



Expanding the Fall Nitrogen Fertilization with Nitrification Inhibitors

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Why More Efficient Fertilizers?



- **Agronomics** – higher yields
- **Environmental** – less leakage into the environment
- **Economics** – better net profits for farmers
- **Conserve the Resource** – it takes fossil fuel energy to produce N fertilizers

Commonly Commercially Available N Fertilizers

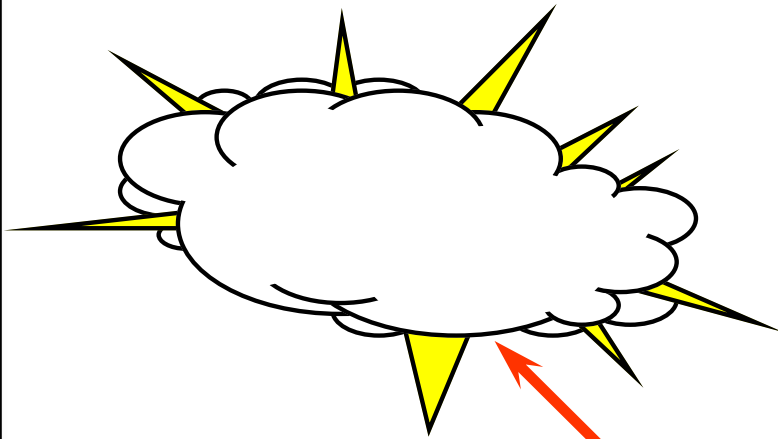


Name	Chemical Formula	Analysis % N-P ₂ O ₅ -K ₂ O
Anhydrous Ammonia	NH₃	82-0-0
Ammonium Nitrate**	NH₄NO₃	34-0-0
Urea*	CO(NH₂)₂	46-0-0
Urea Ammonium Nitrate (UAN) solution	NH₄NO₃ + CO(NH₂)₂ + H₂O	28-0-0/ 32-0-0

* Commonly available

** Very limited availability

Denitrification



N lost to the atmosphere as a gas

- Wet soils (poor aeration)
- Increases with increasing temp
- Increases with crop residue amount

