

SUGARBEET PROFITABILITY AS AFFECTED BY PLANTING DATE, NITROGEN RATE, VARIETY AND HARVEST DATE

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Climatic conditions aside, the variety (V) planted, the nitrogen (N) level and the harvest date (HD), assuming other cultural and chemical practices are at optimum, will affect the profitability of a given field. Pre-pile harvest quality is historically low. To offset this, producers have suggested planting high-sugar type varieties and reducing nitrogen rates on this acreage. The advent of easy to use variable rate technology has resulted in reduced N levels on headlands, but not in the field openings to any degree. Planters capable of varying varieties, without cleaning and refilling seed hoppers, are not yet available and thus not practical. Some producers now plant higher-sugar, lower-tonnage type varieties, and may vary N rate, depending on when a particular field is to be harvested during pre-pile or regular harvest to maximize profitability. Previous research by this author has shown that high-sugar type varieties vs. high-tonnage, lower-sugar content varieties harvested early gave the highest gross return per acre. On the other hand, the high-tonnage, lower-sugar types harvested later in the harvest season, have given equal or greater gross returns.

Rhizomania has now spread across most of the sugarbeet growing regions of MN and ND. The degree and severity of this devastating disease on sugarbeet yield and quality varies greatly. In the southern Minnesota beet growing region, over 85% of the varieties planted are rhizomania resistant or tolerant. In the northern part of the Red River Valley, few producers plant these types of varieties as the disease is new to them, and there is a general concern that planting resistant or tolerant rhizomania varieties will reduce their return, due to lower sugar content and yield in the absence of rhizomania or weather conditions conducive for its full affect.

In 2003, a study was initiated at the Northwest Research and Outreach Center, Crookston, MN to determine how planting varieties differing in the level of rhizomania resistance, as well as yield and quality, at different N rates, and different harvest dates would affect profitability under non-rhizomania conditions. The 2004 study was altered with the addition of planting dates. This resulted from severe crusting and resulting poor emergence of the rhizomania varieties in some replications.

Methods and Materials: Nitrogen rates of 66%, 100% and 133% of the recommended N rates (87, 130, and 173 lb/A total N- 0-4ft respectively) were spring applied as urea. Two rhizomania resistant (tolerant) varieties Hilleshog 2469 and VDH 46177 differing in quality, and Crystal 999 (susceptible check) were planted May 4 and June 3, 2004. All cultural, herbicide, insecticide and fungicide treatments were applied to insure maximum yield and quality. Harvest dates were September 29 and October 12. Quality traits were determined at the ACSC Quality Laboratory, East Grand Forks, MN.

Results and Discussion: The main effects of harvest date (HD), nitrogen level (N), and variety (V) at both planting dates are shown in [Tables 1-3](#). On the May 4 planting date, HD and V showed statistically significant increases in the variables recoverable sucrose/A (RSA), recoverable sucrose/T (RST), yield, and % sucrose. N level significantly affected all variables except yield. There were no HD x V, N x V, HD x V x N interactions. On the June 3 planting date, similar results were obtained.

On the May 4 planting, yield increased less than 0.1 ton/A per day between the Sept. 27 and Oct. 12 harvests. Sucrose % and RST increased 0.127% and 2.51 lb respectively. The June 3 planting showed similar increases. The surprising gains in sucrose % was the main factor for increases in gross return/a, between harvest dates, of \$260/a and \$204/a for the May 4 and June 23 plantings respectively ([Table 1](#)).

Increasing the N rate from 66% to 133% (87-173 lb/A total N 0-4ft) of recommended failed to increase yield. Many have speculated that the cool-wet summer experienced in 2004, reduced N mineralization and extra N was needed to maximize yield ([Table 2](#)). Results of this trial, regardless of planting date, do not support such conclusions. RSA, RST, % sucrose and gross return/A all decreased significantly and LTM increased significantly as N rates were increased from the reduced rate (66%) to the excess rate (133%). The June 3 planting also showed significant reduction or increases in these variables between the reduced rate and recommended N rate (100%).

The main effects of V are shown in Table 3. Crystal 999 produced significantly more RSA than the two rhizomania varieties. VDH 46177 produced significantly more RSA than Hillehog 2469 at the May 4 planting, but equal amounts with the June 3 planting. This is consistent with other similar research by the author relative to the length of time between planting and harvest with the Van der Have varieties. VDH 46177 also had significantly higher RST and % sucrose than Hillehog 2469 at both plantings, while the Hillehog variety had higher yield at the June 3 planting.

Individual V, N, HD, and PD are shown in Table 4. The most noteworthy factor in the table is the reduction in RSA with VDH 46177 on the June 3 planting compared to the May 4 planting.

In summary, there were no interactions with the main variables nitrogen rate and harvest date across varieties, that is, all three varieties reacted in similar fashion regardless of increasing N rates or harvest date. The yield and sucrose % obtained from the June 3 planting was surprising considering the weather conditions of 2004.

Table 1. Main effects of HD (ave over V and N levels) on yield and quality.

