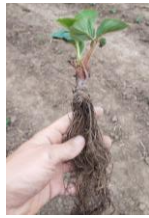


New Strawberry Cultivar Trial for Iowa

By Ray and Jen Kruse



Introduction – Matted row U-pick strawberry producers in Iowa are challenged with finding information on how new strawberry cultivars perform in the state to assess viability for addition to commercial plantings. This project evaluates how 7 new strawberry cultivars perform compared to two check cultivars that have been available commercially in the state. The check cultivar of Jewel has been historically used by growers as a reliable producer for many years. The second check cultivar Clancy has been a successful cultivar for garden production in the area warranting its inclusion.

Conclusions - The Jewel and Clancy strawberry that were the initial control cultivars of this study, performed very well in yield. With Jewel being a commercial production industry standard, and Clancy performing well in local garden production, these two cultivars are still front runners for planting consideration in Iowa. Even though their yields were not always statistically higher from all other cultivars. Archer had poor yields and poor berry quality making it not a good candidate for commercial production consideration in Iowa. Even though Archer's yield was not always significantly less from all other cultivars.

Methods – Strawberry crowns were sourced from Indiana Plant and Berry Company, and Nourse farms. The site's perennial vegetation was cleared with an application of glyphosate on May 5 and May 19 of 2021. Cattle manure was applied to the site as fertilizer and incorporated with a tractor mounted tiller just prior to planting. Crowns were planted on May 31, 2021, in rows thirty-four inches apart to accommodate farm equipment. Crowns were planted by hand twelve inches apart within row. A picture of the plot planting configuration can be seen in Figure 1. To allow for statistical evaluation of strawberry yield, the evaluated cultivars of berries were planted in a four replication, complete randomized block design with twelve crowns for each cultivar planted in each replication. Crowns were watered using overhead irrigation every four days.



Figure 1. Plot during establishment in 2021



Figure 2. Mulch cover on Strawberries



Figure 3. Mulch cover on Strawberries

New Strawberry Cultivar Trial for Iowa

By Ray and Jen Kruse



Methods Continued - Due to unusual heat and dryness, a large number of crowns died. Replacement crowns were ordered and replanted on June 17, 2021. The average number of crowns replaced per cultivar is reported in Table 1. Irrigation continued throughout the summer as needed. Starting July 7, 2021 the plot was weeded using a tractor mounted carousel weeding implement with a hand hoe being used to detail a few missed weeds. On July 25, 2021 plant growth became too vigorous to allow for the tractor to enter the plot, weeding was performed by hand every two weeks until mid September 2021.

On December 4, 2021, a two-to-four-inch layer of first-crop hay mulch was applied to the plot, protecting the crowns from winter damage and providing a weed barrier for the following spring. Hay mulch was used instead of straw since no straw was available that was guaranteed free of chemical residue. A picture of the hay much can be seen in Figure 2 and 3. A small chicken wire fence was temporarily installed protecting the plot from rabbit feeding.

The following spring when the first new trifoliate leaves started emerging from the crowns, they were uncovered using a spring steel leaf rake on March 9, 2022. A picture of the crowns at uncovering can be seen in Figure 4. Crowns were monitored for a recorded bloom date by individual cultivar and replication number. Bloom date was determined when fifty percent of king flowers were in bloom by visual estimation. The results of these observations can be seen in Table 1. The Plot was then supplemented with irrigation until berries were harvested from the plot. Berry harvest occurred on the following dates in June of 2022, 10,12,16,21,25,27 and are presented for each cultivar in Table 1. Each replication of each cultivar was harvested into it's own box. Once picked, berries were counted, weighed, and given a designation of firm or soft. The yield and strawberry counts of the above data can be seen in Figure 11 and 13. The results for strawberry firmness can be seen in Table 1.



