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CULTIVAR RELEASE

BRS 336: A high-quality fiber upland cotton cultivar for Brazilian savanna and semi-arid conditions

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Abstract – *Cotton cultivar BRS 336 is a high-quality fiber upland cultivar and has wide adaptation to the Brazilian growing areas, with resistance to bacterial blight. BRS 336 exhibited fiber length higher than 32.0 mm in all field tests. Also, fiber strength exceeded all upland cotton currently grown in Brazil.*

Key words: Gossypium hirsutum, *disease resistance, fiber quality.*

INTRODUCTION

Cotton fiber is an economically important commodity in the world. Improving fiber quality in cotton cultivars is a major demand of the sector to confront competition with synthetic fibers, and to meet the necessities of the cotton industry and global market competition. The 'BRS 336' upland cotton cultivar (*Gossypium hirsutum* L.) (Reg. no. 27691) was developed by Empresa Brasileira de Pesquisa Agropecuária (Embrapa) and partners (Fundo para o Desenvolvimento do Agronegócio do Algodão - FUNDEAGRO and Fundação Bahia) in 2011 as part of an ongoing effort to develop new cotton lines and cultivars with improved fiber quality and good yield potential adapted to major growing regions in Brazil (Freire et al. 2008).

GENETIC ORIGIN AND DEVELOPMENT

The cultivar BRS 336 was developed by hybridization following pedigree selection. It was originated from a tri-parental cross of cotton cultivars Chaco 520, BRS Itaúba, and Delta Opal [(Chaco 520 x

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BRS Itaúba) x Delta Opal], carried out in 2000 and 2001, respectively. Chaco 520 is an early plant with good fiber quality (30.6 mm 2.5 % SL and 31.4 gf tex^{-1} strength). BRS Itaúba (a selection of the Australian cultivar CS 50) also has a good fiber quality and resistance to the main diseases that occur in Brazil. Hybrid combinations with cultivar Delta Opal (a high-yielding cotton cultivar with pedigree DP 5816 x Sicala 33) are used for the improvement of seed cotton yield, lint yield, seed index and index of production and earliness (Morello et al. 2010).

'BRS 336' was derived from a single $F_{3:4}$ progeny row following single plant selections based on apparent yield potential, HVI fiber properties, disease resistance, and overall plant conformation. The line obtained was treated subsequently as a pure line (CNPA BA 2005-3300 – F6), and was evaluated in Bahia State at two locations in the 2007/2008 and 2008/2009 growing seasons. In the 2009/10 season, it was evaluated in 19 field trials in states of Bahia, Goiás, Mato Grosso do Sul, Mato Grosso, Minas Gerais, Maranhão Piauí, Paraíba, and Rondônia. Over all field tests 'BRS 336' had fiber length readings (UHML HVI) from 32.9 mm to 35.8 mm; micronaire (ìg $inch^{-1}$) from 4.0 to 4.9 and strength from 32.0 to 37.0 gf tex^{-1}.

PERFORMANCE TRAITS

'BRS 336' is a mid to late-season maturity, picker-type upland cotton cultivar with growth habits similar to those of 'Delta Opal' when grown at São Desidério, BA. Plants have trichomes on leaves and on the main stem. 'BRS 336' possesses normal-shaped leaves and bracts (7 to 12 lobes), glands and nectaries. The first reproductive branch is inserted generally on the fifth node, growing with oblique angle insertion. Flowers have cream-colored petals, anthers, and pollen. Full-size green bolls are longer than their width and are broader in the middle. The bolls possess four locks with five locks occurring occasionally. Open bolls are shattering resistant, but not storm proof, being suitable for picker harvesting. Lint and fuzz are white in color.

Plants are of medium height, reaching 115 to 125 cm tall, when 50 to 75 g ha^{-1} of the active ingredient of growth regulator (mepiquat chloride and chlormequat chloride) are applied. In altitude of 794 meters, the first flower appears at 60 to 65 days after emergence (DAE) and the first boll opens at about 110 to 120 DAE. In these environmental conditions and using harvest aid chemicals, the total harvest was attained at 170 to 180 DAE.

