

**Introduction**

- U.S. farm size has increased, leaving producers planting more acres within the same time frame (USDA NASS, 2022)
  - Could potentially lead to acres being planted earlier or in more marginal conditions
  - Cotton production could be severely impacted due to cotton's lack of cold hardiness and early season vigor compared to other crops
- The need for PRE-herbicides is high with the increase of resistant-weed biotypes (Whitaker et al. 2011)
  - PRE-herbicides can cause significant injury to cotton (Schrage, 2015), especially in situations with delayed emergence
- High-vigor seed emerges faster (Quisenberry and Gipson, 1974)
  - Which reduces the exposure of the seedling to soil-applied herbicides, theoretically reducing the risk for PRE-herbicide injury

**Objective**

To evaluate the effect of cotton seed quality on tolerance to commonly used PRE-herbicides.

**Hypothesis**

Cotton varieties with higher vigor will have less PRE-herbicide injury.

**Materials and Methods**

**2022 Locations:**

- Peanut Belt Research Station— **Lewiston, NC**
  - Conv. tillage, Goldsboro Sandy Loam
  - Planted 5/4/22- Adequate Planting Conditions\*
- Upper Coastal Plains Research Station – **Rocky Mount, NC**
  - Conv. tillage, Norfolk Loamy Sand
  - Planted 5/10/22- Good Planting Conditions\*

**Experimental design:**

- RCBD; 4 replications
- Plot size → 12' x 40'
- CO<sub>2</sub>-pressurized backpack sprayer delivering 15 GPA
- TeeJet™ AIXR11002 flat-fan spray nozzles
- PRE-herbicides applied immediately after planting
- In-season weed control included multiple applications of glyphosate and glufosinate

**Treatments:**

- Factorial 3 x 4 x 2, where:
  - 3: Cotton varieties [chosen based on cool germination percentage (CG%; Table 1)]
  - 4: Herbicides (Table 2)
  - 2: Herbicide rates (Table 2)
  - Non-treated check also included for each variety

Table 1:

Variety	CG%	Seed/lb
High Cool Germ	56%	5400
Mod. Cool Germ	45%	5503
Low Cool Germ	25%	5340

Table 2:

Active Ingredient	Trade Name	Rate [fl oz/ac; 1x (2x)]
acetochlor	Warrant	48 (96)
fomesafen	Reflex	16 (32)
diuron	Direx 4L	24 (48)
fluometuron	Cotoran 4L	32 (64)

**Data collected:**

- 1, 2, 3 WAP (Weeks after Planting):
  - Cotton Stand
  - Cotton Visual Injury (0-100%)
- 3 WAP Crop Biomass
- Cotton Lint Yield

**Statistical Analysis:**

- All data was analyzed using R software
- Significant interaction separated data by location for 3 WAP stand (Fig. 1)
- Treatment means were separated using Fisher's Protected LSD at  $\alpha \leq 0.05$  level

