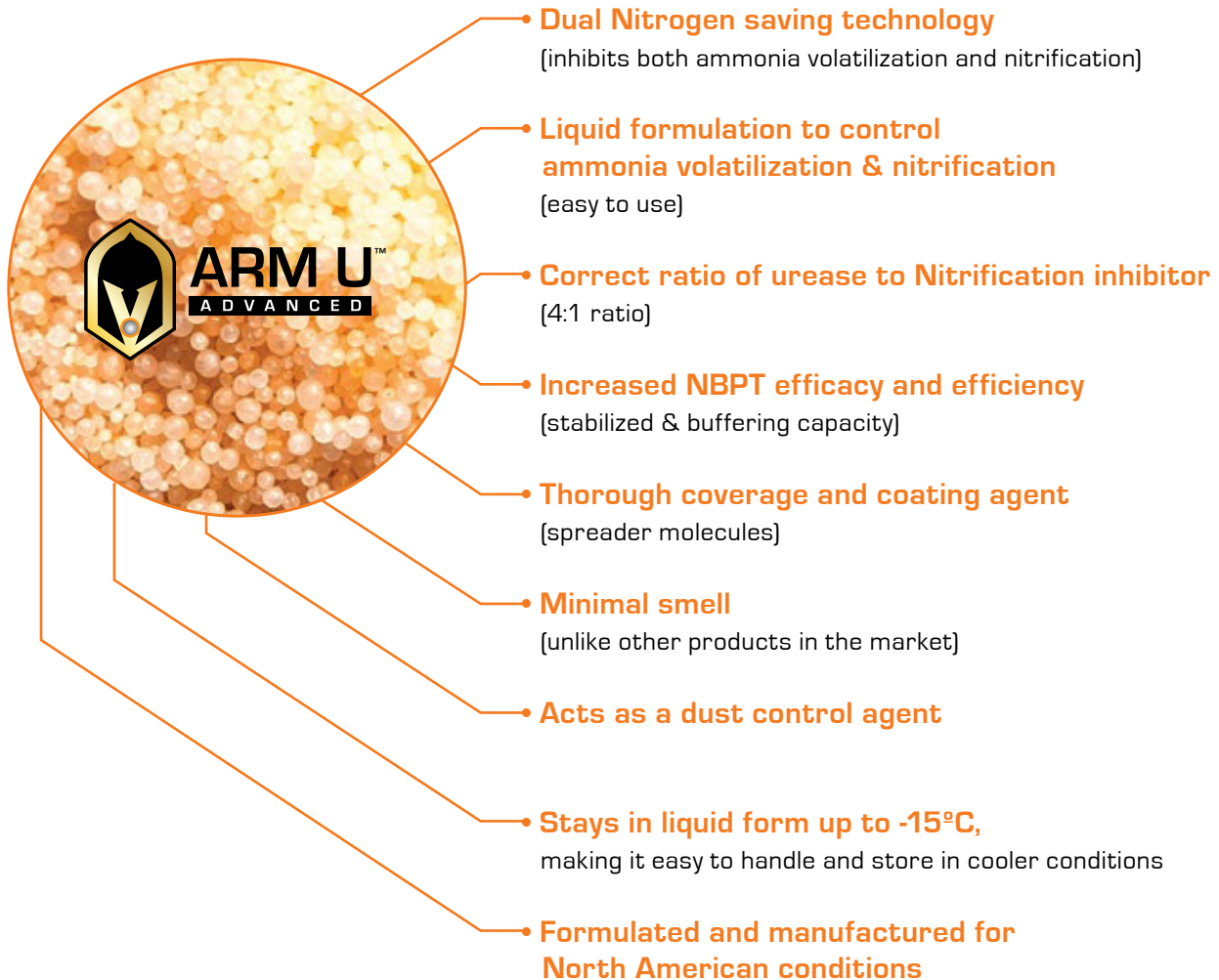
**Patent numbers:** USA: 9422203 B2; Canada: 2889430

**Active ingredient:** 18% N-(n-butyl) thiophosphoric triamide (NBPT), CAS No. 94317-64-3.

**Total inactive ingredients:** 82 % (preservative, colorant, spreading agents, surfactant).

## BENEFITS of ARM U™ ADVANCED

The patent pending ARM U™ ADVANCED formula makes our products one of the most advanced Nitrogen management technologies on the market.



**ARM U™ Advanced consists of two parts:** 1) Part A 2) Part B

**PART A - Active ingredients:** 30% NBPT (N-[n-butyl] thiophosphoric triamide), CAS No. 94317-64-3

**Total inactive Ingredients:** (70%) NMP (N-methyl-2-pyrrolidone), CAS No. 872-50-4, propylene glycol CAS No. 57-55-6, ethylene glycol CAS No. 107-21-1, emulsifier, preservative, dye.

**PART B - Active Ingredients:** 15% DMPP (3, 4-dimethylpyrazole phosphate), CAS No. 202842-98-6

**Total inactive ingredients:** (85%) NMP (N-methyl-2-pyrrolidone), CAS No. 872-50-4, propylene glycol CAS No. 57-55-6, emulsifier, preservative, dye.

## COMPARISON with COMPETITORS



ARM U™	Competitor
Patented technology	Off patent
pH balanced (6.3-6.8)-stable NBPT	High pH (>8)-unstable NBPT
No ammonia odor	Odor of ammonia
Better flowability and mixability	Caking urea
Better low temperature standability	—
Dust control ability	—



ARM U™ ADVANCED	Competitor
Patent pending	—
Liquid formulation	Powdered formulation
pH balanced (6.3-6.8)	High pH (>8)
No ammonia odor	Odor of ammonia
Better flowability and mixability	—
Better low temperature standability	—
Built in dust control ability	—
Lower application rates -1.5qt/mt	Higher application rate -15lbs/mt
Equally works on dry urea & urea solutions (UAN)	Only recommended for urea solutions





### ARM U™ BLENDING INSTRUCTIONS:

**Blending into UREA-AMMONIUM NITRATE (UAN) SOLUTIONS:** Use 1.2 L ARM U™/1000 kg UAN solution (1.5 qt ARM U™/250 gal UAN solution). Fill spray tank with half the desired amount of UAN, Measure the recommended quantity of Arm U™ and add to the tank. Mix well. Add other products at this stage, if needed. Add the second half of the UAN solution. Continue mixing until well blended.

**Blending into UREA:** Use 2 L ARM U™/1000 kg Urea (2 qt ARM U™/2000 lbs Urea). For uniform blending, use a blender with impregnation equipment. Weigh the urea and transfer to blender. Add the required amount of ARM U™ to the urea in the blender. Blend until the ARM U™ is uniformly mixed into the urea. Do not add any other fertilizer materials until ARM U™ is thoroughly distributed. If mixture appears wet or sticky, a drying agent may be added at this time.



### ARM U™ ADVANCED BLENDING INSTRUCTIONS:

**Preparation Instructions:** Use Part A & Part B in a 1: 0.5 ratio by volume. Premixing - Pour Part B into Part A. Mixing is not required; however, if mixing equipment is available, agitate mixture for 1-2 minutes. Use prepared mixture immediately – do not store. Treating System - Direct Part A and Part B toward the fertilizer in a 1: 0.5 ratio.

**Blending into UREA-AMMONIUM NITRATE (UAN) SOLUTIONS:** Use 1.1 L ARM U™ ADVANCED / 1000 kg UAN solution (1.4 qt ARM U™ ADVANCED / 250 gal UAN solution). Fill spray tank with half the desired amount of UAN, Measure the recommended quantity of Arm U™ ADVANCED and add to the tank. Mix well. Add other products at this stage, if needed. Add the second half of the UAN solution. Continue mixing until well blended.

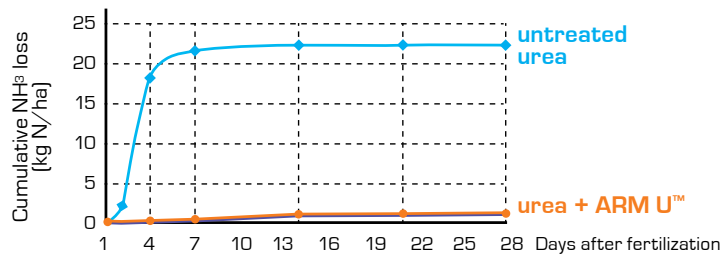
**Blending into UREA:** Use 1.8 L ARM U™ ADVANCED / 1000 kg Urea (1.8 qt ARM U™ ADVANCED / 2000 lbs Urea). For uniform blending, use a blender with impregnation equipment. Weigh the urea and transfer to blender. Add the required amount of ARM U™ ADVANCED to the urea in the blender. Blend until the ARM U™ ADVANCED is uniformly mixed into the urea. Do not add any other fertilizer materials until ARM U™ ADVANCED is thoroughly distributed. If mixture appears wet or sticky, a drying agent may be added at this time.

## 2017 VOLATILIZATION DATA

Cumulative Ammonia Volatilization (kg/ha) - UOM\*\*/UOW\*\*

Treatment	Day 1	Day 2	Day 4	Day 7	Day 14	Day 21	Day 28	% Control
Untreated Urea	0.11a	2.33a	18.46a	21.83a	22.53a	22.56a	22.57a	
Urea+ARM U™ - 2L/Mt	0.03b	0.07b	0.19b	0.35b	0.79b	0.93b	0.96b	96
Urea+ARM U™ - 3L/Mt	0.03b	0.06b	0.15b	0.26b	0.57b	0.69b	0.73b	97
Urea+Competitor 1 - 2L/Mt	0.03b	0.06b	0.17b	0.32b	0.74b	0.86b	0.88b	96
Urea+Competitor 2 - 2L/Mt	0.04b	0.09b	0.22b	0.42b	1.06	1.18b	1.21b	95

### Cumulative ammonia volatilization



Shelflife Study - 2017 Volatilization Data (UOM\*\*/UOW\*\*)\*

Arm U treated urea has minimum one year shelflife

Treatments	TRT	Day 2	Day 4	Day 7	Day 14	Day 21 (Total)	% reduction	kg of N saved/ha
ARM U™ UREA – April 2016	T1	0.6	1.4	2.0	3.8	4.3	87.3	28.8
ARM U™ UREA – October 2016	T2	1.7	2.6	4.1	8.5	9.0	73.2	24.2
ARM U™ UREA – January 2017	T3	0.8	1.4	2.1	5.5	6.3	81.1	26.8
ARM U™ UREA – Fresh (April 2017)	T4	0.5	1.1	1.8	8.5	8.7	73.9	24.4
UNTREATED UREA	T12	3.4	20.3	28.8	32.8	33.1		
ARM U™ UAN – October 2016	T5	2.7	3.6	5.2	8.0	8.6	73.3	23.2
ARM U™ UAN – January 2017	T6	2.3	3.8	5.8	8.7	9.4	70.6	22.4
ARM U™ UAN – Fresh (April 2017)	T7	3.0	5.5	6.9	10.5	11.9	62.6	19.8
UNTREATED UAN	T11	5.4	14.6	21.2	31.3	31.8		

\* Treated samples were preserved at UOM\*\*. Samples were analyzed April, 2017

\*\* UOM-University of Manitoba

\*\* UOW-University of Winnipeg

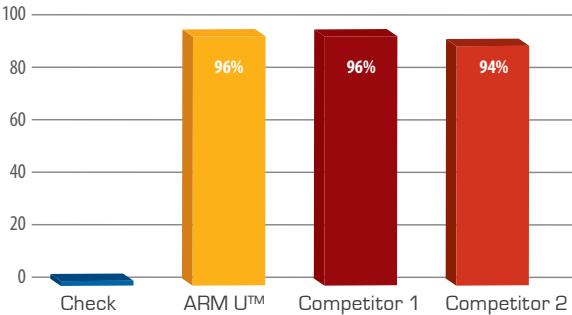
# AMMONIA VOLATILIZATION FROM UREA

treated with ARM U™ compared with two competitor products

3<sup>rd</sup> party Research conducted by University of Manitoba and University of Winnipeg

