

Improving the Performance of Winter Wheat Planted Without Tillage After Grain Sorghum

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Introduction

Grain sorghum and winter wheat are two major crops produced in Kansas. Previous research has revealed that wheat yields following grain sorghum are worse compared to other summer row crops grown in Kansas. Sorghum and wheat are grown in semi-arid regions where no-till has become popular due its ability to conserve soil moisture. Determining effective management strategies for grain sorghum to improve yields of the subsequent wheat crop in no-till is essential for improving cropping system productivity in the Great Plains Region.

Objective

To identify combinations of grain sorghum harvest and residue management techniques that are effective for improving success of wheat planted after sorghum in no-till systems.

Materials and Methods

- Three locations conducive to planting wheat following sorghum in Kansas: Belleville, Manhattan, and Ottawa
- Randomized complete block design with four replications
- Three way factorial treatment structure:
 - Glyphosate (Preharvest, Postharvest, Untreated)
 - Residue (Chopped, Removed, Untreated)
 - Nitrogen (34 kg ha⁻¹ applied to the sorghum residue, untreated)
- Mixed procedure in SAS 9.2 was used for analysis of variance, $\alpha = .05$.

Table 1. Grain sorghum management within location.

Location:	Belleville	Manhattan	Ottawa
Hybrid	DKS 28-06	DKS 36-06	DKS 36-06
Planting Date	06/13/2011	05/16/2011	05/09/2011
Seeding Rate (seeds ha ⁻¹)	160,500	165,500	160,000
Preharvest glyphosate	09/26/2011	09/02/2011	08/30/2011
Harvest Date	10/06/2011	09/13/2011	09/08/2011
Postharvest glyphosate	10/07/2011	09/15/2011	09/08/2011
Residue Chopped	10/13/2011	09/21/2011	09/15/2011
Residue Removed	10/13/2011	09/21/2011	09/15/2011
Nitrogen (34 kg ha⁻¹)	10/14/2011	09/22/2011	09/15/2011

• (Treatments are in bold)

Materials and Methods

- Winter wheat management

Table 2. Winter wheat management within location.

Location:	Belleville	Manhattan	Ottawa
Variety	Everest	Everest	Everest
Planting Date	10/13/2011	10/04/2011	10/11/2011
Seeding Rate (kg ha ⁻¹)	133	133	133
Fertility : N-P-K (kg ha ⁻¹)	90-34-0	80-34-0	50-40-17
Harvest Date	06/18/2012	06/07/2012	06/06/2012

