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## JUSTIFICATION

- ✓ Plants are known to attain water and nutrients through foliage
- ✓ Researchers and growers continue the debate on whether foliar applied nitrogen (N) fertilizers are more efficient than soil applied fertilizers
- POTENTIAL BENEFITS OF FOLIAR APPLIED N:**
- ✓ More efficient because many pathways for N loss are avoided (leaching, runoff, denitrification)
- ✓ N is directly “fed” to the plant, the available N is readily taken up, translocated and utilized
- ✓ Smaller amounts of N would be sufficient to satisfy crop N requirements and to effectively correct N deficiency mid-season
- ✓ Commonly reported advantages: immediate benefits, prolonged flowering, increased yields, enhanced growth during dry spells, increased cold and heat tolerance, increased pest and disease resistance, maximized plant health and quality, improved internal circulation of the plant
- ✓ Most foliar products are highly compatible with other chemicals (herbicides, pesticides), easy to store and transport

## POTENTIAL CHALLENGES IN USING FOLIAR N:

- ✓ Some argue that foliar applied nutrients do not travel through the entire plant as well as they do through root uptake, but accumulate within the nearby tissues.
- ✓ The amount of foliar-absorbed N is uncertain and foliar absorption may not facilitate the rate of uptake needed to satisfy N requirements
- ✓ Foliar N application at high concentrations often results in leaf burn as water evaporates and the fertilizer salts remain behind.
- ✓ Some researchers concluded that significant ammonia loss occurs from foliar applied N fertilizers, which in fact decreases NUE

## DISCUSSION

- ✓ When undiluted N products were used, the highest grain yields were obtained with HNRGN at all 3 sites.
- ✓ At the ratio of 66% product to 33% water, both HNRGN and LU performed better than UAN at dryland sites and at the irrigated site (WARC), grain yields were lower when LU was used.
- ✓ When the solutions were most diluted (ratio of 33% product to 66% water), the grain yields increased significantly depending on product used at dryland sites as: UAN < LU < HNRGN. At the irrigated site, LU resulted in lower grain yields.
- ✓ Due to LU and HNRGN's lower corrosiveness compared to UAN, even when applied undiluted, LU and HNRGN may be a better choice among the three foliar products evaluated.
- ✓ HNRGN's cost is ~ 25% higher compared to LU, and ~ 27% higher than UAN. Further studies will be carried out to assess liquid N fertilizer performance and cost effectiveness.

## RESULTS

Table 1. Treatment structure and mean spring wheat grain yields, 2012.

Trt	Treatment Structure				Mean grain yield, kg ha <sup>-1</sup>		
	Preplant Fertilizer N Rate (urea), kg N ha <sup>-1</sup>	Todress Fertilizer N Source	Todress Fertilizer N Rate, kg N ha <sup>-1</sup>	Todress Fertilizer N to Water Ratio, %	WTARC	PATTON	WARC
1	0	-	-	-	8413	3911	5518
2	90	UAN	56	100/0	8641	3378	5895
3	90	UAN	56	66/33	8287	3502	5600
4	90	UAN	56	33/66	8733	3295	6227
5	90	LU	56	100/0	8794	3941	5303
6	90	LU	56	66/33	9711	4014	5313
7	90	LU	56	33/66	9132	4125	5440
8	90	HNRGN	56	100/0	9613	4400	6295
9	90	HNRGN	56	66/33	8942	3986	6166
10	90	HNRGN	56	33/66	9398	4749	6029



Applying foliar N fertilizers to spring wheat plots using an ATV-mounted stream bar sprayer, Montana, 2012

## OBJECTIVES

- ✓ To compare the efficacy of foliar N fertilizers applied to spring wheat,
- ✓ To determine the optimum N rate and dilution ratio of foliar fertilizers and the threshold at which spring wheat grain yield is reduced due to leaf burn

## MATERIALS AND METHODS

- ✓ Study was initiated in spring of 2012 at 2 dryland sites: Western Triangle Agricultural Research Center (WTARC) - Conrad, Pondera County, MT, and an on-farm study (PATTON) - Jack Patton, Knees, Chouteau County, MT, and 1 irrigated site - Western Agricultural Research Center (WARC) - Corvallis, Ravalli County, MT.
- ✓ Treatment structure and spring wheat grain yields are reported in Table 1. Spring wheat was topdressed at Feekes 5 growth stage using an ATV-mounted stream bar sprayer.

