

Lettuce and Radish Germplasm Evaluation Results in 2000

Information on the Effects of
Planting Date and Genotype on Lettuce and Radish
Yield and Quality in Ohio in 2000

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Extension Vegetable Crops Program - Muck Crops Germplasm Evaluation Results in 2000

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Project Summary

Variety selection is a key management decision, affecting nearly all other aspects of production. Varieties differ in insect and disease tolerance and in their ability to compete against weeds. Varieties are also genetically predisposed to differ in their response to physical and chemical aspects of the growing environment, such as daily temperature cycles and soil moisture availability. Daily temperature cycles are known to affect several crops, including lettuce and radish, that are routinely grown in the organic soils of Ohio. Yet, more needs to be known about the influence of this and other factors on crop yield and quality in Ohio. To be successful, growers must have available varieties adapted to their region's conditions and market needs. Through the cooperation of universities, private breeders, and grower associations, growers may often access results from current research on the performance of numerous vegetable varieties grown under different conditions. This information equips growers to optimize the outcome of their efforts.

The primary goal of these studies was to develop information useful to Ohio growers in selecting lettuce and radish varieties, especially for different planting periods. These studies were also designed to help explain how the interaction between genotype and environment impacts specific crop traits. The goal of this work is to generate useful information for a diverse audience: growers as they work to optimize return through variety selection and management, breeders as they develop improved varieties, and other scientists as they strive to understand how lettuce and radish crops respond to different aspects of the growing environment. Variety selection is an important management decision for the grower. Research-based information on how a variety responds to different planting dates may assist growers in identifying varieties largely unaffected by planting date or in selecting varieties specifically for early or late planting.

To accomplish these goals, we planted a wide assortment of lettuce and radish varieties and experimental lines in fully replicated plots. Thirty lettuce genotypes were studied in the Germplasm Trial in separate Endive/Escarole, Green Leaf, Red Leaf, and Romaine experiments. An additional 48 lettuce varieties and experimental lines evaluated in a separate Specialty Trial containing one replicate per

planting. The lettuce Germplasm and Specialty Trials were repeated in the spring and summer (transplanted on May 22-25 and July 13-17). In the Radish Germplasm Trial, seventeen radish genotypes were direct-seeded at the same location on April 24 and July 27. In each experiment, plot, plant, and head or bulb characteristics were recorded during development and at maturity.

Consumer appeal also impacts the utility of vegetable varieties. In 2000, we completed several public evaluations of lettuce and radish genotypes included in the field trials. First, all research plots were featured in the Muck Crops Research Branch Field Day on June 29. During the Field Day, growers and other members of the industry voluntarily evaluated genotypes in the spring planting of the lettuce Germplasm and Specialty Trials. Second, twelve lettuce and sixteen radish genotypes underwent consumer sensory evaluations at the OARDC in Wooster, Ohio. Third, samples of lettuce varieties included in the Specialty Trial were submitted to produce buyers at a local specialty market-café for culinary and light processing quality evaluation. Finally, additional lettuce samples were retained for measurement of tissue mineral nutrient levels in the lab. The mineral nutrient content of lettuce is generally low but, based on consumption rates, lettuce may supply a significant portion of the total dietary intake of mineral nutrients. Since mineral nutrient accumulation may vary among lettuce types, genotypes, planting dates, and soil types, it is important to examine these effects under Ohio conditions.

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Extension Vegetable Crops Program - Muck Crops Germplasm Evaluation Results in 2000

Crop: Lettuce

Introduction and Project Goal

The primary goal of these studies was to develop information useful to Ohio growers in selecting varieties, especially for different planting periods. These studies were also designed to help explain how the interaction between genotype and growing environment impacts lettuce traits.

Materials and Methods

Study Development and Transplant Production. Entries were solicited from cooperating seed companies in winter 1999-2000 (Table 1 and Table 8). Specific requests were made of seed companies to submit a wide range of material from experimental to standard. Transplants were seeded in early spring and mid-summer, allowed to develop 2-4 true leaves in a climate-controlled greenhouse, and hardened-off before field planting.

Plot Establishment. The Germplasm Trial included four separate experiments: Endive/Escarole, Green Leaf, Red Leaf, and Romaine. A randomized complete block design containing two planting dates (May 22 or 25, July 14 or 17), four replications per entry, per planting, and all entries per type was employed in each experiment. The Specialty Trial was a non-replicated observational study planted on May 22 and July 13. In all experiments, three-row plots were established by hand placing transplants, immediately followed by irrigation. Using this approach, we achieved nearly 100% stand in all plots at each planting. In isolated cases where transplant availability was low due to poor seed germination, transplants were uniformly distributed among the three rows of each plot. Each row was 15 ft. long (each row containing approx. 18 plants), with 19 in. between rows and 10 in. between transplants.

Plot Maintenance. Dead transplants were replaced (if possible) within three days of initial planting. Standard pest management strategies based on scouting, thresholds, and application of labeled pesticides were employed.

Data Collection (Field). Plots were reviewed twice per week. Notes on plant appearance, including head shape, color, bolting, tipburn, and other traits were taken on mature entries immediately prior to harvest. A Munsell color card, considered the standard in describing color in many horticultural evaluations, was used to describe the color of individual entries in the Endive/Escarole, Green Leaf, and Romaine studies. Head color was described without the aid of the Munsell color card in the Red Leaf and Specialty experiments.

Additional evaluations of the spring planting were completed on June 29 as part of the Muck Crops Research Branch Field Day. Growers, consumers, and members of the industry voluntarily rated

entries in the Germplasm and Specialty Trials using a 1-10 scale (1 = least desirable, 10 = most desirable). Participants were also invited to write additional comments on the evaluation form. Field Day participants were also invited to harvest entries from the Specialty Trial for personal consumption. By counting the number of heads in each plot before and after the Field Day, a genotype's consumer appeal could be estimated.

Data Collection (at Harvest). Harvest readiness was determined by visual assessment and with the aid of published maturity information. Plots in flower were not harvested. Head height and diameter were measured before harvest. At harvest, four consecutive heads were removed from the middle row beginning two heads from the end of the plot. Cut heads were weighed untrimmed and trimmed as a group. A trimmed head lacked damaged leaves and the core butt was recut if necessary.

Consumer Quality Analysis. After measurement of head weight and size, two additional heads were removed from the center row of each plot and retained for mineral nutrient analysis in the lab (measured by ICP at The OSU Service Testing and Analytical Research Lab, S.T.A.R.).

Consumer sensory evaluations were completed after harvesting the spring and summer plantings of the Specialty Trial. Approximately twenty heads of twelve genotypes were removed from individual plots and transferred to cool storage at the OARDC in Wooster, OH. One to two days later, four heads per genotype were placed on display (identified with an arbitrary number only) and a fifth head was made available for tasting. Participants in the evaluation were asked to score the color, texture, head size, overall appearance, and taste of each entry using an accepted instrument for consumer evaluation: a 1 to 10 scale (1= not at all desirable, 10 = very desirable; see Figure 1 below). Consumers were also asked questions about their typical lettuce buying habits. Thirty-one people participated in the evaluation of the spring crops and fifteen people in the evaluation of the summer crops, respectively. Additional heads of the same genotypes evaluated by the consumer panels (spring planting only) were provided to managers of a local specialty produce market-café for evaluation using the same instrument.

Figure 1. Portion of instrument used in consumer sensory evaluation.

		Not at all Desirable					Very Desirable				
		----- choose and mark one -----									
variety #1	color	1	2	3	4	5	6	7	8	9	10
	texture	1	2	3	4	5	6	7	8	9	10
	head size	1	2	3	4	5	6	7	8	9	10
	overall	1	2	3	4	5	6	7	8	9	10
	taste (optional)	1	2	3	4	5	6	7	8	9	10

Results Summary

Tables 2, 5, 9, and 11 describe the effect of lettuce type and planting (spring versus summer) on

quantitative head measurements (e.g., diameter, height, and weight). Tables 3, 4, 6, 7, 10, and 12 contain observations of the crop at harvest. Tables 13, 14, and 15 summarize the Field Day, Consumer, and Produce Buyer Evaluations.

Table 1. List of endive, escarole, and lettuce genotypes planted at the OARDC Muck Crops Research Branch in Celeryville, Ohio in 2000.

