

Fall Cauliflower Variety Trial

In a Nutshell:

- Timing the fall planting of cauliflower and other slow-maturing crops is often difficult, especially when planting a new variety. There are many varieties of cauliflower available to farmers in array of colors, plant and head sizes and average days to maturity.
- Building on several past PFI studies, a group of cooperators conducted a trial to determine the performance of seven cauliflower varieties planted as fall crops.

Key Findings:

- Snow Crown was consistently high yielding and outyielded all other trialed varieties at two of three farms that tested it.
- Of the colorful varieties that cooperators tried, Cheddar generally performed the best. Lavender, the only purple variety trialed, produced minimal harvests at Hegmann & Kerns' and Quee's.

BACKGROUND

Cooperators Natasha Hegmann & Pete Kerns, Michael Pipho, Mark Quee and Carmen and Maja Black all had questions about which cauliflower varieties they should plant for their fall crop. Building on previous PFI Cooperator research investigating this topic in 2019 [1] and 2022 [2], they performed a cauliflower variety trial in fall of 2023. Each farm tested a subset of seven cold-tolerant varieties that vary in color, plant size, and days to maturity. The cooperators hoped to use the trial to improve their production by determining the performance of the different varieties. They were also very interested in trying new varieties and gauging customer interaction. At the outset, Carmen and Maja Black said “This research trial will inform when our farm plants cauliflower and which varieties we will prioritize, with yield, diversity, and customer enjoyment (exciting colors) as factors to consider.” Quee added: “figuring out start dates for fall-harvested crops is often challenging and this trial will hopefully help us improve at that.”



Cauliflower in a trial plot at Sundog Farm. Photo taken August 20, 2023.

Cooperators

Natasha Hegmann and Pete Kerns,
Turkey River Farm - Elkport, IA

Michael Pipho, Rooster's Crow Farm
- Dunkerton, IA

Mark Quee, Scattergood Farm –
West Branch, IA

Carmen & Maja Black, Sundog
Farm, - Solon, IA

Funding

Iowa Department of Agriculture and
Land Stewardship

Johnny's Selected Seeds

TABLE 1. Cauliflower varieties grown by cooperators and relevant attributes.

VARIETY	DAYS TO MATURITY	HYBRID?	COLOR	ORGANIC SEED AVAILABLE FROM JOHNNY'S?	RELEVANT TRAITS
Snow Crown	50	F1 Hybrid	White	No	Standard early variety; cold tolerant
Clementine	55	F1 Hybrid	Bright orange	No	
Cheddar	58	F1 Hybrid	Orange	No	Best as fall variety as has low heat tolerance
Flame Star	62	F1 Hybrid	Pastel orange	No	Improved heat tolerance compared to Cheddar
Amazing	68	No	White	No	Tolerant to heat and cold stress
Lavendar	70	F1 Hybrid	Bright purple	No	Best as fall variety as has low heat tolerance
Skywalker	80	F1 Hybrid	White	Yes	Cold tolerant

METHODS

Design

Cooperators tried the following cauliflower varieties: Snow Crown, Clementine, Cheddar, Flame Star, Amazing, Lavender, Skywalker (**Table 1**). Cooperators each chose varieties to grow from this list based on their individual preferences and needs (**Table 2**). Cooperators started seeds indoors and transplanted them in mid-to-late June on a single planting date. Each cooperator established at minimum four replicates of each selected variety; example experimental designs are shown in **Figure A1**. Treatment plot sizes and management details for each farm are shown in **Table 2**.

Measurements

At each harvest date, cooperators measured weight of all marketable heads from each plot (plot weight) and number of all marketable heads from each plot (plot count). Harvest window, average size per head, and harvest rate (heads/plant) were determined from this data. Some cooperators also counted cases of black rot and other common diseases and blemishes.

Data analysis

We used Fischer's LSD at a 90% confidence level to determine if there were significant differences in yield between cauliflower variety. For both number of marketable heads and total marketable cauliflower weight, the difference between any two cauliflower variety yields is compared with the LSD. A difference greater than or equal to the LSD indicates the presence of a statistically significant treatment effect, meaning one treatment outperformed the other and the farmer can expect the same results to occur 90 out of 100 times under the same conditions. A difference smaller than the LSD indicates the difference is not statistically significant and the treatment had no effect. We can perform this analysis because the cooperators had completely randomized and replicated experimental designs (**Figure A1**).



A head of Cheddar (cauliflower) ready for harvest at Hegmann-Kerns'. Photo taken October 8, 2023.

TABLE 2. Planting and management details for each cooperator's trial in 2023.