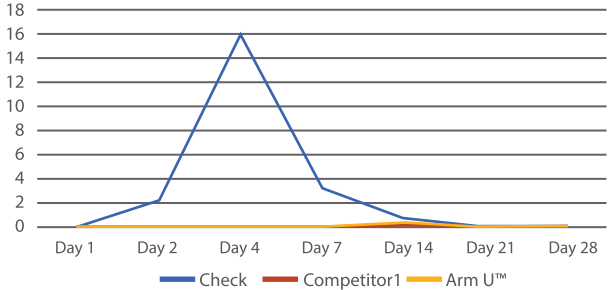


% Reduction of ammonia loss compared to untreated urea

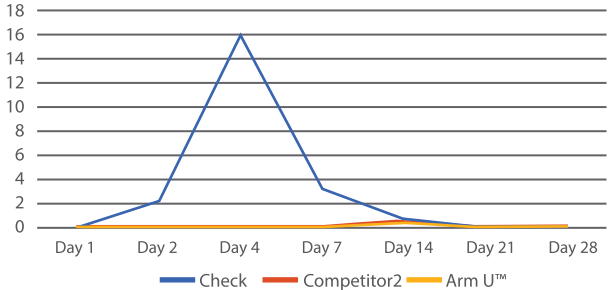


**ARM U™ saves 96% of Nitrogen loss as ammonia gas from urea.**

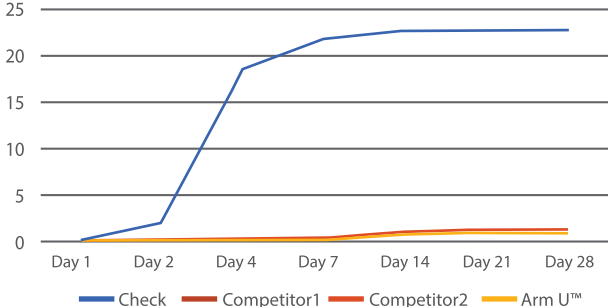
Daily ammonia volatilization loss - kg N/ha



Daily ammonia volatilization loss - kg N/ha

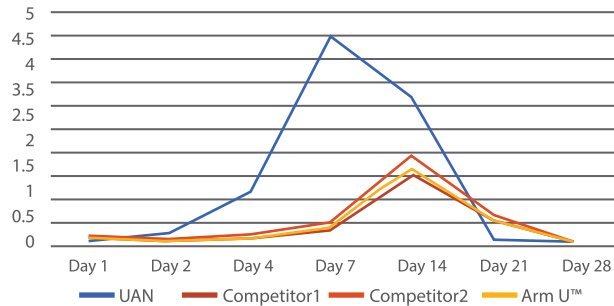


Cumulative ammonia volatilization loss - kg N/ha

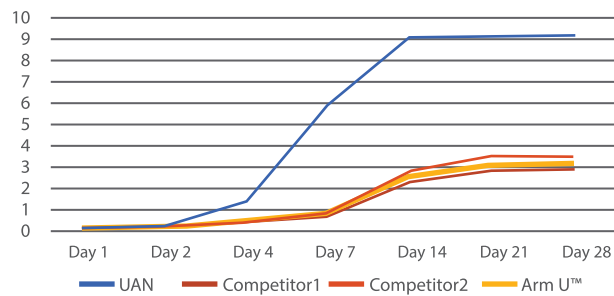


## AMMONIA VOLATILIZATION FROM UAN treated with ARM U™ compared with two competitor products

Daily ammonia volatilization loss - kg N/ha



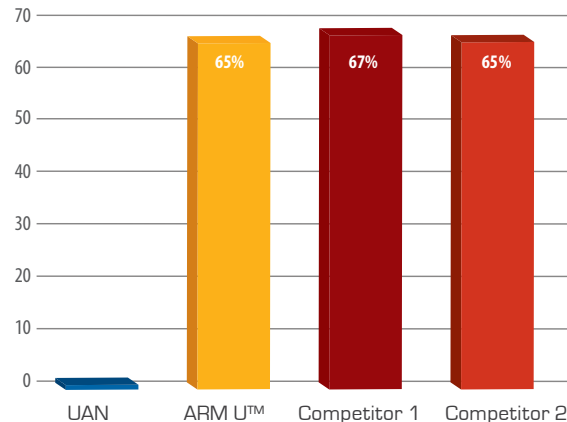
Cumulative ammonia volatilization loss - kg N/ha



Dositube chamber used with desitube



% Reduction of ammonia loss compared to untreated UAN



**ARM U™ saves 65% of Nitrogen loss as ammonia gas from UAN.**

RESEARCH SITES • SOIL PROPERTIES

Year	2016	2016	2017	2017
Soil source/location	Carman, MB	High bluff, MB	Carman, MB	Portage, MB
Soil type	Sandy loam	Loam	Sandy loam	Silty clay loam
Soil pH	5.8	7.7	6.7	7.9
Organic Matter [%]	3.9	4.7	3.2	7.1



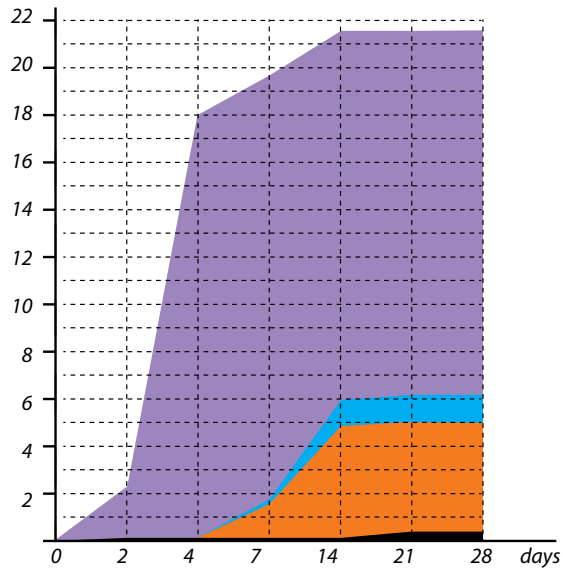


### VOLATILIZATION & YIELD DATA - ARM U™ (UOM\*/UOW\*\*)

Cumulative ammonia loss • Wheat • Carman, Manitoba [kg N/ha]

Treatment	Day 2	Day 4	Day 7	Day 14	Day 21	Day 28
Check	0.1	0.2	0.2	0.1	0.3	0.3
Urea+ARM U™	0.1	0.2	1.7	4.9	5.0	5.0
Urea+Competitor	0.1	0.2	1.8	6.0	6.1	6.1
Urea	2.2	18.0	19.8	21.6	21.6	21.6

Treatment	% reduction	kg of N saved/ha	kg of urea saved/ha	Yield (bu/acre)	% Yield Increase
Check				30.4	
Urea+ARM U™	78%	16.6	36	36.5	20.1
Urea+Competitor	73%	15.5	33.7	32.9	8.2
Urea				31.2	2.6



- Check
- Urea + ARM U™     **78% reduction • 20.1% yield increase**
- Urea + Competitor     **73% reduction • 8.2% yield increase**
- Urea

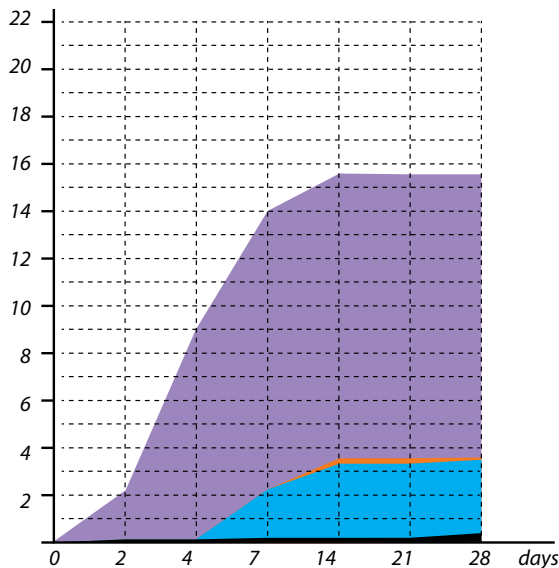


### VOLATILIZATION & YIELD DATA - ARM U™ (UOM\*/UOW\*\*)

Cumulative ammonia loss • Wheat • High Bluff, Manitoba (kg N/ha)

Treatment	Day 2	Day 4	Day 7	Day 14	Day 21	Day 28
Check	0.1	0.1	0.2	0.2	0.2	0.3
Urea+ARM U™	0.1	1.0	2.3	3.5	3.5	3.5
Urea+Competitor	0.1	1.0	2.3	3.3	3.3	3.4
Urea	2.1	9.0	14.0	15.5	15.5	15.5

Treatment	% reduction	kg of N saved/ha	kg of urea saved/ha	Yield (bu/acre)	% Yield Increase
Check				12.9	
Urea+ARM U™	79%	12.0	26.1	26.9	96.4
Urea+Competitor	79%	12.2	26.5	33.8	146.7
Urea				13.7	



- Check
- Urea + ARM U™     **79% reduction • 96.4% yield increase**
- Urea + Competitor     **79% reduction • 146.7% yield increase**
- Urea

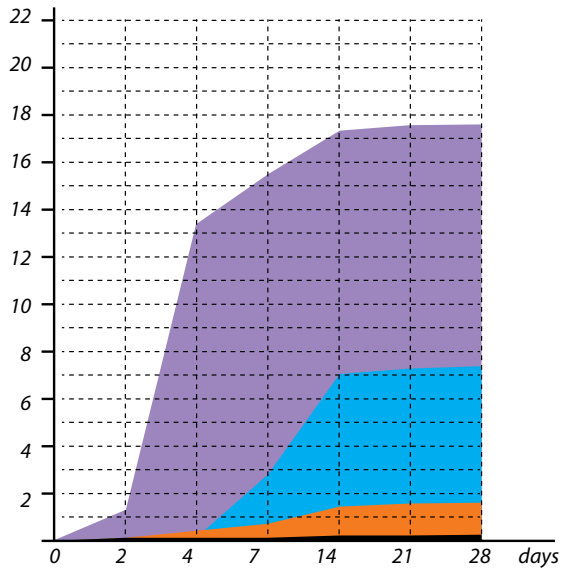
\* UOM-University of Manitoba; \*\* UOW-University of Winnipeg

### VOLATILIZATION & YIELD DATA - ARM U™ (UOM\*/UOW\*\*)

Cumulative ammonia loss • Canola • Carman, Manitoba [kg N/ha]

Treatment	Day 2	Day 4	Day 7	Day 14	Day 21	Day 28
Check	0.1	0.1	0.1	0.2	0.2	0.2
Urea+ARM U™	0.1	0.4	0.7	1.4	1.5	1.5
Urea+Competitor	0.1	0.2	2.9	7.0	7.2	7.3
Urea	1.3	13.4	15.4	16.7	16.8	16.8

Treatment	% reduction	kg of N saved/ha	kg of urea saved/ha	Yield (bu/acre)	% Yield Increase
Check					
Urea+ARM U™	92%	15.3	33.3	34.2	5.9
Urea+Competitor	58%	9.5	20.8	33.2	2.8
Urea				32.3	



