EVALUATING SEEDLING VIGOR OF CURRENT AND EMERGING COTTON CULTIVARS

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Abstract

Characterizing canopy development in the past using Normalized Difference Vegetation Index (NDVI) was demonstrated to be an effective tool. However, characterizing seedling development with NDVI has not been properly demonstrated. Alternatives, such as digital conventional cameras that detect red, green, and blue (RGB) channels are incredibly common today and require a minimal investment compared to conventional NDVI equipment. Furthermore, vegetation indices, such as the Green-Red Vegetation Index (GRVI) can be easily calculated from RGB images. The goal of the project was to evaluate the ability to discern differences in seedling vigor utilizing RGB-derived indices and NDVI methodologies to detect differences in seedling development. Research was conducted at the University of Missouri's Lee Farm in Portageville, MO. This study included a total of fifty-eight treatments and 4 replicate plots in 2018 and 28 treatments with 4 replicate plots in 2019. Remote sensing data were collected 14 and 21 days after planting and included Normalized Difference Vegetation Index (NDVI) and aerial RGB photography. RGB images were converted with Imagej into vegetation index images and vegetation indices were derived for each plot. Significant differences were noted between all fifty eight varieties when overserving the NDVI of each plot in 2018. However, in 2019 significant differences between the varieties were not observed, possibly due to the cooler soil temperatures and cooler growing conditions at planting in 2019 with considerable rainfall present. Significant differences were not observed in the GRVI most likely due to the altitude of the UAV. A list of the ten most and ten least vigorous varieties from 2018 are attached as Figures 1 and 2. A complete list of the 2019 varieties are attached as Figure 3. This study will be continued in 2020.

Figure 1. Top ten most vigorous cotton cultivars in Missouri for 2018. Values are means ± standard error (n = 4)

NDVI	Cultivar
0.2816 a	PHY 330 W3FE
0.2732 ab	ST 5020 GLT
0.2711 bc	BX 1975GLTP
0.2707 bc	PX3B07W3FE
0.2691 bcd	PHY 340 W3FE
0.2687 bcde	CROPLAN 3475
0.2669 bcdef	DP 1518 B2XF
0.2649 bcdefg	17R818B3XF
0.2638 cdefgh	PX5D28BW3FE
0.2637 cdefgh	ST 4949 GLT

Figure 2. Ten least vigorous cotton cultivars in Missouri for 2018. Values are means ± standard error (n = 4)

NDVI	Cultivar
0.24 vwxyz	NG 4689 B2XF
0.24 vwxyz	PX3C06W3FE
0.24 vwxyz	CPS 18506-D
0.2385 wxyz	CPS 18507-D
0.2355 wxyz	DP 1646 B2XF
0.2338 wxyz	DG 3214 B2XF
0.2323 yz	NG 3780 B2XF
0.2308 z	DP 1614 B2XF
0.2291 z	CPS 18501-B
0.2289 z	NG 4777 B2XF

Figure 3. Ndvi of all cotton cultivars in Missouri for 2019. Values are means ± standard error (n = 4).

Cultvar	NDVI
PX3D43W3FE	0.2452
ST 4550GLTP	0.2300
DP1823NR B2XF	0.2299
ST 5471GLTP	0.2298
PHY 350 W3FE	0.2291
PHY 340 W3FE	0.2287
NG 3522 B2XF	0.2277
NG 3930 B3XF	0.2218
PHY 400 W3FE	0.2207
CP 9210 B3XF	0.2202
NG 4936 B3XF	0.2199
ST 5600B2XF	0.2190
PHY 480 W3FE	0.2184
DP1614 B2XF	0.2182
PHY 360 W3FE	0.2177
DP1518 B2XF	0.2176
CP 9608 B3XF	0.2133
NG 5007 B2XF	0.2131
DP1916 B3XF	0.2116
NG 3729 B2XF	0.2094
DP1725 B2XF	0.2077
18R628NR B3XF	0.2075
DP1835 B3XF	0.2059
PX3D32W3FE	0.2056
DP1646 B2XF	0.2007
CP 9178 B3XF	0.1983
NG 3994 B3XF	0.1946
CP 3527 B2XF	0.1874