Report To The Oregon Processed Vegetable Commission
2000-2001

Title: Identification of Sweet Corn Hybrids Resistant to Root/Stalk Rot

Project Leaders: J. R. Myers, Horticulture
B. Yorgey, Food Science and Technology

Cooperators: M. Powelson, C. Ocamb, Botany and Plant Pathology

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Funding was used to establish, evaluate, and analyze data from sweet corn field plots established on the Jim Belden farm near Stayton. Fourteen hybrids with sugary (*su*) endosperm were evaluated for resistance to root/crown rot. Ears were also evaluated for processing quality.

For the past several years a "root rot/crown rot/stalk rot" disease has been afflicting commercial sweet corn fields grown in the Willamette Valley. The disease seems to have a pathogenic basis, but the exact causal agent is unknown. For growers with this disease, yield and quality are reduced, and increased lodging makes harvesting more difficult. While the disease can be found in fields around the Willamette Valley, greatest severity occurs in the Stayton area where rotation times and choices are minimal.

Objectives: Characterize *su* sweet corn hybrids for reaction to root/crown rot.

Report of Progress:

Major U.S. seed companies were contacted in early spring to request sweet corn hybrids with potential for resistance to root/crown rot. Eleven entries were received. We also included 'Jubilee' and 'Reward' as susceptible checks, and 'Bonus' as a resistant check (Table 1). A plot for the trial was identified on Belden's Farm on MacRobbins Lane.

One row plots 30 ft. in length and replicated six times were established by planting with hand pushed belt planters. Plots were over-planted, then thinned to approximately two plants per foot. Seed companies applied standard fungicide treatments to the seed. The grower applied preemergent insecticide and herbicide, and irrigated and performed other cultural procedures (fertilizer application) in conjunction with care of the surrounding sweet corn crop.

Disease severity was rated using a 0-5 scale where 0= no symptoms; 1=leaf at first node necrotic; 2=leaf at first and second node necrotic; 3=leaves at first three nodes necrotic; 4=leaves at first 4 nodes necrotic; and 5=leaves to the ear or first 5 nodes necrotic. Ten plants per plot were rated. At flowering, silking date was estimated. At harvest, plots were visited 12 Sep., 19 Sep., 26 Sep., 3 Oct., and 10 Oct

to observe disease severity. Root samples were collected from two replicates at the end of the season, and evaluated by Cindy Ocamb's group.

At the Vegetable Farm, the same entries were established in observation trials, and data were recorded on yield, and ear and quality measurements. Whole ears of these hybrids were processed and frozen at the OSU Pilot Plant.

Results:

Differences were observed for disease severity across varieties (Table 1, Figure 1). Disease severity increased as varieties passed through harvest maturity. For example, Reward showed relatively little disease severity at the first evaluation date, but quickly fell apart quickly thereafter. Other entries, most notably, Eliminator, XP 3089, El Toro, Jubilee, and GH 5796 showed similar but less extreme trends. GH 2384, Bonus, GH 5702, and Esquire had the lowest disease severity. This is similar to trends from last year, at least for Bonus and GH 5702. Dynamo showed an interesting disease progression in that it started low, but showed moderate disease severity at the last reading. No clear separation among entries was found, which is reflected in the large LSDs.

Area under the disease progression curve (AUDPC) was also calculated. This statistic combines data collected over time into one number that takes into account both the disease severity and the rate at which the disease progresses. Hybrids were ranked somewhat differently from the data table summarized by date (Table 2., Figure 2). In particular, Dynamo had the lowest AUDPC score, followed by GH 2384, GH 5702, Bonus and Esquire. At the other end of the scale, the three entries rated worst in disease progression (HXP 3089, Eliminator, and Reward) also had the highest AUDPC scores.