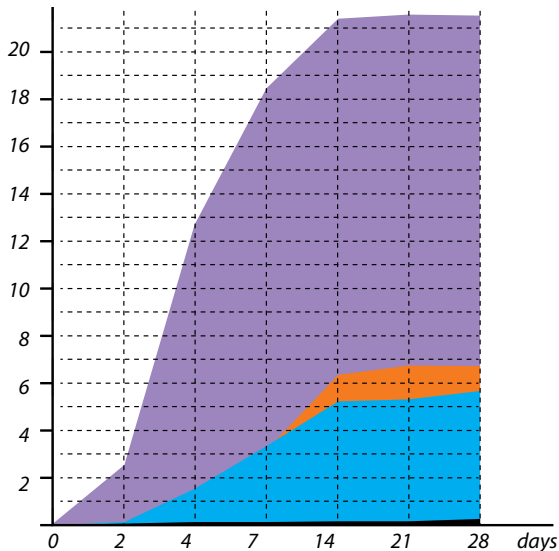
- Check
- Urea + ARM U™     **92% reduction • 5.9% yield increase**
- Urea + Competitor     **58% reduction • 2.8% yield increase**
- Urea

**VOLATILIZATION & YIELD DATA - ARM U™ (UOM\*/UOW\*\*)**

Cumulative ammonia loss • Canola • High Bluff, Manitoba (kg N/ha)

Treatment	Day 2	Day 4	Day 7	Day 14	Day 21	Day 28
Check	0.1	0.2	0.2	0.2	0.2	0.3
Urea+ARM U™	0.1	1.4	3.1	6.3	6.7	6.7
Urea+Competitor	0.1	1.6	3.1	5.1	5.2	5.7
Urea	2.6	12.9	18.5	21.3	21.6	21.6

Treatment	% reduction	kg of N saved/ha	kg of urea saved/ha	Yield (bu/acre)	% Yield Increase
Check					
Urea+ARM U™	70%	14.9	32.3	33.1	134.8
Urea+Competitor	75%	15.9	34.6	41.3	192.9
Urea				14.1	



- Check
- Urea + ARM U™      **70% reduction • 134.8% yield increase**
- Urea + Competitor    **75% reduction • 192.9% yield increase**
- Urea

\* UOM-University of Manitoba; \*\* UOW-University of Winnipeg

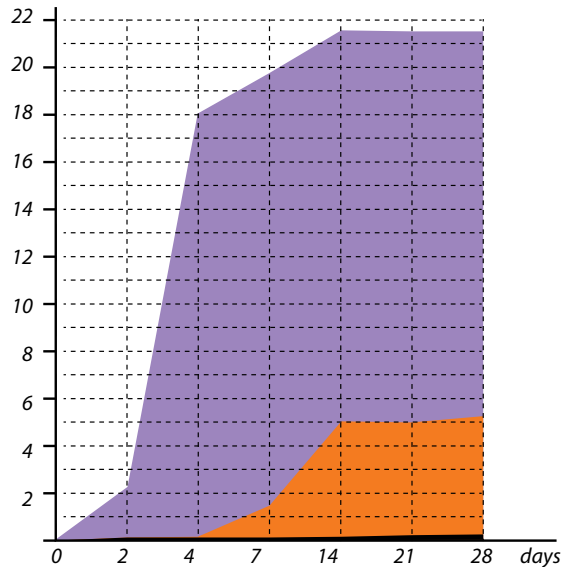


**VOLATILIZATION & YIELD DATA - ARM U™ ADVANCED (UOM\*/UOW\*\*)**

Cumulative ammonia loss • Wheat • Carman, Manitoba [kg N/ha]

Treatment	Day 2	Day 4	Day 7	Day 14	Day 21	Day 28
Check	0.1	0.2	0.2	0.2	0.3	0.3
Urea + ARM U™ ADVANCED	0.1	0.2	1.5	5.0	5.0	5.1
Urea	2.2	18.0	19.8	21.6	21.6	21.6

Treatment	% reduction	kg of N saved/ha	kg of urea saved/ha	Yield (bu/acre)	% Change
Check				30.4	
Urea + ARM U™ ADVANCED	78%	16.6	36	33.9	11.5
Urea				31.2	2.6



- Check
- Urea + ARM U™ Advanced **78% reduction • 11.5% yield increase**
- Urea **2.6% yield increase**



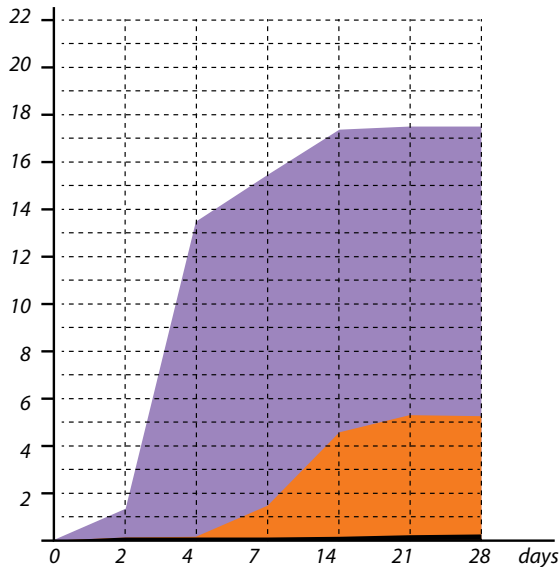


**VOLATILIZATION & YIELD DATA - ARM U™ ADVANCED (UOM\*/UOW\*\*)**

Cumulative ammonia loss • Canola • Carman, Manitoba (kg N/ha)

Treatment	Day 2	Day 4	Day 7	Day 14	Day 21	Day 28
Check	0.1	0.1	0.1	0.2	0.2	0.2
Urea+ ARM U™ ADVANCED	0.1	0.1	1.3	4.8	5.1	5.1
Urea	1.3	13.4	15.4	16.7	16.8	16.8

Treatment	% reduction	kg of N saved/ha	kg of urea saved/ha	Yield (bu/acre)	% Change
Check					
Urea + ARM U™ ADVANCED	71%	11.7	25.4	37.4	15.8
Urea				32.3	



- Check
- Urea + ARM U™ Advanced **71% reduction • 15.8% yield increase**
- Urea

\* UOM-University of Manitoba; \*\* UOW-University of Winnipeg

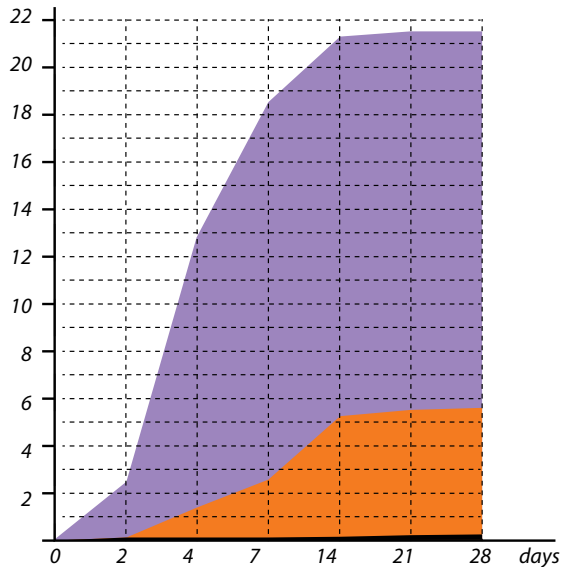


**VOLATILIZATION & YIELD DATA - ARM U™ ADVANCED (UOM\*/UOW\*\*)**

Cumulative ammonia loss • Canola • High Bluff, Manitoba (kg N/ha)

Treatment	Day 2	Day 4	Day 7	Day 14	Day 21	Day 28
Check	0.1	0.2	0.2	0.2	0.2	0.3
Urea + ARM U™ ADVANCED	0.1	1.4	2.7	5.2	5.4	5.5
Urea	2.6	12.9	18.5	21.3	21.6	21.6

Treatment	% reduction	kg of N saved/ha	kg of urea saved/ha	Yield (bu/acre)	% Change
Check					
Urea + ARM U™ ADVANCED	76%	16.1	35.0	39.3	178.7
Urea				14.1	

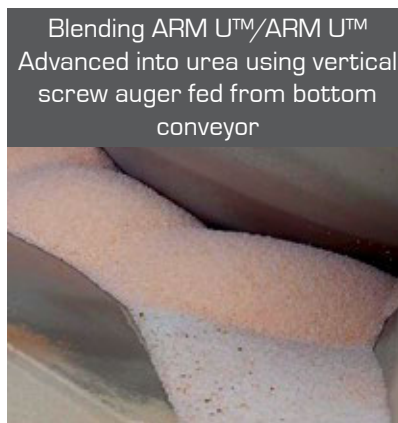


- Check
- Urea + ARM U™ Advanced **76% reduction • 178.7% yield increase**
- Urea



**APPLICATION RATE STUDY -  
ARM U™, ARM U™ ADVANCED (UOM\*/UOW\*\*)**

Treatment	Dry matter yield, g pot <sup>-1</sup>	N uptake, mg pot <sup>-1</sup>	P uptake, mg pot <sup>-1</sup>	NUE, %***
Urea+ ARM U™ (2L/1000kg)	5.6 a	60.1 abc	7.6 ab	38 abc
UAN+ ARM U™ (1L/1000kg)	5.6 a	65.1 a	8.2 a	44 a
Urea+ARM U™ ADVANCED (1L/1000kg)	5.1 a	54.6 cd	7.4 ab	32 cd
Urea+ARM U™ ADVANCED (1.5L/1000kg)	5.5. a	56.3 bed	7.6 ab	34 bcd
Urea+ARM U™ ADVANCED (2L/1000kg)	5.4 a	55.5 bcd	7.4 ab	33 bcd
UAN+ARM U™ ADVANCED (1L/1000kg)	5.4 a	62.5 ab	6.8 bc	41 ab
UAN+ARM U™ ADVANCED (2L/1000kg)	5.3 a	65.6 a	8.0 ab	45 a
Untreated urea	4.8 a	50.8 d	7.8 ab	27 d
Untreated UAN	5.3 a	57.6 bcd	8.7 a	35 bcd
No N fertilizer	3.1 b	27.9 e	5.9 c	—



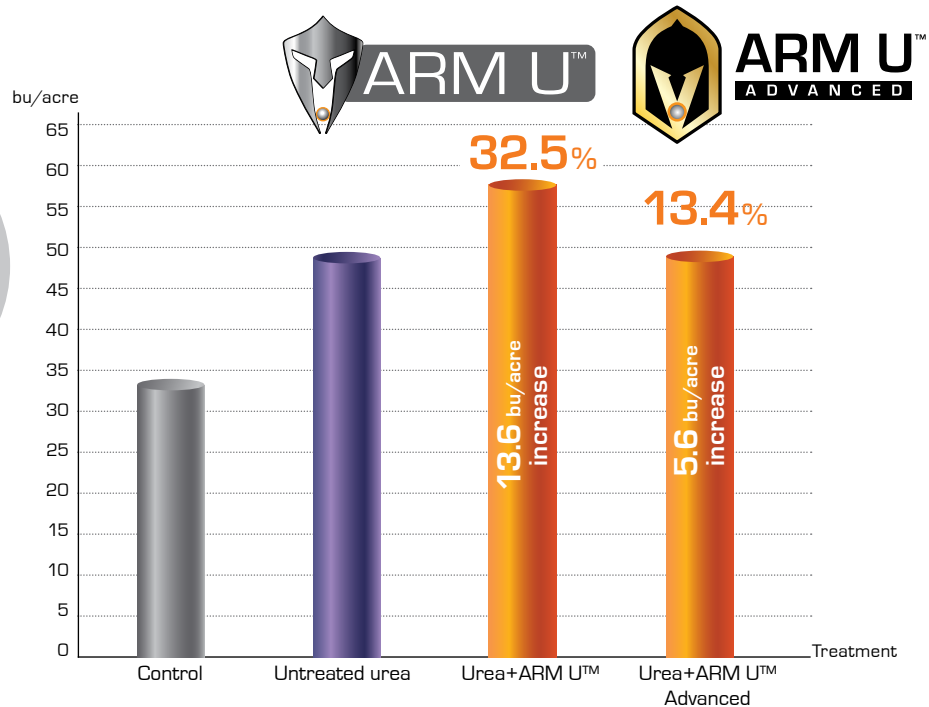
**Based on this research application rate for ARM U™ is 2L/MT of urea and ARM U™ ADVANCED is 1.5L/MT of urea.**

