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Tomato Grafting

Just a few years ago, when I began to tell my grower friends about tomato grafting, they looked at me a little funny. They wondered if I was trying to produce a tomato with seven different varieties on one plant. Most of them had not been raising tomatoes in the greenhouse for more than three or four years and were so far experiencing no serious soil disease problems. Unfortunately, I had been growing in the same soils for considerably longer, up to twelve years in one structure, and my tomato plants were starting to collapse faster than the Red Sox in September. It didn't help that we grew the variety 'Buffalo', consistently one of the wimpiest of the dozen or so greenhouse types we've trialed over the years yet also the hands-down best tasting variety we've ever raised. It also didn't help that we grew organically so we were limited in the amendments that we could add to combat the Evil Empire of soil pathogens that sucked the life out of our healthy green vines. Something had to be done short of hiring a Chinook helicopter to relocate our greenhouses to healthier soils.

We didn't always have soil disease problems. When we first started with Jetstar tomatoes in poly-tunnels in the mid-eighties things went just fine. The tomatoes were big and red, the birds were singing, the cotton was high. Of course Jetstars are field tomatoes and total yield fluctuated with the temperature and weather. One day you picked a load, the next day you had nothing. Then we discovered the magical world of greenhouse tomato types and realized that we could achieve our goal of having red-ripe fruit consistently from the opening of our seasonal farmstand to closing time at Thanksgiving. For a few more years the plants grew fine all season to a length of 14-16' and other than the 'May check' problem when blossoms took a break after four or five cluster sets, plant health was superb. After experiencing only a couple of 'yellowing' plants each year, we suddenly had a season where we lost about twenty-four plants just about the time they began to bear fruit. After talking with other growers and extension agents I found that some greenhouses were experiencing up to fifty percent mortality. One organic Canadian grower had even tried removing his greenhouse soil and replacing it with fresh, healthy soil.

We were determined to solve the problem and hoped that some new products out on the market that contained pathogen fighting organisms might help us stave off the diseases. One season we trialed several of the biological fungicides including 'Backpack' and 'Plantshield'. These materials contained the beneficial microbe *trichoderma harzianum* which when applied as a drench provides prolonged protection against pythium, rhizoctonia and fusarium. These drenches helped dramatically for a while but we knew we needed something more to boost production back to the good old days of fresh, new soil. We heard rumors that other growers were having excellent results combating disease problems by grafting their favorite varieties onto disease resistant tomato rootstocks. The idea of grafting tomatoes seemed a little odd but I remembered how surprised I was a number of times when after accidentally snapping the growing tip of a tomato plant while pruning and then setting the partially severed tip back upright on the stem, I would return a few days later to the same plant and find the tip had reattached itself and the cut had calloused over. We needed to find out more about this mysterious grafting process. It was time to hit the Internet.

We found a 1996 article written by Andre Carrier, a Canadian agronomist, detailing the methods and advantages of tomato grafting. In the article he stated that the main purpose of grafting "is to obtain a better root system that will last longer". Further research found that the Japanese and Koreans because of their intensive cultivation of land over many years and the corresponding buildup of soil disease had been forced to develop grafting techniques to ensure continued crop production. Not only had they experimented with tomatoes but also had grafted peppers, eggplant and various vine crops. Japanese researchers concluded that "Since soil sterilization can never be complete, grafting has become an essential technique for the production of repeated crops of fruit-bearing vegetables grown in greenhouses." Sounded good to us, now all we had to do was fuse two plants together.

The first method we tried was the side-by-side method in which the rootstock and scion stem are planted at the same time in a 4" pot. The rootstock top was cut off with a diagonal cut and stuck into an upward slice in the scion stem. Moisture proof tape was wrapped around the cut to prevent the graft from drying out. Unfortunately it was hard to see if the graft was successful since it was hidden by

the tape. Mortality rates were high for us with this method. Friends of mine had tried top grafting by cutting the rootstock stem in half and placing a portion of the scion stem over a small porcelain pin that joined the two together. The plants were then put into a misting chamber to facilitate the graft healing process. The success rate of this method was not too impressive either. Finally, we were shown a method in which two similar sized young plants from square 128 plug trays were laid down side by side. An upward cut was made with a very sharp razor blade into the scion stem an inch or so above the soil line. The cut was made at about a 35 degree angle cutting halfway through the stem. Another cut was made in the rootstock stem at about the same height and stem thickness downwards at about a 35 degree angle and halfway through the stem. The two stems are then joined and held together by the flaps of tissue. We use a small plastic clothes pin from Japan specifically designed to hold the graft together. The English translation for the Japanese name of the clip is 'the Tomato's Friend'. The clip protects the graft from separating during misting or watering. The grafted plant is placed in a compost mix in a 4.5" pot. After four or five days, we cut the rootstock top off a little above the graft, leaving the scion stem root so there are now two roots powering one plant. In a couple of more days, we remove the clip. It seems to take a week to ten days for the plant to outgrow the shock of the transplant process but when it does, the growth really takes off. Plants are generally ready to put in the ground at 6-8 weeks.

Presently, we are using a rootstock from De Reuiter Seed called Maxfort. Previously we had good results with Kyndia and Beaufort.

For a while, the grafted plants are pretty much indistinguishable from non-grafted plants after they are planted. However, once the rootstock gets a firm foothold, the Jack-in-the-Beanstalk effects begin to take over. First, there is no more 'May Check' on the blossom clusters. The yellow flowers maintain a steady appearance so the plant will be producing consistently. Second, the plants show steady vigor and growth even after picking begins. This translates to larger fruit and more of them, increasing the yield per plant dramatically. Third, loss of plants due to soil disease is relatively non-existent.

Tomato grafting may not be necessary for everyone, especially if fresh soils are available. Organic growers know that rotation of crops is an important step to prevent disease and insect build-up. However, due to the major investment in the greenhouse structure and the fact that tomatoes are an important economic crop, tomato grafting may be the answer to soil fumigation or chemical control. Even if soil disease is not presently a problem, grafted plants can allow growers to harvest a larger crop without significant investment in more structures. An experienced worker can graft 60 to 100 plants per hour, so even with the extra cost of the rootstock, the eventual yield increase makes grafting profitable. There is also an economic opportunity to provide custom grafted plants for other growers.

Don't be scared by the grafting process. It's been done for centuries and is relatively easy with a little patience. Who knows, maybe we will have seven varieties of tomatoes on one plant fairly soon?