TRANSGENIC BROWN LINT COTTON

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Abstract

Brown lint cotton lines were identified as segregates in cotton seed samples received from the national cotton germplasm collection. Individuals were chosen for intensity of color and increased as progeny rows. The brown color of these lines was judged to be good, but fiber properties were poor by USDA standards. In order to facilitate an ongoing investigation of the inheritance of the brown lint trait, improve the fiber properties of these brown lint lines, and to provide a system for the maintenance of the purity of seed stocks, resistance to imidazolinone herbicides was transferred into selected brown lint lines. Preliminary observation on the inheritance of the brown lint trait, fiber quality improvement and herbicide tolerance of the first of these lines is described.

Introduction

Interest in naturally colored cottons for utilization in certain niche consumer markets has increased in recent years. The spinning performance of naturally colored cottons has been notoriously poor, due in large part to the short staple length and low strength of these cottons. These factors, along with low productivity (lint yield) have in some circumstances hindered commercial development of these cottons. In the course of our Acala breeding work, breeding lines are often brought in from the national cotton germplasm collection in order to expand our germplasm base. Brown linted progeny were observed segregating in some of the seed stocks obtained from the national cotton germplasm collection. We chose to utilize the brown lint trait as a tool to better understand the inheritance of multiple traits in cotton. To facilitate this study, a brown linted parent was crossed with a white-linted transgenic cotton line carrying tolerance to imidazolinone herbicides as the source of fiber strength and length genes. This study reports observations on F2 progeny segregating for brown lint color, improved fiber properties and herbicide tolerance.

Methods

Brown linted segregates were selected, bolls were harvested and seed was planted in progeny rows to identify rows exhibiting uniformity of inheritance of the brown lint trait. A single plant selection with medium-brown colored lint was made from a uniform row, planted in a greenhouse, and crossed with line AC1 (see Anderson et al, 1997). The F1 progeny were germinated in soil containing an imidazolinone herbicide (Scepter™) at a concentration of 350 ppb (approximately 10X the field rate for Scepter™). Herbicide resistant progeny segregating for brown lint were self pollinated and the F2 progeny were germinated in soil containing Scepter™ at 350 ppb. Herbicide resistant progeny were grown to maturity, bolls harvested, ginned and the fiber properties measured on individual instruments.

Results and Discussion

Brown linted F1 progeny (GH1970) of the outcross of a brown linted female parent with AC1 (Scepter™ tolerant), and F2 progeny of GH1970 were selected for tolerance to Scepter™. The fiber properties of lint harvested from the parents and a single herbicide tolerant F2 plant (HB1) of the cross are presented in Table 1. As expected, GH1970, though herbicide tolerant, was deficient in length, strength and micronaire. AC1 has length, strength and micronaire within the premium range. The Scepter™-tolerant, brown linted F2 plant HB1 has greatly improved fiber properties over GH1970, with both length and micronaire within the premium range. The 16.4% improvement seen in strength is statistically significant, although the value measured (17.7 g/tex) is still 11% below the premium range.

A transgenic cotton line has been developed which is naturally brown linted, tolerant to imidazolinone herbicides, and has improved fiber properties over the non-transgenic brown lint parent. The herbicide tolerance marker will facilitate maintenance of the purity of seed stocks during further generations as we utilize this line to study the inheritance of multiple traits (fiber properties, herbicide tolerance and fiber color). In addition, the herbicide tolerance marker will serve to fingerprint those lines originating from our program.

References

Anderson, D. M., Pellow, J., Palmer, J., Grula, J., Cooper, H.B., and Rajasekaran, K.R. 1997. Field evaluation of cotton transformed for resistance to imidazolinone herbicides. These Proceedings.

Table 1. Brown lint fiber data.

Entry	Length	UR	T1	Mic
AC1	1.18	47.1	22.7	4.57
GH1970	0.977	51.4	15.2	2.77
HB1 (brown lint)	1.10	48.0	17.7	3.75
LSD	0.06	4.0	2.1	0.16
CV%	2.5	3.3	7.3	2.1

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