Research Report: Radicchio Cultivar Performance in New Hampshire

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**Recommended Citation**  
Sideman, Rebecca G.; Lukacz, Ella; and Hartman, Lilly, "Research Report: Radicchio Cultivar Performance in New Hampshire" (2024). *Faculty Publications*. 1632.  
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**Introduction**

Radicchio (*Cichorium intybus* var. *latifolium*) is grown widely throughout Europe, especially northern Italy. Within radicchio, there are several groups that differ in color and shape. The round heading Rossa di Chioggia type is the most widely grown. These bitter and colorful greens are commonly used as components of salad mixes or as the sole component of winter salads, and some types are more commonly braised or grilled. In addition to having interesting color and flavor profiles, they are rich in phenolics and other bioactive compounds. While increasingly popular as a niche vegetable in the region, there is little research-based information to guide growers.

The New England growing climate is very different from that of major production regions, and it presents unique challenges. There is tremendous phenotypic variation among and within groups and cultivars. Many cultivars are extremely sensitive to bolting (premature flowering) under warm temperatures that are common in our summer months; it is common for fewer than 50% of radicchio plants to form marketable heads in our region. The availability of varieties to commercial growers in the U.S. has expanded greatly, but there remains a need for reliable regionally relevant information about performance of these varieties. Our work with radicchio is a collaboration with Peyton Ginakes and Mark Hutton at the University of Maine.

**What We Did**

In two locations (Durham NH – USDA hardiness zone 6a, and Monmouth ME – zone 5b), we grew 30 (2022) and 34 (2023) cultivars of radicchio belonging to seven main groups (Chioggia, Castelfranco, Treviso, Sugarloaf, Verona, Rosa del Veneto, and Lusia). In both years, they were seeded on 20-21 June, and transplanted on 14-15 July. Plants were harvested and weighed as they reached market maturity. We also noted plants that were not marketable due to bolting, rot, or failure to head. We used standard cultural practices for the region: plants were grown in double rows on 30-inch-wide raised beds covered with white-on-black plastic mulch with drip irrigation. Fertility was applied pre-plant: 110 lbs/acre of N and 150 lbs/acre of K₂O. Plants were spaced 12 inches apart in each row, and each plot had 16 plants/plot.

We also performed two experiments in each site to evaluate the effects of planting date on harvest window, bolting, and crop marketability. Using three typical round red Chioggia cultivars (‘Sirio’, ‘Leonardo’, and ‘Perseo’), we planted at four planting dates: seeding in early May, late May, late June, and mid-July. They were monitored twice a week until frost, and we noted when each head reached market maturity, when it stopped being marketable, and the reason for unmarketability. For these experiments, we used the practices described above, but plants were spaced 8 inches apart in each row, and each plot had 22 plants/plot.

**What We Learned**

*Weather Conditions – 2022 vs. 2023*
The weather in 2022 and 2023 differed greatly, with 2022 experiencing warm and dry conditions, and 2023 much wetter and cooler (see Figure 2). Varieties performing well in both years are likely to have some level of resilience in the face of environmental extremes.

**Figure 2. Comparison of weather conditions in 2022 and 2023.** Mean minimum and maximum monthly temperatures, cumulative precipitation (inches) and cumulative radiation (Langleys) are shown. For the month of November, data are only presented for the first half of the month, 1-15 November.

*Performance of Varieties & Types*

In both years (2022 and 2023), we observed tremendous differences between varieties. For example, the percentage of heads that became marketable ranged from 0-94% in 2022, and from 10-95% in 2023. Several varieties had very high percentages of unmarketable heads, due to tipburn, rot, bolting, or failure to head (likely due to insufficient days to maturity). For the purposes of this report, we are presenting results by type, because the different types of radicchio would be marketed for different uses, and we think that the most useful information is about relative performance between types and between varieties within a given type. See Figure 1 for detailed performance data.

