



Head Lettuce Variety Performance, Matanuska Valley, Alaska 1997

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INTRODUCTION

Head lettuce variety selection is a management decision that impacts all phases of commercial lettuce production. Variety performance information can be obtained from private seed companies. However, field experiments conducted on a local basis can be designed to address problems that are of particular importance to local growers. University-conducted variety trials provide an unbiased source of information on varietal performance. Seed company information, experience of other growers, and University field trial information all should be considered when selecting varieties.

Important traits determining suitability of lettuce varieties in the Matanuska Valley include general appearance, tip burn resistance, head size, days to maturity, and disease resistance. Head size is important because growers are required to pack a fixed number of heads per carton when harvesting. The ideal lettuce head measures approximately 6 in. in diameter and weighs approximately 2 lbs. Head size and general appearance (head shape, leaf texture and color) influence consumer preference in the supermarket. All the traits listed above are important in head lettuce production, but the trait that has proved most elusive is adequate resistance to tip burn. Tip burn is a physiological disorder that results from a calcium deficiency in growing tissues and is expressed as dead tissue at the leaf edges. Lesions may occur on internal or external leaves, and may predispose affected leaves to bacterial soft rot (slime) and other diseases. Calcium supplied to growing leaf tissues is only partially dependent upon the amount of calcium in the soil or growing medium. Calcium is transported solely in xylem tissue - that is, it is only transported upward through the plant with water the plant absorbs from the growing

medium and it cannot be redistributed once inside the plant. Therefore, an interrupted or inadequate supply of water to a growing plant can restrict the flow of calcium into growing tissues and result in calcium deficiency. In head lettuce, inner leaves are isolated from the atmosphere, have very little water flowing through them, and have a tendency to develop calcium deficiency - or tip burn. There are notable differences in the tendency of various varieties to develop tip burn.

The ultimate goal of variety trials is not to describe past performance, but rather to predict superior varieties for future years. This task is made more difficult because top performers in one environment (environment varies with year, site, management situation, etc.) may be outperformed in a different environment due to differences in temperature, rainfall, irrigation, and other conditions. For this reason, variety trials must be conducted over several years to determine average performance across a range of environmental conditions. The ranking of varieties, based on their average performance in head-to-head competition over time, provides powerful and objective information that should be considered when selecting varieties. The power of the information obtained from variety trials to predict which varieties will perform well over a range of conditions increases as the number of years and/or locations is increased.

In 1995, 27 head lettuce varieties were evaluated in a replicated study at the Palmer Research Center, and two growers' fields in the Matanuska Valley. The 15 varieties that performed best in 1995 were selected for evaluation in 1996 and 1997. The performance of those 15 varieties in 1997 is summarized in this report. Results from the 1995 and 1996 trials may be found in UAF circulars 106 and 108 respectively.

MATERIALS AND METHODS

Fifteen head lettuce varieties were evaluated in the trial at the Palmer Research Center. Each variety was evaluated in an early-, mid-, and late-season planting. Seed was provided by five commercial seed companies: Asgrow (AS), Ferry-Morse (FM), Harris-Moran (HM), Petoseed Royal Sluis (PR), and Pybas Seeds (PY); and by Dr. Edward Ryder (RY), a USDA lettuce breeder.

Seed of each variety was planted in a commercial greenhouse into plug flats, and approximately 30 days later, the seedlings were transplanted to the field. Greenhouse planting dates were April 3, May 1, and May 29, and transplanting dates were May 2, May 30, and June 26. Seeding and planting dates were similar in 1995 and 1996.

Seedbed preparation consisted of moldboard plowing followed by rotary tilling and packing. Granular fertilizer (10-20-20) was broadcast at a rate of 120 lbs. N, 240 lbs. P_2O_5 , and 240 lbs. K_2O/A with a drop spreader between plowing and rotary tilling operations. Plots were irrigated with overhead sprinklers immediately after transplanting and thereafter to maintain soil moisture tension at less than 30 centibars. Weeds were controlled by hoeing.

The experimental design was a randomized complete block with four replications. Each plot consisted of 20 plants in a 10 x 2 grid. The 10 plants in each row were spaced 12 inches apart, and the two rows were 18 inches apart. Plots were harvested as they matured, with all plants in a plot harvested at the same time. For each plot, the number of days from transplanting to harvest was recorded. Tip burn was evaluated on all 20 heads of a plot using the following 0-4 scale: 0 = no tip burn, 1 = combined tip burn damage of less than one-half square inch, 2 = combined tip burn damage between one-half and 3 square inches, 3 = combined tip burn damage of more than 3 square inches, and 4 = combined tip burn damage of more than 3 square inches. Head diameter and head weight were measured on all 20 heads in each plot.

Each head was considered either marketable or unmarketable. An individual head was considered unmarketable if 1) its tip burn rating was greater than 2, and 2) if plants had other serious defects (heads failed to form, plants were affected by disease, heads had significant soft rot, etc.).