\* UOM-University of Manitoba; \*\* UOW-University of Winnipeg; \*\*\*Nitrogen Use Efficiency

## WHEAT • CARMAN MANITOBA Fall applied UREA + ARM U™ and UREA + ARM U™ ADVANCED

Cumulative ammonia volatilization loss

Cumulative ammonia volatilization loss (kg N/ha)	Day 0-7	Day 14-21	Total	% reduction	Yield (bu/acre)	% change
Control (without urea and UAN)	0.4	0.1	0.5		33.3	
Untreated urea @ 100 kg N/ha	7.9	8.8	16.7		41.9	
Urea coated with ARM U™ (2 L/1000 kg rate) @ 100 kg N/ha	0.3	4.7	5.0	70.0	55.5	32.5
Urea coated with ARM U™ Advanced (1.5 L/1000 kg rate) @ 100 kg N/ha	0.3	3.9	4.2	75.0	47.5	13.4
Urea + Commercial Product (2 L/1000 kg rate) @ 100 kg N/ha	0.5	8.0	8.5	49.0	52.6	25.5

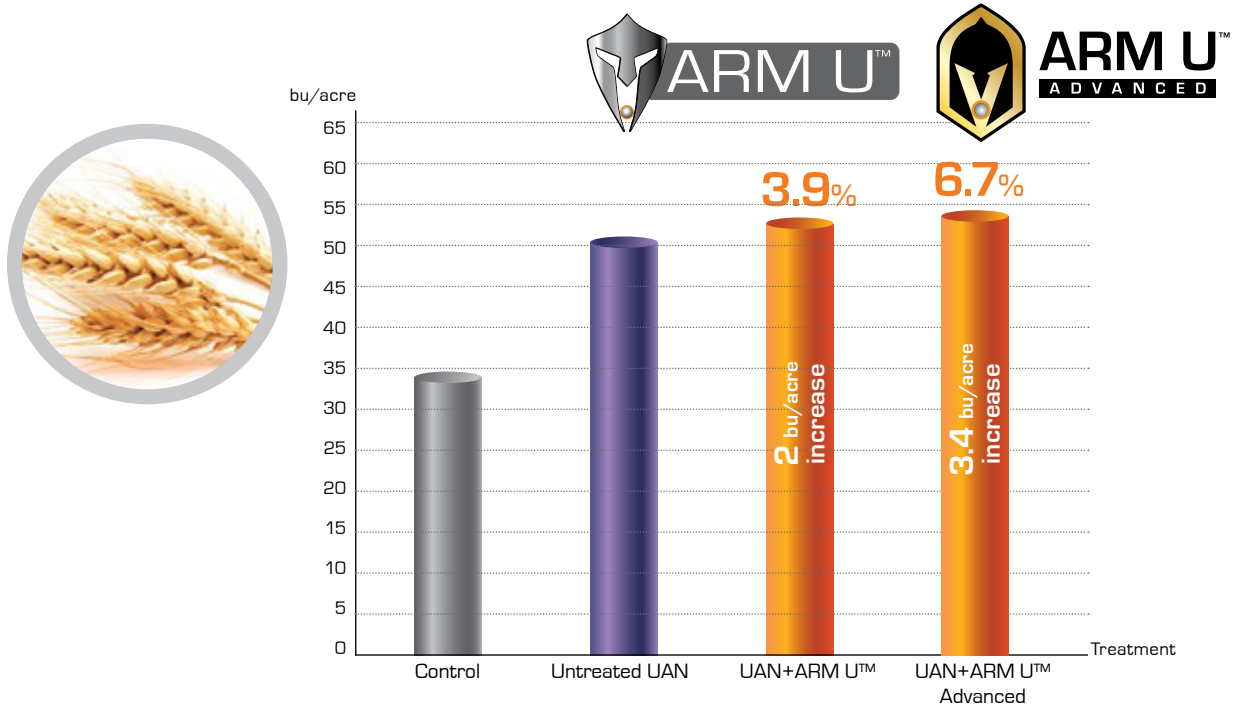


## WHEAT • CARMAN MANITOBA

### Fall applied UAN + ARM U™ and UAN+ ARM U™ ADVANCED

Cumulative ammonia volatilization loss

Cumulative ammonia volatilization loss (kg N/ha)	Day 0-7	Day 14-21	Total	% reduction	Yield (bu/acre)	% change
Control (without urea and UAN)	0.4	0.1	0.5		34.0	
Untreated UAN @ 100 kg N/ha	0.7	6.1	6.8		51.2	
UAN mixed with ARM U™ (1.5 L/1000 L rate) @ 100 kg N/ha	0.5	1.8	2.4	62.0	53.2	3.9
UAN mixed with ARM U™ Advanced (1.5 L/1000 L rate) @ 100 kg N/ha	0.4	1.3	1.7	75.0	54.4	6.7
UAN + Commercial Product (1.5 L/1000 L rate) @ 100 kg N/ha	0.4	1.5	1.9	72.0	52.0	1.6



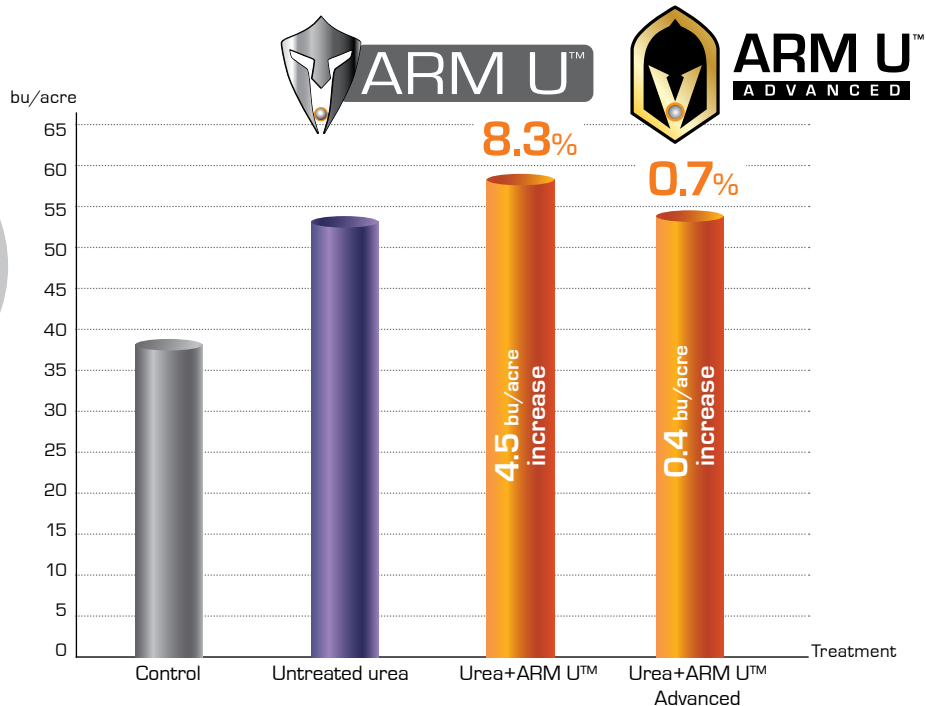


## CANOLA • CARMAN MANITOBA

### Fall applied UREA + ARM U™ and UREA + ARM U™ ADVANCED

Cumulative ammonia volatilization loss

Cumulative ammonia volatilization loss (kg N/ha)	Day 0-7	Day 14-21	Total	% reduction	Yield (bu/acre)	% change
Control (without urea and UAN)	0.2	0	0.2		38.9	
Untreated urea @ 100 kg N/ha	10.8	6.7	17.5		53.9	
Urea coated with ARM U™ (2 L/1000 kg rate) @ 100 kg N/ha	0.2	3.2	3.4	81.0	58.4	8.3
Urea coated with ARM U™ Advanced (1.5 L/1000 kg rate) @ 100 kg N/ha	0.4	4.4	4.8	73.0	54.3	0.7
Urea + Commercial Product (2 L/1000 kg rate) @ 100 kg N/ha	0.3	4.3	4.6	73.0	56.6	5.0

