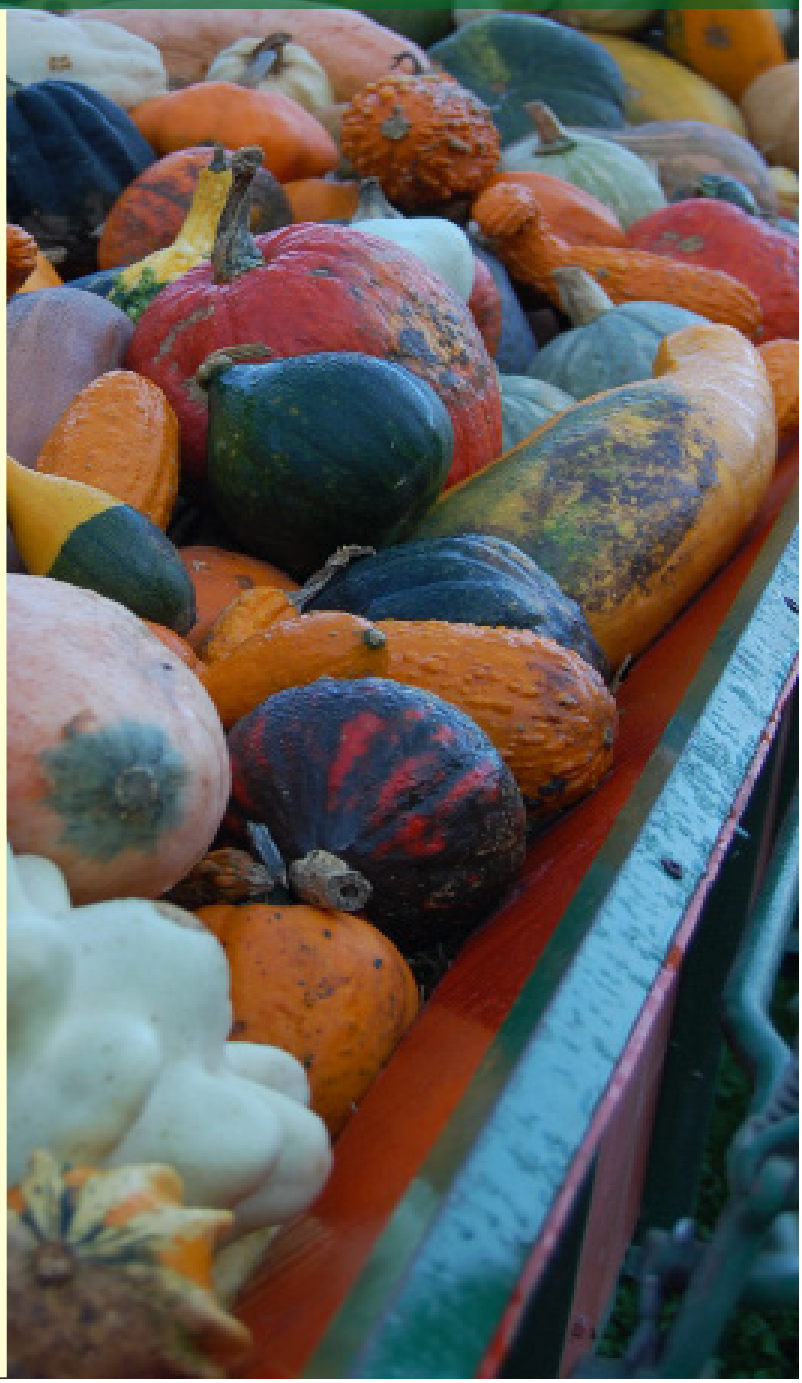
Hand-Pollination: Squash



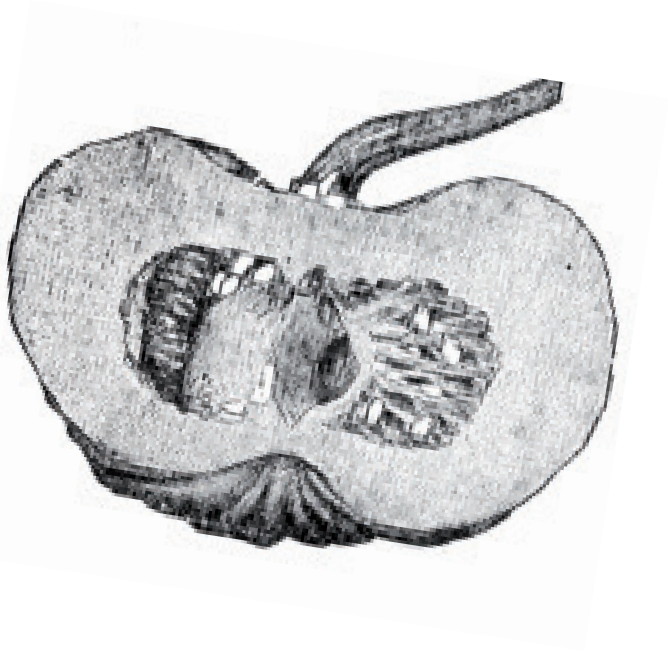
Hand-pollination is a technique used by seed savers to ensure that plants produce seed that is true-to-type and that flowers are not contaminated by the pollen from another variety.

The process varies among species, but with plants that produce unisexual flowers like squash, the uncontaminated pollen from male flowers is transported to the unpollinated stigma of female flowers. Once the pollen is transferred, the female blossom is covered to prevent pollinaters that may be carrying foreign pollen from contaminating the stigma.

Hand-Pollinating Squash

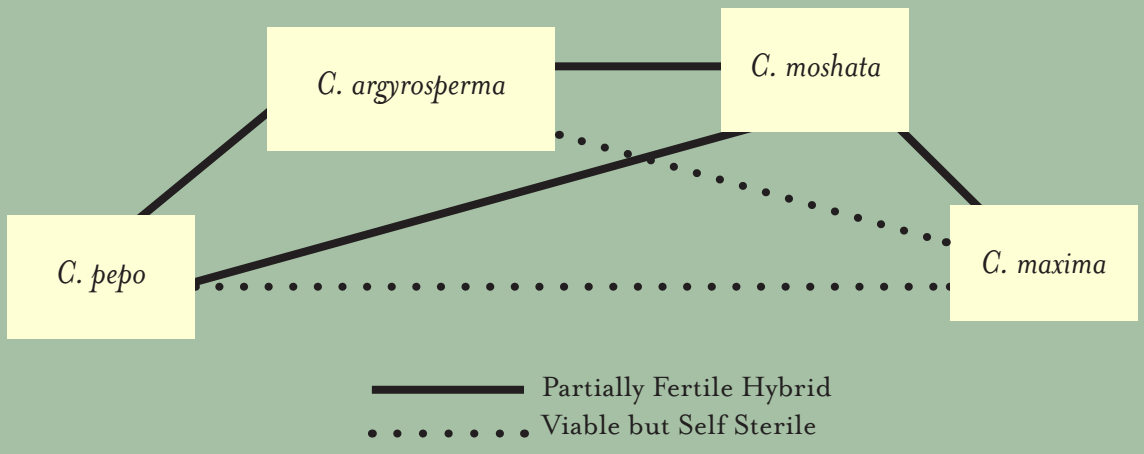
In total, there are four common species that gardeners recognize as squash; all of which are pollinated by insects. These species include *Cucurbita argyrosperma* (cushaw types and silver-seeded types), *Cucurbita maxima* (banana, buttercup, hubbard, turban, kabocha, and most pumpkins), *Cucurbita moschata* (butternut, cheese types), and *Cucurbita pepo* (acorn, scallop, spaghetti, crookneck, zucchini, delicata). Though the species do not generally produce fertile offspring when they cross, occassionally they do (see Inset 1); thus it is safest to take steps to isolate all squash varieties from each other, regardless of species.

In large scale commercial plantings, an isolation distance of ½ mile or more is recommended between varieties in order to reduce the chance of accidental crossing. For gardeners who cannot meet this recommendation, or for those who want to grow more than one variety in their garden, hand pollination will ensure that a variety's seeds are still true-to-type. Because the large male and female blossoms are easily distinguished, hand-pollinating squash can be easy for gardeners of all skill levels.



Inset 1.
Cross-Pollination Among Squash Varieties

This simplified interspecies crossing polygon illustrates the potential crossing relationship between different species of cultivated *Cucurbita*. Such crossings are highly cultivar dependent and usually produce few viable seed. (Diagram adapted from Robinson and Decker-Walters, 1999).