*Sugarloaf types* were represented by two varieties in our experiment: Nettuno and Virtus. Heads of this type resemble large romaine lettuces. They have a relatively mild, slightly bitter
flavor, and are well suited for salads and for grilling or braising. These heads are heavy and large, with mean weight over 1 lb per head (610g for Virtus, 466g for Nettuno). Compared with other types, the sugarloaf varieties were quite uniform, and reached maturity in a relatively concentrated set. In both years, Virtus was larger, more uniform, and had a higher percentage of marketable heads than Nettuno.

**Rosa del Veneto types** were represented by two varieties in our experiment: Rosalba (Monterosa) and Verosa. Both varieties are indicated as being very late (130 days to harvest), and they reportedly require cold temperatures to develop their characteristic (and shocking!) bright pink color. We harvested a very low percentage of marketable heads of both varieties in both years – they just did not have the time to mature. Those that we did harvest had a mild flavor and were a very attractive and unusual addition to salads. We would like to experiment with earlier planting dates for these varieties.

**Lusia types** were represented by three varieties: Adige Precoce, Adige Medio, and Bel Fiore. Lusia types form a soft head, similar to butterhead lettuce. They have the mildest (least bitter) flavor of all the types we evaluated. Heads of Bel Fiore were somewhat smaller (292g) than those of Adige Medio and Adige Precoce (341 and 358g, respectively). All three varieties had somewhat higher percentages of tipburn and rot than other types; the percentage of marketable heads was around 70% in 2022 for all varieties, and ranged from 25-70% in 2023 (a much wetter year).

**Castelfranco types** were represented by Lucrezia, Giorgione, Fenice, and Notte Stellata (grown in 2023 only). In 2022, Giorgione had a much higher percentage of marketable heads than Lucrezia and Fenice; many Lucrezia never formed heads, and over 60% of Fenice bolted. In 2023, none of these exceeded 45% marketable heads; they all exhibited high percentages of rot, tipburn, and bolting.

**Treviso types** produce slender, firm heads, similar to red romaine hearts. We evaluated 7 varieties in 2022, and 8 in 2023. Head weight ranged from 215-434 g, depending on cultivar and year. Some cultivars had a relatively high proportion of heads that bolted (Spring, Braci Ardenti (2023 only), Bramante (2022 only), TVG1) – where others had a very low percentage (Caravaggio, Fiero, Bottiglione, and Salieri (2023 only). In terms of percentage of marketable heads, Caravaggio stood out in both years – though the heads were generally smaller than other varieties.

**Chioggia types** produce round solid heads that are most familiar to consumers as ‘radicchio’. The majority of varieties we evaluated were red, two were variegated, and one green. There was some variability between the two years we conducted the trial, and we observed a much lower percentage of marketable heads in 2022 than in 2023. Of the variegated cultivars, Galileo consistently produced far more marketable heads (>80%) than Marinanta (<30%). Of the traditional round red varieties, some showed inconsistent results, while others (Indigo, Perseo, Leonardo) produced over 80% marketable heads in both years.
**Powdery mildew.** While the primary production issues that we observed were bolting, tipburn, and bottom rot, we also observed varietal differences in susceptibility to powdery mildew. In both years, Rubro developed powdery mildew early and developed severe symptoms, and several other cultivars eventually developed symptoms – while some never did (cultivars not listed in the table below never developed symptoms). Because of extensive trimming during harvest, powdery mildew may not ultimately reduce marketability.

Date of first powdery mildew symptoms noted for specific cultivars in 2022 and 2023.