	HEGMANN & KERNS	PIPHO	QUEE	CARMEN AND MAJA BLACK
Varieties grown	Clementine, Flame Star, Amazing, Skywalker, Lavender	Cheddar, Clementine, Lavendar, Skywalker	Snow Crown, Cheddar, Lavendar, Flame Star, Amazing, Clementine, Vitiverde & Denali (varieties Quee already grows)	Snow Crown, Clementine, Cheddar, Flame Star, Amazing, Lavendar
Number of replicates	4	4	4	6
Plants per variety replicate	12	8	10	8
Plot size	20 x 4 ft	25 x 2.5 ft	20 x 4 ft	--
Row Width	18 in.	18 in.	30 in.	--
In-row Spacing	18 in.	18 in.	22 in.	--
Bed prep	May 10, broadfork and passes with harrow to incorporate fertilizer	June 28, harrow	July 5: Rototilled, cover crop incorporated one week earlier.	July 11: tilled
Seeding date	May 18	May 22	June 12	May 24
Planting date	June 28	July 5	July 5	July 11
Fertilizer	May 10, 0.5 in. compost and Sustane 5-2-4 2 cups per bed	5-5-3, 15 g/plant; bone meal 15 g/plant; Liquid fertilizer 11-3-8, 250 g/plot	Previous season cover crop (sorghum sudangrass and cowpeas), grazed twice	Site was cover cropped and grazed with chicken tractors earlier in summer.
Mulch	Black woven ground cover. Protec net also applied after transplant	Rye straw mulch applied at transplant	None	None
Irrigation	Drip weekly	Drip 2 times weekly	Drip as needed	Drip
Harvest Dates	Oct. 20 (Amazing, Clementine, Flame Star); Oct. 27 (all except Skywalker); Nov. 19 (all)	Oct. 13 (all)	Oct. 6, Oct. 17, Oct. 28 (all at all dates)	Oct. 19 (Snow Crown), Nov. 11 (all varieties but only one replicate of Cheddar)

RESULTS AND DISCUSSION

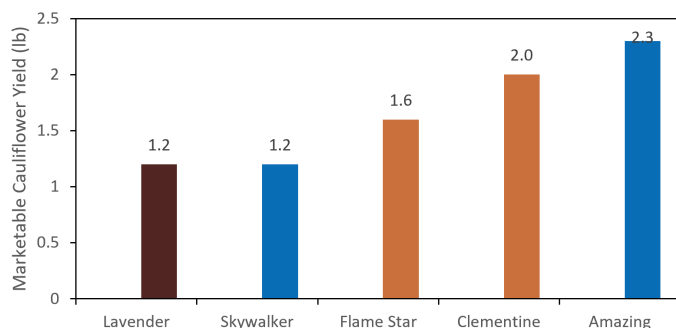
All three farms that tried Snow Crown found that it outperformed most other varieties that they tested (**Figure 1**). Piphoo found that Snow Crown yielded more than double the Clementine and Cheddar varieties he grew, and Carmen and Maja Black found that Snow Crown was the only variety she grew that consistently put out heads in all plots. At Quee's farm, Cheddar was the only one of six varieties that yielded comparably to Snow Crown. Most cooperator's concluded that, as shown in previous PFI trials [1,2], Snow Crown is a winning variety for getting decent yields out of fall cauliflower plantings in a variety of conditions. However, Quee notes that there are still some issues with this variety: "Snow Crown is short season and can finish in this timeframe, but I find the quality of the heads pretty poor--curd too loose and lots of purpling."

Many cooperators were disappointed to find, once again, that the colorful orange and purple cauliflower varieties did not yield very well for fall harvest. While Cheddar yielded well at Quee's, other colorful varieties including Clementine, Lavender and Flame Star produced very few harvestable heads on the farms that tried them.

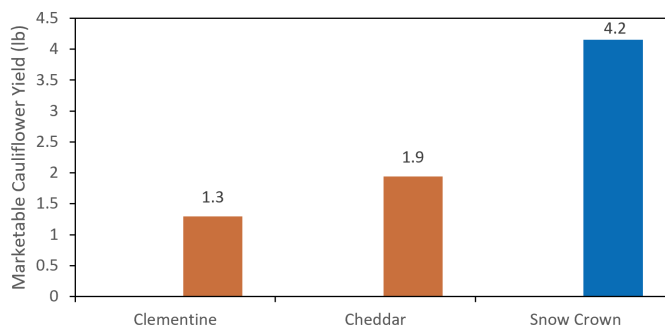
Hegmann reported, "If we do fall cauliflower again, I'd probably avoid growing the orange and purple cauliflower unless I had a ton of room." Quee and Hegmann & Kerns also concluded that in future years they will start their fall cauliflowers two weeks earlier to give the slower growing varieties enough time to produce heads in cooler weather.