### LIQUID N PRODUCTS EVALUATED:

- ✓ **Urea ammonium nitrate (UAN):** most widely used foliar N fertilizer; 28-0-0 or 32-0-0; non-pressurized solution; liquid mix of urea and ammonium nitrate; Nitrate-N = quick response, ammoniac-N = longer-lasting response; water soluble organic N in urea = sustained feeding
- ✓ **Liquid urea (LU):** water-based urea solution (23-0-0); slower uptake helps to maintain N levels application during warm growing months for rapid correction of N deficiency
- ✓ **High NRG N (HNRGN):** several forms of N, sulfur (S), and trace amounts of iron (Fe), Mg, manganese (Mn), and zinc (Zn) (chlorophyll building elements); low in free ammonia, formulated for minimized loss/increased plant uptake; reduced salt index makes it less corrosive to plant tissues.

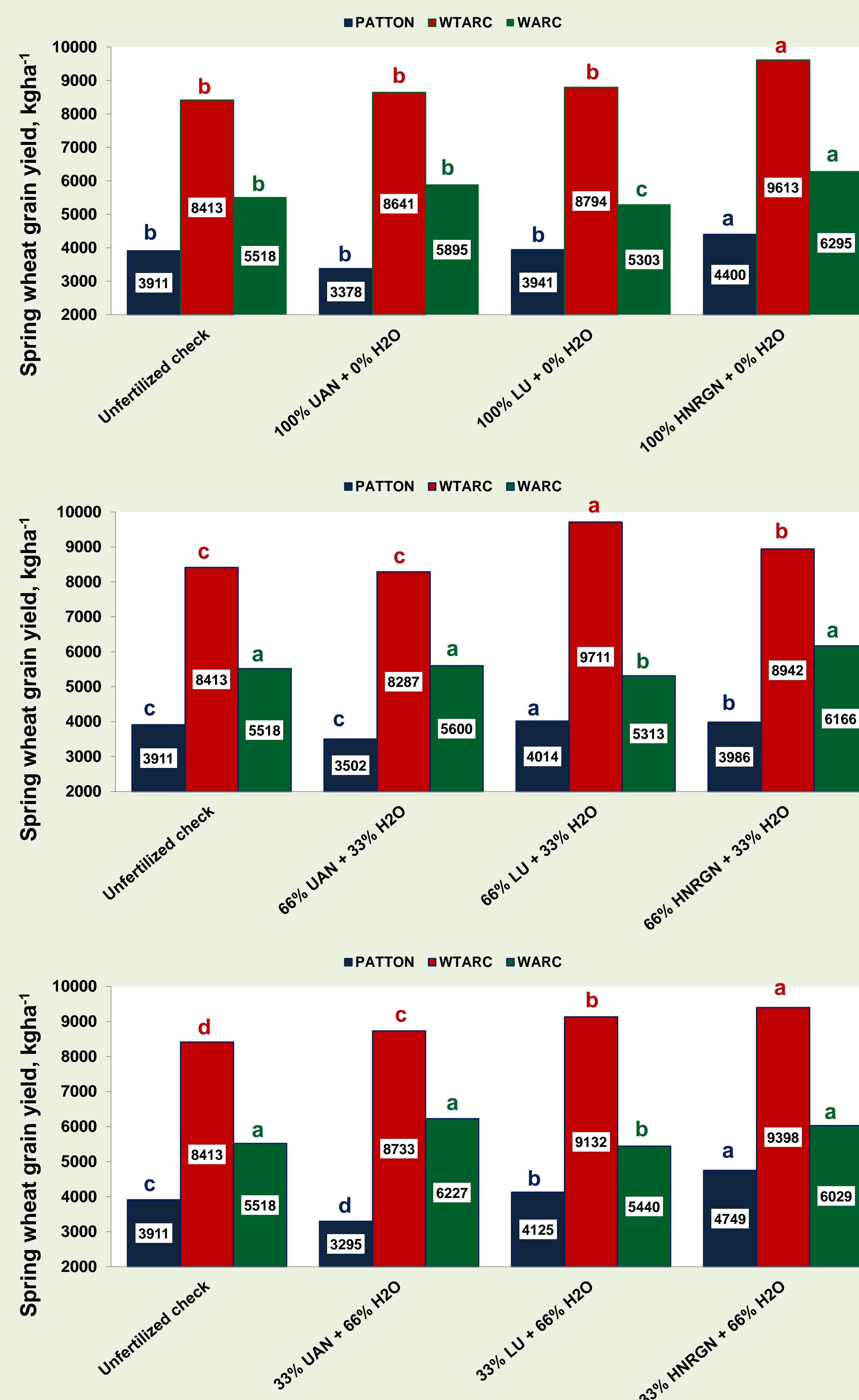


Figure 1. Effect of foliar N topdress source and fertilizer to water ratio on spring wheat grain yields, 2012.