Figure 4. Strawberries being uncovered



Figure 5. Farmers presenting at field day courtesy of Doug Cheever



Figure 6. Taste testing Strawberries courtesy of Cheryl Sheldon

New Strawberry Cultivar Trial for Iowa

By Ray and Jen Kruse



Methods Continued - Cultivars were evaluated for best flavor during a field day held on June 22, of 2022. Berries from each cultivar were harvested, destemmed, and assigned a random number for field day attendees to evaluate. Pictures of the field day can be seen in Figure 5 and 6. Attendees voted using slips of paper put into ballot boxes next to the plates of berries. Attendees were asked to vote for their favorite strawberry, second favorite strawberry, and strawberry they felt should not be planted again. A picture of the voting slips can be seen in figure 7. The field day attendees consisted of fellow local farmers, Master Gardeners, and family and friends of the farmers performing the analysis. Results of the field day taste test are presented in Table 1.



Figure 8. Picture of the great berry quality of Jewel

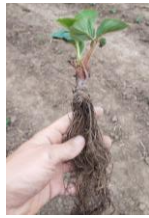


The yield data and strawberry count data was analyzed for statistical differences by averaging the data across harvest dates by replication. Statistical analysis was performed using R for statistical computing (R Core Team, 2021). Analysis of variance (ANOVA) was computed and means that differed were separated using Tukey's HSD. The yield data is presented in Figure 12 and the strawberry number is presented in Figure 14.

Results – Even though plot establishment was challenging with weather in the 2021 year. The farmers performing the evaluation had an average winter for their USDA winter hardiness zone 4B region in Iowa. When mulch was removed from the crowns the following spring, no crown winter damage was observed among strawberry cultivars. The 2022 spring was unusually late, leading to a late bloom season. This factor eliminated the risk of spring blossom frost damage on the strawberry plants for perfect fruit set. After blooming, the weather remained optimal for berry production with moderate temperatures and humidity. For this reason, no measurable differences were observed between cultivars in susceptibility to disease. Notable items are recorded in the notes section of Table 1. The yield data generated for the 2022 year should be viewed as such from a perfect production year.

New Strawberry Cultivar Trial for Iowa

By Ray and Jen Kruse



Results Continued –

Disease and insect pressure was still present in the plot and included gray mold, anthracnose, leather rot, alternaria fruit rot, strawberry leaf spot, garden slugs, lygus bugs, leafhopper damage, and sap beetles. Verticillium wilt and/or anthracnose crown rot were present but were unsure due to difficulty in identifying these diseases.

The highest producing cultivar was Jewel with 90 pounds of strawberries produced per 100 foot of row as seen in Figure 11. When evaluating the standard deviation of strawberry yield as seen in Figure 12, Jewel was not statistically different from Clancy,



Figure 9. Picture of the good berry quality of Clancy



Figure 10. Picture of the poor berry quality of Archer

Dickens, Keepsake, and Mayflower. The count of berries harvested per 100 foot of row almost directly mirrored that of harvested yield as seen in Figure 13. The previously mentioned cultivars for were all statistically similar to Jewel for berry count except for Dickens being statistically less as seen in Figure 14. When looking at other data collected in Table 1. for flavor, number of crowns replanted, and other notes for Jewel, Clancy, Dickens, Jewel, Keepsake and Mayflower there appears to be no significant issues that would not warrant planting these cultivars for commercial production. It would be appropriate to note that Mayflower did have noted issues with establishment problems in the establishment year. The farmers performing the cultivar trial did want to note that Jewel should especially be considered for planting due to the excellent strawberry yield and quality they personally observed along with good flavor as seen in Figure 8 and Table 1. The cultivar Clancy also performed well with good strawberry yield and quality as seen in Figure 9. However, the farmers performing the cultivar trial felt the berry really lacked good flavor as seen in Table 1.

If using this data to determine which cultivars would not be appropriate to plant, Archer is a cultivar that consistently underperformed in the plot as seen in Figure 11. Archer had the lowest yield of all the cultivars though Flavorfest and AC Wendy were not significantly different when looking at the standard deviation of the yields as seen in Figure 12.