Type and Study	Entry #	Entry Name	Source
Endive	1	Neos	Johnny's Selected Seeds
Endive	2	Markant	Grower's Choice, seed donated by OARDC Muck Crops Branch
Endive	3	Salad King	Grower's Choice, seed donated by Zeller's Farm
Escarole	4	Full Heart NR 65	Grower's Choice, seed donated by Zeller's Farm
Escarole	5	Elisa	Grower's Choice, seed donated by Holthouse Farms
Escarole	6	Enza 18053	Grower's Choice, seed donated by OARDC Muck Crops Branch
Green Leaf	1	Two Star MT0	Johnny's Selected Seeds
Green Leaf	2	Crisp & Green MT0	Johnny's Selected Seeds
Green Leaf	3	Krypton	Seminis Vegetable Seeds
Green Leaf	4	Xena MI (HMX 6552)	Harris Moran
Green Leaf	5	Waldman Green	Grower's Choice, seed donated by Zeller's Farm
Green Leaf	6	Tiara	Grower's Choice, seed donated by Zeller's Farm
Green Leaf	7	Slobolt	Grower's Choice, seed donated by Zeller's Farm
Green Leaf	8	North Star	Paragon Seed
Red Leaf	1	Galactic MT0	Johnny's Selected Seeds
Red Leaf	2	PSR 7998	Seminis Vegetable Seeds
Red Leaf	3	New Red Fire	American Takii
Red Leaf	4	Carnival	Grower's Choice, seed donated by Rispens Seed Co.
Red Leaf	5	Red Line MI	Grower's Choice, seed donated by OARDC Muck Crops Branch
Red Leaf	6	PSR 69292 MI	Grower's Choice, seed donated by OARDC Muck Crops Branch
Romaine	1	Green Towers MI	Harris Moran
Romaine	2	HMX 7555 MI	Harris Moran
Romaine	3	Rome 61 MI (Splitkote D)	Harris Moran
Romaine	4	Green Forest	Johnny's Selected Seeds
Romaine	5	Camino Real	Coastal Seed
Romaine	6	Capistrano	Seminis Vegetable Seeds
Romaine	7	PSR 3726	Seminis Vegetable Seeds
Romaine	8	King Henry	Grower's Choice, seed donated by Rispens Seed Co.
Romaine	9	Big Heart	Grower's Choice, seed donated by Rispens Seed Co.
Romaine	10	Grand Prize	Grower's Choice, seed donated by Rispens Seed Co.

Table 2. Quantitative head measurements of endive and escarole genotypes planted on May 22, 2000 and green leaf, red leaf and romaine-type lettuce planted on May 25, 2000 at the OARDC Muck Crops Research Branch in Celeryville, Ohio.

Genotype	Date Harvest	bolt	Average Individual		Average Weight of 4 Heads	
			Width (cm)	Height (cm)	Untrimmed (kg)	Trimmed (kg)
ENDIVE / ESCAROLE						
Neos (end)	5-Jul	N	36.1 ± 3.4	15.4 ± 2.3	1.6 ± 0.7	1.1 ± 0.6
Markant (end)	5-Jul	N	42.6 ± 6.2	14.5 ± 2.5	2.0 ± 0.7	1.6 ± 0.5
Salad King (end)	5-Jul	N	46.3 ± 6.5	15.7 ± 2.0	1.7 ± 0.4	1.2 ± 0.2
Full Heart NR 65 (esc)	5-Jul	N	36.6 ± 4.2	16.0 ± 2.4	1.6 ± 0.5	1.2 ± 0.4
Elisa (esc)	5-Jul	N	37.6 ± 3.2	16.2 ± 1.3	2.0 ± 0.4	1.7 ± 0.3
Enza 18053 (esc)	5-Jul	N	42.4 ± 4.7	19.6 ± 3.7	2.1 ± 0.5	1.5 ± 0.4
GREEN LEAF						
Two Star MT0	28-Jun	N	23.4 ± 8.5	15.4 ± 5.1	0.5 ± 0.4	0.4 ± 0.4
Crisp & Green MT0	28-Jun	N	27.0 ± 8.0	17.8 ± 4.7	0.4 ± 0.3	0.3 ± 0.2
Krypton	28-Jun	N	26.3 ± 4.6	14.7 ± 3.1	0.4 ± 0.2	0.4 ± 0.2
Xena MI (HMX 6552)	28-Jun	N	24.1 ± 6.6	16.6 ± 5.3	0.4 ± 0.4	0.4 ± 0.4
Waldman Green	28-Jun	N	27.5 ± 6.4	18.8 ± 4.5	0.5 ± 0.4	0.4 ± 0.3
Tiara	28-Jun	N	27.6 ± 7.7	17.4 ± 5.0	0.5 ± 0.4	0.4 ± 0.3
Slobolt	28-Jun	N	30.1 ± 6.9	16.4 ± 2.7	0.5 ± 0.4	0.4 ± 0.3
North Star	28-Jun	N	24.4 ± 5.8	13.6 ± 3.5	0.4 ± 0.2	0.3 ± 0.2
RED LEAF						
Galactic MT0	28-Jun	N	21.9 ± 3.8	15.1 ± 2.9	0.2 ± 0.1	0.2 ± 0.1
PSR 7998	28-Jun	N	32.7 ± 5.9	17.0 ± 1.7	0.6 ± 0.3	0.5 ± 0.2
New Red Fire	28-Jun	N	35.0 ± 2.9	15.9 ± 2.1	0.8 ± 0.1	0.6 ± 0.1
Carnival	28-Jun	N	23.3 ± 3.4	16.7 ± 2.5	0.5 ± 0.3	0.4 ± 0.2
Red Line MI	28-Jun	N	27.4 ± 8.4	17.6 ± 5.3	0.4 ± 0.4	0.4 ± 0.3
PSR 69292 MI	28-Jun	N	32.2 ± 4.3	16.7 ± 2.3	0.5 ± 0.2	0.4 ± 0.2
ROMAINE						
Green Towers MI	5-Jul	N	39.6 ± 2.7	33.1 ± 3.7	2.6 ± 0.3	2.4 ± 0.3
HMX 7555 MI	5-Jul	N	36.6 ± 2.0	32.7 ± 4.5	2.5 ± 0.4	2.2 ± 0.3
Rome 61 MI	5-Jul	N	36.6 ± 1.6	29.8 ± 2.5	2.1 ± 0.5	1.9 ± 0.4
Green Forest	5-Jul	N	38.7 ± 3.1	31.4 ± 5.0	2.4 ± 0.7	2.1 ± 0.6
Camino Real	5-Jul	N	39.3 ± 3.1	32.6 ± 4.6	2.4 ± 0.7	2.2 ± 0.6
Capistrano	5-Jul	N	41.1 ± 3.4	27.3 ± 4.9	2.4 ± 0.6	2.1 ± 0.5
PSR 3726	5-Jul	N	38.1 ± 3.7	32.1 ± 4.7	2.3 ± 0.6	2.1 ± 0.6
King Henry	5-Jul	N	37.1 ± 3.6	31.1 ± 4.2	2.5 ± 0.7	2.2 ± 0.7
Big Heart	5-Jul	N	38.6 ± 2.3	31.8 ± 4.0	2.4 ± 0.7	2.1 ± 0.6
Grand Prize	5-Jul	N	39.2 ± 3.6	32.9 ± 3.8	2.2 ± 0.6	2.0 ± 0.5

Table 3. Qualitative head traits of endive and escarole, green leaf, and red leaf-type lettuce planted on May 25, 2000, at the OARDC Muck Crops Research Branch in Celeryville, Ohio.

Genotype	plot uniformity low-high (1-5)	Outer Tipburn # / 5 heads	Internal Rot/Burn # / 5 heads	dull-shiny (1-5)	Leaf morphology flat-curly (1-5)	Head Volume sm-lg (1-5)	Compact Loose- tight (1-5)	color	Comments
ENDIVE / ESCAROLE									
Neos (end)	2.0	0.8	0.3	1	1	2.5	3.8	7.5Gy 6/8strng	Ruffled edge, poor endive
Markant (end)	3.0	1.8	0.0	1	2	3.3	3.8	7.5Gy 6/8strng	Ruffled edge, excellent endive
Salad King (end)	2.8	1.5	0.0	1	1	3.0	3.5	7.5Gy 6/8strng	Ruffled edge, average endive
Full Heart NR 65 (esc)	1.8	4.0	0.3	2	2	2.5	2.8	7.5Gy 6/8strng	Very poor escarole
Elisa (esc)	2.3	2.5	0.0	2	3	2.3	3.3	7.5 Gy 6/8strng	Excellent escarole
Enza 18053 (esc)	3.0	3.3	0.0	1	2	3.3	3.3	7.5Gy 6/8strng	Ruffled edge, average escarole
GREEN LEAF									
Two Star MT0	3.0	2.5	0.0	2	2	2.5	2.8	5Gy 5/6 med.	First to bolt
Crisp & Green MT0	1.3	2.8	0.0	2	3	1.8	2.0	5Gy 6/8strng	Non-uniform, severe aster yellow
Krypton	2.5	3.8	1.0	2	2	2.3	2.3	5Gy 7/10 strng	Severe aster yellow
Xena MI (HMX 6552)	2.5	2.8	0.0	3	2	2.3	2.3	5GY6/8 strong	Nice, sized up late, mild aster yellow
Waldman Green	1.3	2.0	0.3	2	2	2.0	2.5	5Gy 6/8strng	Poor stand, close to bolting, severe aster yellow
Tiara	2.8	4.0	0.0	2	3	2.5	2.0	5Gy 6/8strng	Severe aster yellow problem
Slobolt	2.5	1.8	0.3	3	3	3.3	2.8	5Gy7/10strng	Nice but washed out color
North Star	2.8	1.0	0.0	2	2	2.5	3.0	5Gy6/8 strng	Nice, compact, severe aster yellow
RED LEAF									
Galactic MT0	2.0	0.0	0.0	5	4	2.0	2.3	very deep red	Close to bolting, mild aster yellow
PSR 7998	3.0	0.0	0.0	4	3	3.0	3.3	var.br.red tip lght gr.vns	Brighter than standard, excellent for color & size
New Red Fire	3.3	0.0	0.0	3	3	3.5	3.3	var.br.redtiplghtgr.stem	Mild aster yellow
Carnival	2.5	0.8	0.0	3	1	2.3	3.0	var.mostlghtgr.pinkedge	
Red Line MI	2.0	1.0	0.0	3	2	2.3	2.3	var.mostlghtgr.pinkedge	Mild aster yellow
PSR 69292 MI	2.8	0.0	0.0	3	3	3.3	2.5	var.br.redtiplghtgr.stem	Nice but smaller & color not as red

Table 4. Qualitative head traits of romaine-type lettuce planted on May 25, 2000, at the OARDC Muck Crops Research Branch in Celeryville, Ohio.

