

Trinexapac-ethyl Effects on Crimson Clover Seed Yield In The Willamette Valley

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Introduction

- Oregon accounts for 85% of the total US seed production acreage of crimson clover (*Trifolium incarnatum* L.) and 97% of the total seed production.
- Management of the crop canopy is necessary to reduce lodging and excessive vegetation that leads to reduction in seed yield.
- The effects of plant growth regulators (PGR) have not been reported on crimson clover, however, red clover (*Trifolium pratense* L.) seed yields were increased by 38 and 11% with paclobutrazol and uniconazol applications, respectively (Silberstein et al., 1996).
- Trinexapac-ethyl (TE) is a lodging control agent that is widely used on cool-season forage and turf-grass crops, but red clover seed yields have been increased with TE applications (Anderson et al., 2015; Anderson et al., 2016).
- No work has been done previously to document the effects of TE PGR on crimson clover seed crops.



Crimson clover inflorescence.
Photo – Thomas G. Chastain

Objectives

- The main objective of this study is to determine the effects of trinexapac-ethyl application rate and timing on crimson clover canopy characteristics, seed yield, and yield components in Oregon.
- The second objective is to establish recommendations for TE applications for seed growers in Oregon.

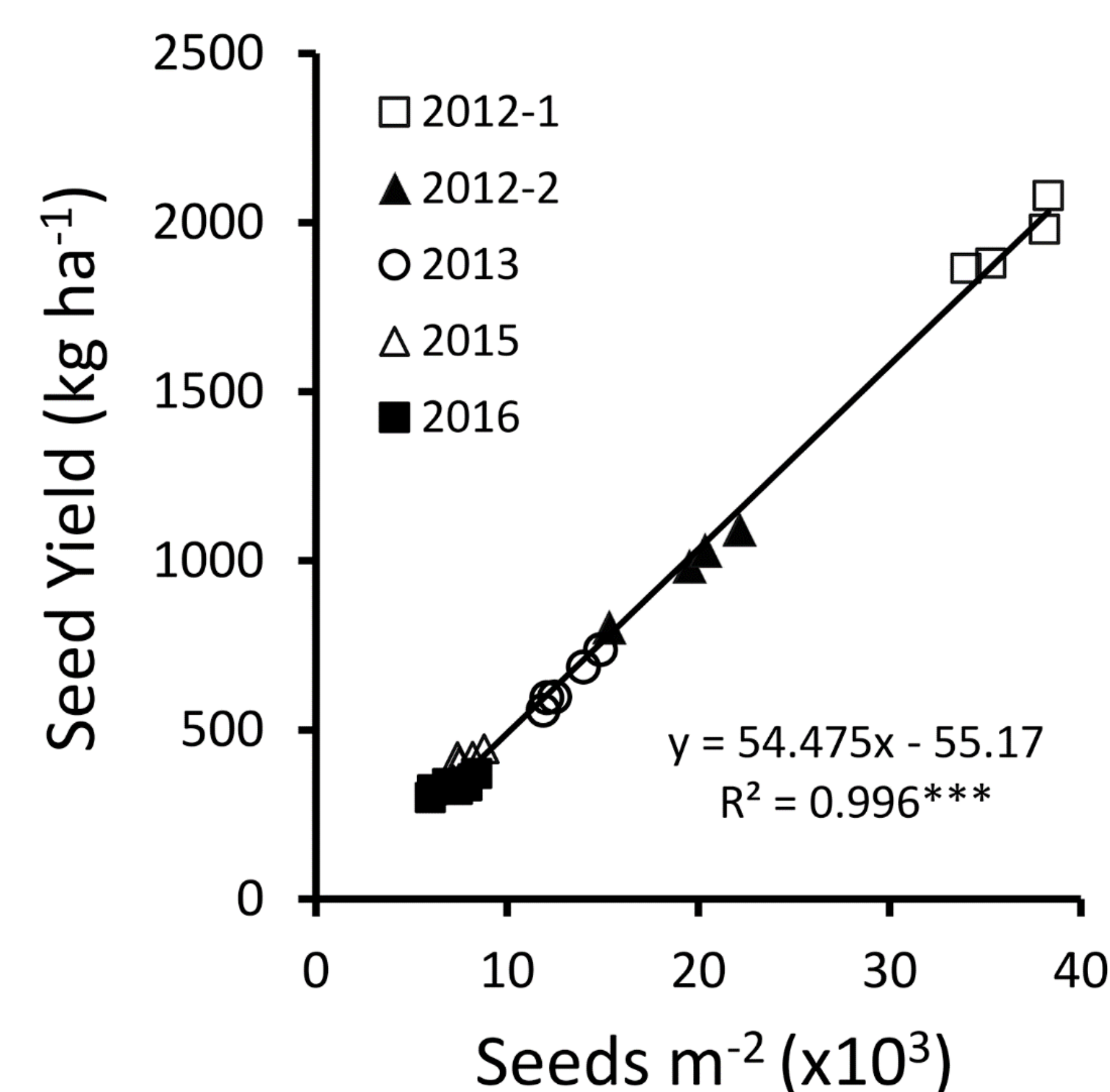
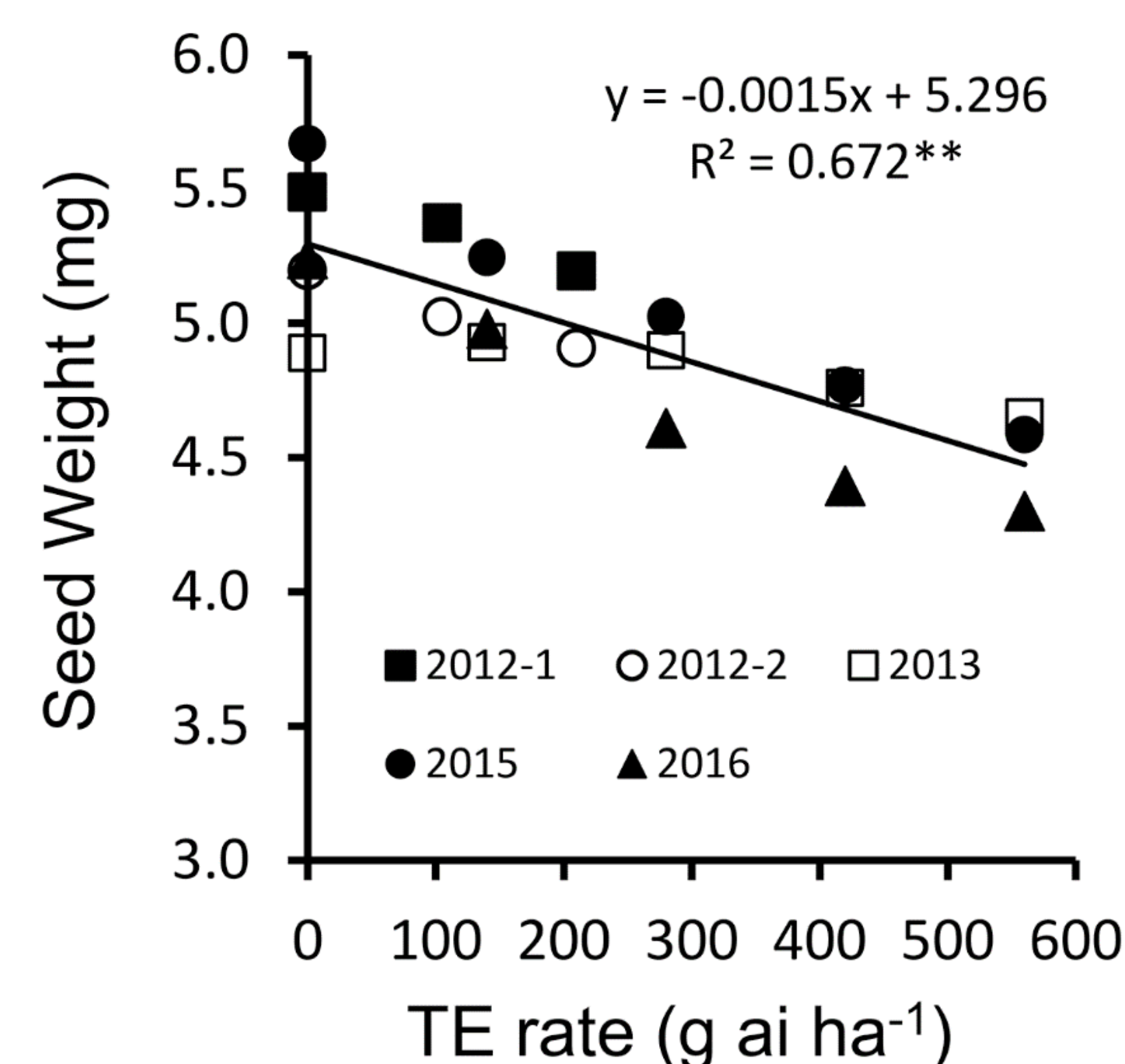
Materials and Methods