Three hybrids had overall ear quality that equaled Jubilee (Table 3 and 4). Esquire also had low disease severity and low AUDPC scores (although not statistically significantly different from Jubilee). Esquire compares favorably to Jubilee for yield (Figure 3) and pericarp toughness (Figure 4). GH 2384, Bonus, Dynamo, and GH 5702 received overall ear quality scores of 3 (compared to 3.5 for Jubilee). They performed well, but may not be acceptable to processors because of a tough pericarp that becomes more apparent as ears go past optimum harvest time (Figure 4). GH 2384 and GH 5702 had the highest yields in the Vegetable Farm Trial (without disease pressure), but it should be remembered that not all entries in this trial were replicated.

Summary: Disease scores steadily increased over evaluation dates. Nine hybrids had lower disease scores than Jubilee on the final data collection date. AUDPC showed similar trends for the hybrids, although Dynamo was ranked first rather than seventh as for the disease progression data. Five lines with the greatest promise are Dynamo, GH 2384, GH 5702, Bonus and Esquire. Of these hybrids, Esquire appears to have the best ear quality.

Table 1. Disease severity for sweet corn hybrids grown in a crown/root rot trial, 2000.

Hybrid	Mean Disease Severity on dates[z]				
	12-Sep	19-Sep	26-Sep	3-Oct	10-Oct
GH 2384	3.67	9.00*	8.33	7.50	14.33
Bonus	5.83	9.17	11.17*	11.17	16.33
GH 5702	1.67	7.33*	7.33	10.50	17.00
Esquire	8.67	12.00	9.83*	12.33	18.00
GH 2547	8.67	12.50	14.83*	15.17	19.83
HMX 8389	9.83	17.67	15.33*	17.00	21.50
Dynamo	2.17	3.50*	6.50	11.17	21.67
Climax	15.67	16.67	19.83*	19.83	25.17
GH 5769	15.33	16.17	19.00*	22.50	28.67
Jubilee	9.67	12.50	11.17*	15.50	30.00
El Toro	11.67	13.67*	16.50	22.67	34.33
XP 3089	14.17	20.67*	21.83	26.17	35.33
Eliminator	12.67	13.33*	15.17	25.67	41.17
Reward	6.67*	16.67	36.50	46.17	50.00
LSD @5%	6.79	8.30	6.93	8.19	8.93

[z]Scale of 0-5 where 0 = no symptoms and 5 = necrotic leaves at five nodes or to ear. Average of 6 plots, 10 plants per plot. * indicates approximate maturity date.

Table 2. Area under the disease progression curve (AUDPC) for sweet corn hybrids grown in a crown/root rot trial, 2000.

Hybrid	AUDPC	T Grouping[z]
Reward	935	A
XP 3089	678	B
Eliminator	588	B C
GH 5769	578	B C
Climax	557	B C
El Toro	550	B C
HMX 8389	476	C D
Jubilee	426	C D E
GH 2547	412	C D E
Esquire	344	D E
Bonus	309	D E
GH 5702	250	E
GH 2384	245	E
Dynamo	240	E
LSD @5%	188	

[z]Means followed by the same letter are not statistically significant at p=0.05 level.

Table 3. Yield and ear measurements from the OSU Vegetable Farm for sweet corn hybrids grown in a crown/root rot trial, 2000.[z]