Finally, between drought, an unusually hot late summer/early fall, and broad day-to-day temperature fluctuations in the fall, the cooperators faced challenging growing conditions that affected their trials this year (**Figure A2**). Hardening off and keeping young transplants alive in July and August heat was difficult, with one cooperator dropping out of the trial due to transplant deaths. Piphoo felt that in addition to helping him select varieties for the best fall yields, the trial was useful for him in identifying pain points with transplanting at this point in the season, and he plans on adding cauliflower to his late season product line. In contrast, the trial experience left Hegmann & Kerns convinced not to invest too much into fall cauliflower for their CSA shares: "We'll be able to save time by focusing on more reliable (if less fun) crops, and avoid wasted expense of growing a crop that might not work out."

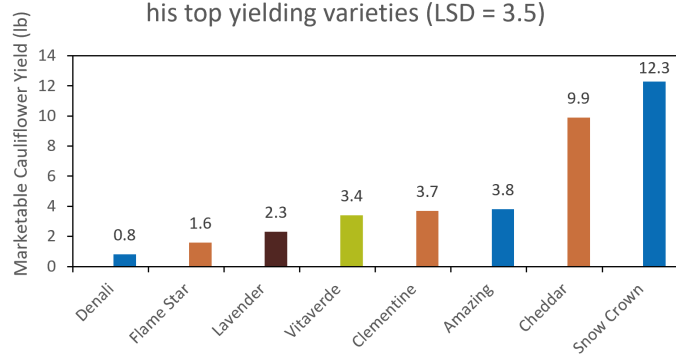
A) Hegmann & Kerns found no significant differences between treatments (LSD = 1.7)



B) Pipho found that Snow Crown outproduces Cheddar and Clementine (LSD = 2.1)



C) Quee found that Snow Crown and Cheddar are his top yielding varieties (LSD = 3.5)



D) Carmen and Maja Black found that Snow Crown outproduces Cheddar and Clementine (LSD = 2.1)

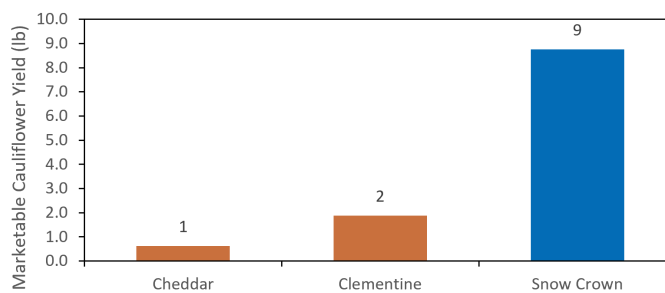


FIGURE 1: Weight of marketable cauliflower for each variety by farm. LSD is listed in the title of each of the four graphs. If the difference between yields of any two varieties on any given farm is greater than the LSD, those yields are considered significantly different.

CONCLUSIONS AND NEXT STEPS

As previous cooperators trials on cauliflower varieties have shown, Snow Crown consistently yields better than most other cauliflower varieties in the fall, colorful varieties tend not perform as well as farmers might want and early seeding for transplants is key to getting a successful fall cauliflower crop. While some cooperators learned that they do not want to continue investing in fall cauliflower, others now feel more confident in trying some specific varieties on a larger scale. Quee and Pipho said that in future fall cauliflower trials, they want to also investigate pest and disease resistance in different varieties.



Two heads of Snow Crown cauliflower from Quee's trial post-harvest. The head on the top is perfect for eating while the curds of the head on the bottom have started to separate. Photo taken October 6, 2023.

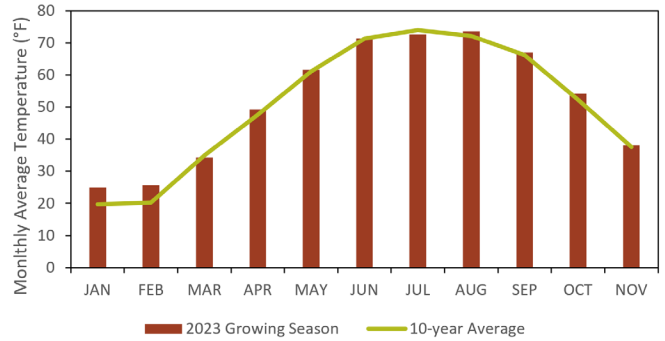
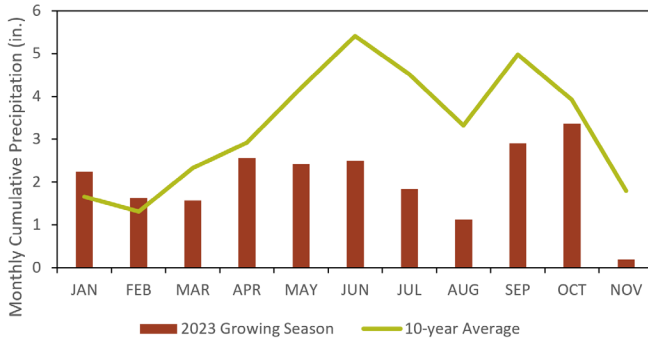
APPENDIX – TRIAL DESIGN AND WEATHER CONDITIONS