New Strawberry Cultivar Trial for Iowa

By Ray and Jen Kruse



Figure 11. Sum of Strawberry Yield From All Harvests for Each Cultivar

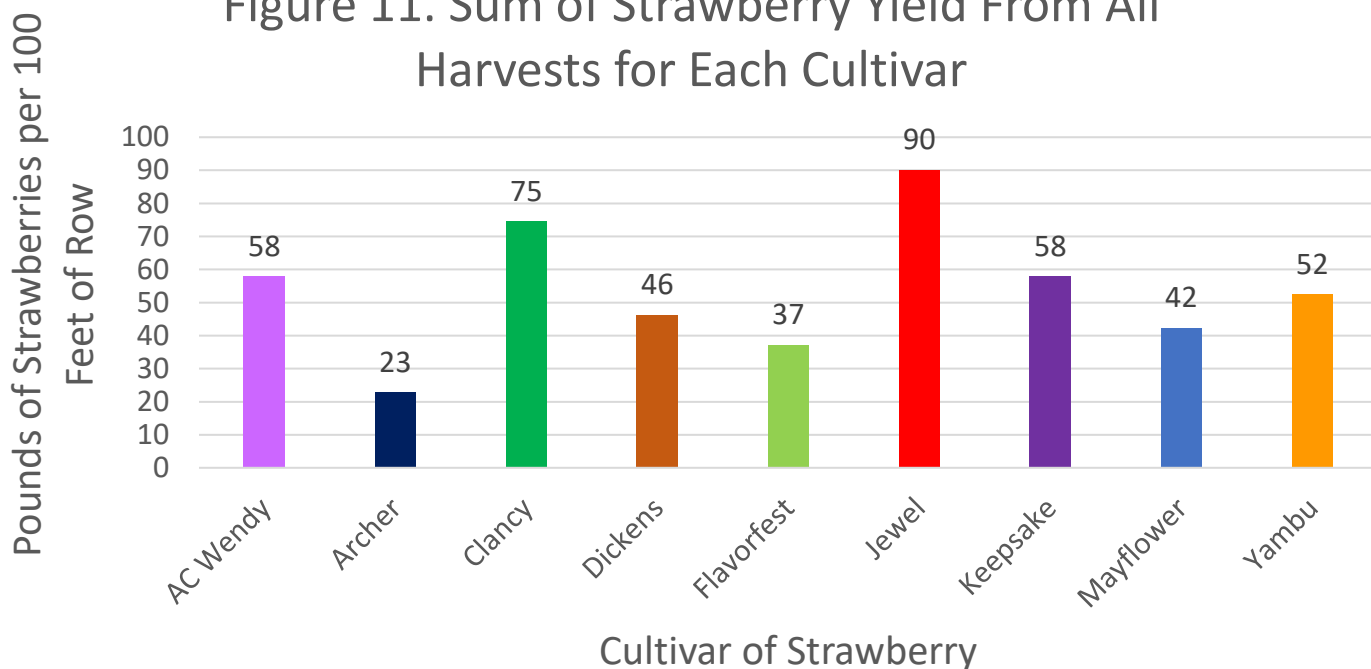
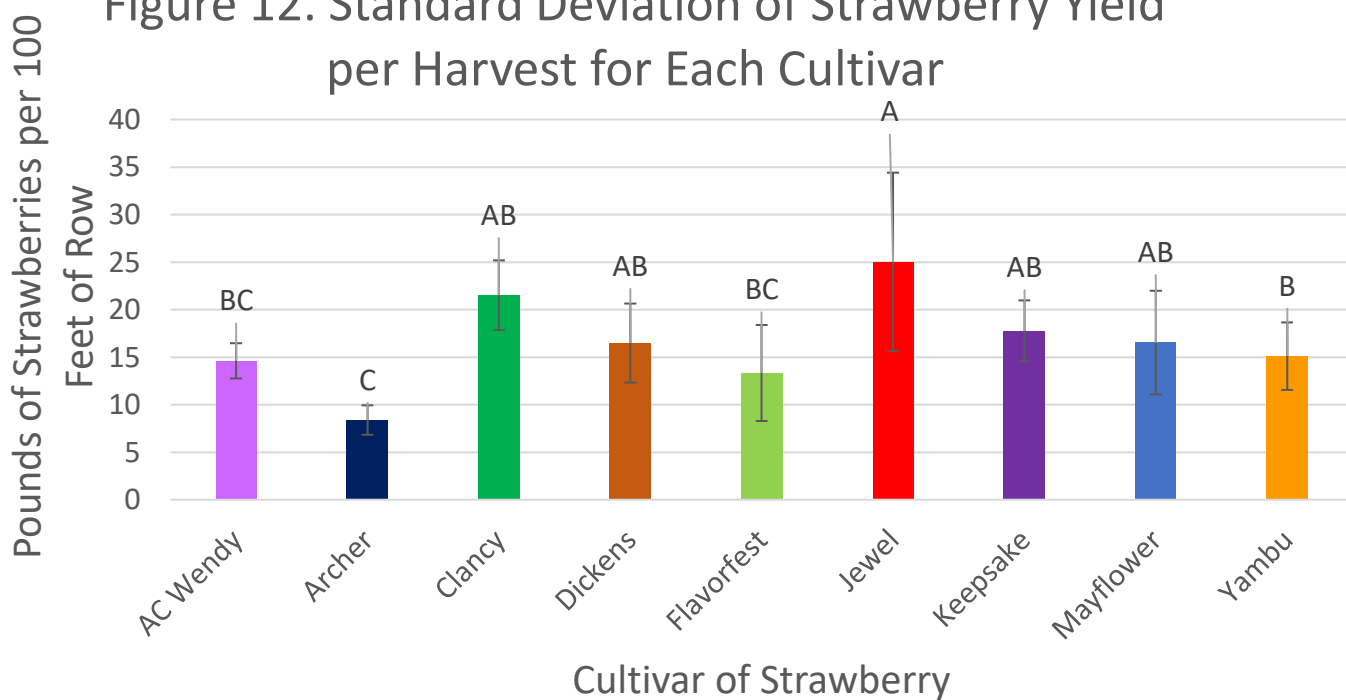