Genotype	plot uniformity low-high (1-5)	Outer Tipburn # / 5 heads	Internal Rot/Burn # / 5 heads	dull-shiny (1-5)	Leaf morphology flat-curly (1-5)	Head Volume sm-lg (1-5)	Compact Loose- tight (1-5)	color	Comments
ROMAINE									
Green Towers MI	3.0	1.9	0.0	3	3	3.0	2.6	7.5 Gy 5/7 med.	Excellent spring romaine, but brittle
HMX 7555 MI	2.5	2.5	0.4	3	2	2.6	2.8	7.5 Gy 5/7 med.	Starting to bolt, severe aster yellow
Rome 61 MI	2.4	1.1	0.0	3	2	2.1	3.1	7.5 Gy 5/7 med.	Tipburn & severe aster yellow problems
Green Forest	3.1	2.4	0.0	3	3	2.4	2.8	7.5Gy 5/7 med.	Mild aster yellow, large core
Camino Real	2.9	1.4	0.0	3	3	3.1	2.4	7.5 Gy 5/7 med.	Severe aster yellow, large core
Capistrano	2.4	1.0	0.1	3	3	2.8	1.6	7.5 Gy 6/8 strng	Very open, mixed off-types, severe aster yellow
PSR 3726	2.8	2.8	0.1	3	2	3.3	2.6	7.5Gy5/7med.	Nice, mild aster yellow
King Henry	2.9	2.5	0.6	4	4	2.6	2.3	7.5 Gy 5/7 med.	Too open, severe aster yellow
Big Heart	2.6	1.5	0.3	2	2	2.9	2.9	7.5 Gy 5/7 med.	Severe aster yellow & tip burn
Grand Prize	2.8	1.6	0.1	3	2	3.3	2.5	7.5 Gy 5/7 med.	Some tip burn, severe aster yellow

Table 5. Quantitative head measurements of green and red leaf-type lettuce planted on July 14, 2000 and romaine lettuce and endive and escarole planted on July 17, 2000 at the OARDC Muck Crops Research Branch in Celeryville, Ohio.

Genotype	Date Harvest		Average Individual		Average Weight of 4 Heads	
			Width (cm)	Height (cm)	Untrimmed (kg)	Trimmed (kg)
ENDIVE / ESCAROLE						
Neos (end)	22-Aug	N	18.0 ± 0.9	4.3 ± 0.5	1.2 ± 0.1	1.0 ± 0.1
Markant (end)	22-Aug	N	18.8 ± 1.6	4.5 ± 0.8	1.2 ± 0.2	1.0 ± 0.2
Salad King (end)	22-Aug	N	19.7 ± 1.7	4.0 ± 0.3	1.2 ± 0.3	1.1 ± 0.3
Full Heart NR 65 (esc)	22-Aug	N	16.7 ± 1.1	4.6 ± 0.8	1.0 ± 0.4	0.8 ± 0.3
Elisa (esc)	22-Aug	N	17.2 ± 1.2	4.7 ± 0.5	1.3 ± 0.2	1.1 ± 0.2
Enza 18053 (esc)	22-Aug	N	17.7 ± 1.8	4.6 ± 0.7	1.3 ± 0.5	1.2 ± 0.5
GREEN LEAF						
Two Star MT0	17-Aug	NC	13.9 ± 1.9	8.5 ± 1.0	1.0 ± 0.2	0.8 ± 0.2
Crisp & Green MT0	17-Aug	N	14.4 ± 1.6	10.3 ± 1.1	1.0 ± 0.2	0.7 ± 0.1
Krypton	17-Aug	N	15.1 ± 1.2	8.9 ± 0.7	1.3 ± 0.3	1.0 ± 0.2
Xena MI (HMX 6552)	17-Aug	N	13.7 ± 1.0	9.6 ± 1.0	1.3 ± 0.4	0.9 ± 0.1
Waldman Green	17-Aug	Y	12.9 ± 1.7	9.1 ± 0.8	0.9 ± 0.2	0.7 ± 0.1
Tiara	17-Aug	N	14.5 ± 1.9	9.5 ± 1.4	1.1 ± 0.4	0.7 ± 0.2
Slobolt	17-Aug	N	13.8 ± 2.0	7.5 ± 1.0	0.8 ± 0.2	0.6 ± 0.2
North Star	17-Aug	NC	13.1 ± 1.6	7.1 ± 1.0	1.0 ± 0.2	0.7 ± 0.1
RED LEAF						
Galactic MT0	17-Aug	NC	9.6 ± 0.9	7.6 ± 1.0	0.3 ± 0.1	0.2 ± 0.1
PSR 7998	17-Aug	N	15.2 ± 1.2	9.0 ± 1.2	0.9 ± 0.1	0.7 ± 0.1
New Red Fire	17-Aug	N	13.8 ± 0.9	7.4 ± 0.5	0.8 ± 0.1	0.7 ± 0.1
Carnival	17-Aug	N	11.3 ± 0.8	9.8 ± 1.2	0.9 ± 0.2	0.8 ± 0.2
Red Line MI	17-Aug	N	14.1 ± 1.8	9.9 ± 1.0	0.9 ± 0.3	0.7 ± 0.2
PSR 69292 MI	17-Aug	N	13.0 ± 1.7	8.3 ± 1.1	0.7 ± 0.2	0.5 ± 0.1
ROMAINE						
Green Towers MI	25-Aug	N	13.0 ± 3.4	9.5 ± 2.1	1.7 ± 0.3	1.4 ± 0.3
HMX 7555 MI	25-Aug	N	13.4 ± 1.9	9.9 ± 2.3	1.4 ± 0.4	1.2 ± 0.3
Rome 61 MI	25-Aug	N	14.0 ± 1.3	11.3 ± 0.9	1.8 ± 0.3	1.6 ± 0.3
Green Forest	25-Aug	N	15.0 ± 1.3	12.8 ± 0.7	1.8 ± 0.2	1.5 ± 0.2
Camino Real	25-Aug	N	15.6 ± 1.1	13.3 ± 0.7	2.0 ± 0.2	1.7 ± 0.2
Capistrano	25-Aug	N	15.2 ± 1.4	9.9 ± 1.2	1.8 ± 0.4	1.5 ± 0.3
PSR 3726	25-Aug	N	15.9 ± 1.7	12.6 ± 1.2	1.8 ± 0.2	1.5 ± 0.2
King Henry	25-Aug	N	14.6 ± 1.7	10.8 ± 1.3	1.7 ± 0.2	1.5 ± 0.2
Big Heart	25-Aug	N	14.7 ± 1.4	12.3 ± 0.9	1.9 ± 0.1	1.7 ± 0.2
Grand Prize	25-Aug	N	15.0 ± 1.2	12.4 ± 1.0	1.9 ± 0.2	1.7 ± 0.2

Table 6. Qualitative head traits of endive, escarole and green leaf, and red leaf-type lettuce planted in July 2000 at the OARDC Muck Crops Research Branch in Celeryville, Ohio.

