ECOLOGICAL FARMERS ASSOCIATION OF ONTARIO

2025

Luffa growing methods

IN A NUTSHELL

Prior to his trial, Logan had heard that trellising should yield straighter, more marketable sponges from luffa plants. He tested this in Ontario and his results showed:

- Untrellised luffas that received 3.0 kg of chicken manure yielded the highest among six combinations of trellising and fertilizer
- Trellised and untrellised luffas that received 1.5 kg of chicken manure performed similarly
- Trellising had an effect on luffa growth when no fertilizer was added, but both trellised and untrellised yields were lowest overall

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MOTIVATION

Logan started growing luffas in 2024. When reviewing the literature for best growing practices, he found most of the studies came from India (1), China (2) and Brazil (3) and were specific to those climates. He could find no research from a North American context except for a paper from North Carolina State University published in 1994 (4). This knowledge gap presented a unique opportunity to conduct a trial on a niche and understudied crop in a southern Ontario growing region.

Logan transplanting luffa seedlings

Luffas, a member of the Cucurbitaceae family, are used as an immature fruit in stir fries, curries and soups. They are more widely known for the coarse sponge that develops in mature fruit that can be used as a biodegradable dish sponge or for body care applications.

Working off the studies in different climates, Logan theorized that trellising could support a straighter, more marketable sponge. Logan was also curious about what the effect of different fertilizer rates would be on the yield and growth of the luffas.

METHODS

TRIAL LAYOUT

Logan's trial consisted of five replicated blocks, each with trellised and untrellised sections. Within each section, he had three plots, each with different fertilizer treatment rates of Actisol, a pelletized chicken manure: High rate (3.0 kg/plot), Low rate (1.5 kg/plot), and No fertilizer (0 kg/plot). Each plot consisted of 10 plants.

Logan utilized a vertical string trellis system for the trellised luffas and applied the fertilizer treatments on the Aug. 15 and 29 and Sep. 12 and 26. Logan had to remove one replicate from the trial due to poor growth of luffas in all treatments, leaving four replicates for data analysis. See **Figure 1** for the full factorial randomized block design for the trial.

Trellised luffa

MEASUREMENTS

Logan measured yield using the following criteria:

- Marketable 3-inch sponge units
- Marketable whole luffas
- Unmarketable but usable luffas
- Edible luffa fruits

Logan also rated his luffas based on fibre strength, visual appeal and overall fibre

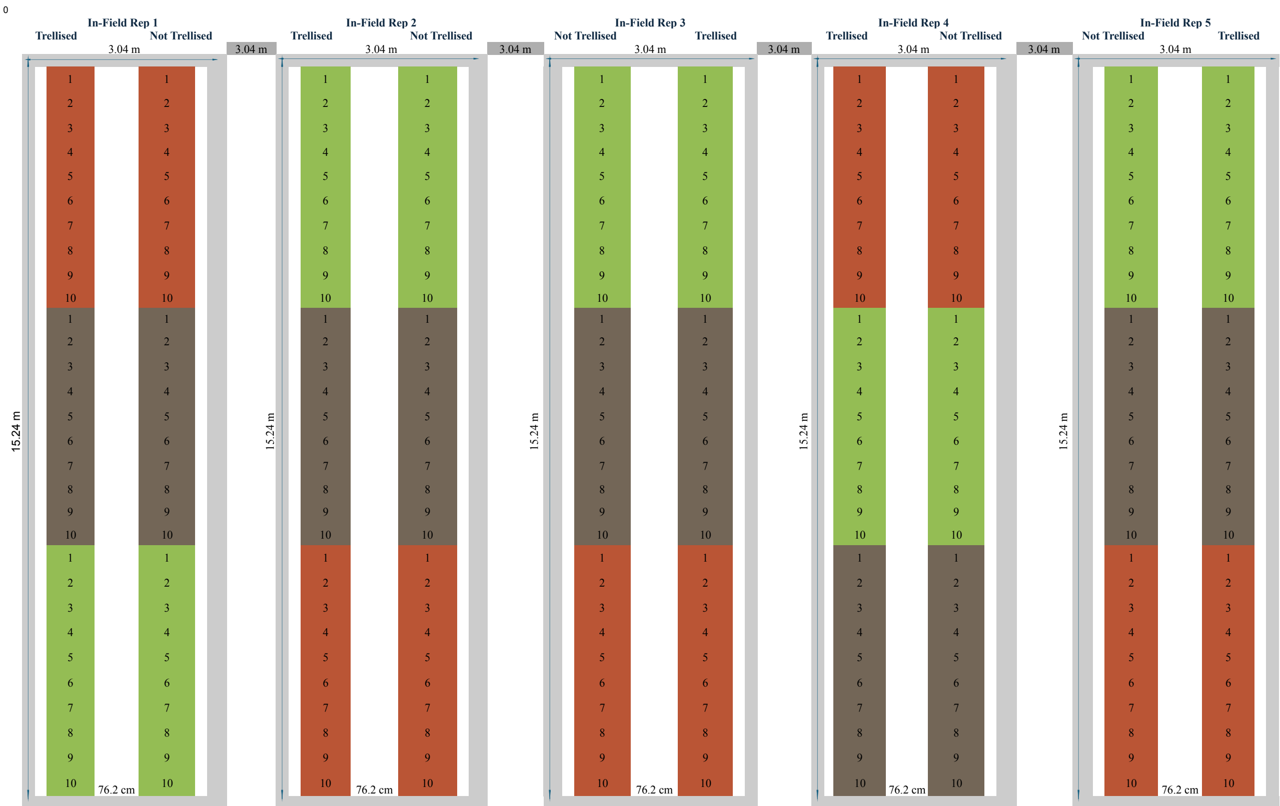

Figure 1. Field map. Fertilizer rates: orange (none), green (high) and grey (low)