Entry	Source	Type	Days to Harvest	Stand	Good Ears				Culls		Ear Length (in.)	Ear Diam. (in.)	Kernal Depth (mm)	Pericarp Toughness[y]
					1000/A	T/A	Ears/ Plant	Lbs/ Ear	1000/A	T/A				
Reward	Rogers	su	91	26	20.3	7.2	1.08	0.71	1.5	0.25	7.9	2.05	13.0	134
XP 3089*	Asgrow	su	98	29	21.6	7.4	1.04	0.68	0.0	0.00	8.1	2.09	12.6	93
Jubilee*	Rogers	su	98	26	26.5	7.1	1.40	0.54	0.4	0.08	7.9	1.94	12.3	84
GH 2384	Rogers	su	102	27	31.2	10.0	1.65	0.64	0.0	0.00	7.8	2.10	13.0	120
Dynamo*	Harris Moran	su	102	27	20.5	8.2	1.03	0.80	0.2	0.06	9.0	2.13	14.1	114
Eliminator	Crookham	su	103	27	21.1	7.9	1.07	0.75	0.7	0.18	8.8	2.10	12.0	147
GH 5702	Rogers	su	103	25	32.7	11.1	1.80	0.68	0.0	0.00	8.0	2.15	13.0	126
El Toro*	Asgrow	su	104	28	20.3	7.7	1.00	0.76	0.9	0.18	8.0	2.20	13.0	109
GH 2547*	Rogers	su	104	27	15.2	4.3	0.78	0.56	5.3	0.98	7.8	1.93	10.6	81
GH 5769	Rogers	su	105	25	17.4	6.2	0.96	0.71	0.0	0.00	8.0	2.10	12.5	94
Bonus	Rogers	su	105	24	22.5	7.0	1.29	0.62	5.8	1.02	7.8	2.10	12.5	126
HMX 8389	Harris Moran	su	105	24	30.5	8.7	1.75	0.57	4.4	0.54	7.7	2.10	12.5	120
Esquire*	Asgrow	su	109	27	23.2	8.0	1.21	0.68	2.5	0.75	8.4	2.15	13.4	80
Climax*	Asgrow	su	109	26	17.2	6.9	0.90	0.80	2.7	0.57	7.6	2.21	13.3	126

[z]Planted June 15 in rows 36" apart, thinned to 9" between plants. Values for varieties marked * are means of 4 replications; all others are from a single 20' plot. All data except cull no. and T/A were obtained from typical husked good ears. For ear length, ear diameter, and tenderness, the value used for each replication was the average of 10 individual ear measurements.

[x]Tenderness determined by a spring-operated puncture guage; lower numbers indicate more tender pericarp.

Table 4. Ear quality evaluations from the OSU Vegetable Farm for sweet corn hybrids grown in a crown/root rot trial, 2000.[z]

Entry	Kernel Refine-ment	Row Straight-ness	Tip Fill	Cylind. Shape	Ear Unif.	Mat. Unif	Kernel Unif.	Flavor	Overall Score	Row #	Notes
Reward	3	2.5	3	3	3	3	2.5	2.5	2.5	16-20	
XP 3089	4.5	4	3	3	3	3	4.5	4	3.5	20-22	tapered ears
Jubilee	3.5	4	3	4.5	3.5	2.5	4.5	3.5	3.5	16-18	
GH 2384	2.5	2.5	4	4	4	4	3	3	3	18	
Dynamo	2.5	3.5	2.5	3	2	3	3	3	3	18-20	best ears look good but too variable
Eliminator	3	4	2	3	2	2.5	3	3	2.5	18	
GH 5702	3	2.5	4	4	3	3	2.5	3	3	18	some lodging
El Toro	2.5	3.5	2.5	3	3	2	3	2	3	18	not sweet
GH 2547	4	3	1	4	2	3	3	3.5	1.5	18-22	variable; very poor tip fill; some lodging
GH 5769	4	3	2	3.5	3.5	3	3.5	3.5	3	22	some curved ears
Bonus	3.5	3.5	1.5	4	4	3.5	3.5	3	3	22	
HMX 8389	3.5	3	4	4	3	3	3	3.5	3	20	
Esquire	3.5	3.5	2	4	3.5	3.5	3.5	3.5	3.5	20-22	some lodging
Climax	2	2.5	2.5	3.5	2.5	3	2	3	2.5	16-20	

[z]Planted June 15. Scores 1-5 scale, 5 = best. Overall score, related to general characteristics of harvested ears, is based on processing potential and does not necessarily reflect home garden potential.