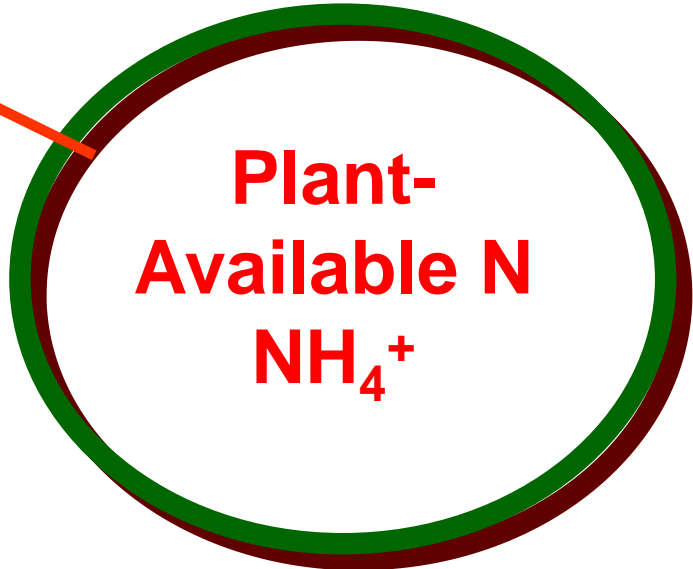
Plant-Available NO_3^-

Volatilization



Atmosphere

Loss of NH_3 gas
to the atmosphere -
 NH_4^+ forms converted to NH_3

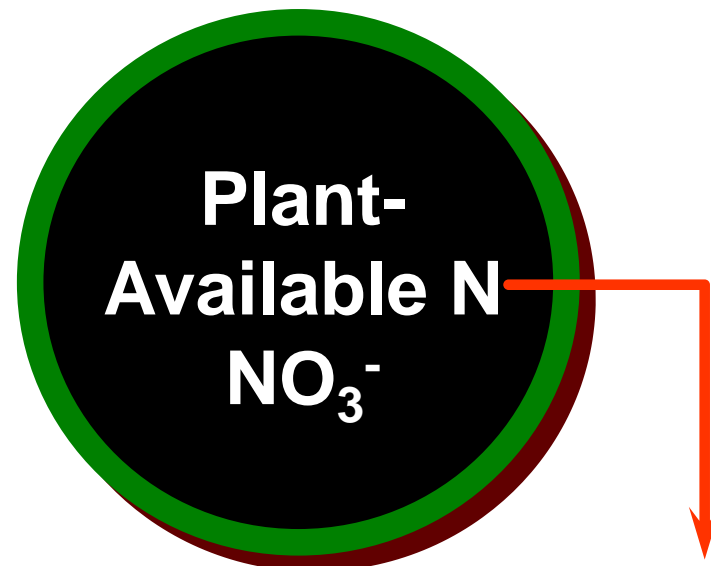


Plant-
Available N
 NH_4^+

- Surface applications of ammonium, high pH; or urea, urease enzyme on surface
- High temperatures
- Improper moisture conditions
- Improper application of ammonia

Nitrogen Leaching

- Mobile NO_3^- removed from the root zone, perhaps NH_4^+ on a sandy soil by downward water movement
- Concern about contamination of groundwater