\*NC Cooperative Extension Cotton Planting Conditions Calculator

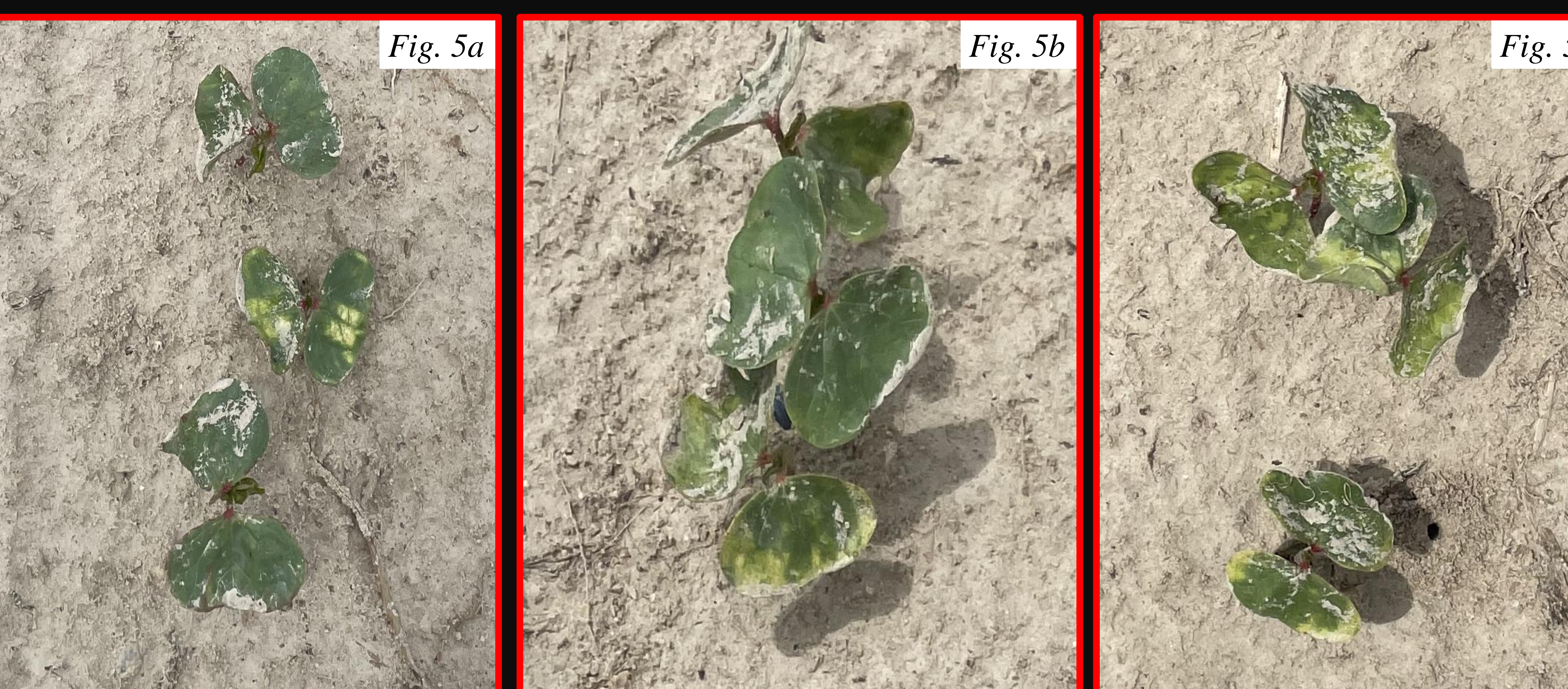
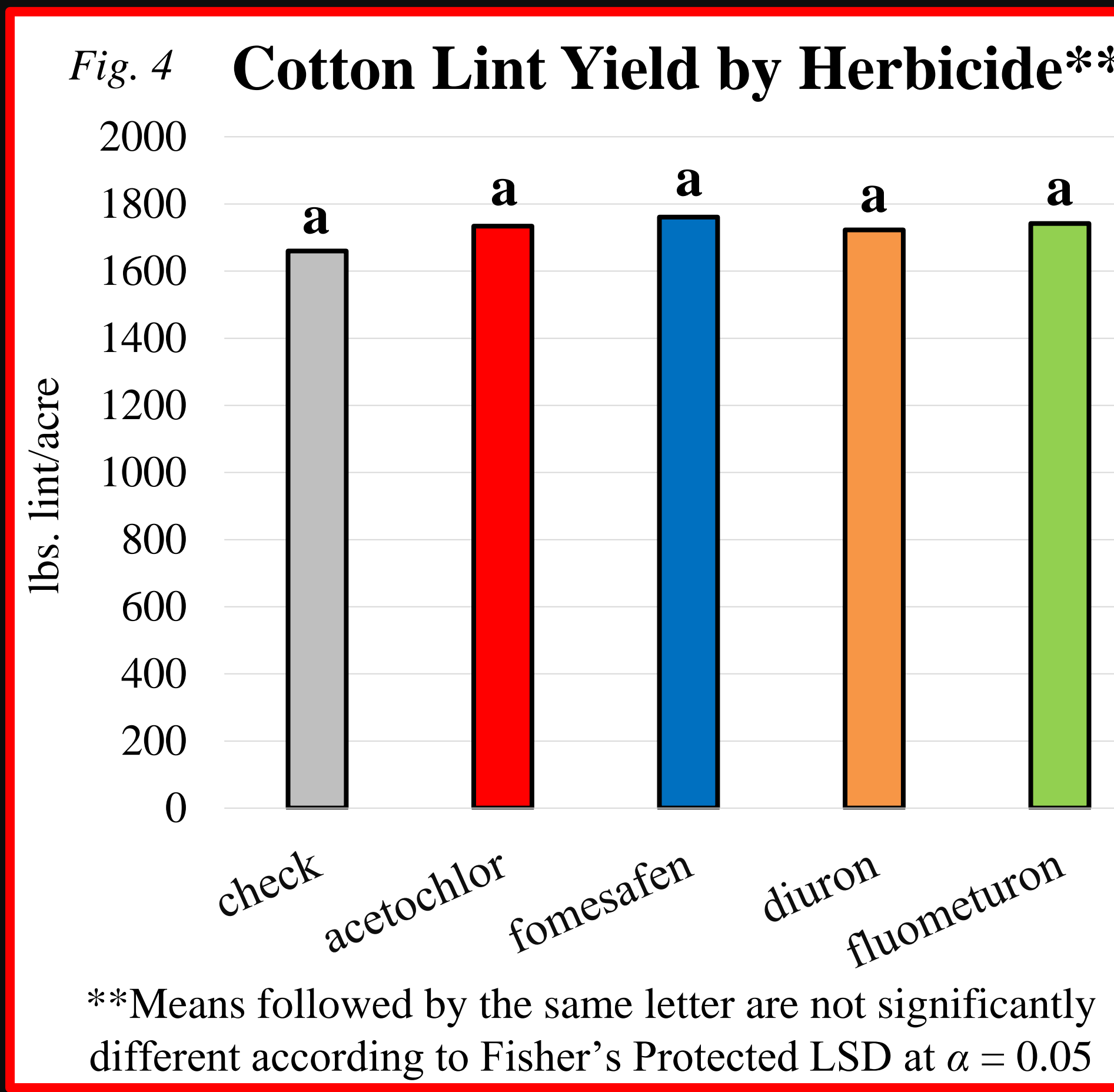