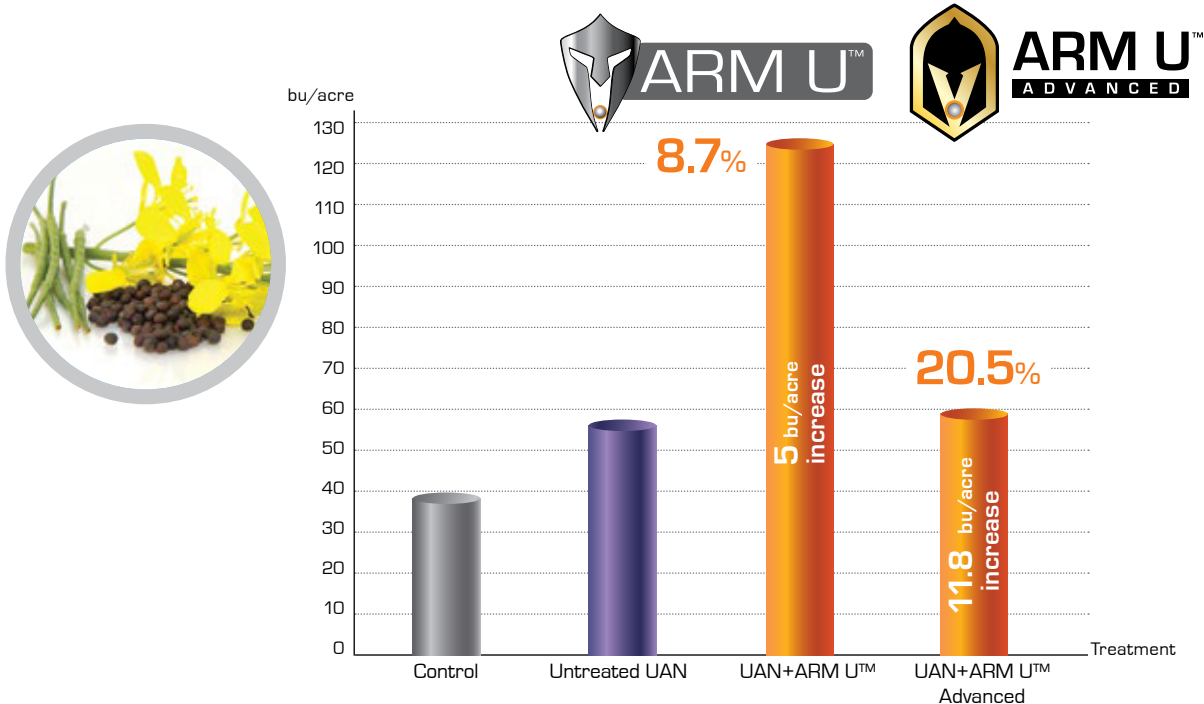


## CANOLA • CARMAN MANITOBA

### Fall applied UAN + ARM U™ and UAN + ARM U™ ADVANCED

Cumulative ammonia volatilization loss

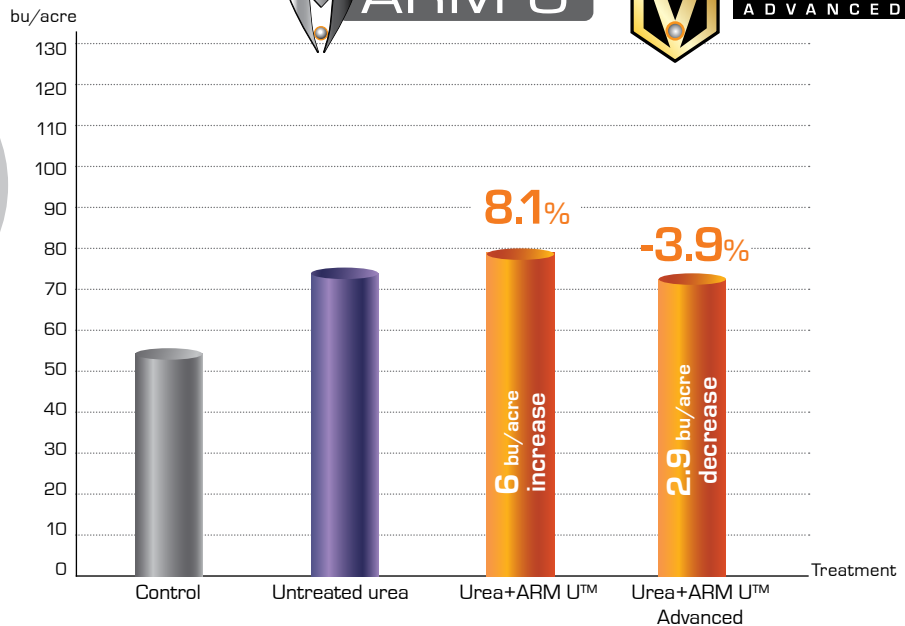
Cumulative ammonia volatilization loss (kg N/ha)	Day 0-7	Day 14-21	Total	% reduction	Yield (bu/acre)	% change
Control (without urea and UAN)	0.2	0	0.2		38.9	
Untreated urea @ 100 kg N/ha	0.5	1.3	1.8		57.6	
UAN mixed with ARM U™ (1.5 L/1000 L rate) @ 100 kg N/ha	0.4	1.3	1.4	22.0	62.6	8.7
UAN mixed with ARM U™ Advanced (1.5 L/1000 L rate) @ 100 kg N/ha	0.4	1.1	1.1	56.0	69.4	20.5
UAN + Commercial Product (1.5 L/1000 L rate) @ 100 kg N/ha	0.2	0.8	1.0	47.0	58.4	1.4



## WHEAT • PORTAGE MANITOBA Fall applied UREA + ARM U™ and UREA + ARM U™ ADVANCED

Cumulative ammonia volatilization loss

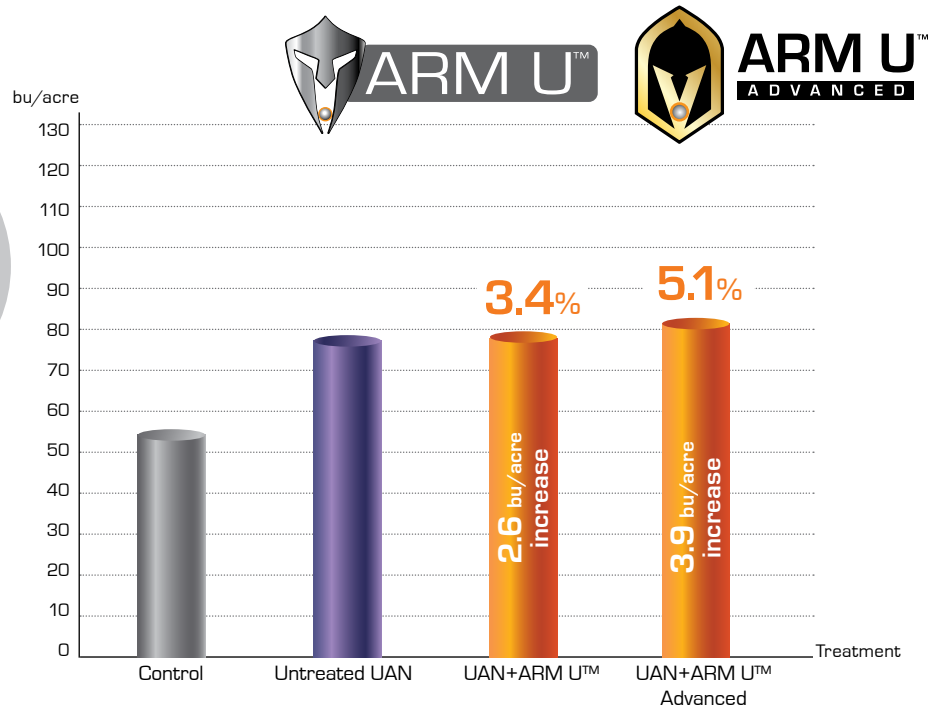
Cumulative ammonia volatilization loss (kg N/ha)	Day 0-7	Day 14-21	Total	% reduction	Yield (bu/acre)	% change
Control (without urea and UAN)	0.4	0.1	0.5		53.4	
Untreated urea @ 100 kg N/ha	8.0	4.1	12.1		73.9	
Urea coated with ARM U™ (2 L/1000 kg rate) @ 100 kg N/ha	1.0	2.2	3.2	74.0	79.9	8.1
Urea coated with ARM U™ Advanced (1.5 L/1000 kg rate) @ 100 kg N/ha	1.1	2.1	3.2	73.0	71.0	-3.9
Urea + Commercial Product (2 L/1000 kg rate) @ 100 kg N/ha	1.0	4.3	5.3	56.0	65.7	-11.1



## WHEAT • PORTAGE MANITOBA Fall applied UAN + ARM U™ and UAN + ARM U™ ADVANCED

Cumulative ammonia volatilization loss

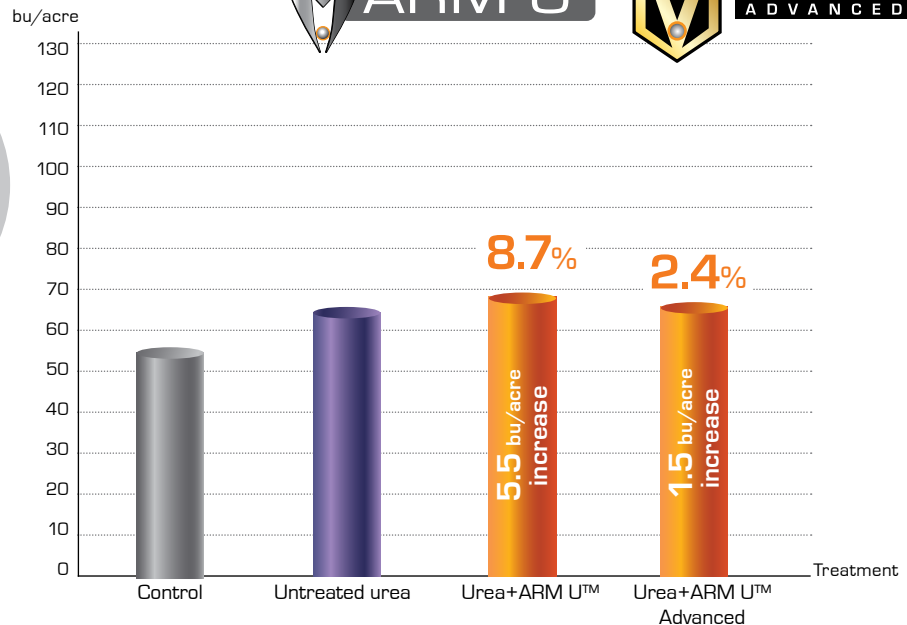
Cumulative ammonia volatilization loss (kg N/ha)	Day 0-7	Day 14-21	Total	% reduction	Yield (bu/acre)	% change
Control (without urea and UAN)	0.4	0.1	0.5		53.4	
Untreated urea @ 100 kg N/ha	7.3	3.0	10.3		76.9	
UAN mixed with ARM U™ (1.5 L/1000 L rate) @ 100 kg N/ha	2.2	3.3	5.5	46.0	79.5	3.4
UAN mixed with ARM U™ Advanced (1.5 L/1000 L rate) @ 100 kg N/ha	1.9	3.2	5.1	51.0	80.8	5.1
UAN + Commercial Product (1.5 L/1000 L rate) @ 100 kg N/ha	1.8	3.5	5.3	49.0	84.3	9.6



## CANOLA • PORTAGE MANITOBA Fall applied UREA + ARM U™ and UREA + ARM U™ ADVANCED

Cumulative ammonia volatilization loss

Cumulative ammonia volatilization loss (kg N/ha)	Day 0-7	Day 14-21	Total	% reduction	Yield (bu/acre)	% change
Control (without urea and UAN)	0.3	0.5	0.8		50.4	
Untreated urea @ 100 kg N/ha	6.8	10.5	17.8		63.0	
Urea coated with ARM U™ (2 L/1000 kg rate) @ 100 kg N/ha	1.0	2.0	3.0	83.0	68.5	8.7
Urea coated with ARM U™ Advanced (1.5 L/1000 kg rate) @ 100 kg N/ha	1.6	3.2	4.8	72.0	64.5	2.4
Urea + Commercial Product (2 L/1000 kg rate) @ 100 kg N/ha	1.3	1.7	3.0	83.0	66.4	5.4