density on a 1-5 scale, using the criteria from North Carolina State University (4). Logan tested fibre strength by twisting and pulling, with a rating of one signifying luffas that broke or crumbled and a rating of five signifying the luffas were resistant to breakage when twisted and pulled. Logan also noted the colour of the luffa sponge in his data. The luffas ranged in colour from cream to dark brown, which could impact potential use and marketing. Lastly, Logan judged fibre density on “whether you could read a newspaper through it” or not when held up to the light. See photo for an example of the two ratings.

Luffas with different fibre density. Luffa on the left is a two and the one on the right is a five

DATA ANALYSIS

To evaluate the effect of trellising and fertilizer on total luffa yield, we fit a linear mixed-effects model with trellis and fertilizer as factorial fixed effects and row (replicate) as a random effect, using the Satterthwaite approximation for denominator degrees of freedom.

To evaluate the effect of trellising and fertilizer on marketable yield, 3-inch marketable yield and unmarketable yield, we used an analysis of variance without the random effect. We removed the random effect of row because it had zero variance when we ran a linear mixed-effects model.

For all models, we calculated the least significant difference (LSD) with a 95% confidence level to determine when treatments were statistically different from each other.

We used these models to determine whether the effects of trellis and fertilizer were distinguishable from chance, and we could make these statistical calculations because Logan’s experimental design involved replication of the treatments.

LUFFA SPONGE PRODUCTION

Luffas need 164 growing days in order to fully mature and dry. In southern Ontario, this is not achievable in a field setting. Therefore, Logan harvested the luffas green, then cut the ends, and placed them in an oven for 1 hour at 100°C. After he dunked the luffas in cold water, he removed the skin and seed before final drying.

From left to right: Luffa harvest; drying out luffa fruit in oven; removing seed and flesh from luffa sponge; drying sponges

FINDINGS

Contrary to Logan's hypothesis, luffa yields were higher in the untrellised treatment with an interaction effect of fertilizer. For the 3-inch units, untrellised luffas that received 3.0 kg of chicken manure yielded the highest of the treatments. Trellised and untrellised luffas that received 1.5 kg of chicken manure performed similarly to each other. In both trellised and untrellised treatments, the plants that received no fertilizer had the lowest yields, with the untrellised treatments still performing better. See **Figure 2**.

Logan did note that the placement of these luffa treatment blocks could have impacted their numbers, since the blocks sat on slight slopes. As such, we tested block placement as a possible confounding factor. Statistically, block accounted for a negligible share of the variation in yield (~3%), suggesting that slope was unlikely to be the primary driver of the higher yields observed in the untrellised treatment.

There were similar results for marketable whole luffas and edible yield. There were no detectable treatment effects for "unmarketable but usable luffas," suggesting the treatments affected quantity but not overall quality of luffas.

Logan was surprised that the trellis did not have a beneficial effect on marketable luffa yield. He theorized the untrellised luffas growing on the ground had the original root ball plus the tendrils that converted to adventitious roots along the stem, unlike the trellised luffas that had only the original root ball. These advantageous roots potentially increased access to nutrients and water, which would be particularly beneficial during the drought that summer. Plants could also experience a moister, cooler microclimate along the ground, versus drier, hotter conditions on the 6-foot trellis.

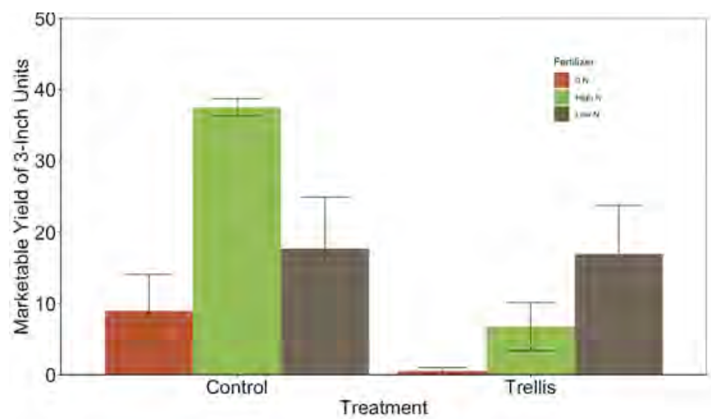

Figure 2. Marketable Yield of 3-inch luffa units. No fertilizer (orange); low fertilizer (brown); high fertilizer (green)

Logan and the trellised luffa

"THIS IS WHY WE DO RESEARCH, TO CHALLENGE AND TEST OUR THEORIES AND GAIN KNOWLEDGE."

TAKE HOME MESSAGE

Most people Logan spoke with assumed that trellising luffa was the best way to get good yields with a straight sponge, but this trial potentially demonstrates that trellising might not be the best way to achieve these goals. They will be using the results of this trial to inform future luffa growing and trials.

ACKNOWLEDGEMENTS

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