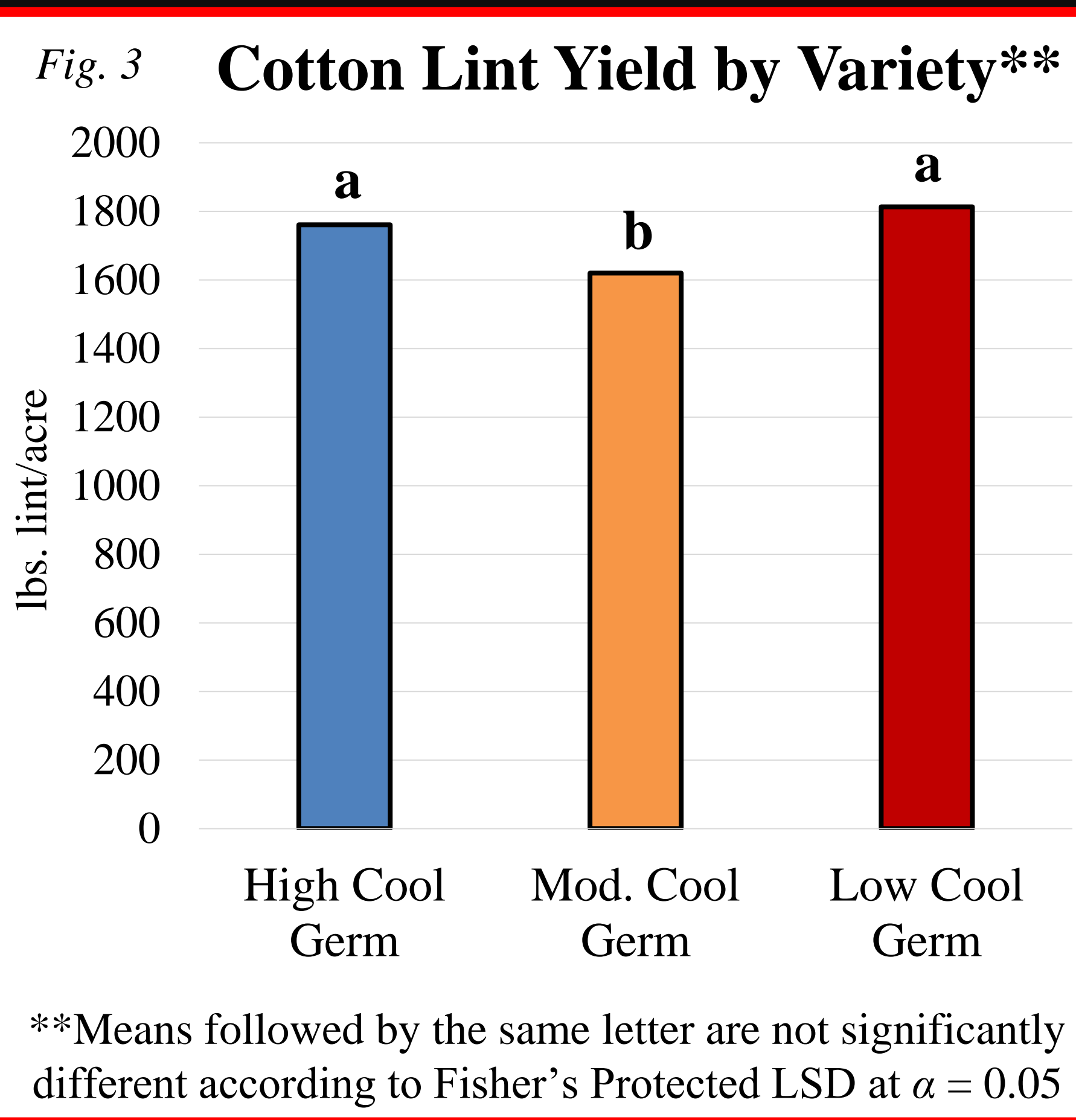