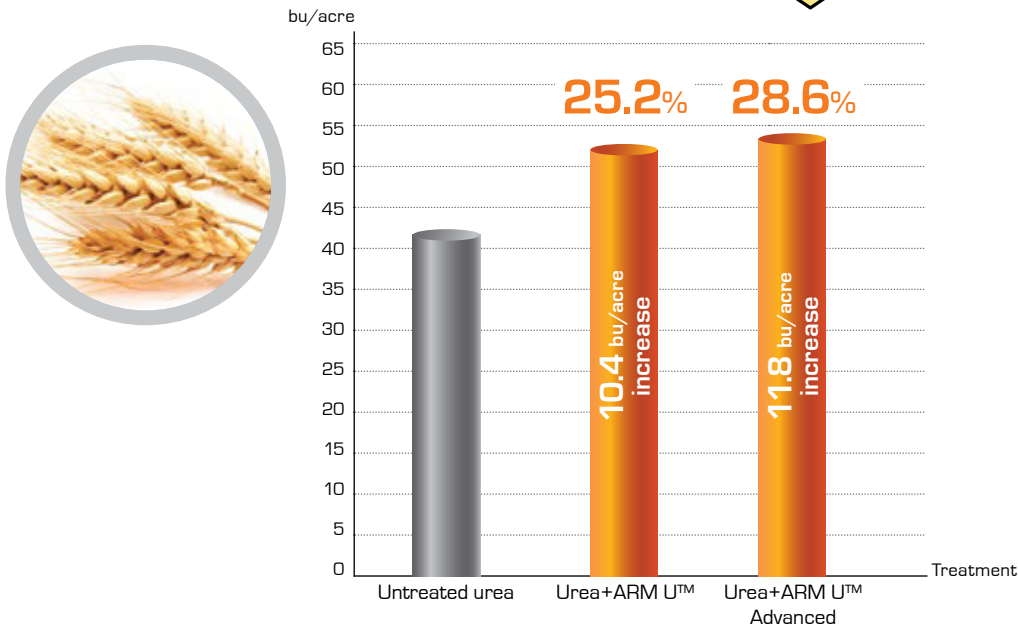


## WHEAT • CARMAN MANITOBA

### Spring applied UREA + ARM U™ and UREA + ARM U™ ADVANCED

Cumulative ammonia volatilization losses [% of applied N] and Yield

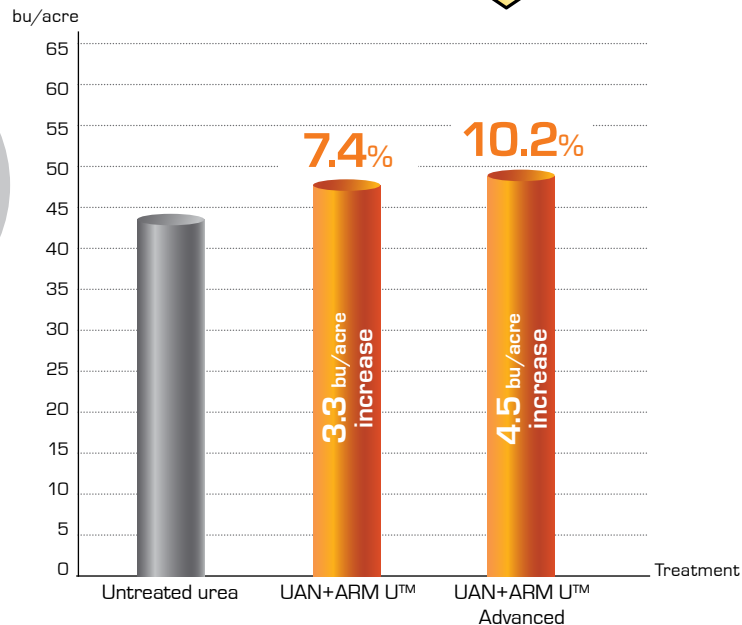
Treatment	Day 0-7	Day 14-28	Total	% reduction	Yield (bu/acre)	% change
Untreated urea @ 100 kg N/ha	17.5	1.4	18.9		41.3	
Urea coated with ARM U™ (2 L/1000 kg rate) @ 100 kg N/ha	0.4	5.4	5.8	69.0	51.7	25.2
Urea coated with ARM U™ Advanced (1.5 L/1000 kg rate) @ 100 kg N/ha	5.8	2.7	8.5	55.0	53.1	28.6



## WHEAT • CARMAN MANITOBA Spring applied UAN + ARM U™ and UAN + ARM U™ ADVANCED

Cumulative ammonia volatilization losses [% of applied N] and Yield

Treatment	Day 0-7	Day 14-28	Total	% reduction	Yield (bu/acre)	% change
Untreated UAN @ 75 kg N/ha	2.0	1.1	3.1		44.3	
UAN + ARM U™ (1.5 L/1000 L rate) @ 75 kg N/ha	0.4	0.9	1.3	58.0	47.6	7.4
UAN + ARM U™ Advanced (1.5 L/1000 L rate) @ 75 kg N/ha	0.9	1.0	1.9	38.0	48.8	10.2

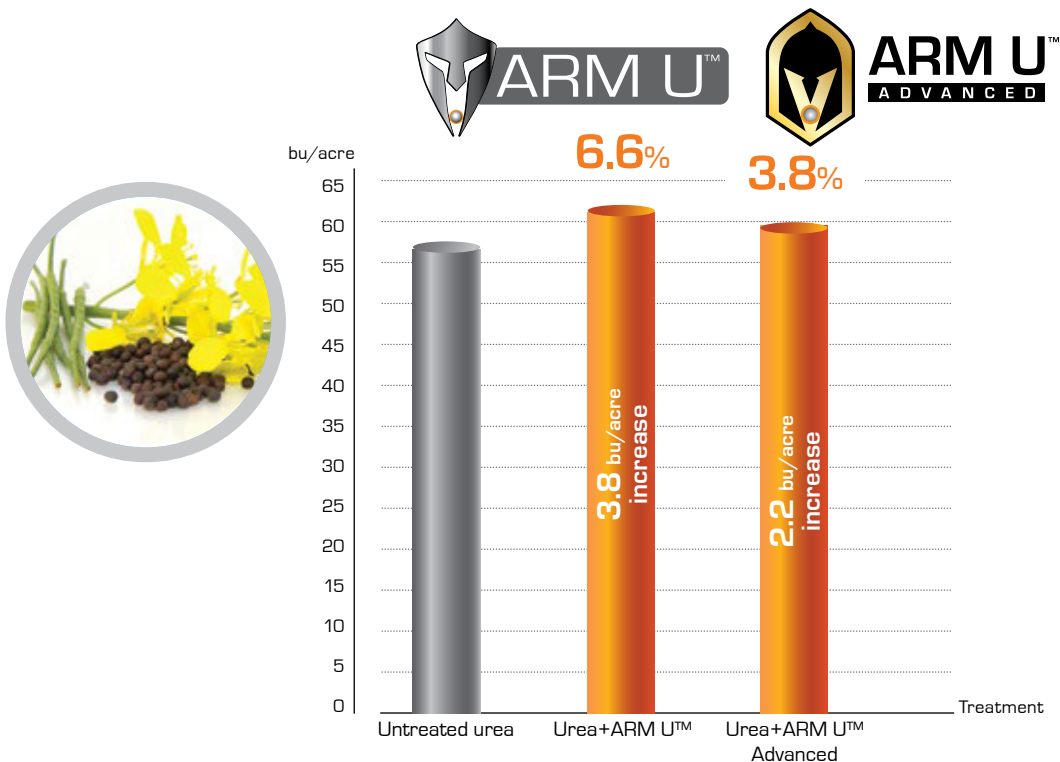


## CANOLA • CARMAN MANITOBA

### Spring applied UREA + ARM U™ and UREA + ARM U™ ADVANCED

Cumulative ammonia volatilization losses [% of applied N] and Yield

Treatment	Day 0-7	Day 14-28	Total	% reduction	Yield (bu/acre)	% change
Untreated urea @ 100 kg N/ha	21.9	1.0	23.3		57.2	
Urea + ARM U™ (2 L/1000 kg rate) @ 100 kg N/ha	1.5	4.9	6.4	73.0	61.0	6.6
Urea + ARM U™ Advanced (1.5 L/1000 L rate) @ 75 kg N/ha	5.3	1.9	7.2	46.0	59.4	3.8

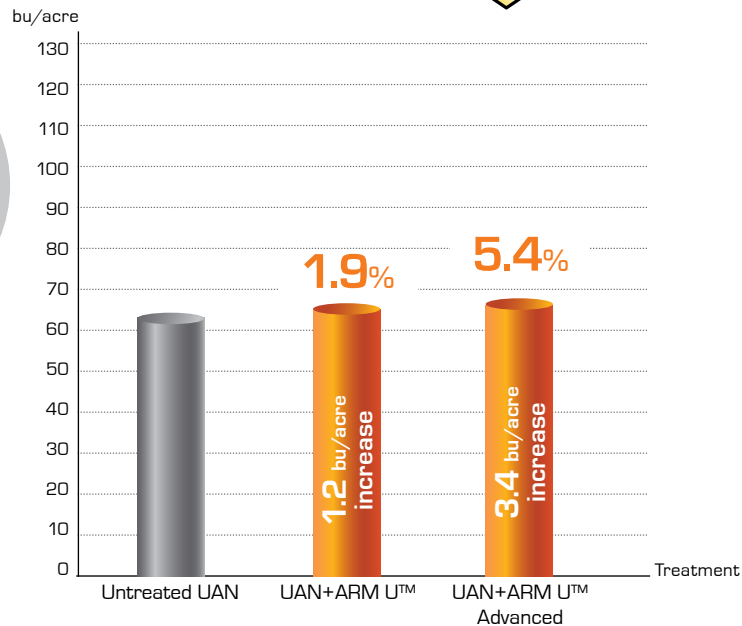


## CANOLA • CARMAN MANITOBA

### Spring applied UAN + ARM U™ and UAN + ARM U™ ADVANCED

Cumulative ammonia volatilization losses [% of applied N] and Yield

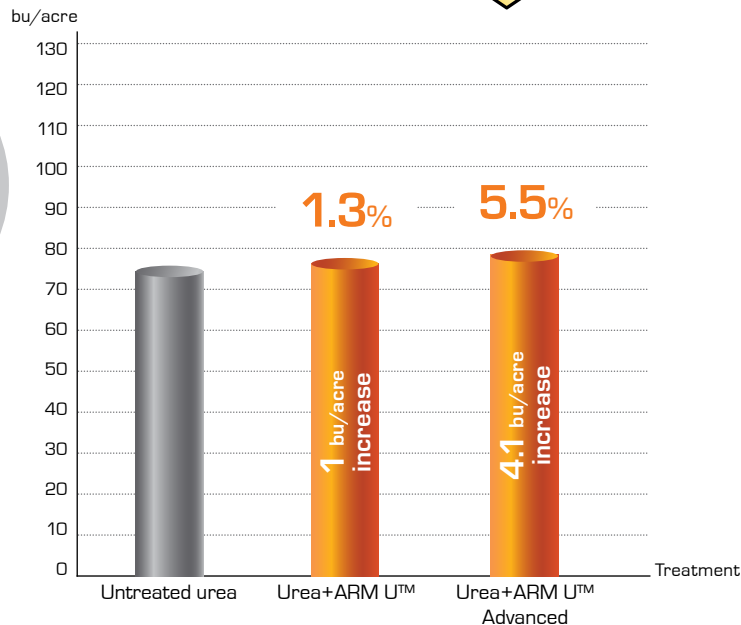
Treatment	Day 0-7	Day 14-28	Total	% reduction	Yield (bu/acre)	% change
Untreated UAN @ 75 kg N/ha	2.1	0.9	3.0		63.1	
UAN + ARM U™ [1.5 L/1000 L rate] @ 75 kg N/ha	0.5	4.6	5.1	-70.0	64.3	1.9
UAN + ARM U™ Advanced [1.5 L/1000 L rate] @ 75 kg N/ha	0.8	3.5	4.3	-43.3	66.5	5.4



## WHEAT • PORTAGE MANITOBA Spring applied UREA + ARM U™ and UREA + ARM U™ ADVANCED

Cumulative ammonia volatilization losses [% of applied N] and Yield

Treatment	Day 0-7	Day 14-28	Total	% reduction	Yield (bu/acre)	% change
Untreated urea @ 100 kg N/ha	10.2	10.2	20.4		74.7	
Urea coated with ARM U™ (2 L/1000 kg rate) @ 100 kg N/ha	0.9	6.7	7.6	63.0	75.7	1.3
Urea coated with ARM U™ Advanced (1.5 L/1000 kg rate) @ 75 kg N/ha	2.3	10.3	12.6	56.0	78.8	5.5

