# Fall 2024 Takii Cabbage Trial: Black Rot Screening and Performance Assessment

**Objective:**

The objective of this report is to present the findings of the fall 2024 cabbage (*Brassica oleracea* L. var. *capitata*) black rot screening trial, conducted in collaboration with Takii Seeds and the University of Georgia, with a focus on evaluating the resistance of various cabbage cultivars to black rot.

**Methodology:**

The study was conducted over one year, encompassing the fall season of 2024. The research site was located at Hort Hill, UGA Tifton campus. Nine cabbage cultivars were grown in a randomized block design with four replications. Relevant agronomic practices, such as irrigation, fertilization, and pest management, were implemented uniformly across all plots. Plants were spray-inoculated with Xcc (170 ml of 10^6 CFU/ml) at 5 and 7 weeks after transplanting. Black rot severity in leaves was assessed on 11/25/2024, 12/02/2024, 12/09/2024, 12/16/2024, 12/30/2024, 01/06/2025, and 01/13/2025 as percentage plot areas with symptoms. The area under the disease progress curve (AUDPC) was calculated using the disease severity percentages accumulated over time from the seven assessment periods. A total of four harvests were taken on the dates 01/03/2025, 01/14/2025, 01/29/2025, and 02/04/2025.

**Statistical Analysis:**

The data analysis was performed using the one-way ANOVA model in JMP Pro 18, and the mean separation was conducted using Tukey's Honestly Significant Difference Test (HSD).

**Results:**

The cabbage screening trial results revealed key differences in marketability, yield, and disease resistance across the varieties. 'Expat' achieved 100% marketability with 8.3 marketable heads/plot, though its first harvest count was lower (2.3 heads/plot). 'Celebrate' had strong marketability (97.2%) with 9.3 marketable heads/plot and performed well in the first harvest (4.8 heads/plot). 'Cheers' had the highest first harvest count (8.3 heads/plot) but a comparatively lower marketability rate (86.7%).

Regarding disease resistance, 'Expat', 'Celebrate', and 'Melissa' showed no visible black rot in cabbage heads, while 'Cheers' had 1.0 black rot-affected heads/plot. 'Acclaim Improved' exhibited the highest black rot susceptibility (4.0 heads/plot). 'Applause' had more black rot-

affected heads (3.0 heads/plot) but lower AUDPC for leaf symptoms (477.0). 'Accolade' (58.0%) and 'Acclaim Improved' (55.0%) had the highest Alternaria rating (58.0%). 'Expat' and 'Melissa' showed the lowest Alternaria ratings (6.0% and 5.0%, respectively), reflecting their strong disease resistance.

**Table 1:** Total count, I harvest count, II harvest count, III harvest count, and IV harvest count of nine cabbage (*Brassica oleracea* L. var. *capitata*) cultivars trial conducted at Hort Hill, UGA Tifton, Georgia, USA during the fall of 2024.

| Variety | Total count[i] (no./plot) | Total marketable count[ii] (no./plot) | Percentage marketable count[iii] (%) | I Harvest[iv] Count (no./plot) | II Harvest Count (no./plot) | III Harvest Count (no./plot) | IV Harvest Count (no./plot) |
|---|---|---|---|---|---|---|---|
| Celebrate | 9.5 a[v] | 9.3 a | 97.2 a | 4.8 abc | 2.0 a | 1.3 a | 1.5 a |
| 1488 | 9.8 a | 9.0 ab | 92.2 a | 6.0 abc | 2.8 a | 0.8 a | 0.3 a |
| Capture | 9.0 a | 8.8 ab | 97.5 a | 2.5 bc | 2.0 a | 1.5 a | 3.0 a |
| Cheers | 9.8 a | 8.5 ab | 86.7 ab | 8.3 a | 0.3 a | 1.0 a | 0.3 a |
| Accolade | 9.0 a | 8.3 ab | 92.2 a | 4.0 abc | 2.5 a | 1.8 a | 0.8 a |
| Melissa | 8.5 a | 8.3 ab | 97.2 a | 3.5 abc | 1.5 a | 1.8 a | 1.8 a |
| Expat | 8.3 a | 8.3 ab | 100.0 a | 2.3 c | 4.0 a | 1.8 a | 0.3 a |
| Applause | 9.5 a | 7.0 ab | 73.9 ab | 5.8 abc | 2.8 a | 0.8 a | 0.3 a |
| Acclaim Improved | 9.8 a | 5.5 b | 56.4 b | 7.8 ab | 1.5 a | 0.5 a | 0.0 a |
| **P value** | 0.1136 | 0.0375* | 0.0013* | 0.0058* | 0.2287 | 0.7854 | 0.1011 |

[i]Count represents the total number of cabbage heads per plot.

[ii]Total marketable count: total count - black rot-affected heads.

