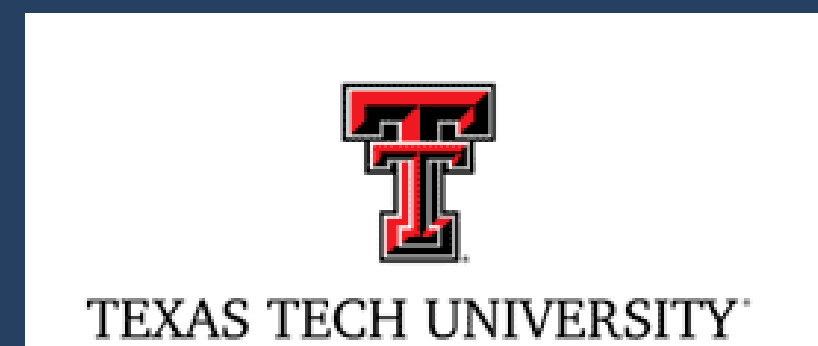


Effects of Rotation, Irrigation, and Cultivar on Cotton Yield in a Field with Root-knot Nematode

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Introduction

Irrigated cotton is produced on the Texas High Plains under varying levels of deficit irrigation. The performance of new cotton cultivars under different irrigation levels is an important factor in cultivar selection. Additionally, pest problems such as root-knot nematode or Verticillium wilt are important factors in evaluating cultivar performance. Field studies were conducted in 2014 and 2015 at the AG-CARES Farm near Lamesa, Texas.

Objectives

- Evaluate effects of five cultivars, three irrigation levels, and crop rotation on cotton yield in a root-knot nematode infested field.
- Determine effects of crop rotation, cultivar, and irrigation levels on nematode reproduction and root galling.

Materials and Methods

- RCBD with 3 replications
- Planting date: 16-May-14 and 16-May-15
- Cultivars:
 - Deltapine 1454NR B2RF
 - FiberMax 2011 GT
 - PhytoGen 417 WRF
 - Stoneville 4946 GLB2
 - NextGen 1511 B2RF (nematode susceptible check)
- In-Season irrigation low energy precision application:
 - 2014: Low (7.6 cm), Base (11.2 cm), and High (15.2 cm)
 - 2015: Low (8.1 cm), Base (12.2 cm), and High (16.3 cm)
- Rainfall:
 - 2014: Jan – Apr: 6.6 cm and May – Sept: 33.02 cm
 - 2015: Jan – Apr: 15.4 cm and May – Sept: 46.2 cm
- Fertility:
 - 2014: 120-40-0
 - 2015: 120-35-0
- Harvest:

	2014	2015
Wheat – Cotton:	28-Oct	29-Oct
Continuous Cotton:	12-Nov	28-Oct



Results

Table 1. Effect of cultivar and irrigation level on cotton lint yield (kg ha⁻¹) under a **wheat – cotton rotation** in 2014.

Cultivar	Irrigation Levels			Average
	Low (7.6)	Base (11.2)	High (15.2)	
	kg ha ⁻¹			
DP 1454NR B2RF	759	1072	1122	985 B
FM 2011 GT	822	1007	1223	1017 B
PHY 417 WRF	761	1058	1204	1008 B
ST 4946 GLB2	1106	1152	1487	1248 A
Average	862 C	1072 B	1259 A	–

Table 2. Effect of cultivar and irrigation level on cotton lint yield (kg ha⁻¹) under a **wheat – cotton rotation** in 2015.

Cultivar	Irrigation Levels			Average
	Low (8.1)	Base (12.2)	High (16.3)	
	kg ha ⁻¹			
DP 1454NR B2RF	887	813	1211	971 AB
FM 2011 GT	910	913	1149	991 AB
PHY 417 WRF	792	782	1021	865 B
ST 4946 GLB2	1051	1023	1234	1103 A
Average	910 B	883 B	1154 A	–

Table 3. Effect of cultivar and irrigation level on cotton lint yield (kg ha⁻¹) under **continuous cotton (terminated rye)** in 2014.

Cultivar	Irrigation Levels			Average
	Low (7.6)	Base (11.2)	High (15.2)	
	kg ha ⁻¹			
DP 1454NR B2RF	596	865	895	785 B
FM 2011 GT	622	809	1008	813 B
PHY 417 WRF	560	760	1040	787 B
ST 4946 GLB2	864	904	1149	972 A
Average	661 C	834 B	1023 A	–

Table 4. Effect of cultivar and irrigation level on cotton lint yield (kg ha⁻¹) under **continuous cotton (terminated rye)** in 2015.

