NEXGEN BOLLGARD II/XTENDFLEX VARIETIES FROM AMERICOT: NG 3405 B2XF, NG 3406 B2XF, AND NG 5007 B2XF

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Abstract

Americot, Inc. will offer three new varieties containing the Bollgard II and XtendFlex transgenic traits. NG 3405 B2XF and NG 3406 B2XF are early-mid maturity varieties, while NG 5007 B2XF is a mid-full maturity variety. NG 3405 B2XF is the most broadly adapted of the three, while NG 3406 B2XF is primarily adapted to the northern high plains, northern midsouth, and northern southeast regions. NG 5007 B2XF is primarily adapted to Arizona and the southern southeast region. Introductory commercial quantities of all three NexGen B2XF varieties are expected to be available for the 2015 season.

Introduction

Americot, Inc. is the only privately-owned cotton planting seed company in the United States, and develops and markets cotton varieties from Arizona to Virginia. The main breeding station, directed by Dr. Tom Brooks, is in Seminole, Texas, with additional nurseries in Lubbock, Texas, Maricopa, Arizona, and Greenville, Mississippi. Americot's headquarters is in Lubbock, Texas, and the company has field representatives across Texas and the midsouth/southeast regions.

Americot cooperated with Monsanto Company to introgress the dicamba and glufosinate traits, together with the currently-available Roundup Ready Flex trait, to be marketed as XtendFlex™, pending regulatory approval by USDA. The company anticipates commercializing three new varieties which possess XtendFlex stacked with the currently-available insect traits, Bollgard II®: NG 3405 B2XF, NG 3406 B2XF, and NG 5007 B2XF. Americot will have saleable quantities of all three of these varieties available for the 2015 season.

Materials and Methods

Data within this manuscript were generated via USDA regulated small-plot Americot trials in 2014. University personnel and contract researchers conducted these trials across the cotton belt. Data are as of December 23, 2014. Relative maturity was determined using nodes above cracked boll method (Speed et al., 2004; Legé, 2014). Plots were machine-harvested using either a stripper or spindle picker. Lint yield, turnout, and fiber quality data are presented. Loan values were calculated from year-specific premiums and discounts. Crop values are presented as plot-level calculations of lint yield X loan value.

Results and Discussion

Relative Maturity

Across the southern areas of Texas, the midsouth and southeast regions, NG 3405 B2XF and NG 3406 B2XF were numerically the earliest varieties in the comparison. NG 5007 B2XF was numerically the latest variety in the comparison (Table 1).

Significant differences in relative maturity were detected for varieties compared in the high plains region, shown in Table 2. NG 3405 B2XF and NG 3406 B2XF were the earliest varieties in the comparison, but were not significantly earlier than NG 1511 B2RF. However, both B2XF varieties were significantly earlier than NG 4111 RF.

Based on the preliminary data in Tables 1 and 2, NG 3405 B2XF and NG 3406 B2XF will be classified as early-mid maturity, while NG 5007 B2XF will be classified as a mid-full maturity variety.

Table 1. Relative maturity of three NexGen B2XF varieties compared to NexGen and competitor B2RF and/or WRF varieties from nine locations from south Texas to South Carolina in 2014. Difference in degree-days, base 60ºF (DD60s) assumes 50 DD60s to develop one node. Estimated day differences: Northern locations based on long-term weather data (weather.com) from Jackson, TN, Keiser, AR, Rocky Mt., NC, and Portageville, MO, showing average of 12.1 DD60s/day from Sept 1-30; Southern locations from Alexandria, LA, Headland, AL, Stoneville, MS, and Tifton, GA, showing average of 16.4 DD60s/day from Sept 1-30 (Legé, 2014).

Variety	Nodes Above Cracked Boll	DD60s later than NG 3405 B2XF	Estimated days later than NG 3405 B2XF in Northern Locations	Estimated days later than NG 3405 B2XF in Southern Locations
NG 3405 B2XF	5.70	-	-	-
NG 3406 B2XF	5.76	2.8	0.2	0.2
DP 1137 B2RF	6.00	15.2	1.3	0.9
AMX4350B2RF	6.09	19.3	1.6	1.2
PHY 499 WRF	6.10	19.9	1.7	1.2
NG 1511 B2RF	6.14	22.1	1.8	1.4
NG 5315 B2RF	6.24	27.2	2.2	1.7
NG 5007 B2XF	6.44	36.9	3.1	2.3
LSD	NS	NS	NS	NS

Table 2. Relative maturity of two NexGen B2XF varieties compared to NexGen and competitor B2RF and/or RF varieties from seven high plains locations in 2014. Difference in degree-days, base 60ºF (DD60s) assumes 50 DD60s to develop one node. Estimated day difference based on 30-year average from September 16 to October 15 at Lubbock, Texas, (source: www.weather.com) of 6.4 DD60s per day (Legé, 2014).