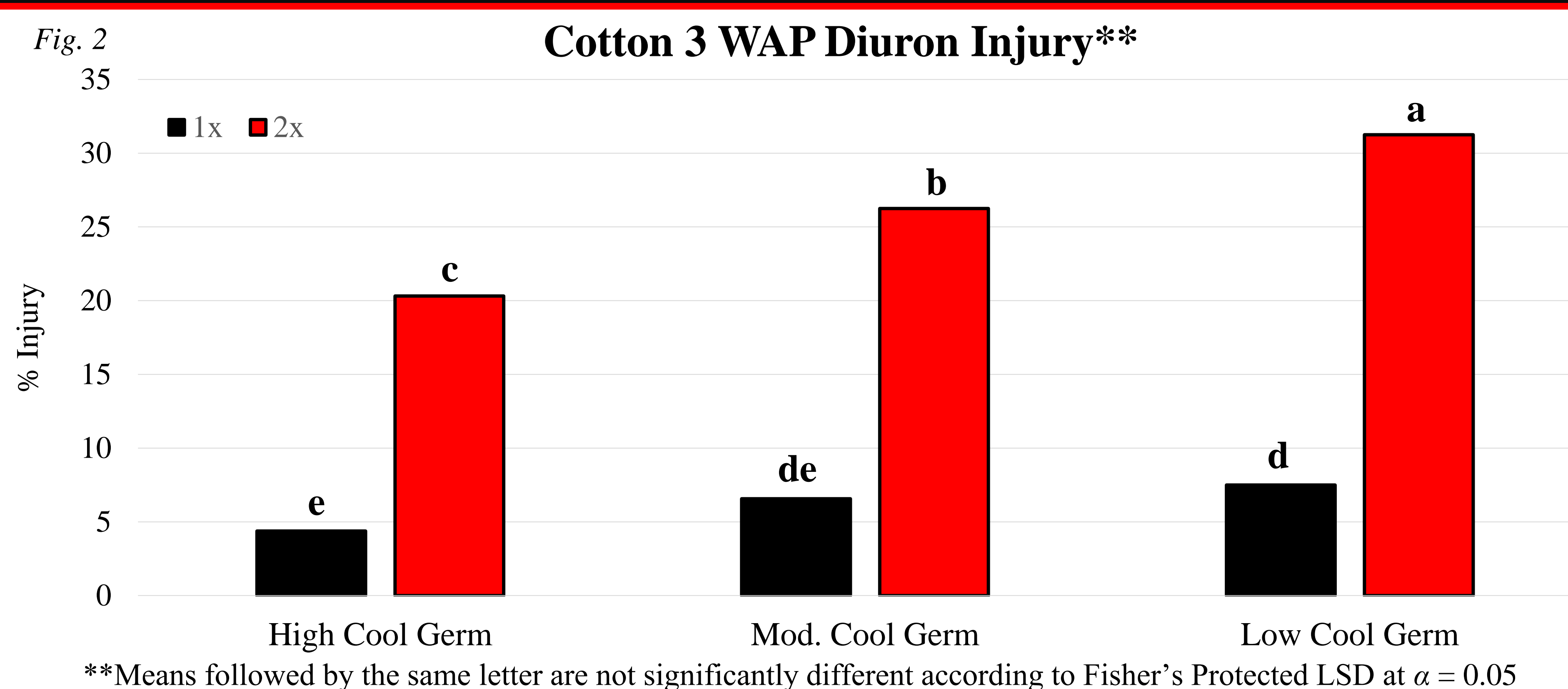
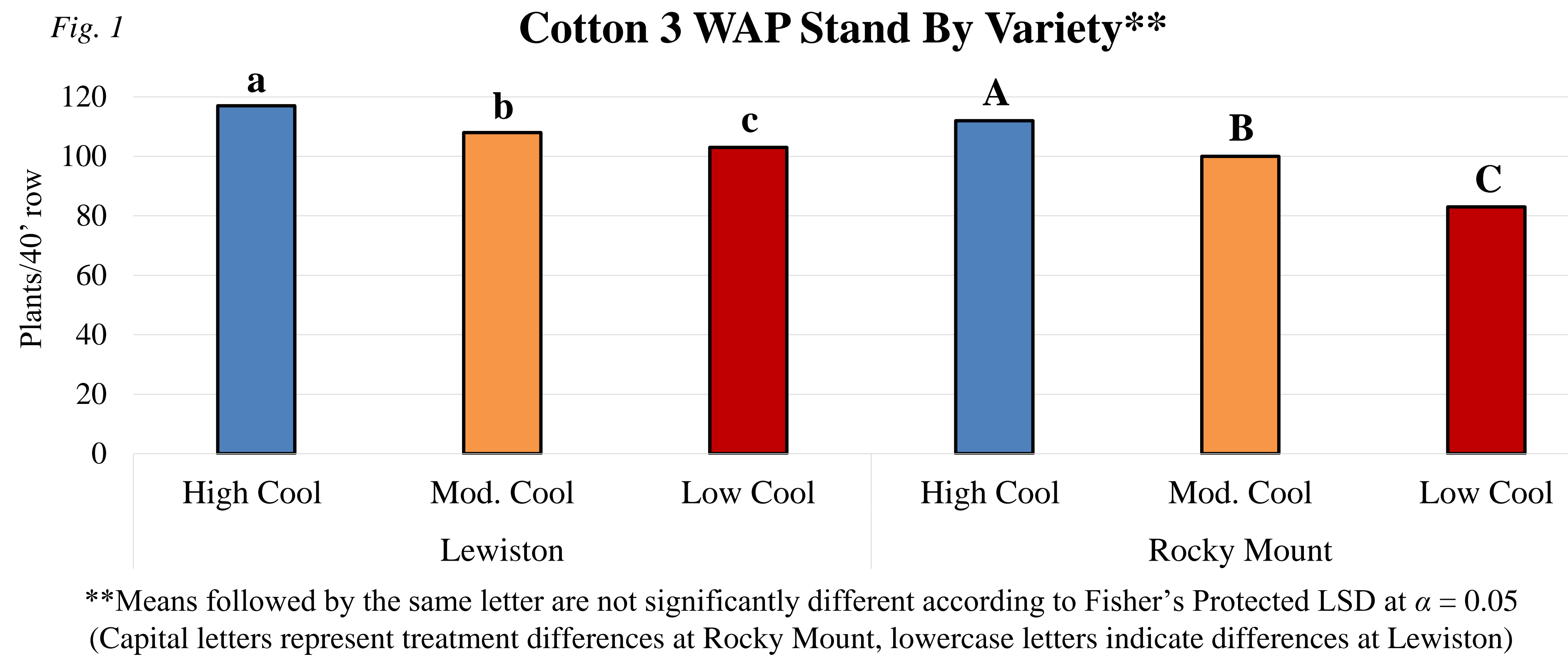