Results and Discussion

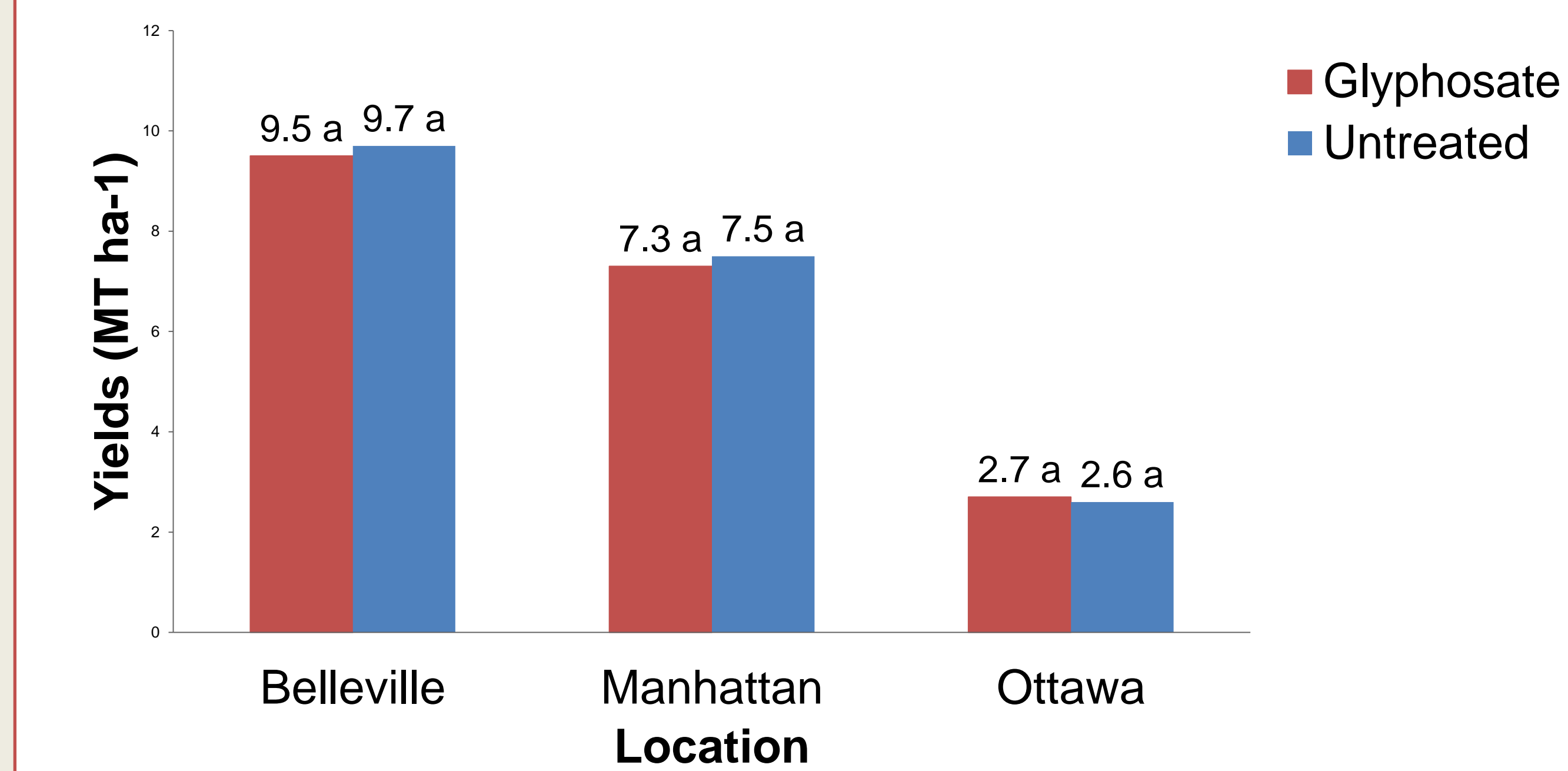


Figure 1. Grain Sorghum Yields.

- Grain sorghum yields showed no response to preharvest glyphosate.