1 Identifying Blossoms

The male (pollen producing) and female (seed producing) squash flowers can be easily distinguished from each other: female flowers have an enlarged ovary just below the flower which resembles a small squash fruit and males lack this swollen structure. Male flowers also start to form before females and are attached to longer peduncles (flower stems). Hand pollination cannot begin until both male and female flowers are present in planting.

In the evening before pollinations are performed, identify male and female blossoms that are beginning to show a yellow flush of color, particularly along the seam of the flower petals. This indicates that they will be ready to open the next day (Figure 1). These flowers are called "tomorrow flowers."

Generally, there will be fewer female tomorrow flowers than males. This is good because it is best to pollinate each female with more than one - and ideally three - different male flowers. Though one male flower has more than enough pollen to pollinate one female flower, pollinating females with three or more males will help to capture more genetic diversity and to reduce the chances that a plant is being pollinated exclusively by pollen from the same plant.

Do not work with tomorrow flowers that have holes in them or that are partially opened at the tip as they may be contaminated by foreign pollen.

2 Covering Blossoms

Seal the tips of the male blossoms shut using ¾" masking tape, clothes pins, or flagging tape (Figure 2), and tie the tips of the female blossoms using flagging tape (Figure 3). As the season progresses and the vines become increasingly vigorous, it is helpful to also use marking flags to mark the location of taped flowers.

Figure 1. *Female (left) and male (right) flowers will begin to show a yellow flush of color at the tips of the petals the day before they will be ready for pollination.*

Figure 2. *Tear a piece of tape off roughly 4" long, place the tape half-way down the petals, and fold over. Give a good press to the sides that you just stuck together so the seams are completely sealed, being careful not to damage the flower.*

Figure 3. *Tie female flowers far enough down the petals that the top is completely sealed but not so far that the stigma is bruised by the tie.*

Figure 4. *When ready, tear the petals from the harvested male flowers in preparation of pollinating the females.*

Figure 5. *When using flagging to tie female flowers, remove the flagging or tear the petals just below the flagging when ready to hand pollinate.*

Figure 6. *Once male and female flowers have been opened, work quickly to complete the hand pollination to prevent unwanted insect visitors.*

3 Preparing Flowers

Return the following morning after the dew has dried to locate the male and female blossoms that were taped, pinned, or tied shut the previous evening.

1. Begin hand-pollination by harvesting all the male flowers, picking them off the plant at a point three or four inches down the flower stem.
2. Divide the male flowers evenly among the female flowers and place them next to the taped female blossoms.
3. Remove the tape, clothes pin, or flagging tape and the petals from each male blossom individually as each female flower is pollinated (Figure 4).
4. Once all three of the male flowers are untaped, immediately tear off the top portion of the female, just below where it was tied (Figures 5 & 6). Be prepared to shoo away any foraging bees that may try to enter this unfettered flower as they may be carrying stray pollen from other varieties. If a bee gets to a flower that was taped shut, do not assume the resulting seeds will be true-to-type.

4 Pollinating

Working quickly, use the male flowers as brushes and swab the pollen-covered anthers of the male flower onto each of the three lobes of the stigma of the female flower (Figure 7). Repeat this with the remaining male flowers before moving onto the next female flower.

Figure 7. *Carefully rub the stamen over the pistil in the female flower, transferring as much pollen as possible.*

Figure 8. *Carefully tape the petals of the female flowers, making sure to seal the tape tightly.*

5 Taping Female Flowers

Immediately after pollination, tape, tie, or pin the female flowers shut again (Figure 8). If using tape, use the technique described in Step 2, handling the fragile petals gently to avoid tearing. At this point, don't press too hard, or twist the flower at all, or it may fall off the plant.

6 Flagging Pollinated Flowers

Loosely tie a piece of flagging tape around the stem of each female pollinated immediately after pollination (Figure 9). This marker may simply serve as a visual reminder that this fruit is for seed not for eating, but it may also include useful information, including variety and hand-pollination date.

Figure 9. *At the end of the hand-pollination process, female flowers should be taped so that no additional pollen can reach the stamen and flagged with flagging tape for identification.*

Materials

- Flagging tape (for females)
- Clothes pins (optional for males)
- Masking tape (for males and for females after pollination)
- Hand sanitizer (optional, use between hand-pollinating two varieties of squash)
- Sharpie (for labeling flagging tape after pollination)
- Flags/markers (2 colors, one for females/one for males, are helpful but not needed)
- Compost bucket (if you choose to remove spent flowers and Open-Pollinated fruit)
- HP Log (optional)