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Garden Column

Pollination
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"It is impossible to under estimate the importance of the pollination process. If the bee disappeared off the surface of the globe, then man would have only four years of life left. No more bees, no more pollination, no more plants, no more animals, no more man." - Albert Einstein

Pollinators are what ecologists call keystone species. A keystone keeps the two halves of an arch together. Remove the keystone and the whole arch collapses. Remove pollinators and nature collapses. Therefore pollination is worth billions of dollars and highlights how nature is interconnected. Bees are perhaps the best known pollinators and you can thank a honey bee for one third of your diet. However other pollinators include other insects such as wasps and flies; wind, animals or anything that 'shakes' the pollen onto the stigma.

Pollination will affect the types of plants we choose to grow. If you buy an apple tree and no fruit is produced there may be several reasons. One of the most basic is a failure to pollinate. Following is fruit tree pollination 101. Most fruit trees require pollination between two or more trees for fruit to set. A bee, or another pollinator, lands in a flower to feed. Pollen from the flower's anthers (male part) dusts its body. With pollen clinging to it, the bee flies on to another flower. As the bee feeds, pollen is brushed onto the stigma of the pistil (female part) of the second flower. The stigma is the part of the pistil that receives the pollen during pollination. Pollen grains travel down to the ovules, and fertilize them. Flower petals drop and the fruit begins to swell. Inside the ripe fruit, ovules have become the seeds. Otherwise, if pollination does not occur, flowers may open and perfume the air but there will not be any fruit. The most common fruit-tree pollinator is the honeybee that gathers nectar from flowers, simultaneously transferring pollen between them. A single honeybee may visit as many as 5,000 flowers in a single day. Flowers use nectar as an attraction and this sugar-rich liquid provides energy for pollinators. Plants also lure pollinators by flowers of different shapes, sizes, smells, and color. Some flower pigments reflect the sun's ultraviolet light, creating a dazzling pattern invisible to humans.

Fruit trees form their flower buds in the fall. Therefore, besides lack of honeybees, other factors can interfere with pollination. Lack of rain, high winds, and frost can damage buds before they blossom. Excessive winter

cold or even a late-spring frost can kill buds and blossoms. That's why it's important to choose a tree selected for the proper climate zone. These trees normally develop buds that avoid the last frost. The same cold weather may also affect bee populations.

With the help of bees some trees are self pollinators and will bear fruit all by themselves. These are most varieties of apricots, peaches, nectarines and sour cherries. However, most of these trees are unlikely to be grown in the Grand Rapids area. Other fruit trees likely to be grown in the Grand Rapids area need another tree for pollination. These include apples, blueberries, pears, plums, and sweet cherries. Most can be purchased from Bloomers. Ideally, the cross pollinating tree should not be of the same variety but a different variety of the same fruit. For example, It's always best to pollinate fruit trees of the same genus with each other (apples with apples, pears with pears) but pears can cross-pollinate with apples as long as both trees bloom at the same time. Most crabapple trees are also good cross-pollinators but must blossom at about the same time as regular apple varieties. Lastly, pollen germination in apples works best at temperatures in the range 60F-70F.

If a gardener raises plums things are less clear. European plums, *Prunus domestica*, can inter-pollinate with closely-related species such as damsons, mirabelles and cherry plums. European plums cannot generally cross-pollinate with Japanese plums, *Prunus salicina*.

Some other aids for best fruit tree pollination are: don't plant fruit trees more than 100 feet and preferably about 50 feet apart. Spray the trees while they're dormant on one of the warmest and sunniest days in winter with dormant oil to smother mites and insect eggs that later emerge and damage the buds. Don't apply insecticides or any pesticide during bloom time as bees are very susceptible to most pesticides including herbicides and fungicides. Remove nearby dandelions and other broadleaf weed flowers before the trees blossom so the bees won't be distracted from their fruit-tree pollination job.

There are other consequences of self and cross pollination. Vine crops like squash, cucumber, pumpkin, and melons are monoecious plants, meaning a single plant has both male and female flowers. However, it is often difficult for pollen from the plant's anthers to get to the pistils; therefore, bees are critical to the fruit production of these plants. Although cucumbers, squash, muskmelons, and watermelons are all cucurbits, they're all different species, making it genetically improbable for them to cross-pollinate, with some rare exceptions among winter squash species.

Sweet corn grown next to field corn will be starchy and tough. The pollen from the field corn causes the endosperm (most of the kernel) of the developing sweet corn kernels to take on the characteristics of the field corn.

Tomatoes are self-fertile, but not in the truest sense of the word. The pollen is produced internally and must travel down a hollow stamen and drop onto the stigma. Left on their own, tomatoes don't set fruit well and motion is required to shake the pollen out. Wind can do it, but bees do it most effectively, which is why greenhouse-grown tomatoes will fail to set fruit unless bees are introduced or humans agitate the plants.

Most beans self-pollinate before they open; however, many varieties of beans still require visits from pollinators to set the maximum number of seeds. Lima beans in particular perform better with the services of pollinators. As unlike most bean species, the anther and stigma do not contact one another during flower development. Instead, most of the pollen falls onto the style (which supports the stigma). When a bee pushes its head into the flower, the style and stigma are forced out, the style's pollen is dusted on the petals, and the stigma picks some of it up when it retracts. Wind may help lima bean pollen find the stigma but bees more effectively "trip" the flowers and get the pollen where it belongs or deliver pollen from other bean plants in the process.

Bees have much to teach us, they fascinate us, they are beautiful, and their importance to mankind is beyond measure. Bees, after mankind, are the creatures most studied by humans.