Data were summarized for each 1997 planting date. The 1997 data were also combined with data from the 1995 and 1996 trials to summarize performance across all years and planting dates. Within each year, the performance of each variety was expressed as percentage of the overall mean for that year (mean of all planting dates), with percentages greater than 100 indicating above average performance, that is, better tip burn resistance. For example, a tip burn rating of 105% in 1995 would indicate that the tip burn resistance of that variety was 5% above the 1995 average, whereas a value of 95% in 1996 would indicate that the tip burn resistance of that variety was 5% below the 1996 average, and a value of 115% in 1997 would indicate performance 15% above the average. Then, for each variety, the annual ratings were averaged across all three years to obtain the three-year average performance. In the above example, the three-year average performance for this hypothetical variety would be 105%, the average of 105%, 95%, and 115%.

RESULTS AND DISCUSSION

Lettuce in the first planting tended to have less than optimum market size and weight (Table 1). Coolgreen was the largest variety, with an average head weight of 1.62 lbs and 5.4 in. diameter. The smallest was Alpha, which weighed just 1.20 lbs. and measured 4.7 in. in diameter. Tip burn pressure was moderate. Average tip burn readings ranged from 0.3 to 2.2 and the percentage of heads unmarketable due to tip burn and other defects was between 6.8% and 37.0%. In general, the varieties with least tip burn also had the least percentage of unmarketable heads. Alpha was an exception, because most of the unmarketable category for this variety consisted of

plants that failed to form solid heads. Alpha, Patriot, Pybas 142, and Pybas 142E had the least tip burn, whereas Premier, Coolgreen, Bullseye, and Target had the most. In general, varieties with larger heads had more tip burn than smaller varieties. It has been noted that tip burn is related to rapid growth and, clearly, the larger varieties grew faster than the smaller ones, perhaps rendering them more susceptible to tip burn.

In the mid-season planting, tip burn ratings were very similar to those found in the early season lettuce, although the size of the lettuce heads was much closer to the desired level (Table 2). Tip burn ratings ranged from 0.9 for 87-714-5 and Montemar, to 1.8 for Bullseye and Patriot and 2.1 for Target. Average head weight was between 1.75 and 2.03 lbs., and head diameter was between 5.2 and 6.6 in. The varieties with the least tip burn also had

the largest proportion of marketable heads. Montemar and 87-714-5 had just 7.8 and 8.7% unmarketable heads, respectively. In contrast, 49.3% of the heads of Target were not marketable.

Tip burn pressure was much lighter in the third planting than in the early- and mid-season plantings. The most severe tip burn in this planting was just 0.5 (Pybas 142). The varieties with the least tip burn were 87-714-5 and Top Gun; these each had average tip burn ratings of 0.1. Head size tended to be greater than optimum. The smallest variety in this planting, Premier, averaged 2.26 lbs. and 5.5 in. per head. Coolgreen, the largest variety, weighed 2.72 lbs. and measured 6.0 in. in diameter. Large percentages of unmarketable heads in this planting were due to bacterial soft rot (slime), a condition that affected much of the lettuce in the third planting, and which

Table 1. Performance of 15 head lettuce varieties in the early-season planting at the Palmer Research Center in 1997.

Variety	Source*	Tip burn (0-4)**	Average head weight (lbs/head)	Average head diameter (inches)	Unmarketable heads*** %	Transplant to harvest (days)
Alpha	HM	0.3	1.20	4.7	36.5	68
Patriot	AS	0.3	1.53	5.1	12.5	67
Pybas 142	PY	0.4	1.51	5.0	12.7	68
Pybas 142E	PY	0.4	1.42	4.8	19.4	67
87-714-5	RY	0.5	1.35	4.7	26.7	67
Montemar	FM	0.5	1.45	4.7	10.2	69
Stinger	AS	0.5	1.46	4.8	6.8	68
Top Gun	AS	0.8	1.61	5.1	9.6	68
87-716-1	RY	1.0	1.52	4.8	8.4	67
Tiber	RY	1.1	1.50	5.2	14.5	69
Salinas	HM	1.1	1.56	5.2	12.0	68
Target	PR	1.4	1.46	4.9	16.9	68
Bullseye	PR	1.7	1.41	4.9	37.0	68
Coolgreen	FM	1.9	1.88	5.4	35.6	69
Premier	HM	2.2	1.63	5.1	36.4	70

*AS = Asgrow, FM = Ferry-Morse, HM = Harris Moran, PR = Petoseed Royal Sluis, PY = Pybas, RY = Dr. Edward Ryder (USDA)
 0 = no tip burn; 4 = severe tip burn. *Most unmarketable heads had unacceptable levels of tip burn.

was apparently not directly related to tip burn. 87-714-5 had 16.6% unmarketable heads, whereas Pybas 142 has 41.7% unmarketable.

Combined results from 1995, 1996, and 1997 represent nine planting date/year combinations (Table 4) and therefore provide a more powerful assessment of varietal performance, because multi-year averages are more reliable indicators of future performance than are results from a single year. Averaged across these three years, 87-714-5, Top Gun, Tiber, and Patriot exhibited the best resistance to tip burn. Coolgreen, Target, Salinas, 87-716-1, Bullseye, and Premier all had below average tip burn ratings.