Planting Date	Harvest Date	RSA (lb/A)	RST (lb/T)	Yield (T/A)	Sucrose (%)	LTM (%)	Gross Return (\$/A)
May 4	Sept. 27	6985	299.1	23.3	16.00	1.05	757
	Oct. 12	8394	336.6	24.9	17.90	1.07	1017
	LSD ₀₅	452	5.7	1.4	0.27	NS	
June 3	Sept. 27	6065	293.6	20.6	15.74	1.06	644
	Oct. 12	7131	328.7	21.7	17.56	1.13	848
	LSD ₀₅	342	16.7	0.3	0.83	NS	

Table 2. Main effects of N rate (ave over HD and V) on yield and quality.

Planting Date	N Rate	RSA (lb/A)	RST (lb/T)	Yield (T/A)	Sucrose (%)	LTM (%)	Gross Return (\$/A)
May 4	66 %	7966	325.8	24.4	17.24	0.96	938
	100%	7737	316.7	24.4	16.93	1.10	888
	133%	7366	311.1	23.6	16.68	1.12	830
	LSD ₀₅	292	7.2	NS	0.32	0.07	
June 3	66 %	6866	321.6	21.3	17.10	1.02	799
	100%	6500	308.7	21.2	16.55	1.12	734
	133%	6427	303.3	21.0	16.31	1.14	702
	LSD ₀₅	298	10.6	NS	0.50	0.07	

Table 3. Main effects of V (ave over HD and N) on yield and quality.

Planting Date	Variety	RSA (lb/A)	RST (lb/T)	Yield (T/A)	Sucrose (%)	LTM (%)	Gross Return (\$/A)
May 4	Crystal 999	8124	326.2	24.9	17.37	1.06	959
	VDH 46177	7765	326.1	23.8	17.29	0.99	916
	Hillehog 2469	7178	301.2	23.8	16.19	1.13	784
	LSD ₀₅	195	5.4	0.6	0.25	0.04	
June 3	Crystal 999	6858	318.9	21.5	17.05	1.11	793
	VDH 46177	6499	316.7	20.5	16.88	1.13	746
	Hillehog 2469	6436	298.0	21.6	16.03	1.04	696
	LSD ₀₅	260	5.1	0.5	0.24	0.05	

Table 4. Variety, nitrogen and harvest date effects on yield, quality and return.

May 4 Planting									
Variety	N rate % of recommended	Harvest Date	RSA (lb/A)	RST (lb/T)	Yield T/A	Sucrose (%)	LTM (%)	Gross Return \$/a	
VDH46177	66	9/29	7178	313.3	22.9	16.57	0.90	817	
	66	10/12	8721	348.0	25.1	18.27	0.87	1087	
	100	9/29	7233	307.3	23.5	16.40	1.03	808	
	100	10/12	8506	344.0	24.7	18.20	1.00	1051	
	133	9/29	6707	303.3	22.1	16.27	1.10	739	
	133	10/12	8247	340.7	24.2	18.07	1.03	1011	
	Hilleshog 2469	66	9/29	7068	294.7	24.0	15.73	1.00	756
		66	10/12	7957	324.0	24.6	17.27	1.07	934
		100	9/29	6396	276.7	23.1	15.03	1.20	635
		100	10/12	8030	323.3	24.8	17.33	1.17	941
		133	9/29	6117	278.0	22.0	14.97	1.07	612
		133	10/12	7502	310.7	24.2	16.83	1.30	847
Crystal 999		66	9/29	7551	317.3	23.8	16.80	0.93	869
		66	10/12	9319	357.3	26.1	18.83	0.97	1185
		100	9/29	7447	298.0	25.0	16.03	1.13	805
		100	10/12	8810	350.7	25.1	18.60	1.07	1105
		133	9/29	7168	303.3	23.6	16.27	1.10	790
		133	10/12	8453	330.7	25.6	17.67	1.13	1010

June 3 Planting

Variety	N rate % of recommended	Harvest Date	RSA (lb/A)	RST (lb/T)	Yield T/A	Sucrose (%)	LTM (%)	Gross Return \$/A	
VDH46177	66	9/29	6329	307.3	20.6	16.40	1.03	707	
	66	10/12	7234	349.3	20.7	18.37	0.90	905	
	100	9/29	5984	301.3	19.9	16.07	1.00	655	
	100	10/12	6839	326.7	20.9	17.53	1.20	809	
	133	9/29	5887	290.7	20.2	15.57	1.03	620	
	133	10/12	6722	324.7	20.7	17.33	1.10	791	
	Hilleshog 2469	66	9/29	5946	286.7	20.8	15.37	1.03	616
		66	10/12	7321	329.3	22.2	17.57	1.10	872
100		9/29	5650	275.3	20.5	14.87	1.10	558	
100		10/12	6959	314.0	22.2	16.87	1.17	793	
133		9/29	57741	273.3	21.0	14.83	1.17	563	
133		10/12	6999	309.3	22.6	16.70	1.23	787	
Crystal 999		66	9/29	6589	311.2	21.2	16.60	1.03	746
		66	10/12	7775	345.3	22.5	18.33	1.07	963
	100	9/29	6197	303.3	20.4	16.33	1.07	683	
	100	10/12	7372	331.3	22.2	17.73	1.17	883	
	133	9/29	6257	293.3	21.3	15.77	1.10	666	
	133	10/12	6956	328.7	21.2	17.67	1.23	827	