

Using Cultivar Mixtures to Improve Yield Stability of Cotton (*Gossypium hirsutum* L.) in Unpredictable Environments

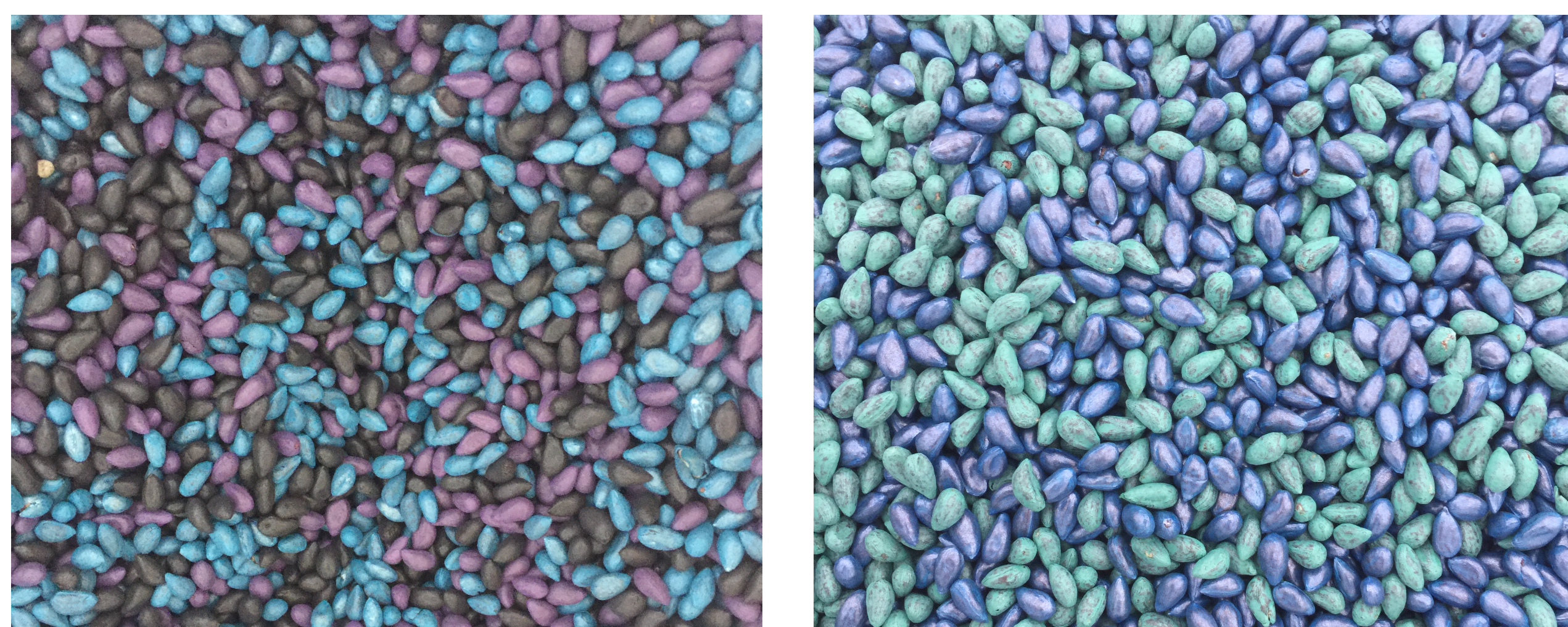
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Introduction

Variety selection is one of the most important decisions a grower can make. However, there is not one variety that will outperform competitors in every environment. Blending varieties that perform well in contrasting environments may help spread the risk when accounting for the uncertainty of weather.



Research Hypothesis

The variety mixture will outperform the singular varieties that make up the mixture on a more consistent basis and over a broader range of environments.

Research Objectives

Determine if a mixture of highly competitive varieties with varieties that show high yield stability in some environments will improve performance stability over a broader range of environments. Lint quality is taken into account to determine if the mixture would help avoid a discount.

