

SYNGENTA GERMPLASM AND VIP 3A INTROGRESSION

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Abstract

The introduction of genetically modified traits has provided growers with alternative means of improved insect and weed control. In order to improve yields, introgression of these traits into superior performing, elite germplasm will be necessary. Syngenta Seeds, Inc., Syngenta Biotechnology, Inc., and Syngenta Crop Protection, Inc. have combined efforts to develop an improved crop solution strategy for cotton growers. Introgression of the Vip3A insecticidal trait into elite germplasm is ongoing and will be the first Syngenta cotton GMO to go to market.

Introduction

Vip3A is a recently discovered insecticidal protein that offers a novel mode of action and provides insecticidal control to numerous economically important lepidopteran insect pests (Shotkoski et al., 2003). In October 1999, Syngenta Seeds, Inc. acquired the United Agri Products cotton breeding program and introgression of the Vip3A trait was soon initiated. The two elite lines of Syngenta Seeds, Inc. to be initially selected for introgression were N2387 and DX2429. N2387 is highly adapted to Texas (except the most northern region), New Mexico, Brazil, and Mexico. It is also highly resistant to cotton leaf crumple disease which is caused by cotton leaf crumple geminivirus and transmitted by sweetpotato whiteflies, *Bemisia tabaci* Gennadius and silverleaf whiteflies, *B. argentifolii* Bellows and Perring (Natwick, et al., 2000). DX2429 was selected based on preliminary strain testing in the Mississippi delta. Introgressions were conducted at two locations, Victoria, TX and Research Triangle Park, NC. Initial introgressions of Vip3A were with the Cot 101 and Cot 102 events. Cot 102 was later selected as the lead event and introgressions with Cot 101 were halted.

Results

Introgressions of Vip3A into N2387 and DX2429 reached BC₃ in Summer, 2002. Individual plant selections were made in Summer, 2003 from BC₃F₂ populations. Each selection was tested for Vip3A homozygosity with Taqman. These selections are currently in seed increase in Hawaii, where additional Vip3A confirmation and adventitious presence testing is being conducted.

Yield and agronomic performance of N2387 and DX2429 has been very favorable. N2387 has shown good adaptability to growing conditions in Texas, New Mexico, Brazil, and Mexico. N2387 has a very high lint turnout and possesses the glabrous trait, which can reduce gin trash. If the cotton leaf crumple virus resistance of N2387 provides significant resistance to the leaf curl virus, then N2387 could be very useful as breeding material for the Syngenta-India hybrid cottonseed program.

Results from Mid-South/Mississippi delta Official Variety Tests (OVT) has shown DX2429 to be very competitive with other varieties (Table 1). DX2429 is medium-early in maturity, has a good fiber quality package, with good fiber strength, uniformity, and elongation (Table 2).

Both of the lines selected for Vip3A introgression have shown good yield performance. Vip3A versions of these two lines are currently in winter seed increase and will be further tested and increased in 2004. Introgressions with new, marker-free Vip3A events are ongoing with N2387, DX2429, and newly developed elite lines.

References

Natwick, E.T., C. Cook, R. Gilbertson, Y. Seo, and T. Turini. 2000. Resistance in upland cotton to the silverleaf whitefly transmitted cotton leaf crumple disease, pp. 164-167. *In* R. Dugger and D.A. Richter [eds.] Proc. Beltwide Cotton Prod. Res. Conf., Natl. Cotton Council of Amer., Memphis, TN.

Shotkoski, F., E. Chen, V. Mascarenhas. 2003. Vip: A novel insecticidal protein with broad spectrum lepidopteran activity, pp. 89-93. *In* R. Dugger and D.A. Richter [eds.] Proc. Beltwide Cotton Prod. Res. Conf., Natl. Cotton Council of Amer., Memphis, TN.

Table 1. Relative lint yield of comparison varieties to Syngenta DX2429.

Variety	Number of trials *	Percent yield of DX2429
BCS Fibermax 958	n=21	89.5%
BCS Fibermax 958B	n=24	98.6%
DPL Paymaster 1218 BG/RR	n=23	96.1%
DPL 555 BG/RR	n=18	93.8%
DPL 444 BG/RR	n=19	104.2%
Stoneville 474	n=16	93.4%

*Trials for comparisons include 2002-2003 OVT results from Mississippi, Arkansas, Louisiana, and Tennessee.

Table 2. Lint percent and fiber properties of DX2429, Stoneville 474, Fibermax 958B, and DPL 555 BG/RR.

Variety	Lint Percent %	Fiber Length in.	Uniformity %	Strength g/tex	Elongation %	Mic. units	
DX 2429	38.1	1.12	84.7	32.9	9.1	4.7	Stoneville
474 n= 16*	40.0	1.10	83.9	30.6	8.4	4.8	
DX 2429	38.9	1.12	84.7	32.5	9.1	4.9	Fibermax
958B n= 15*	39.3	1.14	84.1	33.8	7.8	4.4	
DX 2429	38.5	1.12	84.7	32.5	9.2	4.9	DPL 555
BG/RR n= 11*	41.4	1.13	82.9	29.6	7.5	4.6	

*Trials for comparisons include 2002-2003 OVT results from Mississippi, Arkansas, Louisiana, and Tennessee.