Figure 12. Standard Deviation of Strawberry Yield per Harvest for Each Cultivar



New Strawberry Cultivar Trial for Iowa

By Ray and Jen Kruse



Figure 13. Sum of Strawberry Count From All Harvests for Each Cultivar

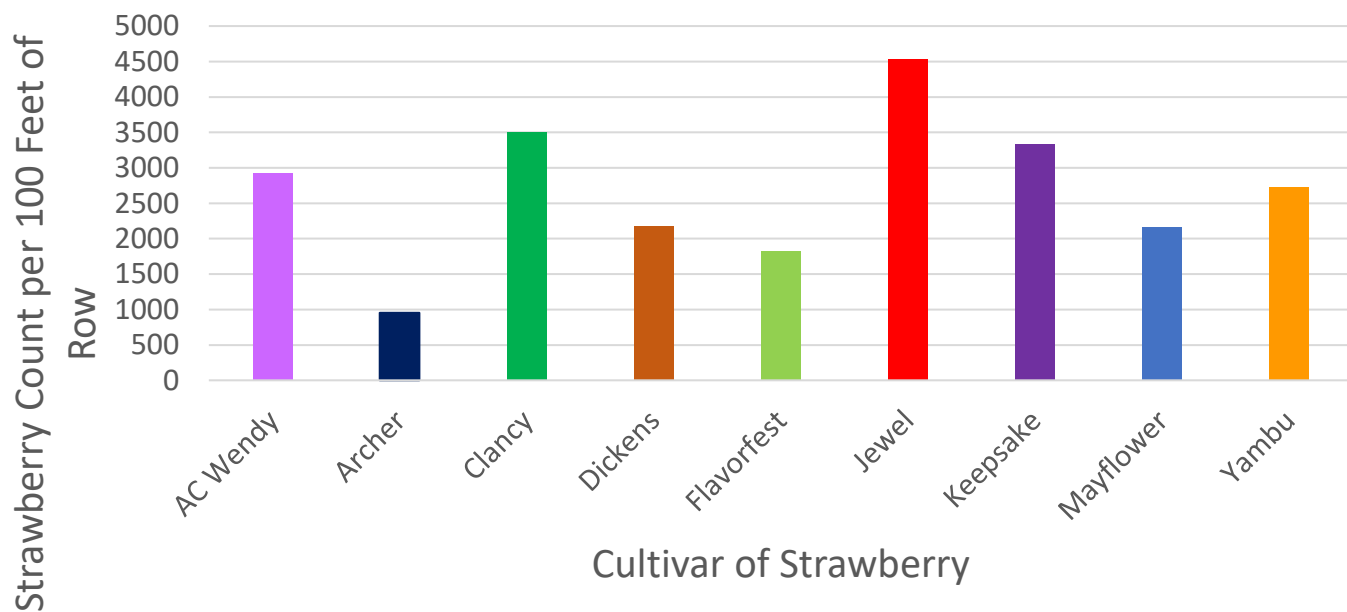
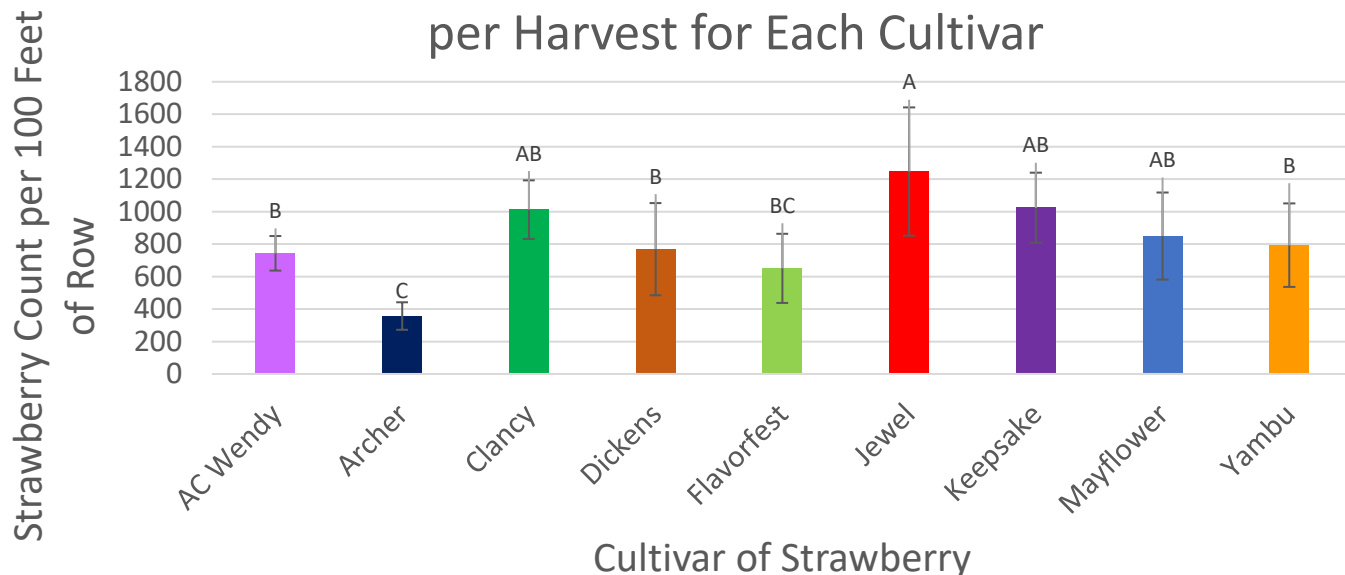


Figure 14. Standard Deviation of Strawberry Count per Harvest for Each Cultivar



New Strawberry Cultivar Trial for Iowa

By Ray and Jen Kruse



Table 1.