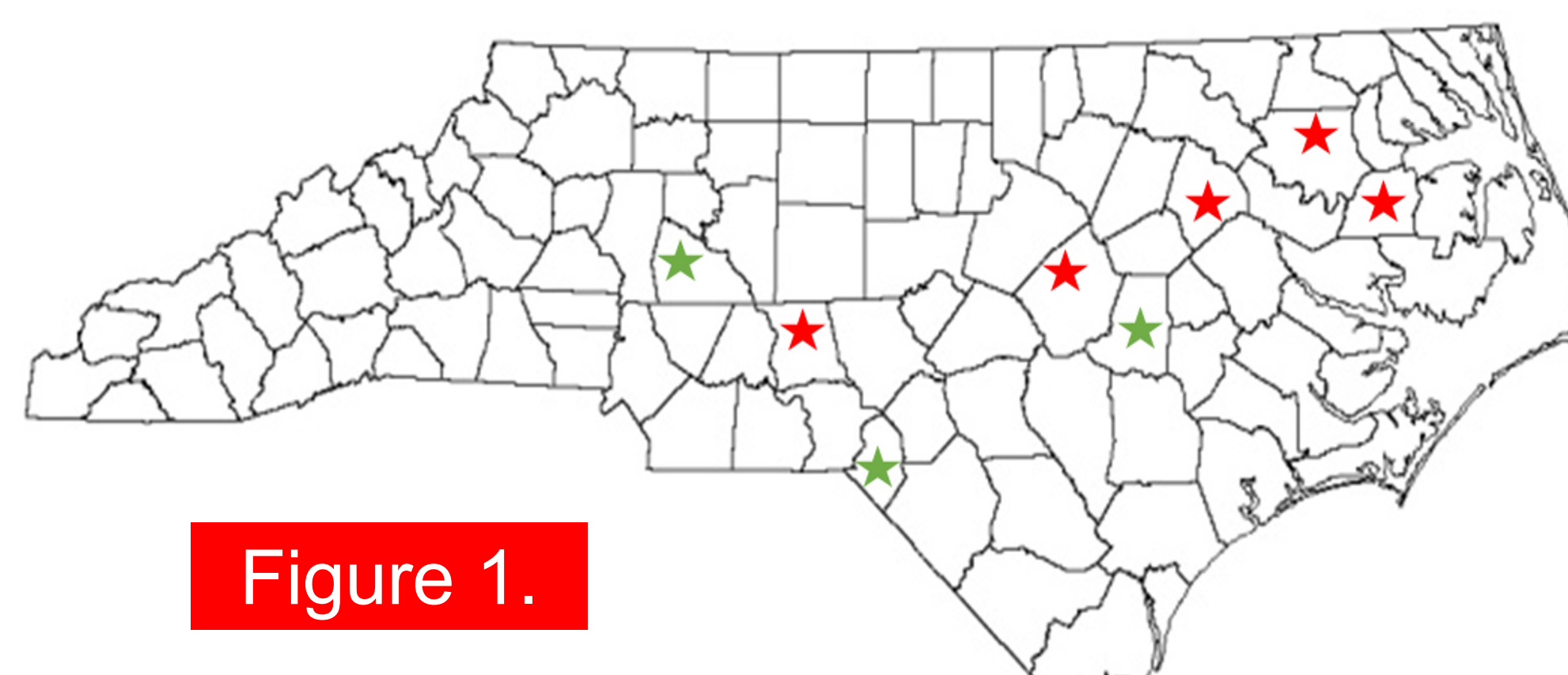


Figure 1.

★ = Locations in both 2017 and 2018

★ = Locations in 2017 only

Materials and Methods

Using historical data collected from multiple on-farm and official variety trials in 2015 and 2016 across the state of North Carolina, and the NC State Extension's NC Cotton Variety Performance Calculator¹, the following 5 varieties were chosen.

- ☞ Deltapine (DP) 1538 B2XF *Consistent in dry years
- ☞ PhytoGen (PHY) 312 WRF *Consistent in wet years
- ☞ DP1646 B2XF *Consistent in wet years
- ☞ NexGen (NG) 3522 B2XF *Consistent in wet years
- ☞ Stoneville (ST) 4848 GLT *High yielding in dry years

There are 8 treatments total and include the aforementioned variety planted alone along with the following three mixtures.

- ☞ All five mixed in equal proportions (All 5)
- ☞ PHY312 + ST4848 (Mix A)
- ☞ DP1538 + DP1646 (Mix B)

Stand counts are taken at the beginning of the season and yield and fiber quality are collected. Trials were conducted in 13 locations in 2017 and 10 locations in 2018 (Figure 1).

Results

Mix A Yield (Table 1.)

- ☞ PHY312 performed better than ST4848 & Mix A
- ☞ Mix A was comparable to ST4848, but still produced the lowest yield in the majority of trials

Variety	Combined Avg Yield (kg ha ⁻¹)	% #1	% #2	% #3
PhytoGen 312 WRF TM	1474	78	9	13
Stoneville 4848 GLT TM	1345	9	52	39
Mixture A	1341	13	35	52

Table 1. Mix A and Component Varieties Ranked by Combined Average Yield and the Frequency They Ranked Highest, Middle, and Lowest Yielding

Mix B Yield (Table 2.)

- ☞ DP1646 performed better than DP1538 & Mix B
- ☞ Mix B performed average compared to the 2 individual varieties

Variety	Combined Avg Yield (kg ha ⁻¹)	% #1	% #2	% #3
Deltapine 1646 B2XF TM	1487	61	26	13
Mixture B	1382	26	44	30
Deltapine 1538 B2XF TM	1312	13	30	57

Table 2. Mix B and Component Varieties Ranked by Combined Average Yield and the Frequency They Ranked Highest, Middle, and Lowest Yielding

Mix C Yield (Table 3.)

- ☞ DP1646 and PHY312 were the top performing varieties
- ☞ Mix C ranked 4th and 5th the majority of the time and favored the varieties that ranked near the bottom of yield performance in this mixture

Variety	Combined Avg Yield (kg ha ⁻¹)	% #1	% #2	% #3	% #4	% #5	% #6
Deltapine 1646 B2XF TM	1487	30	30	9	13	13	4
PhytoGen 312 WRF TM	1474	44	17	22	4	4	9
Mixture C	1382	13	9	17	35	22	4
Stoneville 4848 GLT TM	1345	0	9	30	30	13	17
NexGen 3522 B2XF TM	1342	9	22	13	4	22	30
Deltapine 1538 B2XF TM	1312	4	13	13	13	26	30

Table 3. Mix C and Component Varieties Ranked by Combined Average Yield and the Frequency They Ranked Highest, Middle, and Lowest Yielding

Conclusions

Without knowing which variety will be the highest performer...

- ☞ If the lower yielding variety was chosen, yield stability has the potential to be improved when using a mixture
- ☞ If the higher yielding variety was chosen, yield has the potential to be reduced when using a mixture

References

1. https://trials.ces.ncsu.edu/cotton/select_trials/