- Right Form @
- Right Time
- Right Rate
- Right Placement

Canadian Fertilizer Institute

Banding Benefit for No-Till Cropping

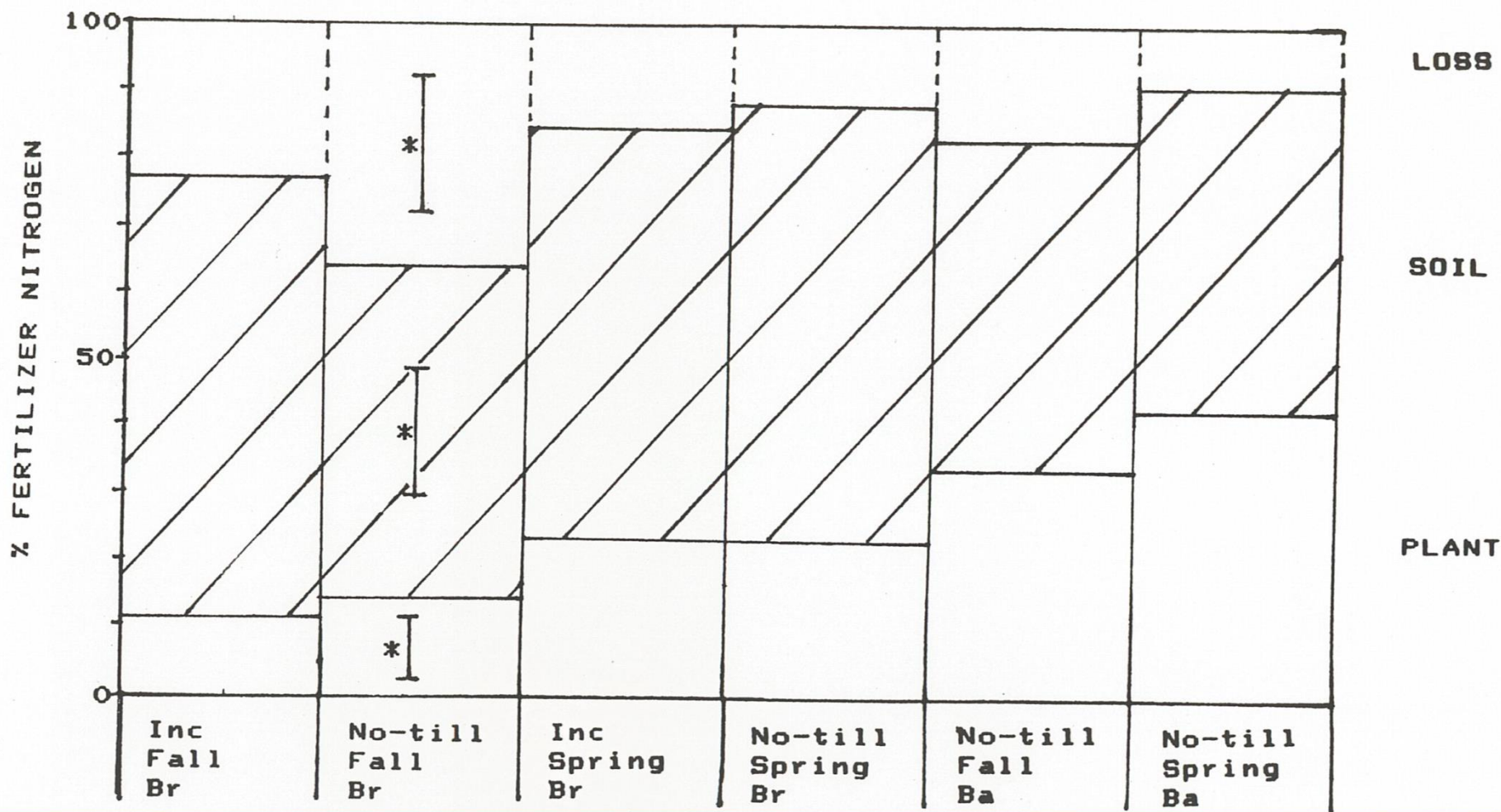


Figure 2 Fertilizer nitrogen recovery

(Inc = incorporated, Br = Broadcast, Ba = Band, * = L.S.D. at 95% confidence)

Benefits of Fall Applied N Fertilizer



- Savings of time
 - Speed up spring planting, less product to handle

- Reduced all versus spring N fertilizer prices

Western Canada Urea, prices CAD \$ per tonne			
Fertilizer year	Previous Mid Sept Price	Early April Price	% Change Fall to Spring
2000	305	380	25
2001	395	585	48
2002	367	422	15
2003	367	592	61
2004	490	544	11
2005	537	578	8
2006	646	585	-9
2007	483	782	62
2008	660	816	24
2009	1374	816	-41
2010	612	702	15
2011	627	784	25
2012	925	966	4
2013	898	816	-9
2014	721	959	33
Fifteen Year Average			18% lower

New Forms or Additives of Nitrogen Fertilizers

Enhanced efficiency fertilizers

Weiske (2006) divided these special types of fertilizers into two general categories:

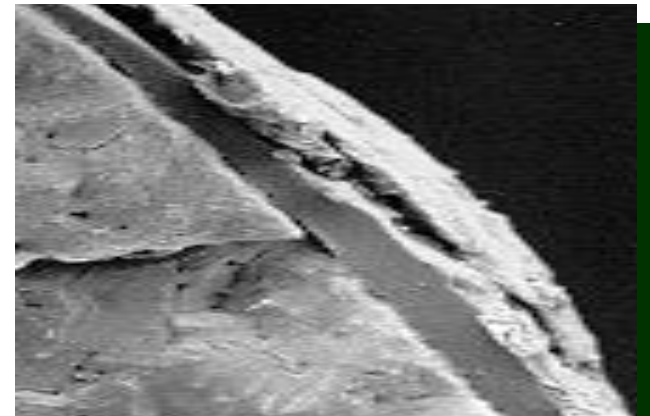
- Slow-release or controlled release, or encapsulated fertilizers
- Stabilized fertilizers fertilizers with nitrification and/or urease inhibitors.



