Evaluating the Benefits of Companion Plantings Using Edible Flower Species

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COLORADO STATE UNIVERSITY EXTENSION

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SARE Sustainable Agriculture Research & Education

DANDELION FARMS

Project Introduction

- **Intercropping** French marigold (*Tagetes patula)* has been found to have positive effects on yield and reduced pest damage when planted with cabbage (Mrnka et al, 2020).
- **Edible flowers** are consumed in many regions around the world for their medicinal properties, and this eating pattern is growing in popularity (Jadhav et al, 2023).
- A study performed on three French marigold flower cultivars resulted in "marigold orange" to possess the highest **radical scavenging ability**, indicating this edible flower can act as a source of natural antioxidants (Bhattacharyya et al, 2010).

❖ **During this internship** we assessed:

➢ The impacts of French marigold cultivation in a monocrop and intercrop situation with zucchini (*Cucuribta pepo*) on **flower** and **fruit yield**

➢ The total antioxidant content (**TAC**) and the total polyphenolic content (**TPC**) in marigold flowers.

❖ Second year of evaluation for a Western Sustainable Agriculture Research & Education (SARE) grant.

❖ On-site farm cooperation with Dandelion Farms; provided three garden beds and irrigation to make this project possible.

❖ Research Design: Three 5'x 15' growing plots were planted with **randomized complete block** designs of three treatments.

➢ Treatments: (Figure 2)

- Monocropped 'Fordhook' zucchini; 6 plants
- Monocropped 'Queen Sophia' marigold; 11 plants
- Intercropped zucchini and marigold; 6 and 4 plants, respectfully.



Figure 1. Pulling weeds from a block section



Figure 2. Collecting marigold flower weights

Applying Knowledge to Practice

❖ Aligns with my double major at Colorado State University.

❖ **Connect** the content learned in class to the real world.

➢ Chemistry, Entomology, Herbaceous plants, Integrated Pest Management.

❖ Working with plants & performing research is a career opportunity.

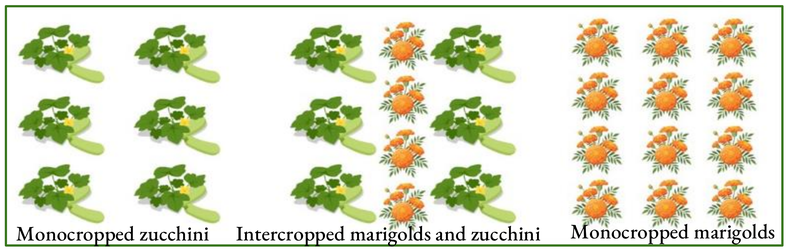


Figure 3. Example of Planting Scheme for the Randomized Complete Block Design

My Efforts

❖ Crops transplanted into site blocks June 2nd, 2026.

❖ **Weekly Activities:**

➢ Observe and document environmental changes over the week.

➢ Scout for pests.

➢ Carry out plant maintenance to reduce weed-crop competition.

❖ **Data Collection:**

➢ Zucchini were harvested when fruit was ≥4.5 in (11.43 cm).

- Fruit stayed on site.

➢ Marigold flowers were collected near **peak maturity**.

- ~95% of all ray flowers were completely unfurled and disk flowers were visible.
- Pest damage was noted when flowers were counted and weighed.

❖ **Flower Samples** stored in a -80°C freezer to stop biological processes.

➢ Flowers will be lyophilized and prepped for analysis this fall.



Figure 4. Immature vs mature marigold flower



Figure 5. French marigolds and Fordhook zucchini



Figure 6. Insects observed at Dandelion Farms



Figure 7. Collection of zucchini

Next Steps

❖ Perform assays to evaluate marigold phytochemical content in collaboration with Dr. Van Buiten.

➢ Analyze TAC.

- 2,2-diphenyl-1-picrylhydrazyl (DPPH).

➢ Analyze TPC.

- Folin–Ciocâlteu.

❖ Analyze data upon experiment conclusion.



Figure 8. Filtered syringes for Folin–Ciocâlteu assay

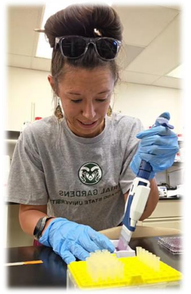


Figure 8. Using a multi-channel pipette to deliver DPPH solution to a well plate

Table 1. Effects of intercropping 'Queen Sophia' marigold (*Tagetes patula*) and 'Fordhook' zucchini (*Cucurbita pepo*) on average flower and fruit sample counts, weights, and lengths for 3, 5, 7, and 9 weeks. Number of plants: z, n = 45; y, n = 35; x, n = 34; w, n = 32.

	Flower Count (#)				Flower Weight (g)				Fruit Length (cm)			
Date	July 15	July 19	Aug. 12	Aug. 29	July 15	July 19	Aug. 12	Aug. 29	July 15	July 19	Aug. 12	Aug. 29
Marigold Flowers **Monocrop**	9.50^{z}	15.42^{z}	12.80^{z}	54.57^{z}	15.99^{z}	28.92^{z}	24.28^{z}	120.88^{z}	n/a	n/a	n/a	n/a
Marigold Flowers **Intercrop**	7.50^{z}	3.67^{z}	3.42^{z}	35.25^{z}	12.68^{z}	5.04^{z}	6.22^{z}	77.99^{z}	n/a	n/a	n/a	n/a
Zucchini **Monocrop**	0.28^{y}	0.72^{y}	0.11^{x}	0.17^{w}	63.43^{y}	223.11^{y}	9.50^{x}	12.99^{w}	8.10^{y}	5.28^{y}	10.30^{x}	12.92^{w}
Zucchini **Intercrop**	0.39^{y}	0.44^{y}	0.33^{x}	1.06^{w}	125.21^{y}	138.69^{y}	104.22^{x}	152.96^{w}	5.74^{y}	27.48^{y}	2.23^{x}	3.78^{W}

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College of Agricultural Sciences