

2004 Romaine Variety Trial Evaluation for Yellow Spot and other Abiotic Disorders

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Objective: To examine Romaine lettuce varieties for resistance to yellow spot disorder

Background: Yellow spot disorder of Romaine lettuce is an erratic and occasional problem on various types of lettuce. It is most pronounced on Romaine lettuce but is also present on head lettuce varieties where it does not present difficulties due to striping of the outer leaves at harvest. It is mostly a problem for mature Romaine lettuce. The symptoms include bright yellow spots 1/8 inch in diameter that tend to occur on mid to older leaves. The cause of this malady is not clear. Examinations of nutritional and water relations with the plant have not yielded a clear connection between these two influences. There was some evidence from the 2003 growing season that the malady varied in severity from variety to variety. As a result, a trial was initiated in 2004 to examine the impact of Romaine lettuce varieties on the expression of this problem. Tip burn and leaf gluing were also evaluated in this trial as they were also present in the field.

Methods: The varieties were seeded on April 16, 2004 at Growers Transplant in Salinas and were transplanted in the field on May 18 (see table 1 for list of varieties). The trial was located east of Chualar and the soil at the site was Chualar sandy loam soil. The lettuce was grown to full maturity and was rated for yellow spot on June 25 and July 1 which were one week prior to and at harvest, respectively. At harvest, samples of a recently matured, fully expanded leaves were collected from a yellow spot resistant and susceptible variety, and sent to the DANR Laboratory at UC, Davis for nutrient analysis. The trial offered an opportunity to examine other characteristics of the varieties. As a result, in addition to yellow spot evaluations the following evaluations were conducted: tip burn (obvious symptoms on the emerged leaves), leaf gluing (the cause of head deformity and whose cause is also not fully determined), as well as some horticultural characteristics.

Results: There were significant differences in the amount of yellow spot among the varieties (table 2). On the first evaluation dates, there were several varieties that were essentially free of yellow spot. However, one week later at harvest no varieties were completely free of the malady; however, Caesar and King Louie were notable in having few yellow spots on the leaves at harvest. There were dramatic differences among the varieties in the level of obvious tip burn with some varieties with none and others with extensive symptoms. There were wide differences among the varieties with respect to leaf color (light green to dark green), leaf texture (flat to savoy), plant height and plant shape (table 3). The nutrient content differed significantly between Caesar which is a variety with little spotting and Heavy Heart a heavily spotted variety (table 4). Total phosphorus, sulfur, calcium, magnesium, manganese and copper levels were higher in the yellow spot affected variety. This observation confirms earlier observations that yellow spot tissue has higher levels of iron, manganese, calcium and magnesium. If yellow spot

is a concern for Romaine production, it can be managed by selection of varieties that have less of a tendency to exhibit the malady.

Table 1. Romaine varieties, types and seed sources.

No.	Name	Description	Seed Source
1	Altura	Green Romaine	Paragon
2	Barcarole	Green Romaine	Seeds of Change
3	Beretta	Green Romaine	Shamrock
4	Braveheart	Green Romaine - heart	Seminis
5	Caesar	Green Romaine - heart	Progeny
6	Coastal Star	Green Romaine	Coastal Seed
7	Conquistador	Green Romaine	Seminis
8	Craquante D'Avignon	Green Romaine	Seeds of Change
9	Darkland	Green Romaine	Central Valley Seeds
10	Fresh Heart	Green Romaine - heart	Orsetti
11	Gladiator	Green Romaine	Coastal Seeds
12	Green Forest	Green Romaine	CVS
13	Green Towers	Green Romaine	Harris Moran
14	Hearts Delight	Green Romaine - heart	Coastal
15	Heavy Heart	Green Romaine - heart	Seminis
16	Jericho	Green Romaine	Seeds of Change
17	King Louie	Green Romaine	Paragon
18	Klamath	Green Romaine	Seminis
19	Paramount	Green Romaine	Coastal Seed
20	Parris Island	Green Romaine	USDA
21	Rubicon	Green Romaine	Paragon
22	Siskiyou	Green Romaine	Seminis
23	SSC 1611	Green Romaine	Shamrock
24	Sunbolt	Green Romaine	CVS
25	Triple Threat	Green Romaine	Seminis
26	Triton	Green Romaine	Harris-Moran
27	Valmaine	Green Romaine	TX Ag. Exp. Station

Table 2. Yellow spot, tip burn and leaf gluing evaluations.

