# GRAFTING FOR SEASON EXTENSION AND YIELD IN HIGH TUNNEL CUCUMBER PRODUCTION IN NEW YORK

Judson Reid* and Kathryn Klotzbach, Cornell Vegetable Program

## Introduction

Grafting, the combination of two distinct plants into one, can be used to manage root zone diseases and increase yield in commercial vegetable crops. Grafting methods of tomato are well documented and replicable. For example in 2007 our program recorded yields of 18.9 lbs per grafted plant compared to 10.2 lbs per ungrafted plant. Survival rates of grafted tomato plants using a top-graft (45° angles secured with silicon clips) has routinely exceeded 90% in our trials.

The Cornell Vegetable Program is currently researching grafting of greenhouse cucumbers for cool soil production. The use of cold hardy rootstocks, in combination with unheated greenhouses, or high tunnels, can bring a product to market 6-8 weeks before the field crop is mature in addition to higher yields per plant (chart 1). However, we have not been as successful grafting cucumbers as tomatoes. In 2011 using the '1-cotyledon method' our program achieved an unacceptable 36 % survival rate. Most of this loss was caused by scions not healing onto the rootstock, or the adventitious growth of rootstock shoots in direct competition with the healed graft. In 2012 we endeavored to improve upon this success rate by introducing a misting table to the healing process and multiple seeding dates of our scions to improve the match with rootstock stem diameter.

## Materials and Methods

Cucumber scions and inter-specific squash hybrid rootstock Strongtosa (*Cucurbita moschata* x *C. maxima* provided by Syngenta) were seeded at three different dates, approximately two weeks apart; Feb 14, Feb 28 and Mar 17 2012 in a commercial greenhouse in Elba, NY. At each date cucumber varieties Diva, Presidio and Tamazula was seeded on three consecutive days into Sunshine Mix No. 1 (Sun Gro Horticulture Canada), in 48 cell count trays. Rootstock seed was soaked for 24 hours in water before being planted three days after the first scion. This same seeding schedule was followed two weeks later and again four weeks later.

Grafting took place in a greenhouse at the New York State Agriculture Experiment Station in Geneva, NY with enclosed misting chambers. Day time temperature was 75°F and nighttime 70°F. Stem diameters were matched as

possible using plants from each of the 3 planting dates at the two cotyledon stage with one true leaf emerging. Using a razor blade one cotyledon and all meristematic tissue was removed from the rootstock at ≤45° angles. Scions were cut approximately one centimeter below the cotyledons with matching angles. The two plants were joined using spring loaded grafting clips. For each planting overhead misting began at 10 seconds durations every ten minutes and gradually reduced in duration and frequency to none over a period of 2 weeks. After observing high mortality rates in the early healing attempts duration and frequency of misting was increased for each planting date.

Group 1: Grafted 13 days after initial scion seeding. Two weeks post grafting 32 percent of grafts were alive (see chart). Gray mold (*Botrytis cinerea*) and secondary rootstock buds caused much of the mortality.

Group 2: Grafted 15 days after initial scion seeding (this was a grafting session of left-over plants from round 1). Two weeks post grafting 46 percent were viable.

Group 3: Grafted 13 days after initial scion seeding. After 2 weeks 60 percent of plants were viable for transplanting into high tunnel soil.

Group 4: Grafted 18 days after initial scion seeding. Several trays were discarded due to lack of water from a malfunctioning mister. Of the remaining plants 76 percent were successful grafts (see chart).

Discussion and Conclusion

Grafting of cucumbers remains a challenge, however by the end of this project our survival rate had increased to 76%, a level approaching commercial acceptance. The increase survival rate is attributed to improved grafting skills, stem diameter matches and misting table management. Challenges to this process include rootstock shoot competition with scion, matching stem diameters and a long healing window. Misting tables can aid the healing process but also increase risk for Gray Mold.

By combining greenhouse cucumber scions with a cold hardy rootstock, northern vegetable farmers will be able to extend their harvest season beyond field production with minimal fuel inputs. Our team will continue to research cucurbit grafting techniques that will help vegetable farmers meet the growing demand for locally-sourced, sustainably grown produce.