SmartNitrogen



- **Guaranteed minimum**
 - **44-0-0**
- **Sized similar to other granular fertilizers**
- **Color: light green**
- **Patented proprietary coating technology**
- **Controlled release**
 - **Moisture and temperature**



Agrium[®]

AGROTAIN[®]
ADVANCED



AGROTAIN[®]
DRI-MAXX

AGROTAIN[®]
ULTRA

- **Urease enzyme inhibitor**
- **Increases the efficiency of Urea, UAN fertilizer, liquid manure**
- **Reduces NH₃ volatilization losses**

K KOCH.
AGRONOMIC SERVICES

Urea
+
AGROTAIN
+
Nitrification
Inhibitor
(DCD) =



SuperU
STABILIZED N™

KOCH
AGRONOMIC SERVICES



N-Serve™
NITROGEN STABILIZER

Anhydrous Ammonia

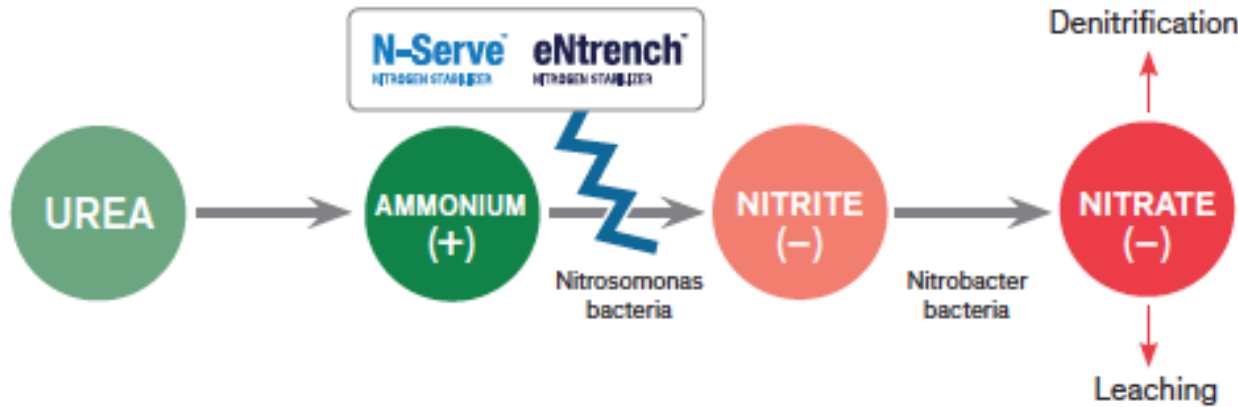
eNtrench™
NITROGEN STABILIZER

Liquid Urea Ammonium Nitrate (UAN)

e.g. 28-0-0

Liquid manures

Urea (pending registration)



- If the weather conditions suitable for losses then there are benefits from these “Improved Efficiency” N fertilizer forms or additives.
- **If there are little or no conditions for loss, then less or no differences.**

Ellerslie, AB 2010, Spring Barley

Form	Yield kg ha-1	Significance
Super Urea	5464	a
Agrotain Treated Urea	5462	a
Agrotain and N-Serve Treated Urea	5173	a
Urea	5030	a

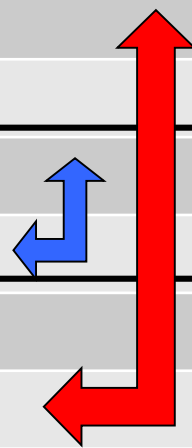


Compare 90 kg N ha⁻¹ Treatments

Beiseker, AB, 2007



Form	Rate	Placement	Yield kg ha ⁻¹	Statistical Significance
Agrotain	90	Broadcast Spring	6229	a
Ammonium Nitrate	90	Broadcast Spring	6145	a
Urea	90	Broadcast Spring	6092	a b
ESN	90	Seed-Row Planting	5917	a b c
Super Urea	90	Broadcast Spring	5768	b c
Super Urea	90	Band at Planting	5738	c
ESN	90	Band at Planting	5280	d
Urea	90	Band at Planting	4659	e
ESN	90	Broadcast Spring	4520	e
Agrotain	90	Band at Planting	4515	e
Ammonium Nitrate	90	Band at Planting	3447	f
Check	0	NA	2818	g
			336 LSD at 0.05	