[iii]Percentage marketable count: total marketable count/total counts*100.

[iv]I Harvest (01/03/2025), II harvest (01/14/2025), III harvest (01/29/2025), and IV harvest (02/04/2025).

[v]Means followed by the same letter are not significantly different based on Tukey's honest significant difference test at 95%.

**Table 2:** Total weight, weight harvest I, weight harvest II, weight harvest III, and weight harvest IV of nine cabbage (*Brassica oleracea* L. var. *capitata*) cultivars trial conducted at Hort Hill, UGA Tifton, Georgia, USA during the fall of 2024.

| **Cultivar** | **Total weight[i] (lbs)** | **Weight harvest I[ii] (lbs)** | **Weight harvest II[ii] (lbs)** | **Weight harvest III[ii] (lbs)** | **Weight harvest IV[ii] (lbs)** | **Avg. weight[iii] (lbs)** |
|---|---|---|---|---|---|---|
| Celebrate | 18.3 a[iv] | 10.4 ab | 3.4 a | 2.2 a | 2.3 a | 1.9 a |
| 1488 | 20.0 a | 13.7 ab | 4.8 a | 1.5 a | 0.0 a | 2.0 a |
| Capture | 15.2 a | 4.9 b | 3.5 a | 1.8 a | 5.0 a | 1.7 a |
| Cheers | 21.1 a | 20.2 a | 0.5 a | 0.4 a | 0.0 a | 2.2 a |
| Accolade | 19.4 a | 9.7 ab | 5.5 a | 3.0 a | 1.1 a | 2.2 a |
| Melissa | 15.3 a | 7.2 b | 2.9 a | 2.4 a | 2.8 a | 1.8 a |
| Expat | 17.1 a | 5.4 b | 7.5 a | 3.6 a | 0.6 a | 2.1 a |
| Applause | 17.5 a | 12.5 ab | 5.1 a | 0.0 a | 0.0 a | 1.8 a |
| Acclaim Improved | 12.5 a | 10.4 ab | 2.0 a | 0.0 a | 0.0 a | 1.3 a |
| **P value** | 0.1450 | 0.0157* | 0.1250 | 0.0926 | 0.0843 | 0.0904 |

[i]Weight was measured in lbs.

[ii]I Harvest (01/03/2025), II harvest (01/14/2025), III harvest (01/29/2025), and IV harvest (02/04/2025).

[iii]Average weight = total weight/total count.

[iv]Means followed by the same letter are not significantly different based on Tukey's honest significant difference test at 95%.

**Table 3:** Average height, average weight, average core height, average core width, height/width ratio, and black rot rating of nine cabbage (*Brassica oleracea* L. var. *capitata*) cultivars trial conducted at Hort Hill, UGA Tifton, Georgia, USA during the fall of 2024.

| Cultivar | Avg. height[i] (inches) | Avg. widtht[i] (inches) | Avg. core height[ii] (inches) | Avg. core width[ii] (inches) |
|---|---|---|---|---|
| Celebrate | 5.1 a[iii] | 6.8 a | 2.7 a | 1.3 a |
| 1488 | 5.1 a | 6.7 a | 2.9 a | 1.3 a |
| Capture | 5.1 a | 6.8 a | 2.2 a | 1.3 a |
| Cheers | 5.3 a | 6.9 a | 2.7 a | 1.1 a |
| Accolade | 5.4 a | 6.6 a | 2.6 a | 1.3 a |
| Melissa | 5.9 a | 6.6 a | 2.7 a | 1.4 a |
| Expat | 5.1 a | 6.4 a | 2.4 a | 1.6 a |
| Applause | 5.3 a | 6.4 a | 2.5 a | 1.8 a |
| Acclaim Improved | 5.2 a | 6.7 a | 2.8 a | 1.4 a |
| **P value** | 0.0928 | 0.4762 | 0.0652 | 0.675 |

[i]Average height and width represent the average height and width of five cabbage heads.

[ii]Average core height and width represent the average core height and core width of five cabbage heads.

[iii]Means followed by the same letter are not significantly different based on Tukey's honest significant difference test at 95%.

**Table 4:** Incidence of black rot and puffy heads in cabbage heads and Alternaria severity in leaves of nine cabbage cultivars grown at Hort Hill, UGA Tifton, Fall 2024.

| Cultivar | Black rot-affected heads (no./plot) | Alternaria rating[i] (%) | AUDPC for black rot in leaves[ii] |
|---|---|---|---|
| Celebrate | 0.0 b[iii] | 30.0 bc | 2188.0 a |
| 1488 | 1.0 b | 8.0 d | 2721.0 a |
| Capture | 0.0 b | 6.0 d | 928.0 bc |
| Cheers | 1.0 b | 13.0 cd | 2546.0 a |
| Accolade | 1.0 b | 58.0 a | 455.0 c |
| Melissa | 0.0 b | 5.0 d | 1925.0 ab |

| | | | |
|---|---|---|---|
| Expat | 0.0 b | 6.0 d | 893.0 bc |
| Applause | 3.0 ab | 43.0 ab | 477.0 c |
| Acclaim Improved | 4.0 a | 55.0 a | 2511.0 a |
| **P value** | 0.0015* | <.0001* | <.0001* |

[i]Alternaria rating (0-100%), where 0 indicates no visible leaf symptoms and 100% represents severe infection with circular spots, necrotic lesions, and potential blight covering the entire leaf.