Fig. 5: 2x diuron injury in Rocky Mount. 5a) High Cool Germ, 5b) Mod. Cool Germ, and 5c) Low Cool Germ

**Results and Discussion**

- **3 WAP Cotton Stand:**
  - Cotton stand was significantly impacted by seed quality (Fig. 1)
  - Locations were statistically different, but followed a similar trend (Fig. 1)
  - Herbicide treatment did not influence cotton stand
- **3 WAP Cotton Injury:**
  - Diuron was the most injurious herbicide (Fig. 2; Fig. 5a-c)
  - Lower quality seed had significantly more diuron injury (Fig. 2)
  - High vigor seed, mod. vigor seed, and low vigor seed had 20, 26, and 31% 2x diuron injury, respectively (Fig. 2)
- **Cotton Lint Yield:**
  - Yield differences between varieties were not representative of seed quality (Fig. 3)
  - There were no significant yield differences between any of the herbicide treatments, suggesting transient injury (Fig. 4, 6a-c)



Fig. 6: 2x diuron treatments 8 WAP, no visible difference in injury. 6a) High Cool Germ, 6b) Mod. Cool Germ, and 6c) Low Cool Germ.

**Conclusions/Significance to NC Agriculture**

- Hypothesis: Cotton varieties with higher vigor will have less PRE-herbicide injury
- **Reject the null hypothesis**
- With high vigor seed, plants can emerge and grow faster, reducing their risk for numerous early season pests, and according to this data, also reduces the risk of PRE-herbicide injury.
- NC farmers have increased risk for marginal planting conditions compared to other parts of the country, which inherently increases the risk of PRE-herbicide injury, making it extremely important for NC farmers to plant high quality seed.

**Future Research**

- Research will be repeated in 2023
- Determine seed quality's impact on injury across a wide variety of environmental conditions
- Perform study at different locations to examine the relationship between PRE-herbicide injury and different soil types

**Work Cited**

- Quisenberry JE, and Gipson JR (1974) Growth and productivity of cotton grown from seed produced under four night temperatures. Crop Sci. 14:300-302
- Schrage, BW (2015) Cotton Injury Due to Soil- or Foliar-Applied Herbicides: An Assessment Based on the Influences of Genetic, Agronomic, and Environmental Factors. Theses and Dissertations. 1334.
- USDA National Ag Statistics Service (2022) Farms and Land in Farms 2021 Summary
- Whitaker JR, York AC, Jordan DL, Culpepper AS, Sosnoskie LM (2011) Residual Herbicides for Palmer Amaranth Control. The Journal of Cotton Science. 15:89-99