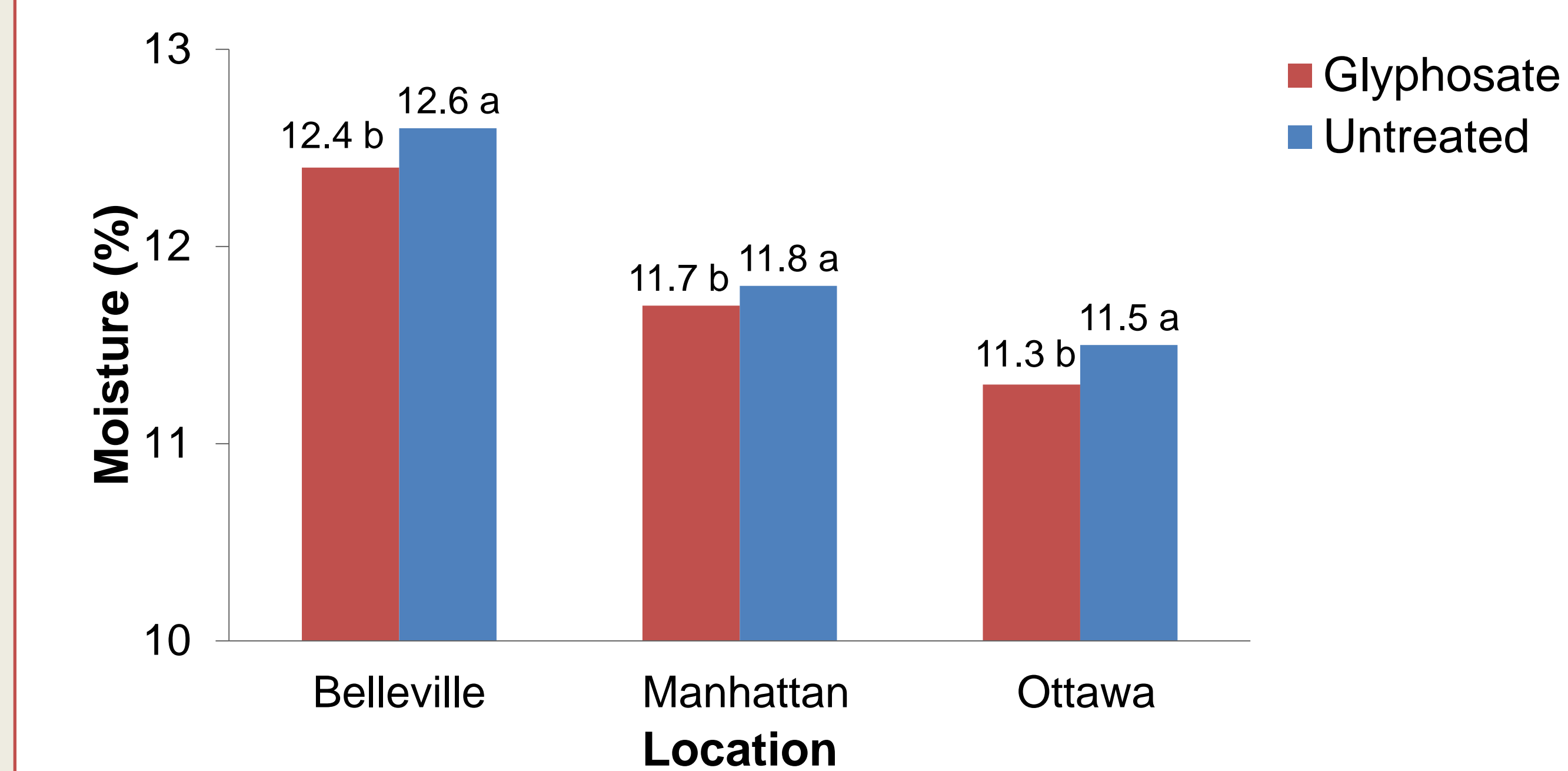
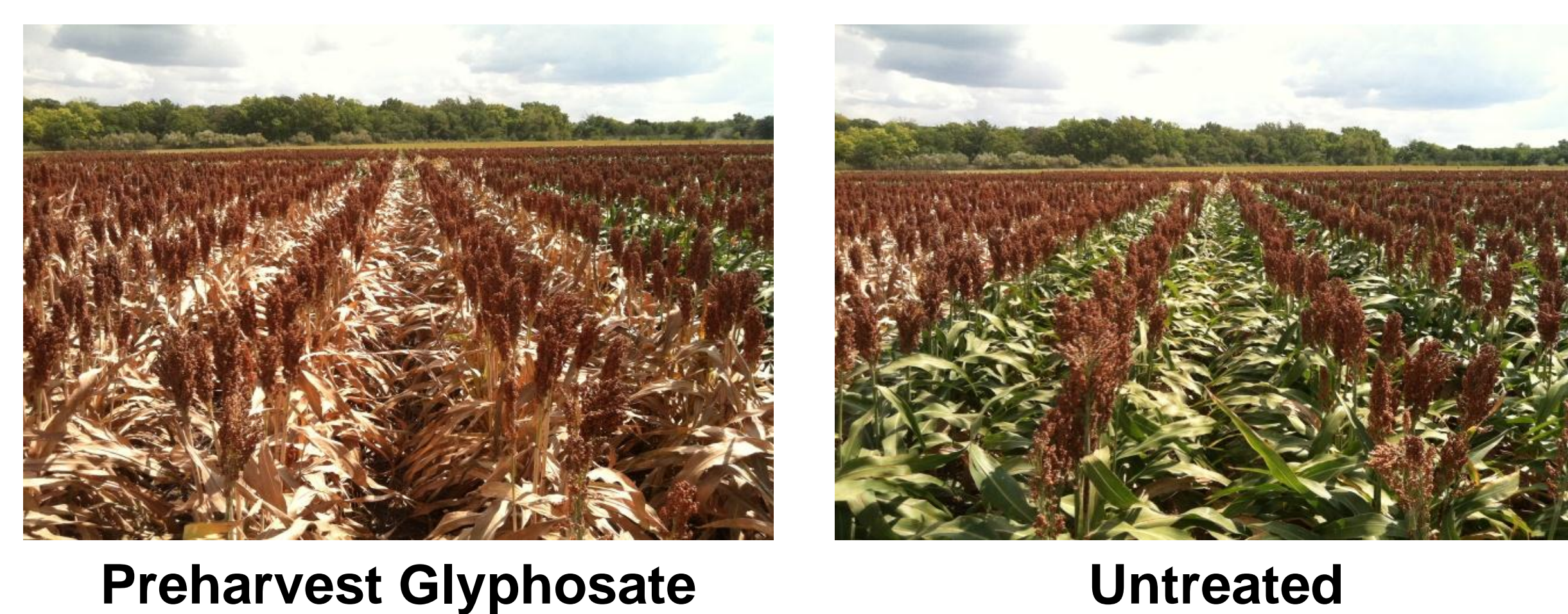


Figure 2. Grain Sorghum Moisture.