Figure 1. Disease progression for 14 sweet corn hybrids over 5 dates. no disease = 0; all plants completely fired = 50

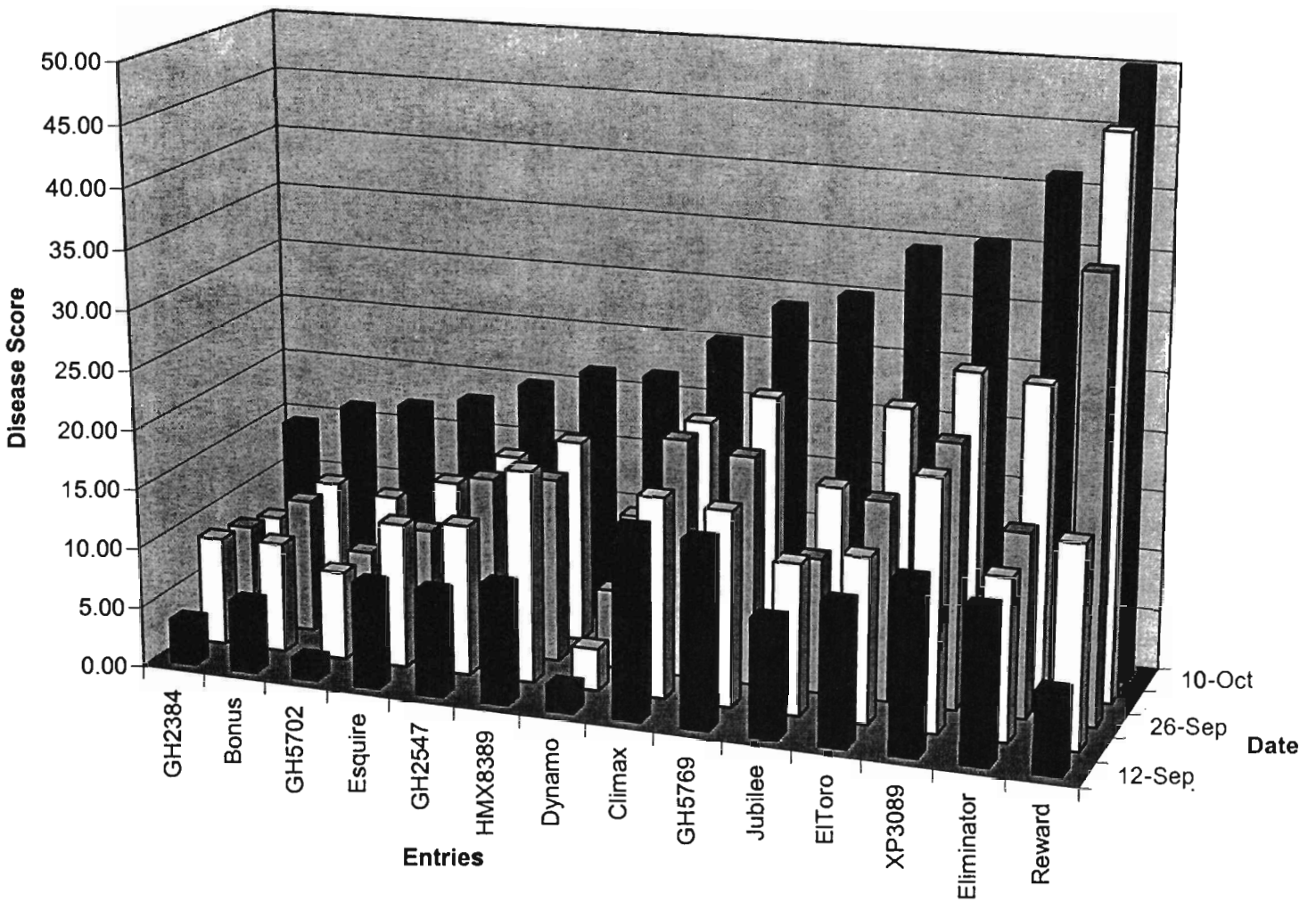

Figure 2. Area under the disease progression curve (AUDPC) for 14 sweet corn hybrids.

