Crop Varieties and Engineered Genetics

Bt-enhanced corn is among the latest products of biotechnology to come to market. Vegetable and some row-crop farmers have used the Bt bacteria (Bacillus thuringiensis) for decades to control the caterpillars of moths. The introduction of the "Bt" gene into the corn itself means that the plant can manufacture the protein that is toxic to these larvae, especially those of the European corn borer. Many scientists believe the widespread use of this technology could hasten development of resistant insects, rendering ineffective even traditional Bt treatments. In the meantime, seed companies are preparing to sell quantities of the product, and many farmers are preparing to buy.

Dave Lubben and Colin Wilson

Three PFI cooperators incorporated Bt corn into trials in 1997. The **Dordt College Agriculture Department** compared three corn hybrids: an inexpensive offering from a local seed house and two "isolines" that reportedly differed only in that one contained the Bt gene (Table 7). With only four replications in the trial, even the nearly 34-bushel yield difference was not quite statistically significant, but taking those yield differences as real and calculating the value of each crop over costs (seed, hauling, and drying), the financial advantage goes to the Bt hybrid (Table 7). The Dordt College cooperators were also interested in ear drop, another factor related to corn borer damage. In the Viking 4612, they measured 3.7 bushels per acre droppage; in the Northrup King 4640 they picked 4.7 bushels per acre off the ground; and in the NK4640-Bt plots they gleaned just one-third of a bushel per acre.

Dave and Lisa Lubben, Monticello, repeated a comparison of Bt and non-Bt corn that they carried out in 1996. As in 1996, there was a significant difference in yield favoring the Bt hybrid from the isoline hybrid that was supposedly identical except for the Bt gene (Table 7). As in 1996, the yield advantage more than paid for the additional seed cost of Bt corn.
None of these trials took into account infestation levels of corn borer; they simply evaluated the performance of Bt corn under whatever infestation conditions prevailed. However, see page 23 for a report of Bt corn and its effect on common stalkborer infestations in strip intercropping.

Dordt College carried out a second variety comparison in which waxy and non-waxy isolines of corn were compared. With only three replications it is not possible to conclude the 9½-bushel yield difference was real (trial LSD=58.3 bushels). With no seed cost difference between the waxy and non-waxy hybrids, there was no greater financial advantage to either hybrid (Table 8). Waxy corn has particular milling qualities and is typically contracted at a small premium, but no sale price difference was reported.

The Neely-Kinyon Research Farm, near Greenfield, compared a conventional soybean variety marketed conventionally to a large-seeded tofu-type soybean marketed through a contract (Table 8). As in a similar 1996 trial, the conventional soybeans yielded more than the tofu soybeans, but the tofu beans were more profitable because of their higher contract price. The tofu beans were sold for $1.07 per bushel more than the standard soybeans in 1997. Related costs included hauling to market, which was greater for the tofu soybeans, and seed cost, which was somewhat less per acre for the tofu soybeans.

Table 7. Multiple-Treatment Variety Trials

Multiple-Treatment Variety Trials

COOPERATOR	CROP	PREVIOUS CROP	YIELD SIGNIFI-CANCE	TREATMENT "A"					TREATMENT "B"					TREATMENT "C"					OVERALL COMMENTS
				DESCRIPTION	YIELD (bu. or T)	STAT.	TRT COSTS	$ BENEFIT	DESCRIPTION	YIELD (bu. or T)	STAT.	TRT COSTS	$ BENEFIT	DESCRIPTION	YIELD (bu. or T)	STAT.	TRT COSTS	$ BENEFIT	
DORDT COLL.	CORN	ALFALFA	@93.4%	NK 4640	129.8	a	$58.53	$0.00	NK_Bt 4640	150.0	a	$84.82	$0.00	VIKING 4612	116.3	a	$41.12	$0.00	4 REPS ONLY. NEAR-SIGNIFICANT 33.7 BU YIELD DIFFERENCE. SEED COSTS: NK, $38.81; NK Bt, $46.88; VIKING, $18.38
				CROP VALUE OVER COSTS:				$265.98	CROP VALUE OVER COSTS:				$290.26	CROP VALUE OVER COSTS:				$249.63	
LUBBEN	CORN	SOYBEANS	*	NON-Bt CIEBA 4494	160.5	b	$31.67	$0.00	Bt CORN MAX454	166.2	a	$35.00	$10.97						THESE ARE "SISTER HYBRIDS," DIFFERING ONLY IN THE Bt GENE. LSD=5.1 BU/ACRE

Table 8. "A/B" Variety and Other Trials

COOPERATOR	CROP	TREATMENT "A"			TREATMENT "B"	"A/B" Variety and Other Trials						
						TRT "B"		DIFFERENCE				
		DESCRIPTION	YIELD (bu.)	TREATMENT COST	DESCRIPTION	YIELD (bu.)	TREATMENT COST	YIELD DIFF.	YLD LSD (bu.)	YLD SIG.	$ BENEFIT OF TRT "A"	COMMENT
DORDT	CORN	WAXY VIKING 4420	113.9	$21.38	NONWAXY VIKING 4420	123.4	$21.38	-9.5	58.3	N.S.	($9.49)	
NEELY-KINYON	SOYBEANS	IA 2017 TOFU VAR.	34.4	$25.13	STINE 2170	38.4	$25.16	-4.0	1.2	*	$9.97	$7.74/BU FOR CONTRACTED TOFU BEANS, $6.67 FOR STANDARD SOYBEANS CONVENTIONALLY MARKETED
LUBBEN	CORN	NO SEED FIRMER	155.0	$0.00	SEEDBED FIRMER	147.7	$0.25	7.2	3.2	*	$18.35	IN 1996 FIRMER YIELDED 3.9 BU LESS (NOT SIGNIFICANT)
OLSON	OATS	SOYBEANS PREVIOUSLY	121.4	$0.00	CORN PREVIOUSLY	109.5	$0.00	11.8	8.2	*	$17.76	