[ii]AUDPC: It was calculated from seven ratings taken on 11/25/2024, 12/02/2024, 12/09/2024, 12/16/2024, 12/30/2024, 01/06/2025, and 01/13/2025.

[iii]Means followed by the same letter are not significantly different based on Tukey's honest significant difference test at 95%.

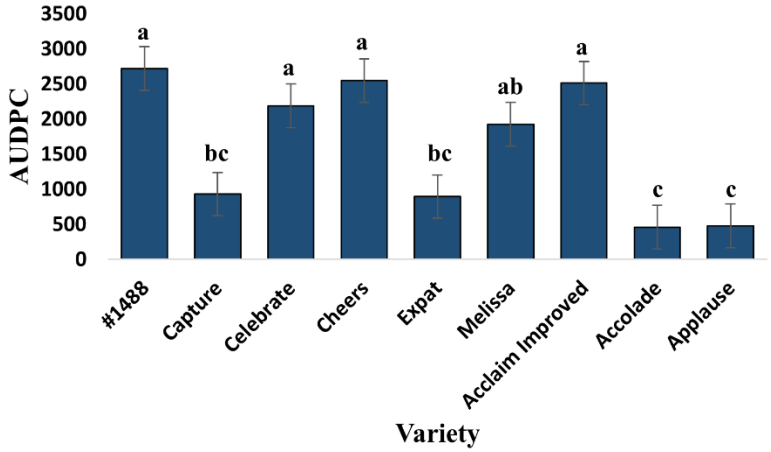


**Fig. 1.** Graph of AUDPC for black rot in leaves across nine cabbage cultivars during the 2024 Fall trial at Hort Hill, UGA Tifton, Georgia, USA.

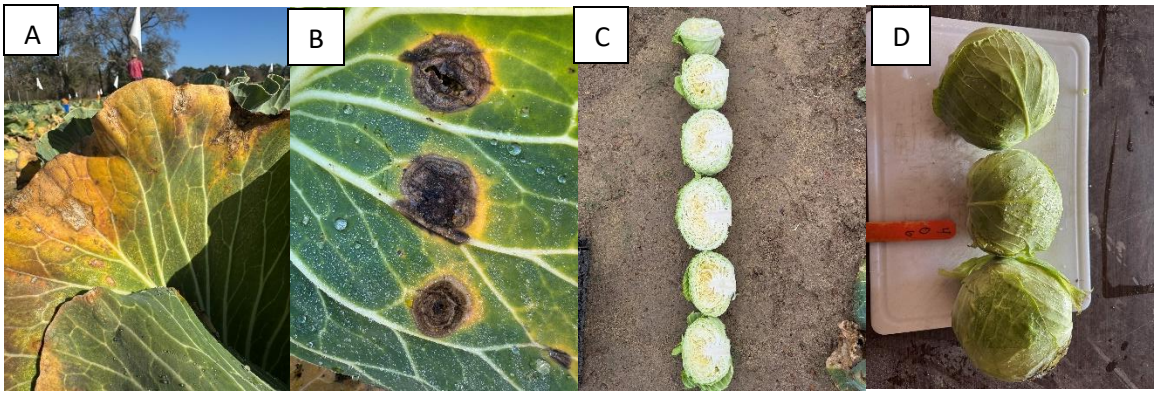

**Fig. 2.** (A) Black rot leaf symptoms, (B) Alternaria leaf spot, (C) Inner appearance of a cabbage head, and (D) Outer appearance of a cabbage head.

**Fig. 3.** Black rot symptoms on cabbage heads of the cultivar ‘Applause’ observed after frost exposure.

## Conclusion

Overall, ‘Expat’ excelled in marketability with the highest marketable headcount, while ‘Cheers’ had the best early yield, particularly in the first harvest. ‘Celebrate’ demonstrated strong all-around performance, with no disease issues and good yields. ‘Applause’ showed resistance to leaf disease but was more susceptible to black rot in heads. ‘Acclaim Improved’ had the lowest yield and was highly susceptible to black rot.

## Acknowledgments

We would like to extend our heartfelt appreciation to Takii Seeds for their generous support and collaboration throughout this research project. Their expertise and dedication to advancing agricultural practices have been invaluable and instrumental in the successful completion of this study.