Variety	Nodes Above Cracked Boll	DD60s later than NG 3406 B2XF	Estimated days later than NG 3406 B2XF
NG 3406 B2XF	5.76	-	-
NG 3405 B2XF	5.95	9.5	1.5
NG 1511 B2RF	5.96	10.2	1.6
FM 2484B2F	6.06	15.2	2.4
AMX4350B2RF	6.08	15.9	2.5
NG 3348 B2RF	6.21	22.4	3.5
NG 4010 B2RF	6.41	32.4	5.1
NG 4012 B2RF	6.81	52.7	8.2
NG 4111 RF	7.17	70.6	11.0
LSD	1.0	48.5	7.6

Plant Growth and Development

Early vigor for NG 3405 B2XF and NG 3406 B2XF was similar compared to NG 1511 B2RF, while NG 5007 B2XF early vigor was not different from NG 5315 B2RF at twenty locations across the cotton belt in 2014 (Table 3). NG 3406 B2XF, while having similar relative maturity as NG 3405 B2XF (Tables 1 and 2), tended to be more determinate than NG 3405 B2XF, though not significantly so, based on the nodes above white flower data in Table 3. NG 3406 B2XF was the shortest variety in the comparison, while NG 5007 B2XF and NG 5315 B2RF had the tallest plants (Table 3). Node of the first fruiting branch, total nodes, and boll size did not differ among the varieties compared in Table 3.

Table 3. Plant growth and development characteristics of NG 3405 B2XF, NG 3406 B2XF, and NG 5007 B2XF compared to other NexGen B2RF varieties across the cotton belt in 2014.

Variety	Early Vigor (1=excellent; 5=very poor)	Node of 1st Fruiting Branch	Nodes Above White Flower @ Late Bloom	Plant Height (in)	Total Nodes	Boll Size (g seedcotton/ boll)
AMX4350B2RF	2.7	6.10	4.60	32.01	18.8	5.28
NG 1511 B2RF	2.4	5.91	4.79	33.24	19.0	5.10
NG 3405 B2XF	2.0	6.04	4.55	32.14	18.4	5.04
NG 3406 B2XF	2.4	5.90	4.27	31.51	18.3	5.15
NG 5007 B2XF	2.9	5.75	5.14	34.95	18.4	4.80
NG 5315 B2RF	3.1	6.04	5.11	35.35	18.3	5.03
LSD	0.7	NS	0.54	2.45	NS	NS
n	20	18	6	20	19	13

Lint Yield, Turnout, and Fiber Quality

Lint yield did not significantly differ among six varieties compared across the cotton belt in 2014 (Table 4). Turnout was significantly highest for NG 1511 B2RF, but not different from NG 5315 B2RF or any of the three NexGen B2XF varieties. Fiber length was significantly highest for NG 5007 B2XF and NG 5315 B2RF, but not different from NG 3406 B2XF, AMX4350B2RF, or NG 1511 B2RF. NG 1511 B2RF had the significantly highest strength. Micronaire was lowest for NG 5007 B2XF, but not different from NG 3405 B2XF, NG 3406 B2XF, NG 5315 B2RF, or AMX4350B2RF. Uniformity was highest for NG 5315 B2RF, which was not different from NG 1511 B2RF or AMX4350B2RF. Loan values, which assumed base color grades of 41 and base leaf grades of 4, did not differ among the six varieties; similarly, crop values did not differ among the varieties.

Table 4. Lint yield, turnout, HVI fiber quality, loan value, and crop value of NG 3405 B2XF, NG 3406 B2XF, and NG 5007 B2XF compared to three NexGen B2RF varieties across the cotton belt in 2014.

Variety	lbs lint/A	Turnout	Length (in)	Strength (g/tex)	Mic	Uniformity	Loan ($/lb)	Crop Value ($/A)
NG 1511 B2RF	1576	44.03%	1.11	31.45	4.78	83.5%	0.5240	793
NG 3405 B2XF	1566	42.76%	1.09	27.81	4.49	82.5%	0.5176	779
NG 3406 B2XF	1524	42.66%	1.12	30.39	4.53	83.9%	0.5308	770
NG 5315 B2RF	1462	43.75%	1.13	29.95	4.59	84.0%	0.5295	727
NG 5007 B2XF	1454	43.53%	1.13	28.65	4.45	83.0%	0.5272	729
AMX4350B2RF	1426	41.53%	1.10	29.05	4.59	83.1%	0.5216	710
LSD	NS	1.40	0.03	1.03	0.23	1.03	NS	NS
n	18	20	13	13	13	15	13	13