Cultivar	*# Favorite Votes	*# 2nd Favorite Votes	*# Don't Plant Votes	Firmness Rating	Flavor Rating	**Number of Replanted Crowns	***Range of Bloom Dates	***Range of First Harvest Dates	Observations
AC Wendy	7	4	10	Soft	Average	2	May 14 - 20	June 10 - 16	Small berries in the crop had lots of cat facing.
Archer	7	4	11	Firm	Average	2	May 20 - 25	June 16 - 21	Calyx dies as berries mature making them look diseased, berry skin is not very attractive.
Clancy	4	1	7	Firm	Poor	4.75	May 20 - 25	June 16 - 21	
Dickens	6	6	0	Firm	Average	5	May 20 - 25	June 21 - 21	Had severe leaf netting during first fruiting year, not sure if virus or insect in origin.
Flavorfest	7	6	1	Soft	Great	4.75	May 14 - 25	June 12 - 21	Had interveinal chlorosis after fruiting, but not really leading to any problems.
Jewel	5	6	6	Firm	Great	3.25	May 20 - 25	June 12 - 21	Had the most upright leaves of all other cultivars, visual appeal of berries was good.
Keepsake	2	4	1	Firm	Great	2.5	May 20 - 25	June 12 - 21	Berries had big showy calyx, leaves had interveinal chlorosis after fruiting, but not really leading to any problems.
Mayflower	3	3	6	Firm	Average	7	May 20 - 25	June 21 - 21	Had a hard time establishing a good plant stand during the establishment year.
Yambu	3	9	0	Soft	Average	5	May 14 - 25	June 12 - 16	King berries were overly large, berries had lots of cat facing.

*Votes were gathered at the farmer field day about the project via a blind taste test.
 **Crowns were replanted during the establishment year due to unseasonably hot weather.
 ***Ranges were presented due to the variation seen between plot replications for each cultivar.

New Strawberry Cultivar Trial for Iowa

By Ray and Jen Kruse



Results Continued — In addition, the fruit had significant problems with ripening and visual appeal for it to be planted for commercial production as described in Table 1. In Figure 10, poor berry coloring, skin quality, and desiccated berry calyxes can be seen demonstrating this issue. Even though Flavorfest and AC Wendy were statistically similar in yield to Archer, the farmers performing this cultivar trial feel they have other shining attributes that lend them to be planted. As seen in Table 1, AC Wendy has an early harvest date. Also seen in Table 1, Flavorfest had great flavor and ripened shortly after AC Wendy for harvest. If a strawberry grower has preference for early berry ripening or great flavor these two cultivars would be appropriate candidates for planting.

The results of the taste test at the farmer’s field day were inconclusive at identifying a crowd favorite. A three-way tie was seen between AC Wendy, Archer, and Flavorfest. The cultivar receiving the most votes not to plant again was Archer. The farmers performing the experiment didn’t really gather any conclusions from the data but did feel that this was a great activity to draw people to the farm to inform them about the experiment.

Special Thanks — Ray and Jen Kruse would like to thank the following people for their help with this SARE Grant.

- Dr. Suzanne Slack for being the Iowa State University staff sponsor on the grant and for her help co-authoring the publication for the statistical analysis of the data.
- Mike and Mary Knipper for their help planting the strawberry crowns.
- Gary and Karen Kruse and Den and Tina Nieland for their help with random plot tasks.
- Marge and Tim Rhines for the use of their refrigerated trailer to store the strawberries for grading.
- Doug Cheever and Cheryl Sheldon for taking photos of the taste testing field day activities.

Works Cited:

R Core Team (2021). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <https://www.R-project.org/>.