'BRS 336' has suitable resistance levels to the main diseases that occur in Brazil (Suassuna and Coutinho 2007). At high inoculum pressure, BRS 336 was resistant to bacterial blight [caused by *Xanthomonas citri* subsp. *malvacearum*], moderately resistant to cotton blue disease [caused by *Cotton leafroll dwarf virus*- CLRDV], moderately susceptible to false mildew [caused by *Ramularia areola*] and ramulosis [caused by *Colletotrichum gossypii* var. *cephalosporioides*], and susceptible to *Fusarium oxysporum* f. sp. *vasinfectum* - *Meloidogyne incognita* complex.

The new cultivar produced 1.4 % more seed cotton and 5.1 % less lint yield than 'Delta Opal', averaged across 19 performance trials in central, northeastern, southeastern, and northern Brazil in 2009/2010. Lower performance in lint yield is due to its low lint percentage, with a mean of 39.5 % (ranging from 38.2 to 43.5 %, measured in a roller gin) (Table 1). However, HVI measurements reveal desirable fiber attributes for an upland cotton cultivar, such as: micronaire (ìg $inch^{-1}$) reading ranging from 4.0 to 4.9; fiber length (UHML) from 32.9 to 35.8 mm and fiber strength from 32.0 to 37.0 gf tex^{-1}. Such fiber quality can be comparable with obsolete low-yielding high staple cultivar BRS Acácia (Acala type) and superior to high-yielding cultivar Delta Opal (Table 2). Cotton Incorporated classifies upland cotton with UHM fiber length of 28.2 to 32.0 mm as long and if > 32.0 mm as extra long (Cotton Incorporated and Textile World 2010).

SEED MAINTENANCE AND DISTRIBUTION

'BRS 336' is registered in Ministério da Agricultura, Pecuária e Abastecimento (MAPA) under the number 27691. Foundation seed is produced by the Embrapa Transferência de Tecnologia (SNT). The Fundação Bahia, working in partnership with Embrapa, is responsible for certified seed production.

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Table 1. Means for seed cotton yield (SCY), lint percentage (LP) and lint yield (LY) obtained by cotton cultivars BRS 336 and Delta Opal (control) in the 2009/10 and 2010/11 growing seasons in 19 locations

Locations /State	Season	BRS 336			Delta Opal (control)			CV*
		SCY (kg ha^{-1})	LP (%)	LY (kg ha^{-1})	SCY (kg ha^{-1})	LP (%)	LY (kg ha^{-1})	
Correntina/BA	2009/10	5074.7	40.4	2048.7	5580.0	43.0	2399.4	12.7
São Desidério/BA	2009/10	5033.2	39.3	1979.1	5029.3	43.7	2197.0	15.5
Mineiros/GO	2009/10	4241.7	38.3	1623.9	4561.4	42.5	1936.5	16.5
Montividiu/GO	2009/10	3616.1	38.2	1379.9	4383.3	40.8	1787.9	11.7
Uberaba/MG	2009/10	3016.0	39.5	1190.4	2401.0	43.4	1042.8	19.7
Vilhena/RO	2009/10	3031.6	39.5	1197.5	2997.8	41.9	1256.1	16.3
São Raimundo/MA	2009/10	3835.0	39.0	1495.7	3763.8	40.8	1535.6	9.3
Bom Jesus/PI	2009/10	3720.0	39.2	1458.2	3577.5	41.5	1484.7	8.7
Chapadão do Sul/MS	2009/10	3160.0	42.0	1326.0	3040.6	44.6	1356.3	13.4
Itaquiraí/MS	2009/10	2636.4	35.9	946.9	2326.0	36.6	851.7	17.7
Sapezal/MT	2009/10	4644.2	38.4	1783.4	4360.3	43.4	1891.7	11.1
Pedra Preta/MT	2009/10	5227.6	43.5	2271.4	4953.2	45.6	2256.4	7.9
Itaporanga/PB	2009/10	2824.5	40.8	1152.4	3129.5	41.9	1309.7	19.5
Formosa do Rio Preto/BA	2010/11	3542.8	38.3	1356.9	3412.8	40.7	1389.0	18.1
Correntina/BA	2010/11	5565.8	39.6	2204.1	5458.9	40.4	2205.4	10.0
Campo Novo dos Parecis/MT	2010/11	1880.8	39.3	739.2	1809.7	40.5	732.9	28.2
Cristalina/GO	2010/11	5897.8	39.6	2334.3	5083.3	41.6	2115.9	10.4
Santa Helena de Goiás/GO	2010/11	3498.6	37.9	1331.8	3848.9	40.2	1548.5	18.1
Chapadão do Sul/MS	2010/11	4191.4	38.5	1615.0	4306.5	40.4	1739.5	9.2
Mean		**3928.3**	**39.3**	**1549.2**	**3895.8**	**41.7**	**1633.5**	**14.4**