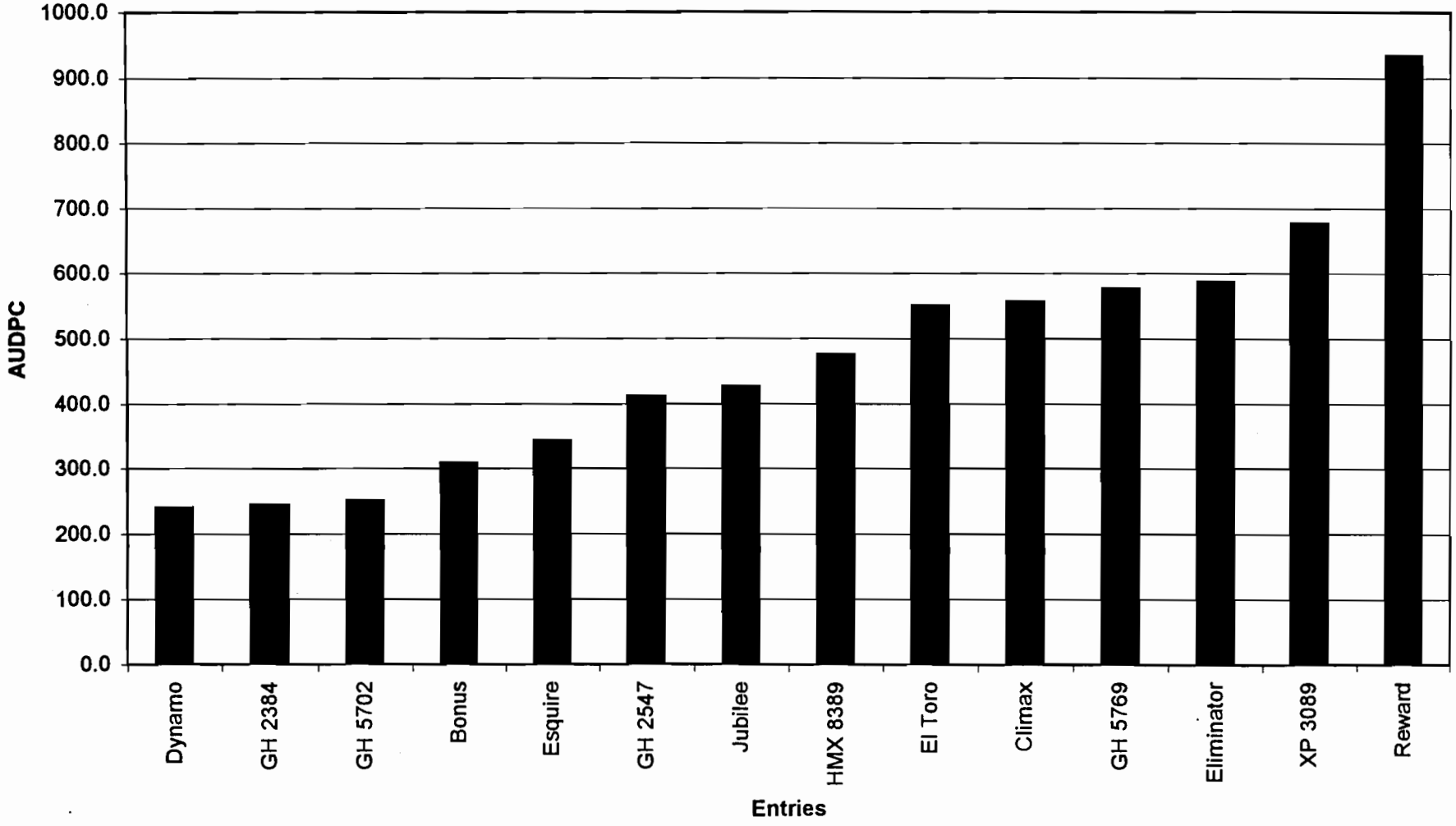

Figure 3. Yield of Sweet Corn Hybrids