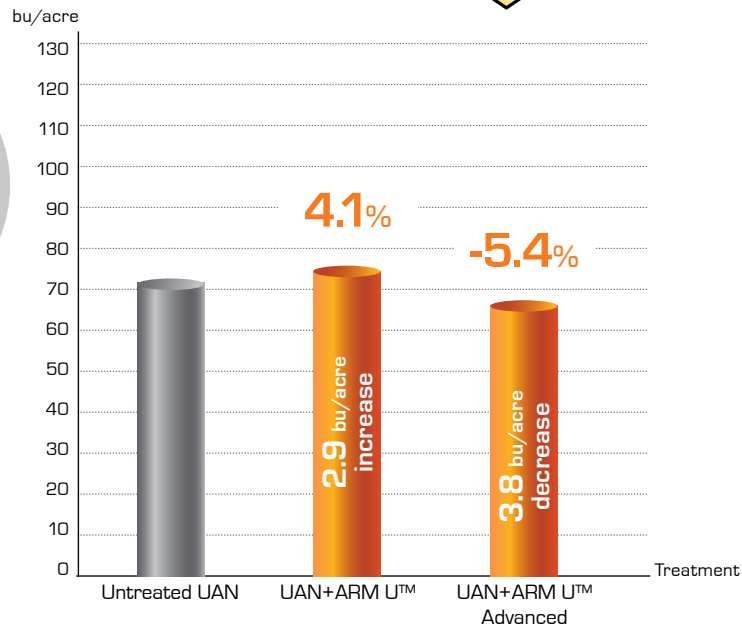




## WHEAT • PORTAGE MANITOBA Spring applied UAN + ARM U™ and UAN + ARM U™ ADVANCED

Cumulative ammonia volatilization losses [% of applied N] and Yield

Treatment	Day 0-7	Day 14-28	Total	% reduction	Yield (bu/acre)	% change
Untreated UAN @ 75 kg N/ha	5.4	8.5	13.9		70.2	
UAN + ARM U™ (1.5 L/1000 L rate) @ 75 kg N/ha	2.3	9.0	11.3	19.0	73.1	4.1
UAN + ARM U™ Advanced (1.5 L/1000 L rate) @ 75 kg N/ha	2.8	13.3	16.1	-16.0	66.4	-5.4

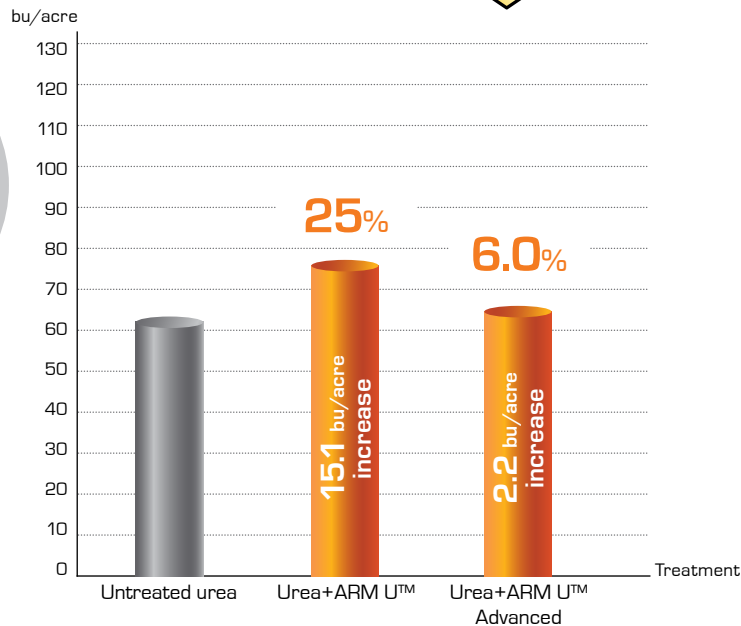


## CANOLA • PORTAGE MANITOBA

### Spring applied UREA + ARM U™ and UREA + ARM U™ ADVANCED

Cumulative ammonia volatilization losses [% of applied N] and Yield

Treatment	Day 0-7	Day 14-28	Total	% reduction	Yield (bu/acre)	% change
Untreated urea @ 100 kg N/ha	5.2	21.9	27.1		60.4	
Urea + ARM U™ (2 L/1000 kg rate) @ 100 kg N/ha	1.0	13.8	14.8	45.0	75.5	25.0
Urea + ARM U™ Advanced (1.5 L/1000 L rate) @ 75 kg N/ha	1.3	17.1	18.4	37.0	64.0	6.0

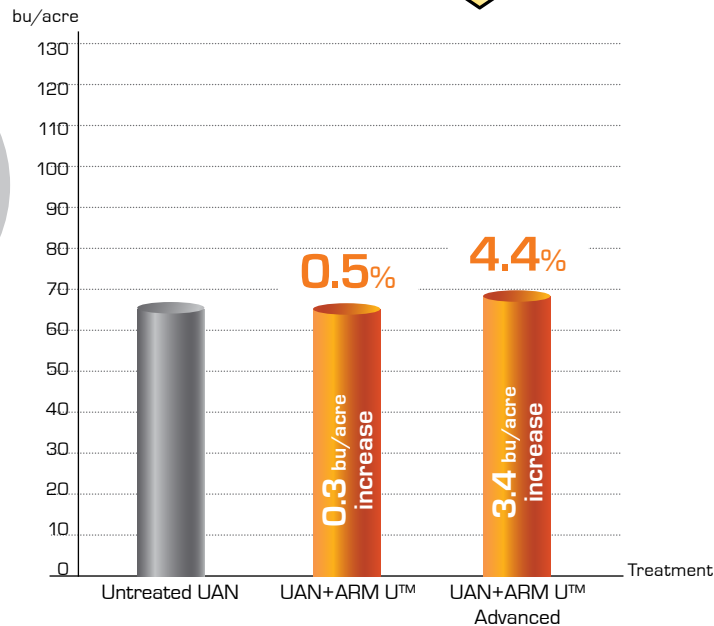


## CANOLA • PORTAGE MANITOBA

### Spring applied UAN + ARM U™ and UAN + ARM U™ ADVANCED

Cumulative ammonia volatilization losses [% of applied N] and Yield

Treatment	Day 0-7	Day 14-28	Total	% reduction	Yield (bu/acre)	% change
Untreated UAN @ 75 kg N/ha	3.0	10.8	13.8		65.9	
UAN + ARM U™ (1.5 L/1000 L rate) @ 75 kg N/ha	1.3	10.3	11.6	16.0	66.2	0.5
UAN + ARM U™ Advanced (1.5 L/1000 L rate) @ 75 kg N/ha	2.4	9.9	12.3	11.0	68.8	4.4

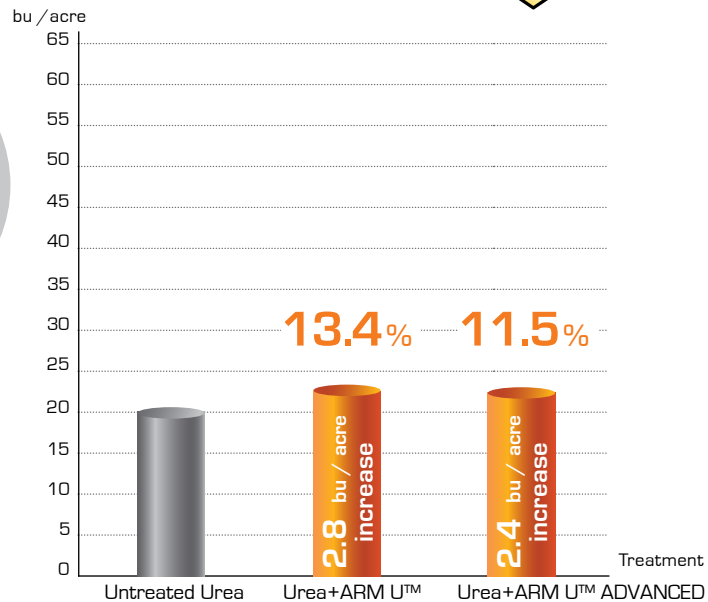


## CANOLA • CARMAN EAST MANITOBA

### Fall applied Urea + ARM U™ and Urea + ARM U™ ADVANCED

Cumulative ammonia volatilization losses [% of applied N] and Yield

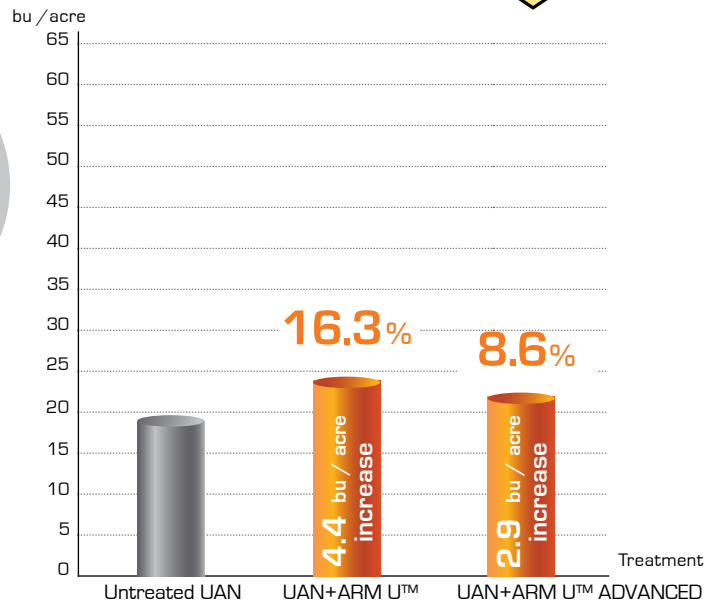
Treatment	Total NH3 loss (kg N/ha)	% reduction	Yield (bu/acre)	% change
Untreated Urea @ 75 kg N/ha	16.6		20.9	
Urea+ ARM U™ @ 75 kg N/ha	9.3	44	23.7	13.4
Urea + ARM U™ ADVANCED @ 75 kg N/ha	5.4	67	23.3	11.5



## CANOLA • CARMAN EAST MANITOBA Fall applied UAN+ ARM U™ and UAN + ARM U™ ADVANCED

Cumulative ammonia volatilization losses [% of applied N] and Yield

Treatment	Total NH3 loss (kg N/ha)	% reduction	Yield (bu/acre)	% change
Untreated UAN @ 75 kg N/ha	6.5		19.9	
UAN + ARM U™ @ 75 kg N/ha	1.2	81	24.3	16.3
UAN + ARM U™ ADVANCED @ 75 kg N/ha	3.2	51	22.7	8.6

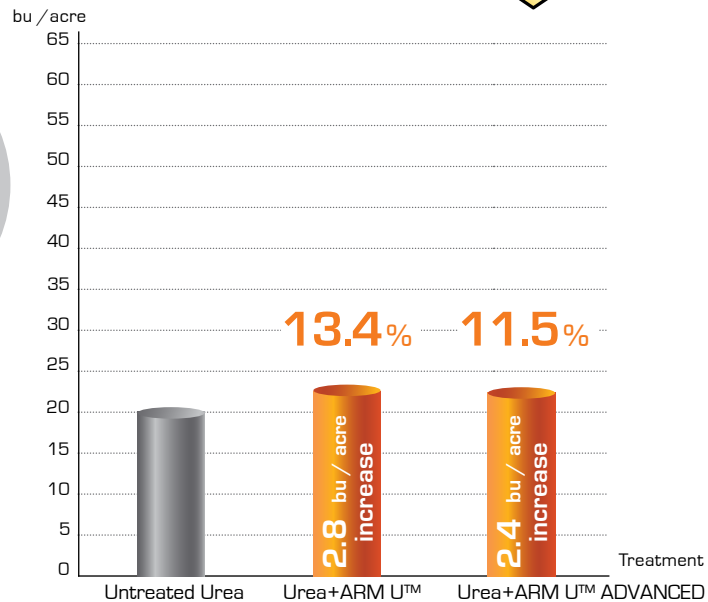


## WHEAT • CARMAN WEST MANITOBA

### Fall applied Urea + ARM U™ and Urea + ARM U™ ADVANCED

Cumulative ammonia volatilization losses [% of applied N] and Yield

Treatment	Total NH3 loss (kg N/ha)	% reduction	Yield (bu/acre)	% change
Untreated Urea @ 75 kg N/ha	16.6		20.9	
Urea+ ARM U™ @ 75 kg N/ha	9.3	44	23.7	13.4
Urea + ARM U™ ADVANCED @ 75 kg N/ha	5.4	67	23.3	11.5

