

Polycultures for cucumbers

IN A NUTSHELL

Cole noticed that mixed-crop (polyculture) systems often perform better than single-crop (monoculture) systems on his farm. To test this observation, he designed a demonstration trial comparing three treatments with cucumbers: monoculture, simple polyculture and complex polyculture.

Despite challenges with plant loss and drought, Cole observed several patterns:

- The monoculture plots had the highest pest pressure and suffered earlier plant death.
- The simple polyculture produced the highest yield.
- The complex polyculture had the fewest pests but lower yields than the simple polyculture.
- Overall, both polyculture systems supported lower pest pressure and greater beneficial biodiversity than the monoculture.

FARMER-RESEARCHER
Cole Etherington, The Good Shit

MOTIVATION

Cole became curious about how different plants interact after observing his gardens — noticing that growing several plant species together might offer advantages over single-crop systems. In particular, he wondered if the diversity in his market garden helped prevent cucumber beetle problems that often affect monocultures.

To explore this idea further, Cole reviewed research on polyculture systems. Several studies suggested that polycultures can boost productivity, support biodiversity, and improve resilience to stress (1-5). However, he found limited evidence specific to his farming region in eastern Ontario. That gap inspired him to test whether polyculture plots on his farm would increase yield, enhance biodiversity and better withstand environmental challenges compared to monoculture plots.

METHODS

EXPERIMENTAL DESIGN

For the experimental design, Cole originally planned a randomized complete block design where each block featured five rows of cucumbers planted with five plants each. However, when a fence came down and hungry ducks and chickens ate up some of his cucumber seedlings, he was forced to restart.

The final design contained five cucumber plants per treatment block (but see DATA ANALYSIS). He planted no other crops in the monoculture treatment blocks; and planted radish, dill and nasturtium along with the cucumbers in the simple polyculture blocks; and the crops in the simple polyculture plus marigolds, bush beans and chives in the complex polyculture blocks. He used no trellises and applied a hay mulch to reduce weed pressure and retain moisture.



Photo 1. Cole's complex polyculture treatment



Photo 2. Measuring cucumber yield

MEASUREMENTS

Cole’s measurements included the following qualitative and quantitative data:

- Productivity, as yield in weight
- Resilience: how long each cucumber produced marketable yields
- Biodiversity: type and number of different species observed
- Pests & disease: type, number, and extent of pest and/or disease pressure observed

DATA ANALYSIS

Due to the loss of his plants and low yield numbers, this trial became a demonstration trial rather than a replicated trial. Although Cole had replicate plots, there were not enough plants within each treatment to determine a statistically meaningful difference. As such, we can’t assign probability to any differences we see among treatments. Rather, Cole hoped to identify which treatment is most conducive to his operation in the future.

FINDINGS

The 2025 growing season was a difficult year on Cole’s farm. Severe drought prevented irrigation after midsummer and yields from the trial plot were unusually low. However, Cole was able to determine a few potential trends from his trial.

The **monoculture** blocks had the highest pest pressure and earlier plant death with two out of four replicates beginning to die before frost. The **simple** and **complex polyculture** treatment blocks all survived until frost.

The **simple polyculture** had the greatest yield, while the **complex polyculture** had lower yield, but the fewest pest observations. Cole theorized that perhaps there is an optimal number of plants before complexity gives way to competition for resources in polyculture treatments.

Within the **monoculture** replicate blocks, Cole noted cucumber beetle and squash bug presence with no sightings of beneficial insects during his observation periods. Meanwhile, when observing **both polyculture** treatments, he noted the presence of parasitic wasps, tachinid flies, dragonflies, lady beetles, amphibians, and other bees and wasps. He also observed the presence of pest insects, but in smaller numbers.

TAKE HOME MESSAGE

The drought posed a particular challenge for Cole’s trial. However, while yields were low, he made encouraging observations: under stress, the polyculture plantings appeared to support healthier vines, fewer pests and attracted more beneficial biodiversity. The observations aren’t definitive but Cole learned that resilience doesn’t always show up as abundance. For him, the real harvest this season was learning what helps cucumbers on his farm and how to better design for water stress and climate resilience.

ACKNOWLEDGEMENTS

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Figure 1. Treatments













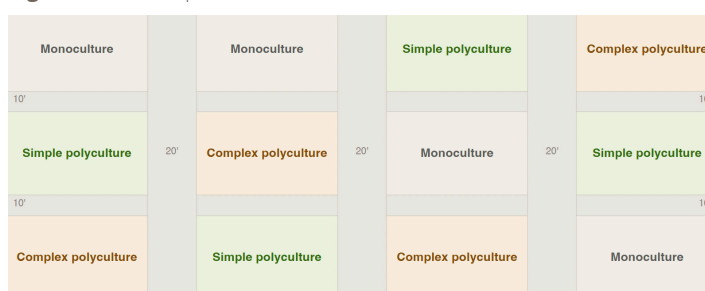
Plant	Monoculture	Simple polyculture	Complex polyculture
'Marketmore' cucumber <i>Cucumis sativus</i>			
'Easter Egg' radish <i>Raphanus sativus</i>	—		
'Mammoth' dill <i>Anethum graveolens</i>	—		
'Jewel Mix' nasturtium <i>Tropaeolum majus</i>	—		
'Durango Outback' marigolds <i>Tagetes patula</i>	—	—	
'Provider' bush beans <i>Phaseolus vulgaris</i>	—	—	
'Nelly' chives <i>Allium schoenoprasum</i>	—	—	

Figure 2. Field map of cucumbers



“RESILIENCE DOESN’T ALWAYS SHOW UP AS ABUNDANCE.”



Photo 3. Leopard frog visits Cole’s trial field

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