Lint yield for NG 3405 B2XF across south/central Texas, midsouth, and southeast regions in 2014 (Table 5) did not significantly differ from NG 1511 B2RF or PHY 499 WRF. NG 3406 B2XF and NG 5007 B2XF lint yields did not differ from NG 1511 B2RF or NG 3405 B2XF across these same regions. PHY 499 WRF had the significantly highest turnouts, but it did not differ from NG 1511 B2RF, NG 5315 B2RF, NG 5007 B2XF, NG 3405 B2XF, or DP 1137 B2RF. NG 3406 B2XF, NG 5007 B2XF, and NG 5315 B2RF had the longest fiber, but these were not different from PHY 499 WRF, DP 1137 B2RF, NG 1511 B2RF, or AMX4350B2RF. Fiber strength significantly differed among the varieties, with PHY 499 WRF having the strongest fiber, followed by NG 1511 B2RF, and NG 3406 B2XF. Uniformity was highest for PHY 499 WRF, but was not different from NG 3406 B2XF, NG 5315 B2RF, DP 1137 B2RF, or NG 1511 B2RF. Loan value was significantly highest for NG 3406 B2XF, but not different from NG 5315 B2RF, DP 1137 B2RF, NG 5007 B2XF, NG 3405 B2XF, PHY 499 WRF, or AMX4350B2RF. Crop value was highest for PHY 499 WRF, which was not different from NG 1511 B2RF or NG 3405 B2XF.

Table 5. Lint yield, turnout, HVI fiber quality, loan value, and crop value of NG 3405 B2XF, NG 3406 B2XF, and NG 5007 B2XF compared to three NexGen B2RF varieties and two competitor varieties across the south/central Texas, midsouth, and southeast regions in 2014.

Variety	lbs lint/A	Turnout	Length (in)	Strength (g/tex)	Mic	Uniformity	Loan ($/lb)	Crop Value ($/A)
PHY 499 WRF	1620	44.16%	1.13	32.88	4.66	84.4%	0.5305	934
NG 1511 B2RF	1532	44.09%	1.12	31.67	4.70	83.8%	0.5262	872
NG 3405 B2XF	1499	43.11%	1.11	28.37	4.29	82.9%	0.5318	858
NG 3406 B2XF	1446	42.51%	1.14	30.67	4.34	84.3%	0.5369	835
NG 5007 B2XF	1400	43.63%	1.14	29.10	4.28	83.1%	0.5324	821
DP 1137 B2RF	1383	43.06%	1.13	30.16	4.51	83.9%	0.5330	806
NG 5315 B2RF	1377	43.90%	1.14	30.32	4.48	84.2%	0.5348	809
AMX4350B2RF	1326	41.77%	1.12	29.41	4.41	83.5%	0.5300	750
LSD	143	1.53	0.02	0.89	0.19	0.8	0.0087	78
n	11	11	8	8	8	8	8	8

Across the high and rolling plains regions of Texas and Oklahoma in 2014, FM 2484B2F had the highest lint yield, but it was not different from NG 3406 B2XF, NG 3405 B2XF, or NG 1511 B2RF (Table 6). NG 1511 B2RF had the highest turnout, while FM 2484B2F had the longest fiber. NG 4111 RF had the highest strength, but was not different from FM 2484B2F, NG 4010 B2RF, or NG 4012 B2RF. Micronaire ranged from a low of 4.49 for NG 3348 B2RF to a high of 4.95 for NG 4010 B2RF. Micronaire for FM 2484B2F and NG 4111 RF did not differ from that of NG 3348 B2RF. NG 4111 RF had the highest uniformity values, but it was not different from FM 2484B2F, NG 4010 B2RF, NG 3348 B2RF, NG 4012 B2RF or NG 1511 B2RF. Loan value was highest for FM 2484B2F, which was not different from NG 4012 B2RF, NG 4111 RF, or NG 3348 B2RF. The highest crop value was observed for FM 2484B2F.

Table 6. Lint yield, turnout, HVI fiber quality, loan value, and crop value of NG 3405 B2XF and NG 3406 B2XF compared to five NexGen B2RF varieties, one NexGen RF variety, and one competitor variety across the high and rolling plains regions of Texas and Oklahoma in 2014.