SC	Am	Lav	Ch	Clem	FS	Am	Ch	SC	Lav	Clem	FS
REP 1						REP 2					
Lav	Clem	FS	SC	Am	Ch	Lav	SC	FS	Clem	Ch	Am
REP 3						REP 4					

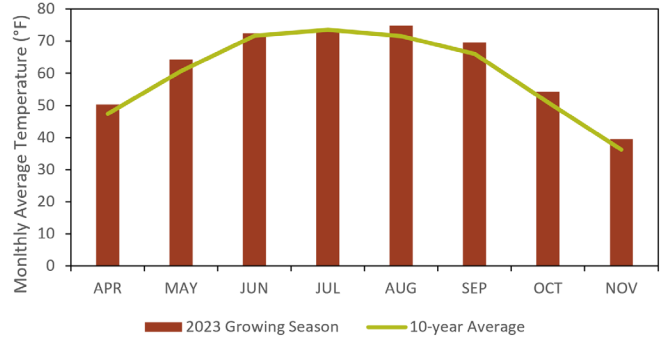
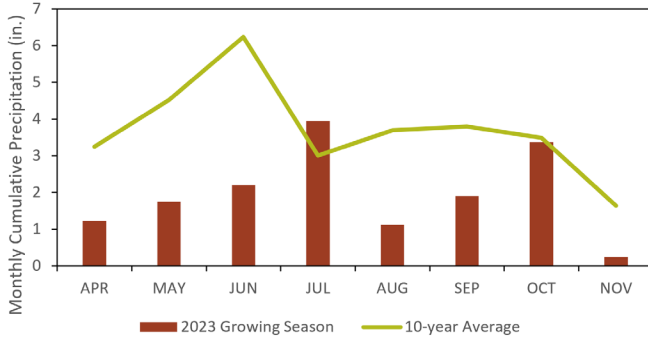
REP 1	Am	Sky	SC
REP 2	SC	Am	Sky
REP 3	Sky	SC	Am
REP 4	Am	SC	Sky

FIGURE A1. Examples of experimental designs used by Hegmann & Kerns, Pipho, Quee and Carmen and Maja Black.

A. Guttenburg -- Hegmann and Kerns



B. Cedar Falls -- Pipho



C. Iowa City -- Quee and Black/Sundog

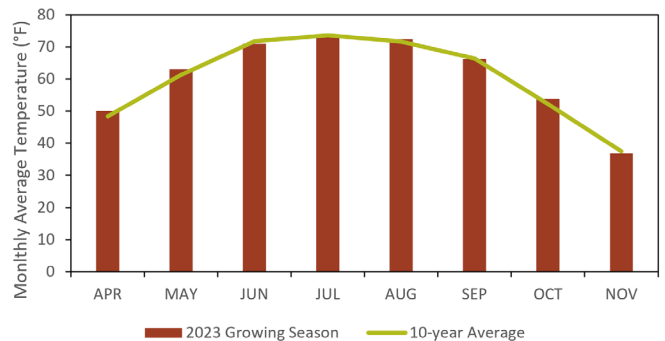
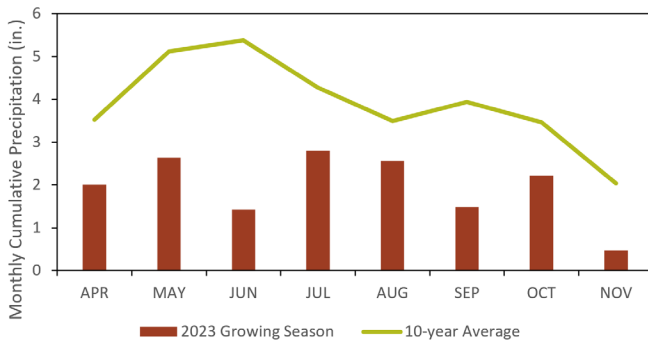


FIGURE A2. Weather data from the 2023 growing season and 10-year climate averages at: **A)** Guttenburg near Elkport (Hegmann & Kerns), **B)** Cedar Falls near Dunkerton (Pipho) and **C)** Iowa City near West Branch and Solon (Quee and Carmen and Maja Black). Left graphs show monthly precipitation accumulation in 2023 vs. 10-year normal and right graphs show monthly average temperature in 2023 vs. 10-year normal.[3]

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- [1] L. Kolbe, M. Quee, and S. Shellz, "Cauliflower Variety Trial," Practical Farmers of Iowa, 2019. [Online]. Available: <https://practicalfarmers.org/research/cauliflower-variety-trial/>
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