Genotype	plot uniformity low-high (1-5)	Outer Tipburn # / 5 heads	Internal Rot/Burn # / 5 heads	dull-shiny (1-5)	Leaf morphology flat-curly (1-5)	Head Volume sm-lg (1-5)	Compact Loose- tight (1-5)	color	Comments
ENDIVE / ESCAROLE									
Neos(end.)	4.0	0.3	0.0	2	1	3.0	4.0	7.5Gy 6/8strng	
Markant(end.)	4.0	0.0	0.0	3	2	3.3	3.0	7.5Gy 6/8strng	Mild bacterial wilt
Salad King(end.)	4.0	0.5	0.3	2	2	3.8	3.3	7.5Gy 6/8strng	Mild bacterial wilt
Full Heart NR 65(esc.)	3.0	1.8	0.3	3	3	2.8	2.8	7.5Gy 6/8strng	Mild bacterial wilt
Elisa(esc.)	2.0	2.0	0.3	2	1	2.8	3.0	7.5 Gy 6/8strng	
Enza 18053(esc.)	4.0	0.3	0.0	3	2	3.5	3.8	7.5Gy 6/8strng	Mild bacterial wilt
GREEN LEAF									
Two Star MT0	3.0	1.8	0.0	2	2	2.3	3.3	5Gy 5/6 med.	Bacterial wilt, mild aster yellow
Crisp & Green MT0	4.0	2.5	0.3	3	3	3.0	2.0	5Gy 6/8strng	Bacterial wilt, mild aster yellow
Krypton	4.0	1.5	0.0	3	3	3.7	3.7	5Gy 7/10 strng	Bacterial wilt
Xena MI (HMX 6552)	2.0	1.3	0.3	2	1	2.8	3.0	5GY6/8 strong	Mild aster yellow, basal shoots
Waldman Green	3.0	1.0	0.0	3	2	2.5	3.0	5Gy 6/8strng	Bacterial wilt, mild aster yellow
Tiara	2.0	2.8	0.3	2	2	3.3	3.0	5Gy 6/8strng	Bacterial wilt, numerous basal shoots, mild aster
Slobolt	3.0	2.0	0.3	3	3	2.5	2.8	5Gy7/10strng	Bacterial wilt, mild aster yellow
North Star	4.0	1.0	0.0	3	2	1.8	3.3	5Gy6/8 strng	No bacterial wilt, mild aster yellow, basal shoots
RED LEAF									
Galactic MT0	1.8	0.0	0.0	4	2	2.0	2.3	dp maroon	Severe aster yellow
PSR 7998	3.0	0.0	0.0	4	2	3.5	2.8	red, gr center	Bacterial wilt, mild aster yellow
New Red Fire	3.3	0.0	0.0	3	2	3.0	3.3	red, gr center	Mild aster yellow
Carnival	2.8	1.0	0.0	3	1	2.0	3.3	gr, pink tips	Bacterial wilt, mild aster yellow
Red Line MI	3.3	0.8	0.0	3	2	3.3	3.3	gr, rose tips	Bacterial wilt, severe aster yellow
PSR 69292 MI	2.8	0.0	0.0	2	3	2.5	2.3	rose, gr veins	Bacterial wilt

Table 7. Qualitative head traits of romaine-type lettuce planted on July 14, 2000, at the OARDC Muck Crops Research Branch in Celeryville, Ohio.

Genotype	plot uniformity low-high (1-5)	Outer Tipburn # / 5 heads	Internal Rot/Burn # / 5 heads	dull-shiny (1-5)	Leaf morphology flat-curly (1-5)	Head Volume sm-lg (1-5)	Compact Loose- tight (1-5)	color	Comments
ROMAINE									
Green Towers MI	1.0	0	0	2	2	1.5	2.3	7.5 Gy 5/7 med.	Bacterial wilt, severe aster yellow
HMX 7555 MI	3.0	0	0	2	3	2.3	2.5	7.5 Gy 5/7 med.	Severe bacterial, severe aster yellow
Rome 61 MI (Splitkote)	3.0	0	0	2	2	2.8	3.0	7.5 Gy 5/7 med.	Severe bacterial, severe aster yellow
Green Forest	3.0	0	0	2	3	2.8	3.0	7.5Gy 5/7 med.	Bacterial wilt, mild aster yellow
Camino Real	4.0	0	0	2	2	3.5	3.0	7.5 Gy 5/7 med.	Bacterial wilt, severe aster yellow
Capistrano	3.0	0	0	2	2	3.0	3.0	7.5 Gy 6/8 strng	Off type plants, severe aster yellow
PSR 3726	3.0	0	0	2	2	3.3	3.3	7.5 Gy 5/7 med.	Mild bacterial, severe aster yellow
King Henry	4.0	0	0	3	3	2.8	3.5	7.5 Gy 5/7 med.	Bacterial wilt, severe aster yellow
Big Heart	4.0	0	0	2	2	3.3	3.3	7.5 Gy 5/7 med.	Mild bacterial, severe aster yellow
Grand Prize	2.0	0	0	2	1	3.0	3.0	7.5 Gy 5/7 med.	Bacterial wilt, severe aster yellow

Table 8. List of specialty lettuce genotypes planted at the OARDC Muck Crops Research Branch in Celeryville, Ohio in 2000.

Entry Name	Type	Company	22-May	13-Jul
P1404-12072-1	Green Leaf	Petoseed	yes	yes
P1466-4102	Oak Leaf	Petoseed	yes	yes
Diamond Gem MT0	Green Bibb	Johnny's Selected Seeds	yes	yes
Deer Tongue	Pointed Green Bibb	Johnny's Selected Seeds	yes	no
LM 1812	Green Curly	Sunseed	yes	yes
Berenice	Round Green Oakleaf	Johnny's Selected Seeds	yes	no
OA 9302	Red Oakleaf	Sunseed	yes	yes
Nevada MT0	Green Summer Crisp	Johnny's Selected Seeds	yes	yes
Loma MT0	Green Summer Crisp	Johnny's Selected Seeds	yes	yes
P1368-7287	Green Leaf	Petoseed	yes	yes
P1404-12394-3	Red Batavian	Petoseed	yes	yes
P1404-11479-4	Green Batavian	Petoseed	yes	yes
P1300-4624	Kelly Green Batavian	Petoseed	yes	no
LO 9356	Green Lollo Bionda	Sunseed	yes	yes
LO 9351	Red/Green Lollo Rossa	Sunseed	yes	yes
LO 9357	Red Lollo Rossa	Sunseed	yes	yes
LO 9355	Red/Green Lollo Rossa	Sunseed	yes	yes
Impuls MT0	Red/Green Lollo	Johnny's Selected Seeds	yes	yes
Dark Lollo Rossa	Red/Green Lollo	Johnny's Selected Seeds	yes	yes
P1497-7396	Green Oakleaf	Petoseed	yes	no
P1497-7318	Red Leaf	Petoseed	yes	no
Carmona MT0	Red Butterhead	Johnny's Selected Seeds	yes	yes
Mikola MT0	Red Butterhead	Johnny's Selected Seeds	yes	yes
Pirat MT0	Red Butterhead	Johnny's Selected Seeds	yes	yes
Galactic MT0	Dark Red Grand Rapids	Johnny's Selected Seeds	yes	yes
LR 9254	Dark Red Leaf	Sunseed	yes	no
Dano MT0	Red Oakleaf	Johnny's Selected Seeds	yes	yes
Cocarde MT0	Pointed Red Oakleaf	Johnny's Selected Seeds	yes	yes
Samantha MT0	Pointed Red Oakleaf	Johnny's Selected Seeds	yes	yes
Sunfire MT0	Deep Cut Red Oakleaf	Johnny's Selected Seeds	yes	yes
Hussarde	Round Arrow Red Oakleaf	Johnny's Selected Seeds	yes	yes
Cardinale MT0	Red Summer Crisp	Johnny's Selected Seeds	yes	yes
P1497-7408	Red Oakleaf	Petoseed	yes	no
P1404-12226-4	Red Leaf	Petoseed	yes	yes
Red Romaine #4	Red Romaine	Petoseed	yes	yes
P1337-6028-3	Small Butter Cream Center	Petoseed	yes	yes
Red Derby M.T.	Red Butterhead	Coastal Seed	yes	yes
PSR 5025	Green Leaf	Petoseed	yes	yes
P1404-11896-2	Tall Red Oakleaf	Petoseed	yes	no
Winter Density	Romaine	Petoseed	yes	yes
PSR 5179	Pointed Edge Romaine	Petoseed	yes	yes
Outredgeous MT0	Red Romaine/COS	Johnny's Selected Seeds	yes	yes
Integrata Red MT0	Red Romaine/COS	Johnny's Selected Seeds	yes	yes
Rosalita MT0	Red Romaine/COS	Johnny's Selected Seeds	yes	yes
Freckles	Red Romaine/COS	Johnny's Selected Seeds	yes	yes
P1368-7277	Pointed Mini-Romaine	Petoseed	yes	yes
P1368-7278	Mini-Romaine	Petoseed	yes	yes
P1335-4856-3	Missile Red Romaine	Petoseed	yes	yes

Table 9. Quantitative head measurements of specialty lettuce planted on May 22, 2000 at the OARDC Muck Crops Research Branch in Celeryville, Ohio.