Variety	lbs lint/A	Turnout	Length (in)	Strength (g/tex)	Mic	Uniformity	Loan ($/lb)	Crop Value ($/A)
FM 2484B2F	1434	43.70%	1.17	32.18	4.56	83.6%	0.5420	763
NG 3406 B2XF	1329	44.56%	1.09	29.95	4.83	83.3%	0.5210	665
NG 3405 B2XF	1321	44.26%	1.05	26.93	4.81	81.9%	0.4950	653
NG 1511 B2RF	1271	45.88%	1.09	31.10	4.91	83.0%	0.5205	667
NG 4010 B2RF	1200	40.92%	1.11	31.96	4.95	83.1%	0.5128	550
NG 4111 RF	1192	42.73%	1.11	32.51	4.69	83.6%	0.5279	622
AMX4350B2RF	1191	42.77%	1.07	28.47	4.87	82.3%	0.5082	645
NG 4012 B2RF	1158	42.54%	1.11	31.93	4.71	83.0%	0.5301	543
NG 3348 B2RF	1135	41.76%	1.10	30.58	4.49	83.1%	0.5275	626
LSD	175	0.89	0.03	1.22	0.21	0.9	0.0164	94
n	7	7	5	5	5	5	5	5

Because NG 1511 B2RF is the company's most popular variety and since it has very good yield stability across a wide range of environments (Brooks, 2012), each of the three new NexGen B2XF varieties are compared to this standard variety by growing region in Tables 7 through 9.

NG 3405 B2XF had similar lint yield performance in all growing regions, except for Arizona and the northern high plains regions, where NG 3405 B2XF significantly outyielded NG 1511 B2RF (Table 7).

Table 7. Lint yield by growing region for NG 3405 B2XF and NG 1511 B2RF in 2014.

	lbs. lint/A			
Region	NG 3405 B2XF	NG 1511 B2RF	t test	n
Arizona	2360	2169	0.0487	1
Southern high plains	1562	1542	0.8311	3
Northern high plains	982	820	0.0896	2
Rolling plains	1552	1573	0.8111	3
South Texas	1376	1450	0.2846	2
Central Texas	1404	1374	0.6456	1
Southern midsouth	1286	1298	0.8969	2
Northern midsouth	1318	1397	0.2484	3
Southern southeast	1827	1763	0.2686	2
Northern southeast	2151	2257	0.1363	1

NG 3406 B2XF yielded comparably to NG 1511 B2RF in all growing regions, except for the northern high plains and southern southeast regions. NG 3406 B2XF yielded significantly higher than NG 1511 B2RF in the northern high plains, while the opposite was observed for the southern southeast region (Table 8).

Table 8. Lint yield by growing region for NG 3406 B2XF and NG 1511 B2RF in 2014.

	lbs. lint/A			
Region	NG 3406 B2XF	NG 1511 B2RF	t test	n
Arizona	2171	2169	0.9841	1
Southern high plains	1553	1542	0.9027	3
Northern high plains	983	832	0.0589	2
Rolling plains	1563	1573	0.8642	3
South Texas	1372	1450	0.2630	2
Central Texas	1350	1374	0.5986	1
Southern midsouth	1189	1298	0.2420	2
Northern midsouth	1294	1397	0.1835	3
Southern southeast	1688	1763	0.0738	2
Northern southeast	2173	2257	0.2900	1

NG 5007 B2XF did not exhibit widespread adaptation compared to NG 1511 B2RF, but rather is more specific in its area of adaptation. NG 5007 B2RF significantly outyielded NG 1511 B2RF in Arizona and in the southern southeast, but was significantly lower yielding than NG 1511 B2RF in the southern high plains, rolling plains, central Texas, southern midsouth, northern midsouth, and northern southeast regions.

Table 9. Lint yield by growing region for NG 5007 B2XF and NG 1511 B2RF in 2014.

	lbs. lint/A			
Region	NG 5007 B2XF	NG 1511 B2RF	t test	n
Arizona	2504	2169	0.0076	1
Southern high plains	1334	1542	0.0248	3
Northern high plains	998	1008	0.9810	1
Rolling plains	1422	1573	0.0193	3
South Texas	1355	1450	0.1262	2
Central Texas	1185	1374	0.0178	1
Southern midsouth	1143	1298	0.0764	2
Northern midsouth	1148	1397	0.0013	3
Southern southeast	1876	1763	0.0538	2
Northern southeast	2020	2257	0.0907	1

Summary

Americot, Inc. will offer three new varieties containing the Bollgard II and XtendFlex transgenic traits. NG 3405 B2XF has early-mid maturity with broad adaptability across the cotton belt. It has performed well under dryland or irrigated fields and over a wide range of soil types. It has exhibited very good yield potential and yield stability. NG 3406 B2XF is also an early-mid maturity, but is more determinate than NG 3405 B2XF. NG 3406 B2XF yield performance has indicated it is best suited for the northern high plains, northern midsouth, and northern southeast regions. It has performed best on highly productive and irrigated fields. NG 3406 B2XF has very good storm tolerance and fiber quality. NG 5007 B2XF is a mid-full maturity variety that is potentially best-suited to Arizona and the southern southeast region. Its best yield performance has been observed on highly productive and irrigated fields. NG 5007 B2XF has exhibited very good fiber quality and high turnout. Introductory commercial quantities of all three NexGen B2XF varieties are expected to be available for the 2015 season.

References

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