Cultivar	Irrigation Levels			Average
	Low (8.1)	Base (12.2)	High (16.3)	
	kg ha ⁻¹			
DP 1454NR B2RF	563	682	766	671 B
FM 2011 GT	586	653	747	662 B
PHY 417 WRF	646	703	854	734 AB
ST 4946 GLB2	719	761	943	808 A
Average	629 B	700 B	827 A	–

Table 5. Comparing the effect of rotation and irrigation level on cotton lint yield (kg ha⁻¹). Values were averaged across cultivar and year.

Cultivar	Irrigation Levels		
	Low	Base	High
	kg ha ⁻¹		
Wheat - cotton rotation	886	978	1207
Continuous cotton (terminated rye)	645	767	925
Change (%) with rotation	+37	+27	+30

Results cont'd

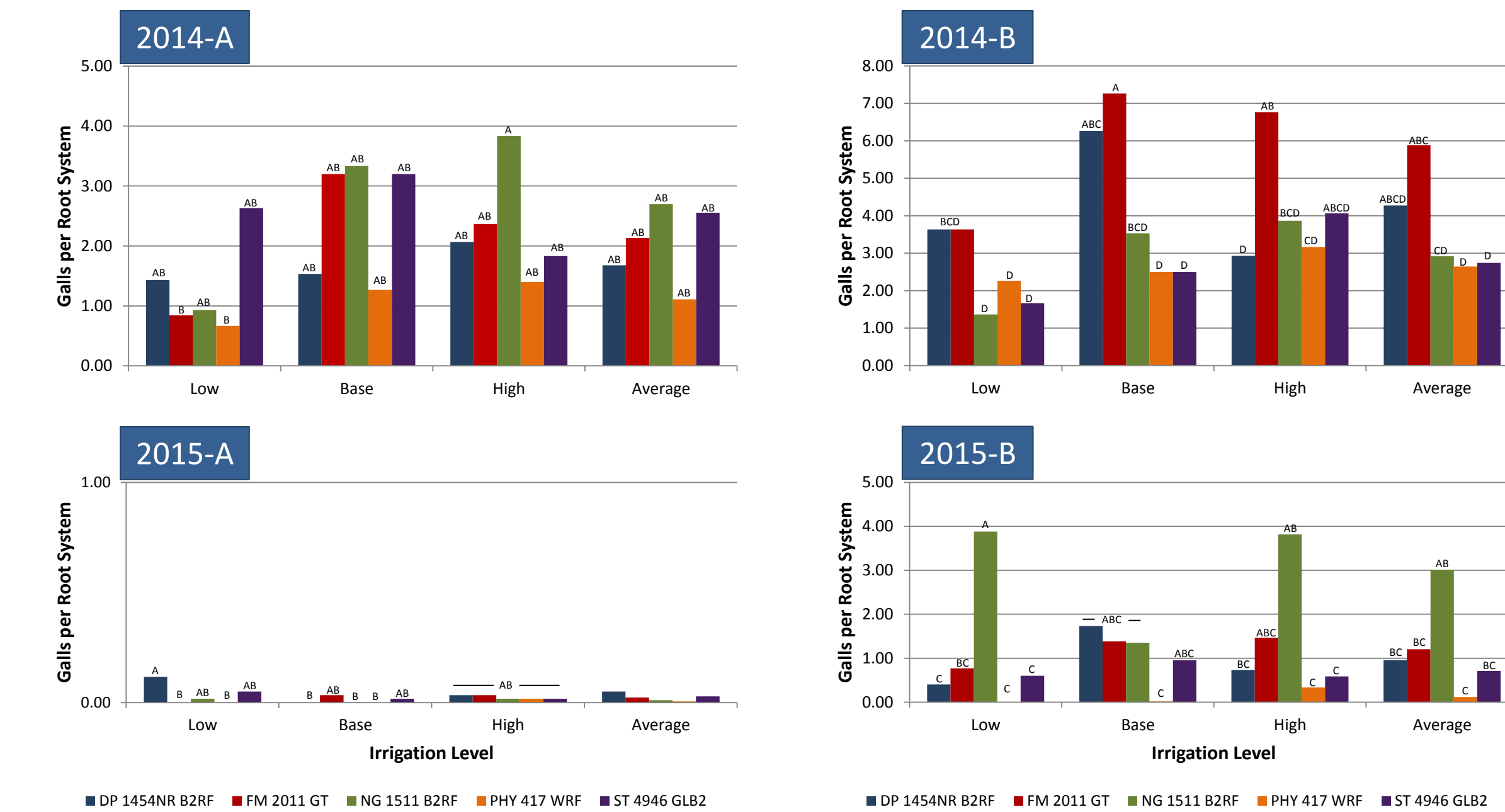


Figure 1. Effect of variety and irrigation levels on root-knot nematode galls in cotton in 2014 and 2015 by rotation (wheat-cotton – A and continuous cotton (terminated rye cover) - B).