Genotype	Harvest Date	Bolting	Average of 4 Individual Heads		Total Weight of 4 heads	
			width (cm)	Height (cm)	Untrimmed (kg)	Trimmed (kg)
P1404-12072-1	27-Jun	N	33.6 ± 1.8	24.0 ± 1.2	1.1	0.9
P1466-4102	27-Jun	Y	32.0 ± 2.9	17.8 ± 2.6	0.9	0.8
Diamond Gem MT0	27-Jun	Y	20.5 ± 1.0	16.5 ± 1.3	0.8	0.7
Deer Tongue	27-Jun	NC	25.8 ± 3.2	17.0 ± 1.4	0.8	0.7
LM 1812	27-Jun	Y				
Berenice	27-Jun	NC	31.3 ± 2.9	22.8 ± 1.7	1.0	0.9
OA 9302	27-Jun	N	28.3 ± 1.5	14.0 ± 0.8	0.8	0.7
Nevada MT0	27-Jun	NC	25.9 ± 2.1	20.3 ± 1.3	1.1	0.9
Loma MT0	27-Jun	N	27.9 ± 1.0	15.8 ± 0.5	1.1	1.0
P1368-7287	27-Jun	N	36.4 ± 2.1	23.8 ± 1.7	1.4	1.2
P1404-12394-3	27-Jun	NC	28.5 ± 1.0	23.5 ± 1.7	0.8	0.6
P1404-11479-4	27-Jun	NC	32.3 ± 1.7	24.5 ± 1.3	1.4	1.3
P1300-4624	27-Jun	NC	30.3 ± 2.8	25.0 ± 1.4	1.5	1.4
LO 9356	27-Jun	N	19.5 ± 1.3	23.0 ± 13.1	0.4	0.3
LO 9351	27-Jun	N	22.3 ± 2.2	11.0 ± 1.4	0.3	0.3
LO 9357	27-Jun	N	22.0 ± 2.0	11.8 ± 1.5	0.3	0.2
LO 9355	27-Jun	N	18.5 ± 1.9	11.8 ± 1.7	0.3	0.2
Impuls MT0	27-Jun	N	20.5 ± 1.3	13.5 ± 1.3	0.3	0.2
Dark Lollo Rossa	27-Jun	N	21.0 ± 0.8	11.8 ± 2.1	0.2	0.2
P1497-7396	27-Jun	Y	23.8 ± 1.7	15.0 ± 1.8	0.4	0.4
P1497-7318	27-Jun	N	30.5 ± 1.7	19.0 ± 0.8	0.7	0.6
Carmona MT0	27-Jun	N	27.8 ± 2.9	18.3 ± 2.6	0.5	0.5
Mikola MT0	27-Jun	N	22.0 ± 2.0	18.8 ± 1.0	0.8	0.7
Pirat MT0	27-Jun	N	26.5 ± 1.3	15.8 ± 2.1	0.6	0.5
Galactic MT0	27-Jun	N	23.5 ± 1.9	14.3 ± 0.5	0.3	0.2
LR 9254	27-Jun	N	25.5 ± 4.0	17.3 ± 1.0	0.2	0.2
Dano MT0	27-Jun	N	31.5 ± 1.3	17.8 ± 0.5	0.7	0.6
Cocarde MT0	27-Jun	Y	32.5 ± 2.5	25.8 ± 2.1	1.3	1.2
Samantha MT0	27-Jun	N	27.0 ± 0.8	14.8 ± 0.5	0.5	0.5
Sunfire MT0	27-Jun	NC	36.5 ± 1.3	16.5 ± 1.3	1.1	1.0
Hussarde	27-Jun	N	26.5 ± 0.6	18.5 ± 1.3	1.0	0.9
Cardinale MT0	27-Jun	Y	32.5 ± 1.0	22.8 ± 1.9	1.1	1.0
P1497-7408	27-Jun	N	31.8 ± 3.3	14.0 ± 0.8	0.8	0.6
P1404-12226-4	27-Jun	NC	23.8 ± 1.0	20.3 ± 1.7	0.4	0.3
Red Romaine #4	27-Jun	N	20.3 ± 4.1	27.0 ± 2.2	0.5	0.4
P1337-6028-3	27-Jun	Y	20.5 ± 1.7	14.3 ± 1.0	0.4	0.4
Red Derby M.T.	27-Jun	N	28.0 ± 2.2	16.5 ± 1.9	0.9	0.6
PSR 5025	27-Jun	N	33.0 ± 1.4	26.5 ± 2.4	1.5	1.4
P1404-11896-2	27-Jun	NC	28.8 ± 0.5	20.3 ± 1.7	0.6	0.5
Winter Density	27-Jun	N	20.8 ± 1.5	20.0 ± 1.2	0.5	0.4
PSR 5179	27-Jun	N	26.5 ± 5.7	21.0 ± 4.1	0.8	0.7
Outredgeous MT0	27-Jun	N	25.8 ± 3.1	24.0 ± 1.4	0.4	0.3
Integrata Red MT0	27-Jun	N	26.8 ± 1.7	25.6 ± 1.1	0.6	0.5
Rosalita MT0	27-Jun	N	20.5 ± 1.9	26.6 ± 1.6	0.7	0.7
Freckles	27-Jun	N	26.0 ± 2.2	24.4 ± 0.9	1.3	1.2
P1368-7277	27-Jun	N	21.4 ± 1.3	25.6 ± 1.3	1.1	1.0
P1368-7278	27-Jun	N	25.8 ± 3.1	25.5 ± 2.9	1.2	1.0
P1335-4856-3	27-Jun	N	28.5 ± 7.0	33.3 ± 2.5	1.1	1.0

Table 10. Qualitative head characteristics of specialty lettuce planted on May 22, 2000, at the OARDC Muck Crops Research Branch in Celeryville, Ohio. (cont.)

Genotype	plot uniformity low-high (1-5)	Outer Tipburn # / 5 heads	Internal Rot/Burn # / 5 heads	dull-shiny (1-5)	Leaf morphology flat-curly (1-5)	Head Volume sm-lg (1-5)	Compact Loose- tight (1-5)	Color	Comments
P1404-12072-1	4	1	0	2	2	3	3	med grn	Nice
P1466-4102	3	5	3	3	1	3	3	lime grn	
Diamond Gem MT0	3	0	0	3	2	2	4	gr	
Deer Tongue	4	1	0	3	2	3	3	lt grn	Pointed bib
LM 1812	3	4	0	3	2	1	2	lt grn	
Berenice	3	3	0	4	2	3	4	lime grn	
OA 9302	4	0	0	2	1	2	4	lt grn/mar	
Nevada MT0	3	1	0	3	2	3	4	lime grn	Good green leaf
Loma MT0	3	1	0	2	3	3	4	lt grn	
P1368-7287	2	1	0	3	3	4	3	med grn	Aster yellow present
P1404-12394-3	3	0	0	3	2	3	3	grn, mar edges	Very good red leaf
P1404-11479-4	2	0	0	3	1	3	3	med grn	Very good green leaf
P1300-4624	2	0	0	3	1	4	4	med grn	
LO 9356	2	0	0	3	3	3	2	lime grn	
LO 9351	2	1	0	2	3	2	2	pink, grn veins	Aster yellow
LO 9357	2	0	0	5	3	3	3	mar, yel veins	Too loose for Lollo Rosa
LO 9355	3	0	0	4	3	3	2	dk mar, lt grn veins	Very good Lollo Rosa, bright contrast
Impuls MT0	3	0	0	2	3	3	3	pink, lt grn veins	Good Lollo Rosa, nice contrast
Dark Lollo Rossa	4	*	*	2	3	3	4	mar, lt grn veins	Excellent Lollo Rosa, nice contrast
P1497-7396	2	2	0	2	2	2	2	lime grn	
P1497-7318	3	1	0	4	2	4	3	rd, lt grn veins	Very marketable red leaf
Carmona MT0	2	2	0	3	3	3	3	lt grn, rd tip	Aster yellow present
Mikola MT0	4	0	0	4	1	4	4	grn, rd tip	Excellent butterhead
Pirat MT0	3	0	0	4	1	4	4	lime grn, pink tip	Very good butterhead
Galactic MT0	3	0	0	5	2	3	2	mar, lt grn veins	Striking color combination, best red color
LR 9254	2	0	0	5	2	2	2	maroon	Darkest red in field
Dano MT0	4	0	0	3	1	4	4	var mar	Excellent red oak leaf
Cocarde MT0	4	3	0	2	1	4	4	grn w/rd tip	Pointed oak leaf, early
Samantha MT0	2	0	0	4	2	2	4	var grn/rd	

Table 10. Qualitative head characteristics of specialty lettuce planted on May 22, 2000, at the OARDC Muck Crops Research Branch in Celeryville, Ohio. (cont.)

Genotype	plot uniformity low-high (1-5)	Outer Tipburn # / 5 heads	Internal Rot/Burn # / 5 heads	dull-shiny (1-5)	Leaf morphology flat-curly (1-5)	Head Volume sm-lg (1-5)	Compact Loose- tight (1-5)	Color	Comments
Sunfire MT0	3	0	0	2	1	4	2	var grn/rd	Extra-fancy, deep cut oak leaf
Hussarde	4	2	0	3	1	3	4	var grn/rd	Round arrow oak leaf
Cardinale MT0	3	3	0	4	1	4	3	lt grn/pink	
P1497-7408	4	0	0	3	1	4	4	var grn/rd	Very good oak leaf
P1404-12226-4	3	0	0	4	3	3	2	brt mar, lt grn veins	Red leaf or lg lollo rosa; nice contrast
Red Romaine #4	3	5	0	2	1	1	2	dk red tip	Large core
P1337-6028-3	3	4	4	3	3	2	4	grn, crm edges	
Red Derby M.T.	3	2	0	3	2	3	2	lt grn, rd tip	Aster yellow present
PSR 5025	4	2	0	2	3	4	4	med grn	Excellent green leaf
P1404-11896-2	2	0	0	2	1	3	2	grn, mar edges	
Winter Density	2	5	0	2	1	2	3	gr	
PSR 5179	2	2	0	2	2	3	2	gr	Pointed edge romaine
Outredgeous MT0	3	1	0	4	3	3	3	rd, gr center	Nice romaine, but large core
Integrata Red MT0	3	1	0	3	1	4	4	dk red tip	Very good romaine, large core
Rosalita MT0	3	4	0	1	2	3	4	red and gr	
Freckles	4	0	0	2	2	4	4	lt grn/mar	
P1368-7277	3	5	2	2	2	3	3	lt grn	Large core, pointed tip romaine
P1368-7278	5	2	0	2	2	4	4	lt grn	
P1335-4856-3	3	0	0	3	1	4	4	lt grn/mar tip	

Table 11. Quantitative head measurements of specialty lettuce planted on July 13, 2000 at the OARDC Muck Crops Research Branch in Celeryville, Ohio.

