PRACTICAL FARMERS OF IOWA
COOPERATORS' PROGRAM Farmer-Led Research

EXPERIMENT

2024

Potato Planting Date

PFI Contact:
Graham Giesting
(515) 232-5661 ext. 1052
graham.giesting@practicalfarmers.org

In a Nutshell:

- Potato seedlings are hardier than those of many other crops, and so have a wide window of potential planting dates.
- Lee Matteson wanted to test different planting dates of two potato varieties (Kennebec, Red Pontiac) to inform future planting schedules.

Key Findings:

- Early-planted Kennebec significantly outperformed late-planted Kennebec.
- Red Pontiac, on the other hand, was not affected by planting date.
- All yields were diminished by wet conditions and high weed and pest pressure.

Cooperators

Lee Matteson, Lee's Greens - Nevada, IA

Funding

Ceres Trust

Stranahan Foundation

BACKGROUND

Planting date is an important decision for potato growers. The hardiness of potatoes, which developed originally in the Andes mountains of South America, enables a degree of flexibility with planting dates, but there is an optimum planting date or window when the chances are highest to achieve the best yield [1]. Because of local differences in climate and soil conditions, research done in one place towards identifying an optimal planting date may not be applicable in another. In the two most characteristic potato-growing regions of the United States, Idaho State University extension recommends planting around the second week of April for central Idaho, while University of Maine extension suggests planting in May for central Maine [2], [3]. This study was designed to try to identify an optimal planting date in central Iowa, given the local conditions and weather there.

There is a tradition of planting potatoes on or around Good Friday. This tradition probably originates from a superstition from medieval Europe, where potatoes, recently introduced from the Western Hemisphere, were treated with suspicion, and Good Friday was seen as good time to put things in the ground that one would later dig up/resurrect. There are some issues with Good Friday as a target date. Good Friday can fall anywhere between Mar. 20 and Apr. 23, and generally varies year-to-year. Furthermore, Northern Europe has very different climatic and phenological patterns to those of Iowa. Lee Matteson decided to investigate the traditional approach by running an experiment.

Matteson has seen better success from early planting dates, but there is also a risk that the cold and wet of earlier in the year could cause acute problems for earlier-planted plants. Beginning the experiment, he hoped to see similar results for late-planted potatoes as for early-planted potatoes, which would help him avoid the difficult cold, wet, muddy conditions of early plantings.

Red Pontiac and Kennebec potatoes at Lee Matteson's in 2024.

Lee Matteson's trial field after the first planting date in March 2024.

METHODS

Design

Matteson tested the effect of planting date (early, late) on both a red and white potato variety for a total of four treatments:

- Early red: Red Pontiac planted Mar. 29
- Early white: Kennebec planted Mar. 29
- Late red: Red Pontiac planted May 15
- Late white: Kennebec planted May 15

Treatments were arranged in randomized plots with four replications. Early potatoes were planted on Good Friday, Mar. 29, 2024, and late potatoes were planted six weeks later, on May 15. The potatoes were planted approximately 6-8 in. apart. Four replicate rows were planted early, and four were planted late; the two halves of each row were randomly assigned to the two varieties. Granular 20-20-20 fertilizer was applied in keeping with Matteson's standard practice. The trial field was sprayed with herbicide pre-emergence on Apr. 20, then weeded by hand on June 15.

Measurements

The total weight of all marketable potatoes from each plot was measured fresh at harvest.

Data analysis

We ran a 2-way Analysis of Variance (ANOVA). We then used Tukey's Honest Statistical Difference (HSD) at a 95% confidence level to determine whether there were significant differences between treatments. Among statistical tests, HSD is the most helpful for determining statistical differences in this type of experimental design, with two independent variables (planting date and variety). Where the means of any two treatments differ by more than the Honest Significant Difference (HSD = 0.41 in this trial) the yields do not share any similar letters and are considered statistically different at the 95% confidence interval. Where yield differences are less than the HSD, the yields share similar letters and are considered statistically similar. A treatment labeled "a" is significantly different from one labeled "a", but neither "a" nor "b" is statistically different from a group bearing an "ab". We can perform this analysis because the trial had completely randomized and replicated experimental design (**Figure A1**).

TABLE 1. Planting and management details at Lee Matteson's in 2024.

Varieties	Red Pontiac and Kennebec
Treatment: Planting date	Mar. 29 and May 14
Replicates	4
Plot length × width (ft)	57 x 3
In-row spacing (in.)	6-8
Field preparation	Tilled 4-6 in. deep twice before planting
Fertilizer application	Granular 20-20-20 on June 6 and July 7
Weed control	Apr. 20: Preemergence spray June 15: Hand weeding
Harvest	Aug. 20 and 21

RESULTS AND DISCUSSION

In this experiment, the potato varieties responded differently to the different planting dates. Early Kennebec yielded 162% of the harvest of late Kennebec on average (**Figure 1).** This is presumably because the Early Kennebec were able to put the extra 57 days of growing time to use filling tubers. However, the red potatoes did not profit from the extra time: Red Pontiac performed slightly better when planted later, although the difference was not significant (**Figure 1)**.