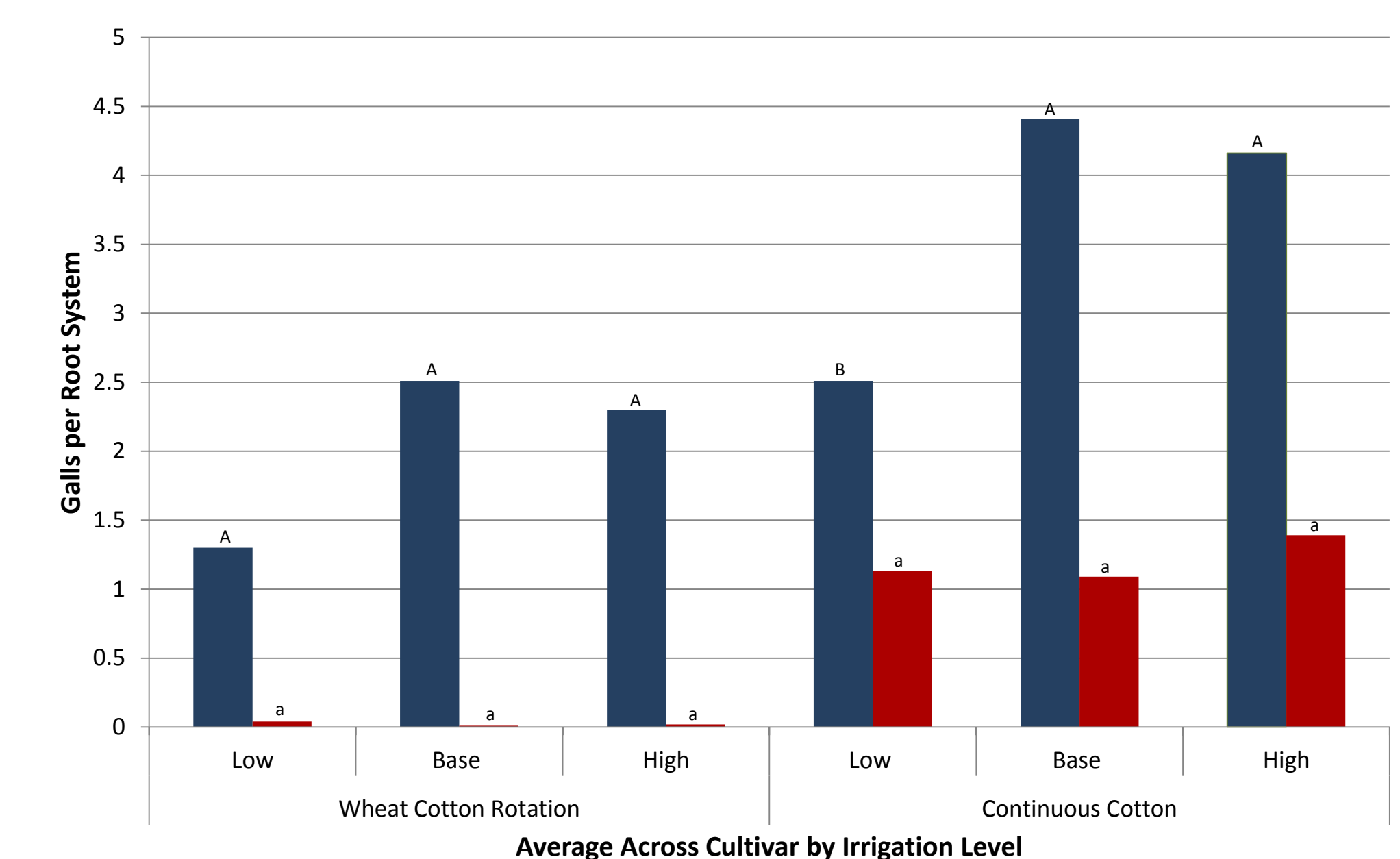


Figure 2. Effect of rotation on root-knot nematode galls in cotton in 2014 (blue) and 2015 (red).

Summary

- Increased irrigation level increased yields for both wheat – cotton rotation and continuous cotton.
- Over both years and in both systems, ST 4946 GLB2 produced yields equal to or higher than other varieties.
- Wheat – cotton rotation produced 27-37% higher yields compared to continuous cotton system across irrigation level when averaged over two years.
- Early season root galls indicated that:
 - Wheat rotation did reduce the root-knot nematode population density over the continuous cotton system,
 - Further reduction in root-knot nematode numbers were seen during 2015 in the wheat-cotton rotation.
 - Overall density of root-knot nematode was low to start in 2014, and lower still in 2015.
- Nematode buildup during the season was affected by cultivar, but not by rotation in both years.
- Low initial nematode pressure was insufficient to cause substantial yield losses, so the susceptible NG 1511 B2RF was able to yield similar to the cultivars with some nematode resistance. However, the root-knot nematode buildup in the susceptible cultivar should eventually result in a more damaging nematode density in the future, as was the case in 2015.