Genotype	Harvest Date	Bolted	Average of 4 Individual Heads		Total Weight of 4 heads	
			width (cm)	Height (cm)	Untrimmed (kg)	Trimmed (kg)
P1404-12072-1	21-Aug	N	42.5 ± 3.2	22.9 ± 2.1	1.54	1.34
P1466-4102	21-Aug	Y				
Diamond Gem MT0	21-Aug	Y	18.7 ± 1.2	18.1 ± 0.6	0.64	0.44
LM 1812	21-Aug	Y				
OA 9302	21-Aug	Y	31.1 ± 2.4	14.6 ± 1.3	0.88	0.74
Nevada MT0	21-Aug	N	25.1 ± 0.6	20.0 ± 0.6	0.74	0.62
Loma MT0	21-Aug	N	32.4 ± 2.4	19.7 ± 1.3	1.54	1.14
P1368-7287	21-Aug	N	36.8 ± 2.5	19.1 ± 1.0	1.16	1.02
P1404-12394-3	21-Aug	NC	34.9 ± 1.3	23.5 ± 2.4	1.10	0.96
P1404-11479-4	21-Aug	N	33.7 ± 2.4	26.0 ± 2.4	0.96	0.80
LO 9356	21-Aug	Y				
LO 9351	21-Aug	N	24.1 ± 3.3	12.7 ± 2.1	0.28	0.26
LO 9357	21-Aug	N	25.1 ± 2.2	14.0 ± 1.5	0.20	0.16
LO 9355	21-Aug	N	21.3 ± 1.2	12.7 ± 0.0	0.20	0.18
Impuls MT0	21-Aug	N	22.5 ± 0.6	14.0 ± 1.5	0.24	0.20
Dark Lollo Rossa	21-Aug	N	21.9 ± 2.2	12.7 ± 0.0	0.16	0.14
Carmona MT0	21-Aug	N	32.4 ± 3.8	19.4 ± 2.8	0.88	0.72
Mikola MT0	21-Aug	N	27.3 ± 1.6	20.3 ± 0.0	1.18	1.08
Pirat MT0	21-Aug	N	29.8 ± 1.3	17.8 ± 0.0	0.90	0.74
Galactic MT0	21-Aug	Y	25.4 ± 2.1	20.3 ± 0.0	0.28	0.26
Dano MT0	21-Aug	N	31.1 ± 2.4	14.6 ± 1.3	0.60	0.52
Cocarde MT0	21-Aug	Y	35.6 ± 2.9	22.9 ± 0.0	0.98	0.86
Samantha MT0	21-Aug	N	29.2 ± 1.5	13.3 ± 0.7	0.62	0.50
Sunfire MT0	21-Aug	Y	35.6 ± 2.9	16.8 ± 1.9	0.94	0.86
Hussarde	21-Aug	NC	33.0 ± 5.9	22.2 ± 2.4	0.98	0.86
Cardinale MT0	21-Aug	N	36.8 ± 1.5	25.7 ± 0.6	1.12	0.96
P1404-12226-4	21-Aug	Y	25.4 ± 2.7	19.4 ± 0.6	0.28	0.24
Red Romaine #4	21-Aug	Y	37.5 ± 8.6	28.6 ± 2.4	0.74	0.64
P1337-6028-3	21-Aug	Y				
Red Derby M.T.	21-Aug	N	28.6 ± 3.8	17.8 ± 0.0	0.96	0.80
PSR 5025	21-Aug	N	43.2 ± 2.9	26.4 ± 1.2	1.74	1.48
Winter Density	21-Aug	NC	27.0 ± 2.8	20.0 ± 2.6	1.04	0.96
PSR 5179	21-Aug	N	35.6 ± 2.9	29.8 ± 1.3	1.70	1.56
Outredgeous MT0	21-Aug	Y	40.6 ± 4.6	27.9 ± 0.0	0.56	0.50
Integrata Red MT0	21-Aug	Y	38.7 ± 2.4	22.9 ± 2.1	1.16	0.96
Rosalita MT0	21-Aug	Y	32.4 ± 3.8	26.7 ± 1.5	0.80	0.68
Freckles	21-Aug	N	29.2 ± 2.5	23.5 ± 0.7	0.76	0.66
P1368-7277	21-Aug	NC	28.3 ± 3.2	31.1 ± 1.6	1.26	1.12
P1368-7278	21-Aug	NC	34.9 ± 1.3	27.9 ± 0.0	1.70	1.42
P1335-4856-3	21-Aug	NC	37.5 ± 2.4	26.7 ± 1.5	1.40	1.18

Table 12. Qualitative head characteristics of specialty lettuce planted on July 13, 2000 at the OARDC Muck Crops Research Branch in Celeryville, Ohio. (cont.)

Genotype	plot uniformity low-high (1-5)	Outer Tipburn # / 5 heads	Internal Rot/Burn # / 5 heads	dull-shiny (1-5)	Leaf morphology flat-curl (1-5)	Head Volume sm-lg (1-5)	Compact Loose- tight (1-5)	Color	Comments
P1404-12072-1	5	0	0	3	3	3	2	med grn	Nice, but didn't size, mild aster yellow
P1466-4102	2	0	0	2	1	3	4	lt grn	Not uniform, basal shoots, mild aster yellow
Diamond Gem, MT0	2	3	0	1	2	2	3	lt grn	Bacterial wilt, mild aster yellow
LM 1812	5	2	0	1	1	1	2	lt grn	Bolted very early
OA 9302	3	0	0	1	1	2	4	rd, grn mix	Poor germination, severe aster yellow
Nevada, MT0	2	0	0	2	1	2	3	lt grn	Nice, didn't size up, butt necrosis, mild aster yellow
Loma, MT0	4	1	0	2	3	2	3	med grn	Nice dense head, crisp, basal shoots, severe aster yellow
P1368-7287	3	3	0	1	1	3	2	lt grn	Not uniform, severe aster yellow
P1404-12394-3	5	0	0	3	1	3	3	med grn, red	Nice red leaf but not best color, clean
P1404-11479-4	4	2	3	2	1	3	4	med grn	Average green leaf, severe aster yellow
LO 9356	4	4	0	2	2	3	4	lt grn	Bolted very early, mild aster yellow
LO 9351	4	0	0	3	5	3	4	lt red, gr center	Poorest lollo rosa, poor germination , severe aster yellow
LO 9357	2	0	0	4	4	3	2	dk red	Lollo rosa, didn't size, aster yellow
LO 9355	4	0	0	4	4	3	3	dk red	Darkest red lollo rosa, nice, mild aster yellow
Impuls, MT0	3	0	0	3	4	3	4	lt red, yel center	Similar to entry 'Dark Lolla Rosa', aster yellow
Dark Lollo Rossa	4	0	0	3	4	3	3	lt red, yel center	Excellent Lollo Rosa
Carmona, MT0	5	2	0	1	2	3	3	lt grn, rd tip	Didn't size up, severe aster yellow
Mikola, MT0	4	0	0	2	2	3	4	rd tip, grn center	Severe aster yellow problem
Pirat, MT0	5	0	0	1	2	2	3	lt grn, pink tip	Nice butterhead, severe aster yellow
Galactic, MT0	5	0	0	5	4	2	3	dk red	Nice red, did not size before bolting, aster yellow
Dano, MT0	3	0	0	1	2	2	4	lt red, grn center	Excellent oakleaf, aster yellow
Cocarde, MT0	2	0	0	1	1	3	4	med grn	Nice, unusual, severe aster yellow
Samantha, MT0	2	0	0	1	1	2	3	rd tip, grn center	Too small, severe aster yellow
Sunfire, MT0	3	0	0	1	1	2	4	rd, grn mix	Nice size, but bolted, mild aster yellow
Hussarde	4	0	0	3	1	3	4	med grn	Poor germination, severe aster yellow
Cardinale, MT0	3	0	0	2	1	4	3	med grn, rd tip	Didn't size, severe aster yellow
P1404-12226-4	2	0	0	4	3	3	3	lt rd, lt grn center	Okay red color, didn't size, severe aster yellow
Red Romaine #4	5	0	0	2	1	2	2	lt rd and grn	Darkest red romaine, average plant, aster yellow

Table 12. Qualitative head characteristics of specialty lettuce planted on July 13, 2000 at the OARDC Muck Crops Research Branch in Celeryville, Ohio. (cont.)