Weather and field conditions affected the results. 2024 was a bad year for potatoes -- Matteson estimated that this year's harvests were only two thirds to half of some of his recent harvests. Both plantings for this experiment were done into very wet soil, which compacted the soil (see photo). The compacted soil made digging the potatoes harder than usual, with clods of compacted soil sticking to the digger. Matteson suspects that this lowered yields.

Pest pressure from potato beetles (*Leptinotarsa decemlineata*) was also very high, despite a stepped-up insecticide regime. The combined pressure of heavy rainfalls throughout the growing season and pests contributed to early die off and lower yields. Matteson usually harvests potatoes in late August or September, but harvested on Aug. 20 this year because all of the potato plants' vegetative matter had died off.

This investigation of planting date may have artificially lowered yields by constraining Matteson's ability to plant into the best available or predictable conditions. To illustrate this, this experiment's planting dates straddled a relatively dry period in mid-April. Potatoes planted during this dryer period yielded an average of 2.4 pounds of potato per row-foot, where the average yield of all the treatments in this trial was only 1.3 pounds per row-foot.

An advantage of planting potatoes earlier is that they get a head start against weeds and are less affected by weed pressure. Both early- and late-planted rows were weedy, but Matteson noted that the late-planted rows were particularly weedy. Matteson had difficulty hilling the potatoes from the later planting date because they were next to the early-planted rows which could have affected weed pressure and yield.

Although we saw significant differences in potato yields, we cannot draw a clear conclusion about best practices for the future based on this data. The differences between the treatments could have been due to interactions with any one or any combination of local factors, including weed pressure, lack of hilling, soil compaction, soil moisture, and potato beetle pest pressure.

CONCLUSIONS AND NEXT STEPS

The advantages of planting early can be easily imagined: more growing time and a head start against weeds. However, planting conditions earlier in the season offer more risk, e.g. frost or wet weather. This balance is central to the question that Matteson set out to answer, and our results are mixed, with different potato varieties responding differently to the different planting dates and the different conditions that came with them.

Matteson said that he would have liked to see comparable yields from the later planting, as that would mean that he could avoid the riskier, soggier March planting conditions. This year, this desire was realized, in part, for the Red Pontiac variety. Matteson plans to repeat the experiment to see whether drier years might give different results.

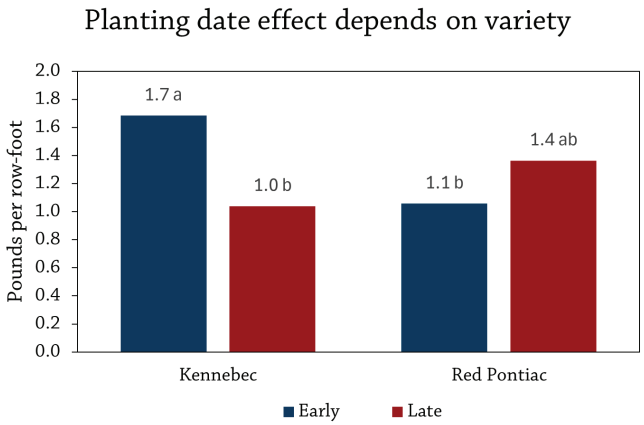

FIGURE 1: Harvest yield values in pounds per linear foot of potato variety and planting date treatments averaged across four replications. Treatments are labeled with group mean and Tukey HSD set. Where the means of any two treatments differ by more than the Honest Significant Difference (HSD = 0.41 lb/row-ft) the yields do not share any similar letters and are considered statistically different at the 95% confidence interval. Where yield differences are less than the HSD, the yields share similar letters and are considered statistically similar.

APPENDIX – TRIAL DESIGN AND WEATHER CONDITIONS

REP 1	Early row	Kennebec	Red Pontiac
	Late row	Red Pontiac	Kennebec
REP 2	Late row	Kennebec	Red Pontiac
	Early row	Red Pontiac	Kennebec
REP 3	Late row	Kennebec	Red Pontiac
	Early row	Red Pontiac	Kennebec
REP 4	Early row	Red Pontiac	Kennebec
	Late row	Kennebec	Red Pontiac

FIGURE A1. Experimental design used by Matteson.