Five additional varieties, 87-715-4, 87-716-4 (from Dr. Edward Ryder, USDA) and Cypress,

Alpha 2, and Lobos (Harris-Moran) were included in the observational on-farm trials for initial evaluation. The most promising of these varieties will be considered for inclusion in the replicated experimental plots in 1998.

Results from this trial should not be considered definitive, but rather should be interpreted in the context of expected on-farm performance. That is, known differences between conditions at this experimental site and a specific farm situation should be considered. Differences in visual appearance that might influence buyer acceptance were not quantitatively evaluated in this trial. These subjective considerations, in conjunction with the objective results of this variety trial, provide information that can assist growers in identifying superior varieties.

Table 2. Performance of 15 head lettuce varieties in the mid-season planting at the Palmer Research Center in 1997.

Variety	Source*	Tip burn (0-4)**	Average head weight (lbs/head)	Average head diameter (in)	Unmarketable heads*** (%)	Transplant to harvest (days)
87-714-5	RY	0.9	1.96	5.7	8.7	60
Montemar	FM	0.9	3.76	5.4	7.8	60
Pybas 142	PY	1.3	1.83	5.6	38.9	61
Premier	HM	1.3	1.75	5.2	25.1	64
Alpha	HM	1.4	1.92	5.6	18.7	62
Tiber	RY	1.4	2.03	5.8	28.7	60
Pybas 142E	PY	1.4	1.81	5.6	27.7	60
87-716-1	RY	1.5	1.92	5.6	29.2	59
Coolgreen	FM	1.5	2.03	5.7	31.7	61
Salinas	HM	1.6	1.88	6.6	32.5	60
Stinger	AS	1.6	1.80	5.5	35.9	61
Top Gun	AS	1.7	1.77	5.4	36.6	62
Bullseye	PR	1.8	1.91	5.5	38.0	61
Patriot	AS	1.8	1.97	5.6	30.9	63
Target	PR	2.1	1.76	5.4	49.3	59

*AS = Asgrow, FM = Ferry-Morse, HM = Harris Moran, PR = Petoseed Royal Sluis, PY = Pybas, RY = Dr. Edward Ryder (USDA) **0 = no tip burn; 4 = severe tip burn. ***Most unmarketable heads had unacceptable levels of tip burn.

Table 3. Performance of 15 head lettuce varieties in the late-season planting at the Palmer Research Center in 1997.

Variety	Source*	Tip burn (0-4)**	Average head weight (lbs/head)	Average head diameter (in)	Unmarketable heads*** (%)	Transplant to harvest (days)
87-714-5	RY	0.1	2.37	5.9	16.6	63
Top Gun	AS	0.1	2.41	5.8	34.2	63
Tiber	RY	0.2	2.52	5.8	31.3	63
Stinger	AS	0.2	2.34	5.7	27.5	63
Patriot	AS	0.2	2.41	5.8	30.0	63
Alpha	HM	0.2	2.37	5.7	25.9	63
Bullseye	PR	0.3	2.38	5.7	33.7	63
Salinas	HM	0.3	2.56	5.8	32.3	63
Premier	HM	0.3	2.26	5.5	23.0	63
Coolgreen	FM	0.3	2.72	6.0	40.0	63
87-716-1	RY	0.3	2.61	5.9	23.7	63
Montemar	FM	0.4	2.40	5.7	27.5	63
Pybas 142E	PY	0.4	2.44	5.7	47.9	63
Target	PR	0.4	2.46	5.8	33.5	63
Pybas 142	PY	0.5	2.48	5.7	41.7	63

*AS = Asgrow, FM = Ferry-Morse, HM = Harris Moran, PR = Petoseed Royal Sluis, PY = Pybas, RY = Dr. Edward Ryder (USDA)
 0 = no tip burn; 4 = severe tip burn. *Most unmarketable heads had unacceptable levels of bacterial soft rot (slime).

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Table 4. Performance of 15 head lettuce varieties grown at the Palmer Research Center in 1995, 1996, and 1997, averaged across three planting dates and three years, expressed as percent of trial mean. *

Variety	Source**	Tip Burn			Average***
		1995	1996	1997	
87-714-5	RY	111	106	152	123
Top Gun	AS	100	122	125	116
Tiber	RY	106	128	110	115
Patriot	AS	98	113	128	113
Alpha	HM	99	98	137	111
Pybas 142E	PY	99	112	111	107
Pybas 142	PY	100	109	102	104
Montemar	FM	107	83	119	103
Stinger	AS	99	77	125	101
Premier	HM	100	108	64	91
Bullseye	PR	93	102	70	89
87-716-1	RY	109	47	100	85
Salinas	HM	94	56	94	82
Target	PR	88	64	62	72
Coolgreen	FM	91	51	70	71

* Values greater than 100 indicated higher tip burn resistance than average; values lower than 100 indicate lower than average tip burn resistance. See text for method used to calculate values. ** AS = Asgrow, FM = Ferry-Morse, HM = Harris Moran, PR = Petoseed Royal Sluis, PY = Pybas, RY = Dr. Edward Ryder (USDA). *** Slight discrepancies between annual data and averages are due to rounding.

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