Genotype	plot uniformity low-high (1-5)	Outer Tipburn # / 5 heads	Internal Rot/Burn # / 5 heads	dull-shiny (1-5)	Leaf morphology flat-curl (1-5)	Head Volume sm-lg (1-5)	Compact Loose- tight (1-5)	Color	Comments
P1337-6028-3	3	2	0	3	1	2	3	lt grn	Did not size, mild aster yellow
Red Derby, M.T.	5	0	0	2	1	2	4	lt grn	Nice but did not size, severe aster yellow
PSR 5025	5	0	0	2	2	4	4	med grn	Nice heavy head, excellent green leaf, mild aster yellow
Winter Density	5	1	0	1	1	2	3	med grn	Poor romaine, mild aster yellow
PSR 5179	4	0	0	2	1	4	2	lt grn	Nice romaine, severe aster yellow
Outredgeous, MT0	5	0	0	4	1	3	3	lt red, grn center	Excellent red romaine, bolted early, severe aster yellow
Integrata Red, MT0	5	0	0	2	1	4	4	med grn, rd tip	Excellent romaine
Rosalita, MT0	4	0	0	2	1	2	2	dk grn, rd tip	Didn't size, severe aster yellow
Freckles	3	0	0	2	1	3	2	lt grn w/freckles	Okay size, severe aster yellow
P1368-7277	4	0	0	1	1	2	3	med grn	Didn't size, severe aster yellow
P1368-7278	5	0	0	2	1	3	3	med grn	Did not size before bolting, severe aster yellow
P1335-4856-3	5	0	0	3	1	4	4	mar, grn mix	Average romaine, not compact, severe aster yellow

Table 13. Evaluation of lettuce genotypes by growers, consumers and members of the industry at the OSU-OARDC Muck Crop Research Branch Field Day on June 29, 2000. Twenty participants rated each variety on a scale of 1 to 10 (1 = not desirable, 10 = highly desirable).

Study Group	Genotype	Average Score
Endive/Escrole	Markant(end.)	5.39
	Neos(end.)	3.63
	Salad King(end.)	4.95
	Elisa(esc.)	4.85
	Full Heart NR 65(esc.)	2.32
	Enza 18053(esc.)	4.37
Green Leaf	Waldman Green	5.63
	Krypton	5.42
	Xena MI (HMX 6552)	7.37
	North Star	5.58
	Tiara	6.74
	Crisp & Green MT0	4.82
	Slobolt	6.39
	Two Star MT0	7.05
	Red Leaf	PSR 7998
Carnival		4.95
New Red Fire		6.68
PSR 69292 MI		6.11
Red Line MI		5.83
Galactic MT0		6.22
Romaine	PSR 3726	6.94
	Green Forest	6.67
	Capistrano	5.25
	King Henry	6.18
	Big Heart	6.44
	Green Towers MI	7.13
	Rome 61 MI (Splitkote D)	6.38
	HMX 7555 MI	5.71
	Camino Real	7.59
Grand Prize	7.53	

Table 14. Lettuce consumer sensory evaluations of twelve selected lettuce varieties planted on May 22, 2000 at the OARDC Muck Crops Research Branch in Celeryville, Ohio. See Materials and Methods.

variety		overall					average	total
		color	texture	head size	appearance	taste		
PSR 5025	mean	8.8	7.5	8.2	7.9	5.8	7.7	1,384.5
	median	9.0	8.0	8.0	8.0	6.0	7.4	
	sum	272.0	234.0	246.0	244.0	151.0	237.5	
Loma MTO	mean	8.0	7.3	6.5	6.8	6.2	7.0	1,268.9
	median	8.0	7.0	7.0	7.0	7.0	7.2	
	sum	249.0	225.0	200.0	211.0	168.0	215.9	
PSR 7998	mean	8.0	8.0	7.4	7.3	6.8	7.5	1,365.9
	median	9.0	8.0	7.0	7.0	7.0	7.4	
	sum	249.0	249.0	228.0	225.0	183.0	231.9	
Galactic MTO	mean	6.9	7.4	5.3	6.3	5.8	6.3	1,137.0
	median	7.0	7.0	5.0	6.0	6.0	6.2	
	sum	215.0	228.0	163.0	190.0	145.0	196.0	
P1368-7278	mean	8.3	7.0	7.8	7.0	5.4	7.1	1,296.6
	median	8.0	7.0	8.0	7.0	6.0	7.0	
	sum	256.0	218.0	242.0	218.0	141.0	221.6	
Outredgeous MTO	mean	7.7	7.7	6.9	7.2	6.1	7.1	1,294.5
	median	8.0	8.0	7.0	8.0	6.0	7.4	
	sum	240.0	238.0	214.0	223.0	159.0	220.5	
LO 9355	mean	7.1	7.0	6.2	6.0	4.6	6.2	1,117.0
	median	7.0	7.0	6.0	6.0	5.0	5.8	
	sum	219.0	217.0	193.0	181.0	114.0	193.0	
Dark Lolla Rosa	mean	7.0	7.3	5.4	6.0	5.4	6.2	1,112.2
	median	7.0	8.0	5.0	6.0	5.0	6.4	
	sum	216.0	220.0	168.0	186.0	130.0	192.2	
Bernice	mean	8.2	7.2	7.5	7.1	6.4	7.3	1,330.3
	median	8.0	8.0	7.0	7.0	7.0	7.2	
	sum	255.0	224.0	233.0	221.0	172.0	225.3	
Sunfire MTO	mean	6.8	6.2	7.1	6.4	6.4	6.5	1,185.6
	median	8.0	7.0	7.0	7.0	6.0	7.0	
	sum	211.0	193.0	221.0	199.0	159.0	202.6	
Red Tango	mean	7.8	7.5	7.4	7.6	7.7	7.5	1,363.1
	median	8.0	7.0	8.0	8.0	7.0	7.6	
	sum	241.0	231.0	229.0	236.0	193.0	233.1	
Mikola MTO	mean	7.9	7.7	7.6	7.7	7.9	7.7	1,415.0
	median	9.0	8.0	8.0	8.0	8.0	8.0	
	sum	244.0	240.0	237.0	240.0	214.0	240.0	

Table 15. Lettuce consumer sensory evaluations of twelve selected lettuce varieties planted on July 13, 2000 at the OARDC Muck Crops Research Branch in Celeryville, Ohio. See Materials and Methods.

variety		overall					average	total
		color	texture	head size	appearance	taste		
PSR 5025	mean	8.6	7.9	7.9	8.1	7.3	7.9	
	median	9.0	9.0	8.0	9.0	7.5	8.2	
	sum	120.0	111.0	110.0	113.0	88.0	110.7	652.7
Loma MTO	mean	7.9	7.6	8.1	7.7	7.5	7.7	
	median	8.0	7.5	8.0	7.5	7.5	7.3	
	sum	111.0	106.0	113.0	108.0	90.0	108.3	636.3
PSR 7998	mean	8.0	8.4	8.5	8.4	8.8	8.3	
	median	8.0	8.5	8.5	8.0	9.0	8.3	
	sum	112.0	117.0	119.0	117.0	97.0	116.6	678.6
Galactic MTO	mean	7.7	7.5	5.9	7.2	7.2	7.1	
	median	8.5	8.0	6.5	8.0	7.0	7.7	
	sum	108.0	105.0	82.0	101.0	86.0	98.9	580.9
P1368-7278	mean	9.0	7.9	8.4	8.1	6.0	7.9	
	median	9.5	8.0	8.5	8.0	6.5	7.3	
	sum	126.0	111.0	118.0	114.0	72.0	111.0	652.0
Outredgeous MTO	mean	8.4	8.4	8.7	8.3	7.4	8.2	
	median	8.5	8.0	9.0	8.5	8.0	8.5	
	sum	117.0	117.0	122.0	116.0	89.0	115.1	676.1
LO 9355	mean	7.4	7.3	6.3	6.8	6.2	6.8	
	median	8.5	8.0	7.0	8.0	7.0	7.0	
	sum	104.0	102.0	82.0	88.0	68.0	94.9	538.9
Dark Lolla Rosa	mean	6.9	7.3	6.7	5.9	4.0	6.2	
	median	7.0	8.0	7.0	6.0	4.0	6.3	
	sum	97.0	102.0	94.0	83.0	52.0	87.0	515.0
Freckels	mean	5.1	6.8	7.5	6.0	6.5	6.4	
	median	5.0	7.0	8.0	6.0	7.0	6.3	
	sum	71.0	95.0	105.0	84.0	78.0	88.9	521.9
Sunfire MTO	mean	7.3	6.5	7.6	7.2	8.2	7.3	
	median	7.5	6.5	8.0	7.5	9.0	7.8	
	sum	102.0	91.0	107.0	101.0	107.0	102.7	610.7
Dano MTO	mean	8.2	7.6	8.1	8.2	8.2	8.0	
	median	9.0	8.0	8.5	9.0	9.0	8.5	
	sum	115.0	107.0	113.0	115.0	106.0	112.4	668.4
Mikola MTO	mean	8.7	8.6	8.6	8.6	7.4	8.4	
	median	9.0	9.0	9.0	9.0	8.0	8.5	
	sum	122.0	121.0	121.0	121.0	96.0	117.2	698.2