<table>
<thead>
<tr>
<th>2022</th>
<th>2023</th>
</tr>
</thead>
<tbody>
<tr>
<td>27 Sept: Rubro</td>
<td>9 Sept: Braci Ardenti (grown 2023 only), Rubro, Virtus</td>
</tr>
<tr>
<td>13 Oct: Baldo, Bel Fiore, Bramante, Giorgione, Nettuno, Virtus, TVG1, Spring</td>
<td>14 Sept: T&amp;T615, Verosa</td>
</tr>
<tr>
<td>21 Oct: Bottiglione, Costarossa</td>
<td>27 Sept: Spring</td>
</tr>
<tr>
<td>5 Oct: Salieri (grown 2023 only), TVG1</td>
<td></td>
</tr>
</tbody>
</table>

**Slotting/Planting Date vs. Harvest Maturity**

We planted three red Chioggia type cultivars at four different dates – seeding early May, late May, mid-June, and mid-July. Harvest window (the number of days that a given head was marketable) varied between cultivar and seeding date. All three varieties had a high percentage of marketable heads – ultimately exceeding 93%, with the exception of the last planting. While ultimately several heads did bolt, all cultivars did have a reasonably long maturity window. The longest harvest window was observed with planting C (planting in 3rd week of June) in 2022, and planting D (planting in mid-July) in 2023.

<table>
<thead>
<tr>
<th>Maturity Window (days marketable) for radicchio seeded at different dates, 2022 and 2023</th>
<th>2022 Seeding Date</th>
<th>2023 Seeding Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leonardo F1</td>
<td>23.7</td>
<td>34.9</td>
</tr>
<tr>
<td>Perseo</td>
<td>18.7</td>
<td>20.8</td>
</tr>
<tr>
<td>Sirio</td>
<td>19.7</td>
<td>23.8</td>
</tr>
<tr>
<td>2022 Overall</td>
<td>20.7</td>
<td>26.5</td>
</tr>
</tbody>
</table>
Figure 1. Performance of several radicchio varieties of several types in 2022 and 2023 at Woodman Farm in Durham NH. All were seeded on 20-21 June. Each bar shows the percentage of plant that were harvested, bolted, rotted, had tipburn, were off-type, unmarketable for some other reason, or failed to reach maturity (late).

Text color indicates type/class

Portion of each bar indicates fate of plants

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5 | [Radicchio performance] NH Agricultural Experiment Station | [Jan 2024]
Conclusions

- Variety selection is critical for success in producing radicchio, as varieties differ greatly in the percentage of marketable heads produced and susceptibility to production issues such as bolting, bottom rot, tipburn, and powdery mildew.

- For traditional round red Chioggia types, several varieties had very high percentages of marketable heads, and appear to be well adapted to production in the northeast.

- Harvesting every two weeks would avoid losses due to bolting for the three varieties we used in slotting experiments (Perseo, Sirio, and Leonardo). Conservatively, we would suggest a weekly harvest to minimize crop losses.

- Other market classes offer attractive colors and different culinary uses. We identified varieties within both sugarloaf and Treviso types that were well adapted, with high percentages of marketable heads.

- The varieties we evaluated within the Lusia and Rosa del Veneto types were especially interesting from a culinary and attractiveness point of view, but were the most difficult to produce, with high percentages of rot (Lusia types) and very long days to maturity required (Rosa del Veneto types).

- Seeding in the third week of June maximized the harvested window for the three Chioggia varieties we looked at (Perseo, Sirio, and Leonardo), and appeared to work well for many of the varieties in the variety trial – but earlier or later dates might work better for some varieties that failed to mature or to lengthen the harvest window for early-to-mature varieties.

Additional work will continue in 2024 and we will update this report as more results become available. With any questions, please contact the author at: becky.sideman@unh.edu or 603-862-3203. You can follow the Sideman Lab’s work on Instagram @unh_sidemanlab.

Acknowledgements. This work was supported by NH Agricultural Experiment Station, the NH Vegetable & Berry Growers’ Association, and UNH Cooperative Extension. Seeds were purchased or donated by Osborne Quality Seeds (Mt. Vernon, WA), Johnny’s Selected Seeds (Albion, ME), High Mowing Seeds (Wolcott, VT), and Bejo Seeds (Geneva, NY). We thank Marley Gonsalves, Caterina Roman, Evan Ford, Kyle Quigley, Mark Trabold, Amber Kittle, and Luke Hydock for their technical support and expertise.