

Cross-Pollination and Breeding for Tomatoes



Welcome to another demonstration on plant breeding. Today, we are having another important lesson for you. If you didn't read the title yourself, we are going to show you how to cross-pollinate for tomatoes and give you some more information on reasons for plant breeding. This here is my secret garden. Behind me are some poorly drawn tomatoes that we will use for the demonstration today.

All of the tomatoes are also ready for today. Flowers everywhere. Everyone come on. Let's get closer so we can see the various flower parts so we can begin.

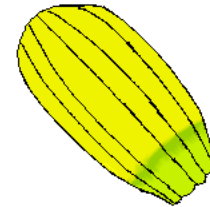
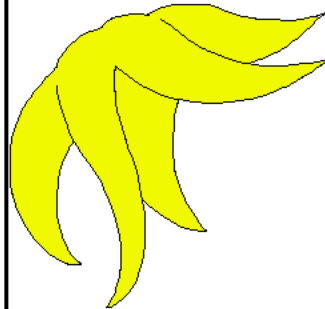
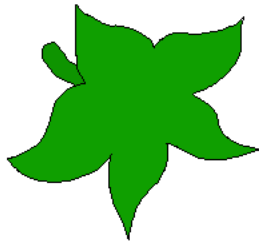
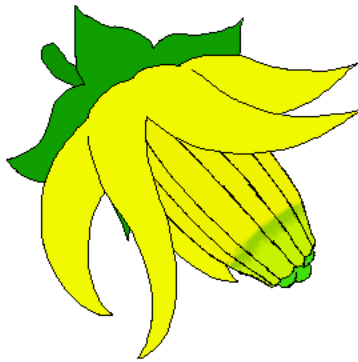
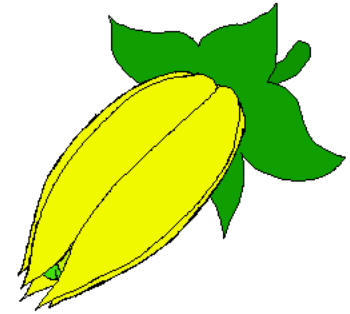
This is a tomato flower. If you don't like how it looks or you feel like there are problems with it, just know this is the best I could do.

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Tomatoes are naturally self-fertile, so timing is important when making crosses. The plant's anthers and stigma are very close together, so by the time the flower is fully mature and open, it has likely already pollinated itself.

The flower on the left is such said self-pollinated flower. The petals have opened and is not usable for cross-pollination.

The flower on the right is closer to what we are looking for. When the flower is closed, the stamen is likely undeveloped, but the pistil is. The timing for this is crucial!



If you are deprived of any plant anatomy classes or just don't remember what everything is, I'll take apart this flower and show you what each part of the flower is and what they do.

Just as a reminder, tomatoes are perfect flowers; as in they contain both male and female parts. This is why timing is crucial to prevent self-pollination.

These are the sepals. Together they make up the calyx. It's not important for making cross-pollinations. It is mostly there to protect the flower when it is still a bud.

These are the petals. They are there usually to attract pollinators. We'll be using these to determine when the flower is ready to be cross-pollinated.

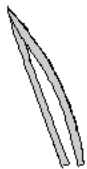
We say that the flower is ready and not undeveloped or already self-pollinated. A mature, self-pollinated flower is shown in the above panel on the left, and a flower ready to emasculate is on the right.

These are the stamen, or anther cone, since in a tomato, the stamen coming together make a little conical shape with the anthers at the point. This is the male reproductive parts. The darker part is where the anther is located. The anther is where the pollen is created. This is important as this is what needs to be removed to prevent self-pollination in the early stages of the flower's development.

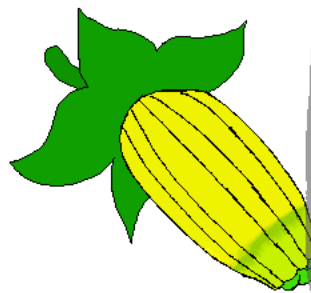
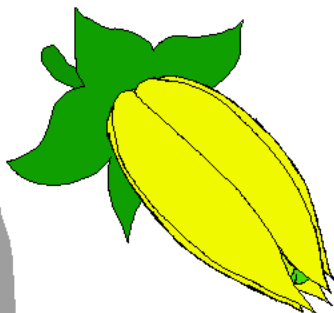
This is the pistil. The pistil is made up of the female reproductive parts. The tip of the pistil is called the stigma, and the round bottom is the ovary. The stigma is where the pollen grains need to land in order to send pollen tubes down to fertilize the ovary and start the production of a new seed.