Table 16. Lettuce sensory evaluations completed by chefs and produce buyers from a specialty market-café. Twelve varieties were selected for evaluation from among those planted on May 22, 2000, at OARDC Muck Crops Research Branch in Celeryville, Ohio. See Materials and Methods.

variety	color	texture	head size	overall appearance	taste	average
PSR 5025	9.3	9.2	9.3	8.8	6.0	8.5
Loma MTO	9.5	8.8	9.0	9.0	7.3	8.7
PSR 7998	8.3	8.5	8.7	8.3	6.8	8.1
Galactic MTO	9.7	9.0	8.7	9.0	6.5	8.6
P1368-7278	9.3	8.5	9.0	9.0	7.0	8.6
Outredgeous MTO	9.2	9.0	9.2	9.0	7.0	8.7
LO 9355	8.5	8.3	8.3	8.3	7.0	8.1
Dark Lolla Rosa	9.3	8.7	9.0	8.7	6.8	8.5
Bernice	9.3	9.3	9.2	9.0	7.5	8.9
Sunfire MTO	9.3	9.2	9.5	9.2	8.0	9.0
Red Tango	9.7	9.3	7.8	9.0	5.8	8.3
Mikola MTO	9.7	9.3	8.0	8.0	5.7	8.1

Extension Vegetable Crops Program - Muck Crops Germplasm Evaluation Results in 2000

Crop: Radish

Introduction and Project Goal

The primary goal of these studies was to develop information useful to Ohio growers in selecting varieties, especially for different planting periods. These studies were also designed to help explain how the interaction between genotype and growing environment impacts specific crop traits. To accomplish these goals, we planted a wide assortment of radish varieties and experimental lines in fully replicated plots in April and July. Yield and physical external plant and bulb traits were recorded in addition to consumer-driven estimates of desirability.

Materials and Methods

Study Development and Plot Establishment. Entries were solicited from cooperating seed companies in winter 1999-2000 (Table 1). Specific requests were made of seed companies to submit a wide range of entries from experimental to standard. A randomized complete block design was used. The experiment contained four replications per entry, per planting and two planting dates (April 24, July 27). The three-row plots were sown with a precision belt seeder. Each row was 15 ft. long with 16.5 in. between rows and 1 in. between seed.

Plot Maintenance. Standard pest management strategies based on scouting, thresholds, and application of labeled pesticides were employed.

Data Collection (Field). Plots were reviewed twice weekly to assess development. Notes on stand establishment were taken several weeks after planting.

Data Collection (at Harvest). Harvest readiness for individual entries and the entire planting was estimated from published maturity information and visual examination of the four replicates per planting. At harvest, all plants were removed within a two meter length at the north end of the middle row of each plot. No plants were removed from within 0.5 m of the end of the row. Whole plants from each planting were rinsed free of soil within thirty minutes of harvest, weighed, placed in plastic bags, and transferred to cool storage at the OARDC in Wooster, OH. The following weight data were collected on whole plants removed from the two meter length of each experimental row: 1) total biomass, 2) total bulb, 3) marketable bulb, and 4) non-marketable bulb. The following data were collected on ten individual plants containing marketable bulbs selected at random within each experimental row (10/plot): 1) total plant length (root-leaf tip), 2) foliage length, 3) bulb length, and 4) bulb width. With these measures on individual plants, it is possible to examine relationships among traits that may have market significance (e.g., bulb size-leaf length ratio). Color readings were also taken on the ten individual bulb sample using a Minolta CR300 Colorimeter. These data are not reported here.

Consumer Quality Analysis. Consumer sensory evaluations were completed after harvesting and measuring (see above) bulbs and plants from the spring planting. Marketable bulbs of each entry were retained after laboratory measurement, placed in breathable plastic bags, and maintained in refrigerated storage at the OARDC in Wooster, OH. On June 12, 13, and 14, 5-8 marketable bulbs per genotype (identified with an arbitrary number only) were placed on display in clear glass bowls. Participants in the evaluation were asked to score the taste, texture, bulb size, and overall acceptability of each entry using an accepted instrument for consumer panel evaluation: 15 cm unstructured lines anchored by undesirable endpoints upon which consumers made a mark indicating at which position between the anchors the entry fell in a particular trait (e.g., see Figure 1 below). The distance from the left anchor was then measured and is reported in Table 2.

Figure 1. Portion of instrument used in consumer sensory evaluation. Lines were repeated for bulb texture (too soft-too pithy), size (too small-too large), and overall acceptability (not at all desirable-very desirable).

Criteria 1. Taste

too sweet

too hot

Statistical Analysis. Replicate averages were calculated and used in means analysis. Main effects and interactions were analyzed with fully specified model statements in SAS (alpha = 0.10). The L.S.D. test was used to analyze the effect of planting date and replicate while the Duncan Multiple Range test was used to analyze the effect of entry.

Results Summary

The second planting was not harvested due to significant rainfall (6" overnight on August 24, 2000) and flooding during the week of harvest which reduced bulb and foliage quality. Therefore, data from the second planting are not included in this report. Overall, marketable yield ranged from 605 to 1493 boxes per acre with an average of 873 boxes per acre (Table 1). It is also important to note that the entry (Tinto) with the highest average marketable yield also had the highest percent marketable yield by weight and harvest index, suggesting that this variety produced the greatest marketable yield with the least amount of waste in terms of non-marketable bulbs and foliage weight.

Sensory characteristics (e.g., bulb taste and texture), as evaluated by consumer panelists, also differed among entries (Table 2). In two of three evaluations (June 12, 13), consumers noted significant differences in bulb taste. Significant differences among entries in bulb texture were found in one evaluation (June 14). Consumers noted significant differences in bulb size in all three evaluations. Interestingly, despite differences in bulb taste, texture, and size on various days, differences in overall

acceptability were not statistically significant in any evaluation.

Table 1. Yield of radish genotypes planted in the Spring Radish Trial 2000 at OARDC Muck Crops Branch in Celeryville, OH.

Entry	Genotype	Source	Marketable yield (box/A)	% Marketable yield by wt.	Harvest Index (%)
1	Brio	Vilmorin	888	73	42
2	Cabernet	Novartis / Rogers	807	72	41
3	Julio	Vilmorin (Nickerson Zuaon)	1222	60	40
4	Rebel	Bejo	863	68	34
5	Red Fortress F1	Harris Moran	700	64	26
6	Red Silk	Harris Moran	857	83	32
7	Rudolf	Bejo	605	45	25
8	SRA 1501	Sakata	926	64	31
9	SRA 6508	Sakata	700	58	19
10	SRA6507	Sakata	920	66	28
11	Tinto	Vilmorin	1493	88	50
12	Belle Glade	Grower's choice, 1999 seed from OARDC Inventory	1147	84	31
13	Fancy Red	Grower's choice, seed donated Rispen's	662	65	26
14	Master red (PS97103)	Grower's choice, seed donated Rispen's	605	86	32
15	SRA 4504	Grower's choice, 1999 seed from OARDC Inventory	700	57	26
DMRT_(0.10)			343	14	9

Table 2. Radish Consumer Taste 2000

Date	Genotype	Taste	Texture	size	overall
6/12/00					
	1 Cabernet	7.9	7.7	8.6	9.3
	2 Brio	10.2	8.4	9.9	6.7
	3 Julio	9.3	8.5	9.5	8.5
	4 Rebel	9.4	8.8	10.7	7.2
	5 Red Fortress	9.3	9	7.8	7.4
	6 Red Silk	7.6	8.9	8.5	7.4
	7 Cabernet*	7.4	3.9	8.2	6.4
	Pr > F	0.0408	< 0.0001	0.0003	0.0794
	DMRT _(0.10)	1.93	1.69	1.33	2.04
6/13/00					
	1 Cabernet	7	8.2	9.8	8.5
	2 Rudolf	9.7	8.5	8.9	9.1
	3 SRA 1501	8.5	8.3	8.3	9.1
	4 SRA 6508	7.8	8.3	6.8	7.7
	5 SRA 6507	9.1	7.7	7.2	8.2
	6				
	7 Cabernet*	6	3.6	9	4.9
	Pr > F	0.0031	< 0.0001	0.0004	0.0006
	DMRT _(0.10)	1.86	1.58	1.37	1.88
6/14/00					
	1 Cabernet	7.8	7	9.5	7.4
	2 Belle Glade	8	9.5	7.6	7.2
	3 Fancy Red	8.1	8	8	6.7
	4 SRA 35035	9.4	9.4	11.5	6.7
	5 Tinto	7.5	8.1	7.9	6.4
	6				
	7 Cabernet*	6.9	5.3	9.9	6.5
	Pr > F	0.3375	0.0009	< 0.0001	0.9456
	DMRT _(0.10)	2.02	1.99	1.60	2.19