Pollinators for Food

Planting pollinator attractive annuals with peppers to improve harvest

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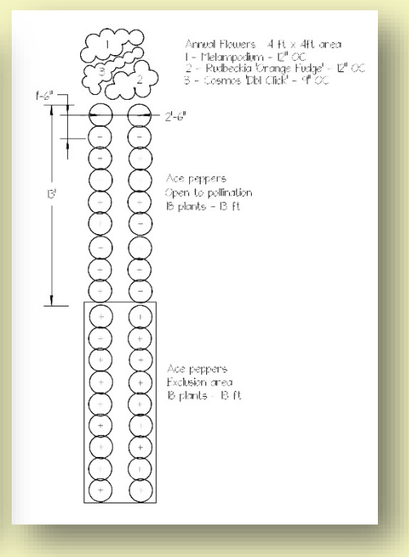
The issue

It is well-known that many food crops require insect pollination to produce fruit, but what about self-pollinated crops? Would planting bee-attractive flowers near the crops make a difference in the quality and quantity of pepper production? Based on results from Flowers for Pollinators (F4P), a 4-year study that demonstrated annual flowers attract bees and other insect pollinators, Pollinators for Food (P4F) explores whether planting pollinator-attractive annual flowers might improve production and quality of self-fertile crops when planted nearby.

Materials and methods

Planting sites: Minnesota Landscape Arboretum (Chaska, MN), the University of Minnesota North Central Research and Outreach Center (Grand Rapids, MN) and the Ottertail County fairgrounds (Perham, MN). A small, half-sized planting was also established in a raised bed in Goldy's Garden, a children's garden space located in the Horticultural Science Display Garden on the St. Paul campus of the University of Minnesota. Chaska and St. Paul sites were located in hardiness zone 4, Grand Rapids and Perham are located in zone 3.

We chose Ace (F1) sweet bell peppers (*Capsicum annum* 'Ace') because they produce early and perform well in northern regions and cooler climates. Peppers self-pollinate, but bees (honey, bumble) are the primary insect pollinators, so we selected three of the F4P annual flowers shown to attract honey and bumble bees, and demonstrated continuous bloom: Showstar butter daisy *(Melampodium paludosum* 'Showstar'), Double Click cosmos *(Cosmos bipinnatus* 'Double click'), and Orange Fudge black-eyed Susan *(Rudbeckia hirta* 'Orange fudge'*).* Seeds were purchased from commercial vendors and started in our university greenhouse in late March. Plants were transplanted into larger pots at 4-5 weeks, set out in cold frames in mid-May, and planted at the four sites in late May and early June. At each location (except St. Paul which was half-sized), we planted 36 Ace bell peppers adjacent to a flower patch composed of 12 of each of the three annual flowers. The 18 peppers closest to the flowers were left open to pollinators. Hoops were installed over the other 18 peppers and covered with exclusion fabric (90% light transmission) that would prevent insect pollination. Landscape fabric was used for weed control. Slow release 10-10-10 fertilizer was applied at planting. Plants were hand-watered at all sites except Grand Rapids (irrigated).



L – R: Pollinators for Food planting site, MN Landscape Arboretum (Chaska, MN); planting design.

Data collection

Unfortunately, complete data were only obtained from the Grand Rapids and Arboretum site as peppers were stolen from both St. Paul and Perham. Perham also experienced plant loss due to a virus.

Fruit was harvested at the Arboretum Site 21 times from July 11 – Sept. 6. Fruit harvest was shorter at Grand Rapids (Aug. 7 – Sept. 13), but almost equally frequent (20 harvests). Extension Master Gardeners assisted with data collection at all sites. Peppers were harvested when they started to ripen – a visual indication they had reached their mature size. Fruits harvested from each area (open and excluded) were counted, then individually weighted, and measured (girth and length). Totals were averaged to determine an average fruit size and weight for that particular harvest. Seeds were also extracted from harvested fruit and weighed (we pre-determined that 500 seeds = 3 g) and an average seed count per fruit was obtained and recorded.

Results

The unfortunate loss of peppers at the Perham and St. Paul sites reduced the data quality. There was no evidence of a significant difference between the open and covered plantings at the Grand Rapids. However, the open area at the Arboretum had significantly more fruit ($p < .0001$) than the excluded area. This is the single instance where we can make a statement of statistical significance.

Sites	Area	Total # peppers harvested	Total weight of peppers (g)	Aver pepper length (in)	Aver pepper girth (in)	Weight of total seeds (g)	Aver pepper weight (g)	Aver total seed weight per pepper (g)
ARBORETUM	EXCLUDED	66.00	6175.00	46.32	94.58	127.26	1005.97	22.84
ARBORETUM	OPEN	120.00	13935.00	52.66	106.75	297.00	1401.13	30.14
	Difference	**54.00**	**7760.00**	**6.34**	**12.17**	**169.74**	**395.16**	**7.30**
GRAND RAPIDS	EXCLUDED	204.00	20678.69	34.03	65.93	558.07	890.36	22.97
GRAND RAPIDS	OPEN	207.00	21551.46	33.35	68.01	415.45	952.44	22.48
	Difference	**3.00**	**872.77**	**-0.68**	**2.08**	**-142.62**	**62.08**	**-0.49**

Discussion

As with any outdoor study, there are many variables; for example, Grand Rapids results may have varied due to a shorter growing season. However, experience and results, especially from the Arboretum site, are encouraging and lead us to conjecture that bees do help increase crop pollination, leading us to do another study in 2019. In 2019, three P4F sites were established that look at planting flower patches vs. interplanting peppers attract pollinators and influence crop production and quality. Grand Rapids was again planted as part of this new study. We also added The Acreage, a property managed by our funder the Horst M. Rechelbacher Foundation (Osceola, WI). We also added a location in Minneapolis, MN. This site is managed by Pillsbury United Communities (PUC), a 140-year old non-profit focused on growing, cooking and providing access to healthy foods for people. Peppers collected from The Acreage and PUC will be used to prepare meals and supply PUC foodshelves.

Literature

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