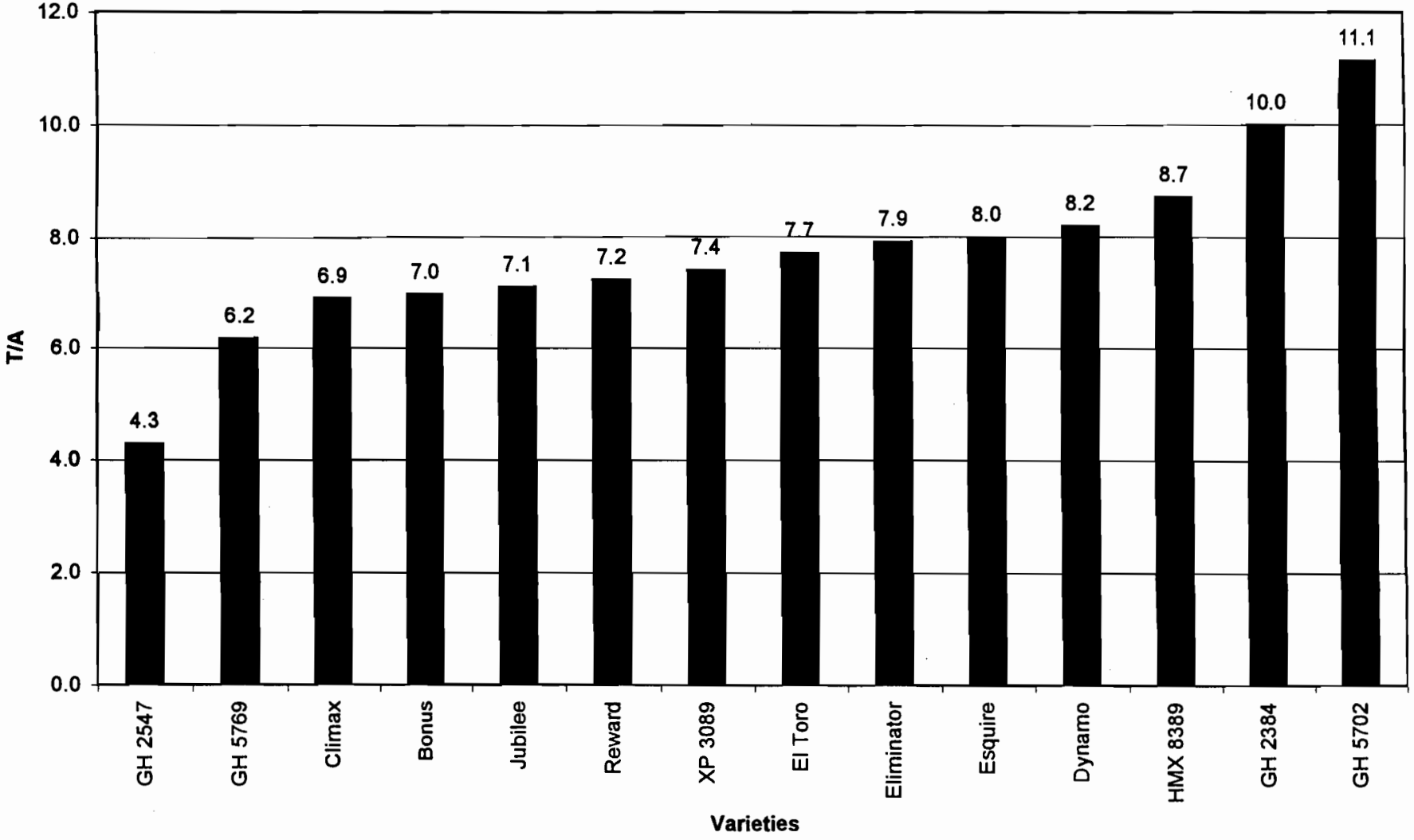

Figure 4. Sweet Corn Hybrid Toughness