The anther cone surrounds the stigma. This is the reason why tomatoes self-pollinate so easily.

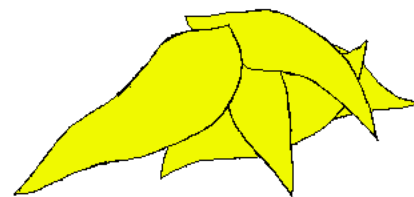
*Note: Keep the female flower attached to the plant. Flower will NOT produce fruits, seeds, or even grow if the vascular system is not attached.



With the flower you will use as the female, remember you want one that the petals are still closed. Next use something that can accurately pull off the petals.

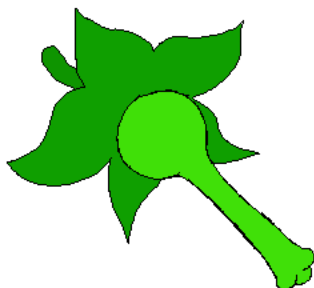


Once the petals are off you will do the same with the stamen. Next we will do the same with the stamen, but be careful not to damage the pistil as it is hiding inside the anther cone.



Since the flower is still young, the anthers will not have created pollen and there shouldn't be a risk of self-pollination.

Now that the stamen is removed, we can begin pollinating this emasculated tomato flower.

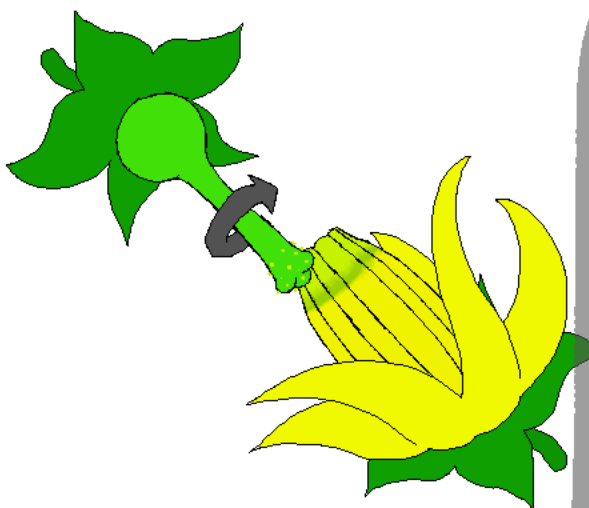


Make sure that the remains of the flower is well intact. A damaged pistil may not fruit and if the calyx, inflorescence, or branch behind the flower is damaged you might want to start over.



Now, we need to get the pollen from the male parent.

You can gather the pollen manually using a number of methods, such as a modified electric tooth brush. In this case you can catch the pollen in a gel capsule and refrigerate it to use it later. Other people use tweezers or forceps and collect the pollen grains on a piece of plastic, like a pot label, to use right away...



But, you can also take the entire male flower from the male plant and rub its anthers around the stigma of the female plant. In all cases, you want to make sure you can see the yellow pollen grains sticking to the stigma of the female.

Finally, when the female is successfully pollinated by pollen from the male flower, hang a label from the calyx with the name of the female and then the male parent and the date that the cross was made. The female parent is always written first when making a cross. You can say to yourself the old-fashioned phrase, "ladies first" so that you remember. The date will help you determine when to decide if the cross was successful or not. If you are making a lot of crosses, you may want to keep a log of all of the crosses you have made, and make notes later if you successfully harvested a fruit, or if the cross aborted (this is what we say when the flower dies before making a fruit).

Wait, where'd-? Alan, what did you do to my backyard? Where's my dad's plants? You didn't-! Come on! He's going to kill me!

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Alan, what are you doing with that tomato-? Hold on, no. Don't-!



Aahhhgggg!!! I think I ate the purple one!

Join me again next time for another interesting lesson on plant breeding!

Please don't...