* Coefficient of variation (%) for seed cotton yield (kg ha^{-1})

Table 2. Other traits obtained for cultivars BRS 336, BRS Acácia (long staple control) and Delta Opal (control)

Traits	'BRS 336'	'BRS Acácia'	'Delta Opal'
First flower (DAE)*	60 – 65	–	55 – 60
First open boll (DAE)*	110 – 120	–	100 – 110
Boll weight (g) [a]	6.6	–	6.4
Upper half mean Length HVI (mm) [a]	32.9 – 35.8	32.1 – 34.9	29.3 – 31.9
Uniformity index (ML/UHML - %) [a]	82.6 – 86.3	–	82.3 – 86.6
Strength HVI (gf.tex^{-1}) [a]	32.0 – 37.0	28.8 – 36.2	27.7 – 33.5
Micronaire reading (g.inch^{-1}) [a]	4.0 – 4.9	3.8 – 4.5	3.7 – 4.7
Elongation (%) [a]	4.6 – 7.1	–	5.9 – 8.1
Reflectance – Rd (%) [a]	68.4 – 82.8	–	70.4 – 82.2
Yellowness (+ b) [a]	4.9 – 8.6	–	6.2 – 8.7
Spinning consistency index [a]	156.5 – 180.5	–	144.0 – 154.0
Short fiber index (%) [a]	4.6 – 7.3	–	5.2 – 10.0
Total seed oil (%) [b]	24.96	–	21.2
Cotton leafroll dwarf virus [c]	0.4	–	0.0
False mildew [d]	3.5	–	4.0
Bacterial blight [d]	1.0	4.5	1.0
Ramulosis [e]	45.2	33.5 [h]	–
Root-knot nematode [f]	4.0	1.3 [h]	–
Fusarium wilt [g]	22.7	9.6 [h]	–

* Data recorded at São Desidério, BA (lat 12° 57' 71'' S, long 45° 58' 92'' W and alt 794m asl).

[a] Means from 7 field trials in 2006/2007, 2007/2008, 2008/2009, and 2009/2010 seasons at four locations (Bahia State); [b] Total seed oil (%) measured by nuclear magnetic resonance (NMR); [c] Incidence (%) of plants with cotton blue disease symptoms - data from two experiments with no control of virus vector (*Aphis gossypii*); [d] Disease severity (grades from 1 = resistant to 5 = highly susceptible) - data from two experiments with no fungicide application; [e] Amaral disease index (Amaral 1969) – data from two experiments artificially inoculated with *Colletotrichum gossypii* var. *cephalosporioides* using methods proposed by Oliveira et al. (2010); [f] Galling index (Zhang et al. 2006); [g] Disease index (Machado et al. 2009); [h] Cultivar IAC-25 used as resistant control.

BRS 336: Cultivar de algodoeiro de alta qualidade de fibra para cultivo no cerrado e semi-árido do Brasil

Resumo – *A cultivar de algodoeiro BRS 336 possui alta qualidade de fibra, adaptação às principais regiões produtoras de algodoeiro no Brasil e resistência à mancha angular. BRS 336 possui comprimento de fibra acima de 32,0 mm e resistência da fibra superior às demais cultivares em uso no Brasil.*

Palavras-chave: Gossypium hirsutum, *resistência às doenças, qualidade de fibra.*

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