Variety	Yellow Spot ¹		Tip Burn ²		Gluing ³
	June 25	July 1	June 25	July 1	June 25
Altura	0.0	2.3	0.3	0.0	1.4
Barcarole	0.0	1.0	1.9	1.3	1.7
Beretta	0.0	1.8	0.3	0.0	2.3
Braveheart	0.3	3.0	0.5	1.0	1.0
Caesar	0.0	0.3	0.5	0.7	1.5
Coastal Star	0.3	2.3	1.2	1.3	2.0
Conquistador	0.3	2.7	0.7	1.3	3.7
Craquante D'Avignon	1.4	3.2	1.9	2.2	1.1
Darkland	0.2	1.8	0.0	0.3	2.2
Fresh Heart	0.5	2.3	2.1	1.8	1.0
Gladiator	0.8	2.5	0.0	0.0	1.0
Green Forest	0.3	2.7	0.0	0.7	1.7
Green Towers	0.3	2.3	1.3	1.1	1.7
Heart's Delight	0.0	1.7	1.0	0.8	3.1
Heavy Heart	1.3	3.1	1.0	1.3	1.1
Jericho	0.7	1.7	2.2	2.3	1.0
King Louie	0.0	0.7	0.0	0.0	1.1
Klamath	0.0	1.7	0.7	0.7	1.4
Paramount	0.3	2.3	1.7	0.7	2.5
Parris Island	0.7	1.7	1.7	1.4	1.1
Rubicon	0.0	1.7	1.3	0.3	1.4
Siskiyou	0.0	1.2	0.3	0.0	1.4
SSC 1611	0.5	3.0	1.3	1.0	1.4
Sunbolt	0.0	1.0	1.0	0.3	1.2
Triple Threat	1.3	2.8	0.7	0.7	1.4
Triton	0.3	2.0	0.3	0.3	2.3
Valmaine	0.3	2.3	1.2	0.7	1.9
Grower's	1.0	2.0	0.5	0.0	1.0
LSD (0.05)	ns	1.0	1.2	1.4	1.4

1. Yellow spot rating: 0 = none, 1 = few, 2 = many

2. Tipburn rating: 0 = none, 1 = some, 2 = extensive

3. Glued leaf symptoms: Number of plants/plot (square-root transformed)

Table 3. Horticultural characteristics of Romaine varieties on June 25

Variety	Plant Color ¹	Leaf Texture ²	Plant Height ³	Plant Shape ⁴
Altura	2.2	1.8	1.8	1.8
Barcarole	2.2	1.7	1.7	1.7
Beretta	2.0	1.8	1.5	1.5
Braveheart	1.8	1.2	1.7	2.0
Caesar	1.8	2.3	2.0	2.0
Coastal Star	1.7	1.5	1.5	1.5
Conquistador	1.7	1.8	1.7	1.7
Craquante D'Avignon	2.2	2.5	2.0	2.5
Darkland	1.7	1.7	2.0	2.0
Fresh Heart	1.9	2.0	1.8	1.7
Gladiator	1.8	2.0	2.0	2.0
Green Forest	1.8	1.8	1.7	1.8
Green Towers	2.2	2.0	1.8	1.7
Heart's Delight	2.3	1.7	2.2	2.2
Heavy Heart	1.8	1.2	1.8	1.7
Jericho	1.7	3.1	2.2	2.0
King Louie	2.0	2.8	2.3	2.3
Klamath	2.2	1.8	1.8	1.5
Paramount	1.7	1.7	1.7	1.8
Parris Island	2.0	1.7	1.8	1.7
Rubicon	2.2	2.5	2.3	2.5
Siskiyou	1.8	2.5	2.0	2.0
SSC 1611	1.8	1.8	1.8	2.0
Sunbolt	2.3	2.2	2.3	2.5
Triple Threat	2.0	1.8	2.0	1.7
Triton	1.8	1.5	1.7	1.7
Valmaine	2.0	2.3	2.3	2.0
Grower's	2.0	2.0	1.8	2.0
LSD (0.0.0.05)	n.s.	0.6	n.s.	n.s.

1. Plant color: 1 = light, 2 = medium, 3 = dark green
2. Leaf texture: 1 = smooth, 2 = intermediate, 3 = savoy
3. Plant height: 1 = short, 2 = intermediate, 3 = tall
4. Head shape: 1 = flat, 2 = intermediate, 3 = upright

Table 4. Total nutrient content of Caesar (little yellow spot variety) and Heavy Heart (yellow spot susceptible)

Variety	Percent					ppm					
	Nitrogen	Phosphorus	Potassium	Calcium	Magnesium	Sulfur	Boron	Zinc	Manganese	Iron	Copper
Caesar ¹	4.01	0.54	7.09	0.70	0.29	2450	35.5	44.8	47.5	77.8	5.9
Heavy Heart ²	4.41	0.71	7.09	1.05	0.38	3157	34.3	105.0	74.3	113.2	7.9
LSD (0.05)	n.s.	0.07	n.s.	0.14	0.04	546	n.s.	n.s.	12.6	10.8	1.3

1 – Yellow spot tolerant variety; 2 – Yellow spot susceptible variety