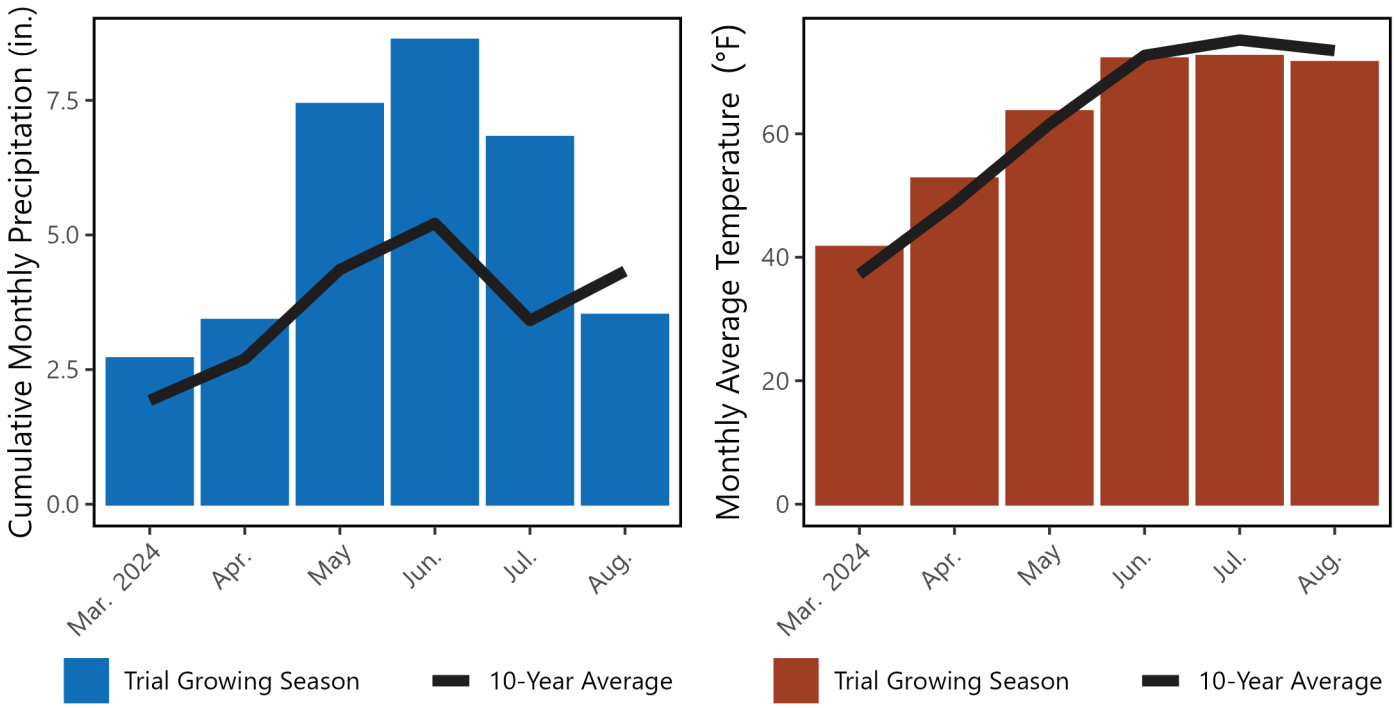

FIGURE A2. Cumulative monthly precipitation and mean monthly temperature in 2024 (columns) and 10-year averages (lines) for Nevada IA [4], [5]. It was abnormally wet throughout the growing season.

REFERENCES

[1] "How Potato Grows," International Potato Center. Accessed: Oct. 02, 2024. [Online]. Available: https://cipotato.org/potato/how-potato-grows/

[2] "When Does The Idaho® Potato Planting And Harvesting Season Begin? | Idaho Potato Commission," Idaho® Potato Commission. Accessed: Oct. 02, 2024. [Online]. Available: https://idahopotato.com/dr-potato/when-does-the-idaho-potato-planting-and-harvesting-season-begin

[3] J. Foster, "What is the best time to plant potatoes in our raised garden beds? - Cooperative Extension: Garden and Yard - University of Maine Cooperative Extension," Cooperative Extension: Garden and Yard. Accessed: Oct. 02, 2024. [Online]. Available: https://extension.umaine.edu/gardening/2023/05/03/what-is-the-best-time-to-plant-potatoes-in-our-raised-garden-beds/

[4] A. H. Sparks, "nasapower: A NASA POWER Global Meteorology, Surface Solar Energy and Climatology Data Client for R," J. Open Source Softw., vol. 3, no. 30, p. 1035, Oct. 2018, doi: 10.21105/joss.01035.

[5] A. Sparks, nasapower: NASA-POWER Data from R. (2024). [Online]. Available: https://CRAN.R-project.org/package=nasapower

PRACTICAL FARMERS of Iowa

PFI COOPERATORS' PROGRAM

PFI's Cooperators' Program helps farmers find practical answers and make informed decisions through on-farm research projects. The Cooperators' Program began in 1987 with farmers looking to save money through more judicious use of inputs. If you are interested in conducting an on-farm trial contact Stefan Gailans @ 515-232-5661 or stefan.gailans@practicalfarmers.org.