- Trials were conducted at two on-farm sites near Banks, Oregon, in 2011-2012, and at an on-farm site near St. Paul, Oregon, in 2012 to 2013. Trials were also conducted at Oregon State University's Hyslop Crop Science Research Farm near Corvallis, Oregon, in 2014 to 2015 and 2015 to 2016. The first two sites (2012-1 and 2012-2) were Aloha silt loam, and Laurelwood silt loam. The sites near St. Paul (2013) and Corvallis (2015 and 2016) were on Woodburn silt loam.
- All trials sites were prepared and managed with practices recommended for the crimson clover seed production for the Willamette Valley.
- The TE PGR was applied using a bicycle-type boom sprayer. Applications were made at 105, 140, 210, 280, 420, and 560 g ai ha⁻¹ at two timings: BBCH 32, and BBCH 50.
- Canopy height was determined at BBCH 65 by placing a sward stick in three locations.
- Stem number and above-ground biomass by harvesting three samples per plot at BBCH 65.
- Seed harvest was a two-step process; the seed crop was cut at 35% moisture content and dried in windrows. The dried crop was threshed and cleaned for seed yield determination.
- Seed weight and seed number m⁻² were determined from seed cleaned by screens for counting and weighing.
- Analysis of variance was conducted to test the TE timing and rate effects on crimson clover seed yield components. Bartlett's χ^2 test showed that error variances were not homogenous so trials were analyzed separately.