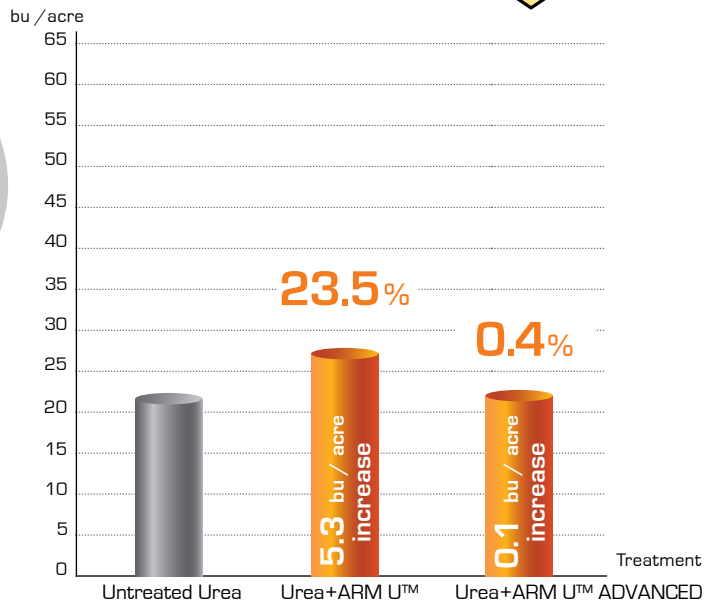




## CANOLA • PORTAGE EAST MANITOBA Fall applied Urea + ARM U™ and Urea + ARM U™ ADVANCED

Cumulative ammonia volatilization losses [% of applied N] and Yield

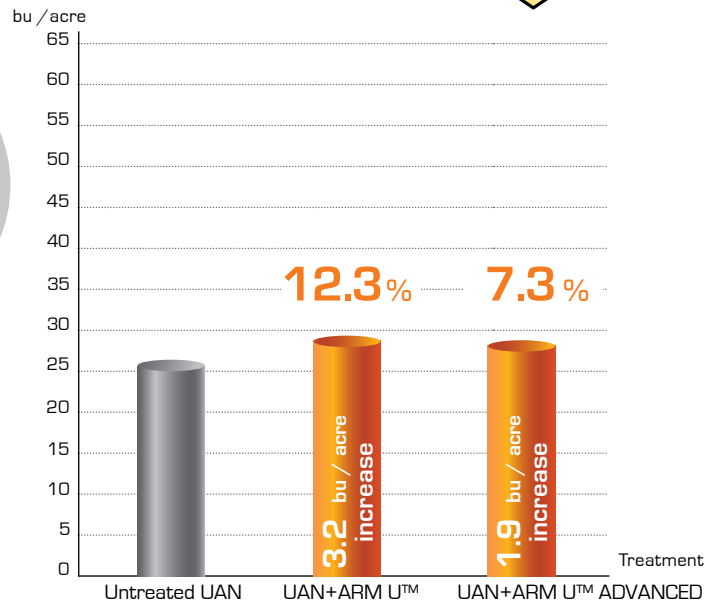
Treatment	Total NH3 loss (kg N/ha)	% reduction	Yield (bu/acre)	% change
Untreated Urea @ 75 kg N/ha	15.1		22.5	
Urea + ARM U™ @ 75 kg N/ha	2.9	81	27.8	23.5
Urea + ARM U™ ADVANCED @ 75 kg N/ha	3.1	79	22.6	0.4



## CANOLA • CARMAN EAST MANITOBA Spring applied UAN + ARM U™ and UAN + ARM U™ ADVANCED

Cumulative ammonia volatilization losses [% of applied N] and Yield

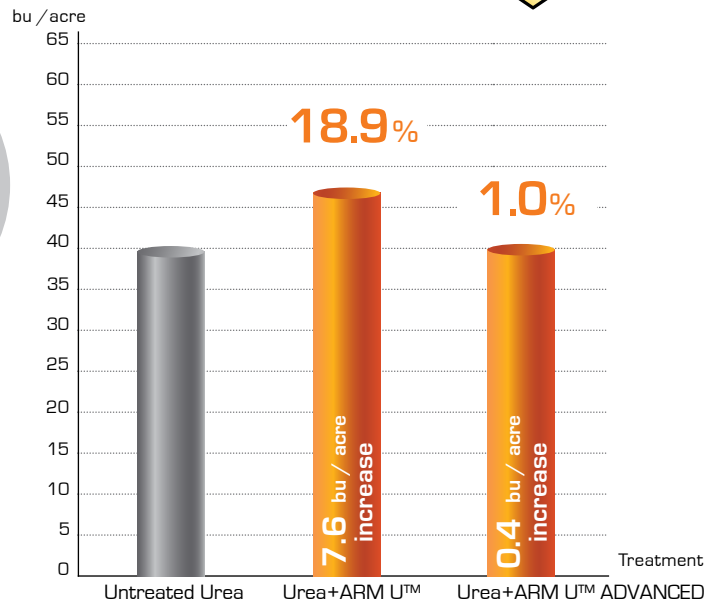
Treatment	Total NH3 loss (kg N/ha)	% reduction	Yield (bu/acre)	% change
Untreated UAN @ 75 kg N/ha	4.0		26.1	
UAN+ ARM U™ @ 75 kg N/ha	4.2	-5	29.3	12.3
UAN + ARM U™ ADVANCED @ 75 kg N/ha	1.2	70	28.0	7.3



## WHEAT • CARMAN WEST MANITOBA Spring applied Urea + ARM U™ and Urea + ARM U™ ADVANCED

Cumulative ammonia volatilization losses [% of applied N] and Yield

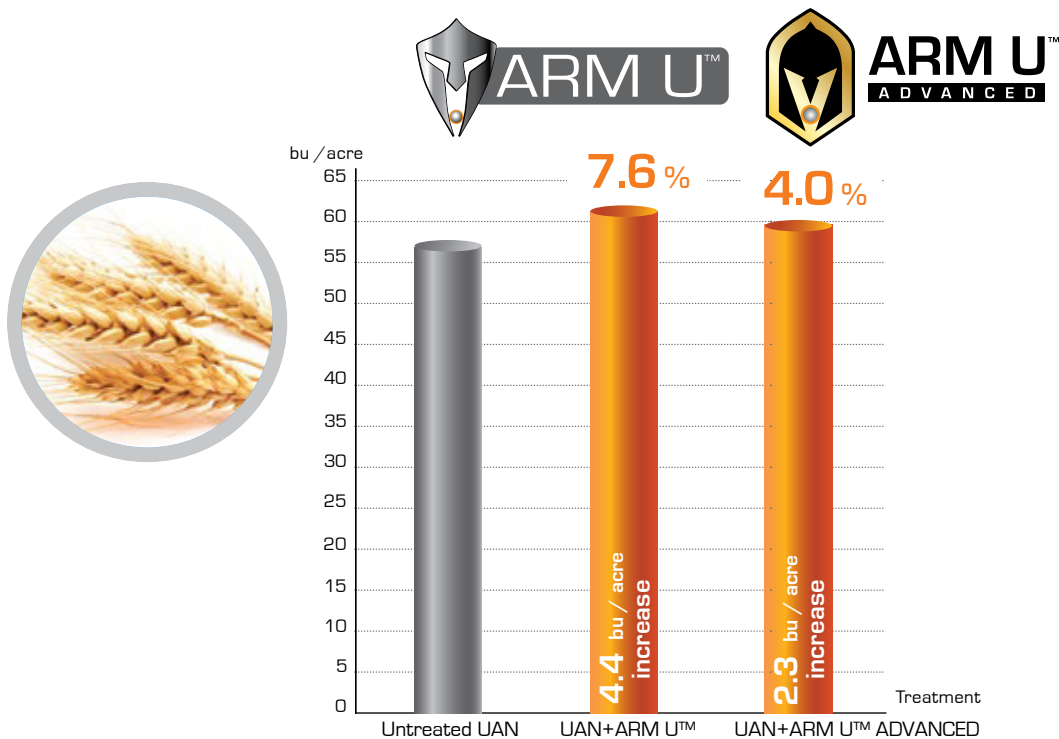
Treatment	Total NH3 loss (kg N/ha)	% reduction	Yield (bu/acre)	% change
Untreated Urea @ 75 kg N/ha	6.9		40.3	
Urea + ARM U™ @ 75 kg N/ha	2.4	65	47.9	18.9
Urea + ARM U™ ADVANCED @ 75 kg N/ha	5.1	26	40.7	1.0



## WHEAT • PORTAGE WEST MANITOBA Spring applied UAN + ARM U™ and UAN + ARM U™ ADVANCED

Cumulative ammonia volatilization losses [% of applied N] and Yield

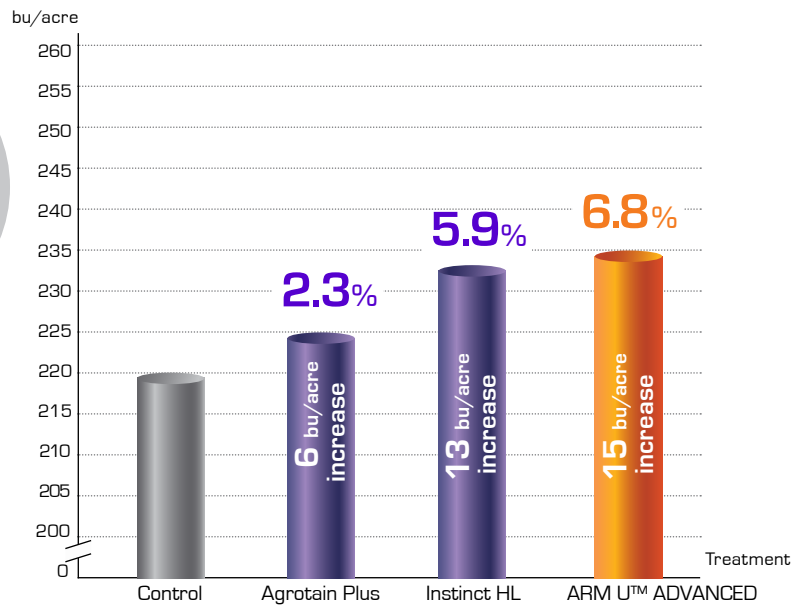
Treatment	Total NH3 loss (kg N/ha)	% reduction	Yield (bu/acre)	% change
Untreated UAN @ 75 kg N/ha	8.1		58.0	
UAN + ARM U™ @ 75 kg N/ha	5.6	31	62.4	7.6
UAN + ARM U™ ADVANCED @ 75 kg N/ha	6.5	20	60.3	4.0



## CANOLA • COMPETITOR COMPARISON 2018

All dual nitrogen saving technologies compared to ARM U™ ADVANCED

Treatment	Yield (bu/acre)	Bu/acre difference	% change
Untreated	220		
Agrotain Plus @ 168 kg N/ha	225	6	2.3
Instinct HL @ 168 kg N/ha	233	13	5.9
ARM U™ ADVANCED @ 168 kg N/ha	235	15	6.8





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