Yield data is currently being collected and will be presented in poster form at the Grafting Vegetable Symposium ‘Development of Grafting Technology to Improve Sustainability and Competitiveness of the US Fruiting Vegetable Industry’ in Maitland, FL, November 8 2012.

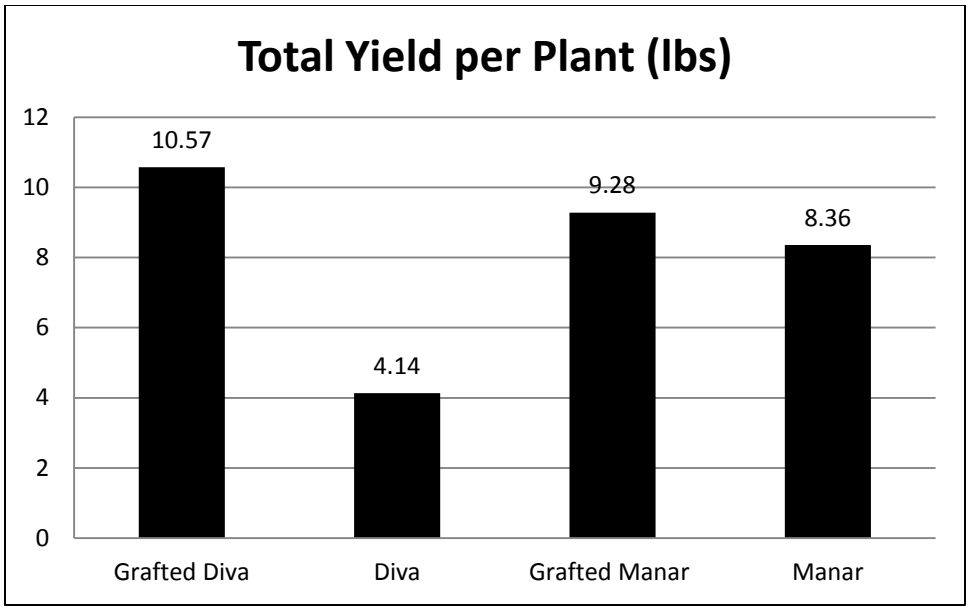


**Figure 1. 2010 Cornell Vegetable Program grafted cucumber trial increased yield in Diva and Manar varieties.**

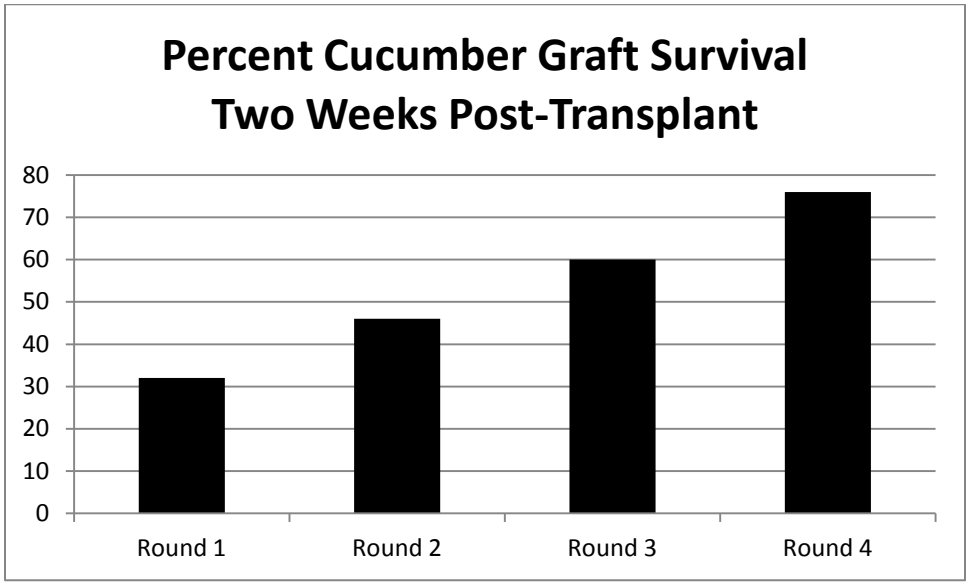


**Figure 2. Grafted cucumber survival rates increased as stem diameter between rootstock and scion were more closely matched.**