Youngstown, AB, 2012 forage grass hay, g/plot

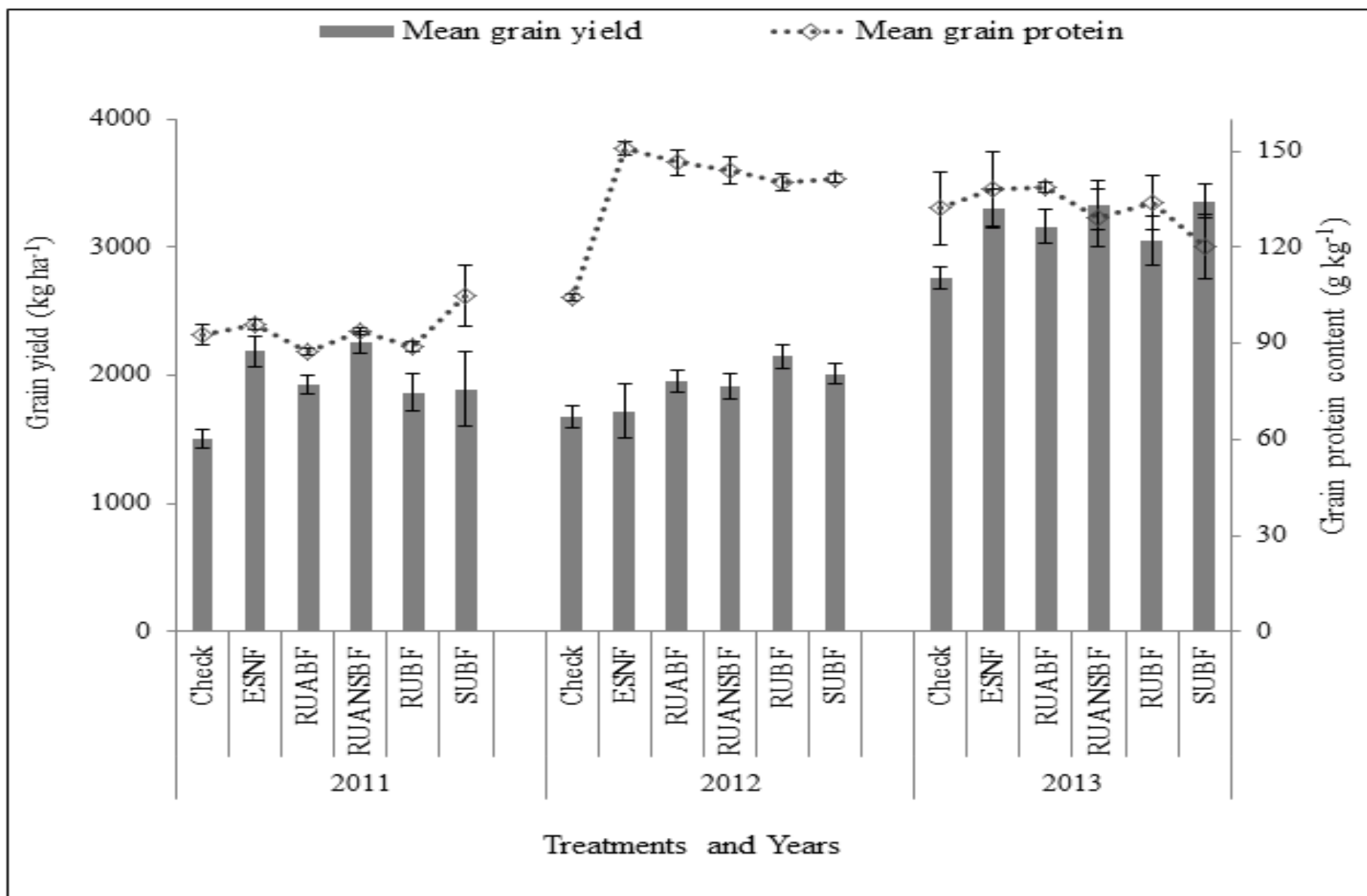
Form	Mean	n	Non-significant ranges,
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1 Agro + eNtrench	1508	16	a
2 Agro + DCD	1408	16	a
3 Urea	1126	16	b
4 Agrotain	1044	16	b

90% confidence

Moccasin MT, 2001, 2002, 2013

N Fertilizer Forms for Winter Wheat



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Questions

