

Optimization of cotton variety registration criteria aided with a genotype-by-trait biplot analysis

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Author Naiyin Xu, Michel Fok, Jian Li, Xiaoni Yang & Weikai Yan

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Abstract

China is one of the largest cotton producing countries in the world thanks to high yields, on which a variety registration system has mainly focused, so that a lack of quality is nowadays acknowledged as a weak point of the cotton industry in that country. The objective of this study was to check the hypothesis that bias in cultivar selection in favor of yield has been maintained through the application of an imperfect selection index (SI), but that a better outcome is possible. Our demonstration is based on an analysis of the data from ten years of cotton variety trials using genotype-by-trait biplots, implemented both for the cultivar selection index (SI) currently applied in China and for an adjusted selection index (ASI) that more effectively took into account the antagonism between yield and quality traits. The main findings were: 1) significant negative associations between yield and fiber quality hindered their simultaneous improvement; 2) registered genotypes were mainly determined by the SI which was primarily yield-oriented; 3) no progress in fiber quality was recorded unlike yield; 4) balanced progress in yield and quality is possible through an adjusted selection index (ASI) guided by genotype-by-trait biplot analysis.

English abstract

China is one of the largest cotton producing countries in the world thanks to high yields, on which a variety registration system has mainly focused, so that a lack of quality is nowadays acknowledged as a weak point of the cotton industry in that country. The objective of this study was to check the hypothesis that bias in cultivar selection in favor of yield has been maintained through the application of an imperfect selection index (SI), but that a better outcome is possible. Our demonstration is based on an analysis of the data from ten years of cotton variety trials using genotype-by-trait biplots, implemented both for the cultivar selection index (SI) currently applied in China and for an adjusted selection index (ASI) that more effectively took into account the antagonism between yield and quality traits. The main findings were: 1) significant negative associations between yield and fiber quality hindered their simultaneous improvement; 2) registered genotypes were mainly determined by the SI which was primarily yield-oriented; 3) no progress in fiber quality was recorded unlike yield; 4) balanced progress in yield and quality is possible through an adjusted selection index (ASI) guided by genotype-by-trait biplot analysis.

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