EFAO
ECOLOGICAL FARMERS ASSOCIATION OF ONTARIO

SEED PRODUCTION & BREEDING

POLLINATOR SERVICES

FARMER-RESEARCHER

Kim Delaney
Hawthorn Farm Organic Seeds

Hawthorn Farm Organic Seeds is located in Palmerston on the Huron Tract Treaty of 1827 and on the traditional land that is part of the Three Fires Confederacy of the Ojibwe, Odawa and Potawatomi.

RESEARCH REPORT 2021

Isolation distance for cut flower seed production

IN A NUTSHELL

From 2019 to 2021, Kim used white and pink Cosmos flowers to test isolation distances of 400 ft and 600 ft.

- Kim observed off-type colours at 400 ft for Purity (white) and Rubenza (pink) Cosmos
- Kim observed off-type colours at 600 ft for Purity (white) Cosmos

This project was funded by the Brian and Joannah Lawson Family Foundation and The Arrell Family Foundation.

MOTIVATION

With local cut flower production blooming in Ontario, there's a need for more information on how to grow cut flower seed to meet the demand from growers. However, isolation distance for cut flower seed production is notoriously undocumented and, often, proprietary. Currently, Kim uses an isolation distance of 800 ft for her cut flower seed production but she'd like to reduce this distance in order to free up space for greater flexibility in production.

METHODS

Kim tested isolation distance for cut flowers using white (variety: Purity) and pink (variety: Rubenza) Cosmos (**Photos 1 & 5**), a flowering plant used for cut flower production that produces simple flowers and is insect pollinated (**Photo 2**). She reasoned that if she observes no crossing at 400 or 600 ft, she can transfer this finding with confidence to species with double flowers, which are harder to pollinate.

Design

2019

In 2019, Kim planted pure lines of white (recessive trait) and pink (dominant trait) Cosmos varieties in two plots as follows:

Plot one: 50 plants Purity (white) at an isolation distance of 400 ft from 50 plants Rubenza (pink; dominant) Cosmos.

Plot two: 50 plants Purity (white) at an isolation distance of 600 ft from 50 plants Rubenza (pink; dominant) Cosmos.

To test isolation distance between Cosmos, Kim separated each set of isolation plots with bush beans and other plants that are unattractive to bees.

She collected seed from the four plots from August to frost 2019 (**Photo 3**) and jarred and labelled them individually.

Photo 1. Purity Cosmos flowers growing at Hawthorn Farm Organic Seeds.

Photo 2. A lovely bumble bee (Bombus sp.), the main pollinators of Cosmos, gathering pollen from a Rubenza flower.

2020

Kim grew out the seed she collected in 2019 but the grow-out wasn't successful (the plants were too small, etc) so she decided to plant the remaining seed from 2019 in 2021.

2021

On June 3, 2021, Kim transplanted plants from each of the 2019 isolations plots as follows:

- 50 plants of Purity with 400 ft isolation
- 50 plants of Rubenza with 400 ft isolation
- 50 plants of Purity with 600 ft isolation
- 50 plants of Rubenza with 600 ft isolation

When the plants flowered, Kim flagged stems with off-type flowers and counted the the number of plants at each isolation distance at the end of the season. As she can't sell the seed as pure lines, she will use the extra Cosmos seed in her native pollinator mix.

Justification

This trial differed from standard research trials in that Kim tested two new isolation distances with no replicates, and she did not compare her "business-as-usual"/control distance of 800 ft. These deviations were for practical reasons, as Kim doesn't have space to test three distances in replication. We justified these deviations as follows:

No replicates: It is difficult to have true replicates because pollinators travel so far! Especially given the abundant pollinator population on Kim's farm, which has been certified organic since 1996, with 24 honey bee hives on the 100 acre property, and approx. 90 acres of wild habitat.

No control: 800 ft is the standard distance that Kim has used for over a decade and is commonly used by other cut flower seed growers. She knows it works to isolate pollination without outcrossing, and didn't have space to "test" it in this trial.

FINDINGS

In 2021 Kim observed off-type flower colour in Purity (white) and Rubenza (pink) at both 400 and 600 ft isolation distances, although she did not observe any off-type Rubenzas at 600 ft (**Table 1**). The off-types included a pale pink and a striped flower as well as straight Purity and Rubenza coloured flowers (**Photo 4**).

Photo 3. Purity seed heads!

Photo 4. An example of a cross-pollinated off-type Rubenza Cosmos with white stripes.

Table 1. Number and percentage of off type Cosmos flowers grown out in 2021.

	PURITY			RUBENZA		
DISTANCE	# TRANS-PLANTED	# OF OFF TYPES	% OFF TYPES	# TRANS-PLANTED	# OF OFF TYPES	% OFF TYPES
400 ft	50	4	8%	50	3	6%
600 ft	60	1	2%	50	0	0%

From these results, Kim concludes that 400ft is not enough isolation distance but her results from 2021 give her some confidence that 600ft may work. While she observed some crossing, 1-2% is acceptable for retail seed packs (but not foundation seed).

NEXT STEPS

In order to be confident in 600ft isolation distance for cut flowers, Kim wants to repeat growing flowers at 600ft, followed by growing out their seeds, at least 2 more times and maybe with a different type of cut flower.

Photo 5. Rubenza Cosmos flowers growing at Hawthorn Farm Organic Seeds.

TAKE HOME MESSAGE

For years, Kim has wanted to test her standard isolation distance of 800ft for cut flowers as a way to maximize space in her garden.

Results from this study show Kim that 400ft is too short a distance but that 600ft may work! A reduction in 200ft would be substantial for space savings.

EFAO ECOLOGICAL FARMERS ASSOCIATION OF ONTARIO

Brian and Joannah Lawson Family Foundation

THE ARRELL FAMILY FOUNDATION

Hawthorn Farm Organic Seeds

WORKING TOGETHER TO BUILD RESILIENT ECOLOGICAL FARMS