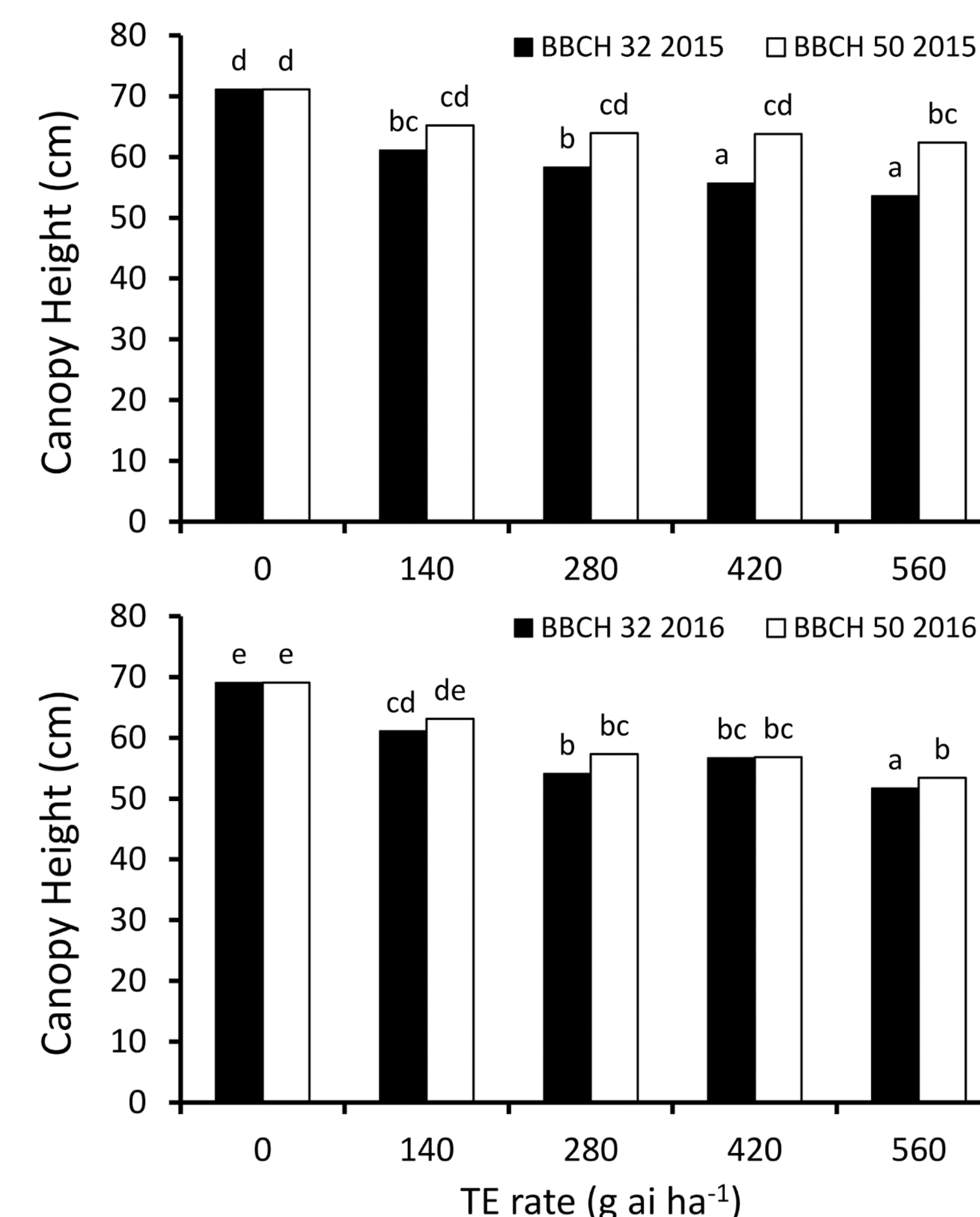
Results

- Canopy height was reduced by TE application and in turn, contributed to losses in soil water content.
- Stem number and above-ground biomass were not affected by TE application.
- Seed weight was inversely proportional to TE rate. Higher TE rates decreased seed weight.
- Seed yield was increased with TE applications ≤ 280 g ai TE ha⁻² at BBCH 32 in 2012 and 2013, but was ineffective in 2015 and 2016 due to dry and warm spring conditions.
- Seed yield increases attributable to TE ranged from 12 to 36%, and were related to seed number.
- Increased seed number offset small losses in seed weight caused by TE application at low rates, leading to increased yield.



Timing/Rate g ai ha ⁻¹	Seed Yield	
	2012-1	2012-2
Control	1864a	800a
BBCH 32		
105	2080b	981b
210	1980ab	1090c
BBCH 50		
105	1880a	1028bc

Timing/Rate g ai ha ⁻¹	Seed Yield		
	2013	2015	2016
Control	594a	421a	322a
BBCH 32			
140	736b	404a	341a
280	685b	422a	326a
420	596a	444a	371a
560	557a	356a	335a
BBCH 50			
140	-	326a	299a
280	-	352a	329a
420	-	340a	344a
560	-	325a	323a



Conclusion

- Trinexapac-ethyl is an effective tool for lodging reduction and canopy manipulation in crimson clover.
- The PGR can increase seed number, and seed yield under wet and cool spring weather conditions.

References

- ❖ Anderson, N.P., T.G. Chastain, and C.J. Garbacik. 2016. Irrigation and trinexapac-ethyl effects on seed yield in first- and second-year red clover stands. Agron. J. 108:1116-1123.
- ❖ Anderson, N.P., D.P. Monks, T.G. Chastain, M.P. Rolston, C.J. Garbacik, C.-H. Ma, and C.W. Bell. 2015. Trinexapac-ethyl effects on red clover seed crops in diverse production environments. Agron. J. 107:951-956.
- ❖ Silberstein, T.B., T.G. Chastain, and W.C. Young, III. 1996. Growth and yield of red clover seed crops treated with paclobutrazol and uniconazol. J. Appl. Seed Prod. 16:17-23.