- Grain was drier with preharvest glyphosate.



Results and Discussion

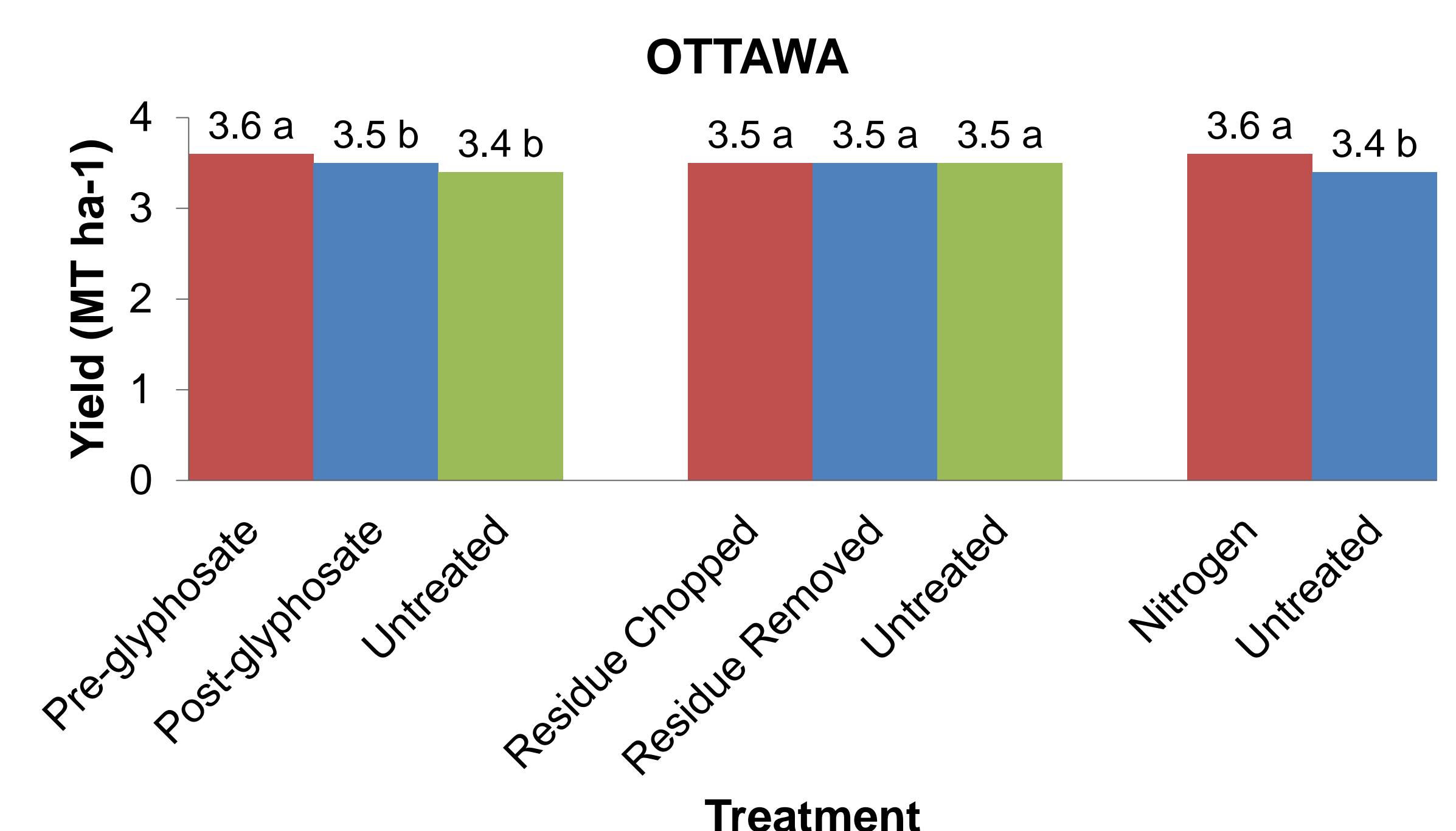
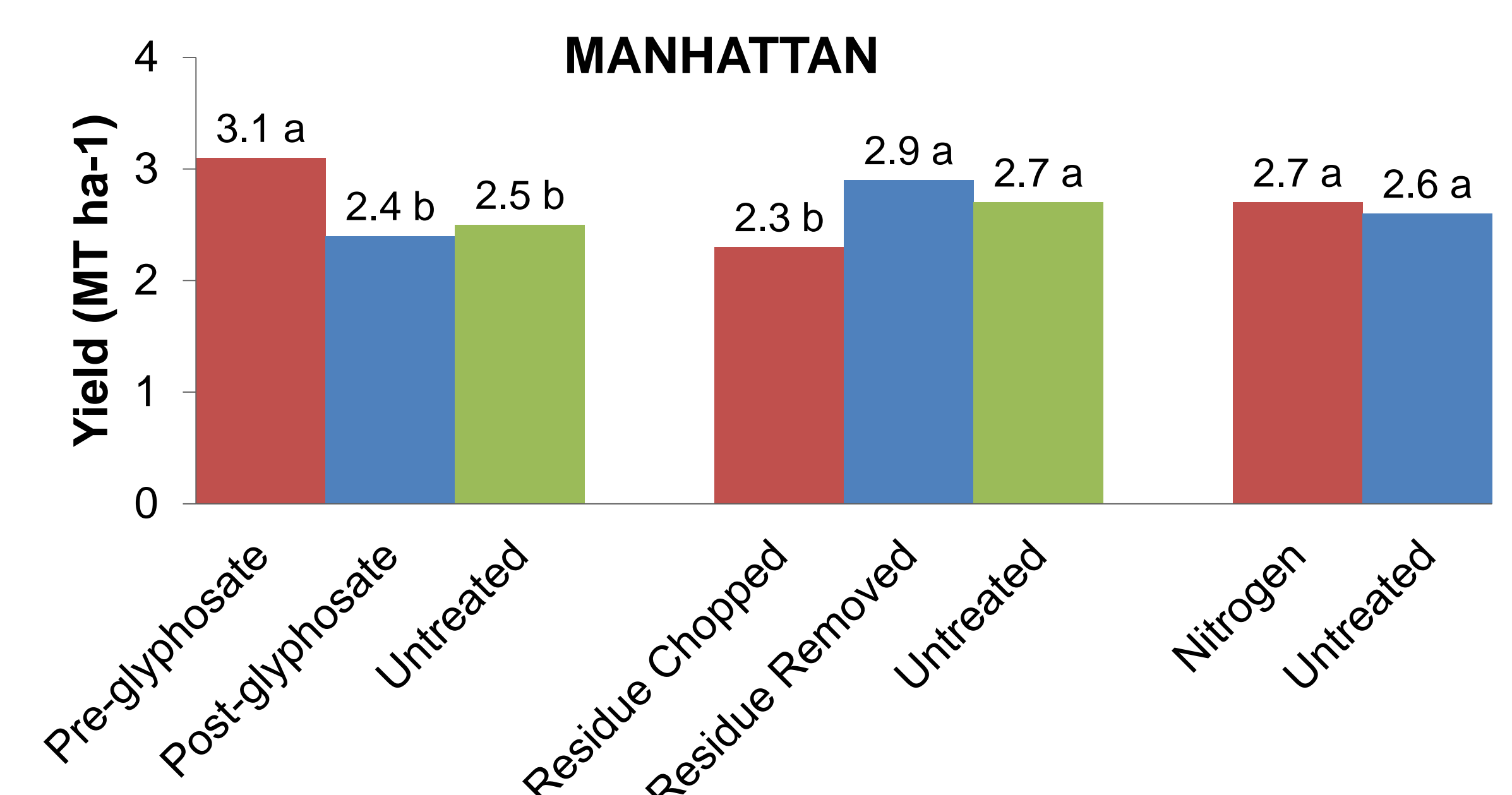
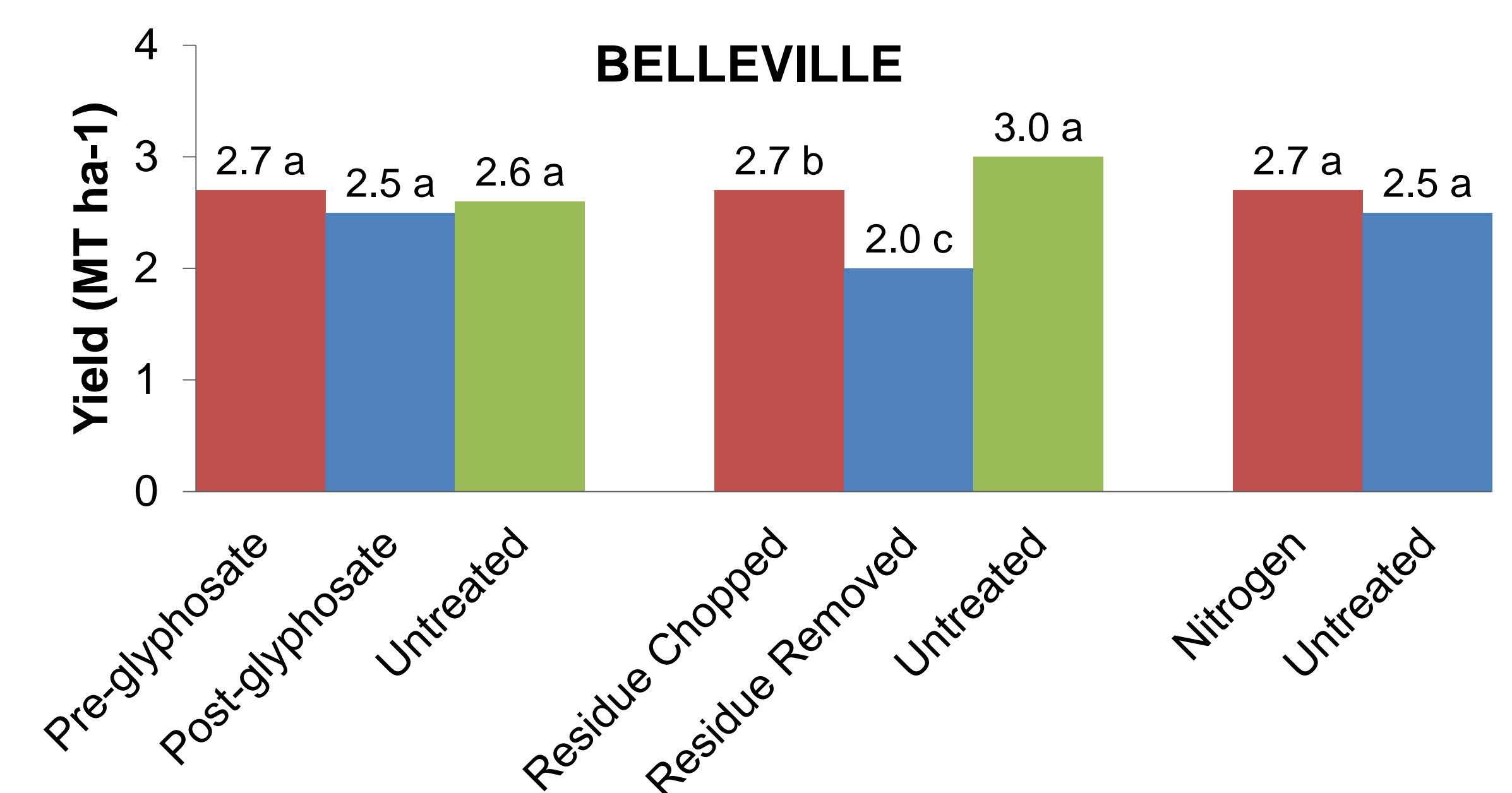


Figure 3. Wheat Yields.

- Preharvest glyphosate increased wheat yields at both **Manhattan** and **Ottawa**. Glyphosate postharvest had little impact at all three locations.
- Wheat yields at **Belleville** were greater when sorghum residue was left standing. Yields of wheat were less in **Manhattan** when the sorghum residue was chopped. Residue management at **Ottawa** had little effect on wheat yields.
- Nitrogen applied to the sorghum residue increased wheat yields at **Ottawa**, but had no response at other locations.

Conclusion

- Response of wheat yield to sorghum management varied with environment.
- Harvest and residue management of sorghum can influence yields of winter wheat in no-till systems.