EVALUATION OF GRAFTED SEEDLINGS IN COMMERCIAL MUSKMELON PRODUCTION IN SOUTHWESTERN UNITED STATES

Chieri Kubota*[1], Michael A. McClure[1], Mary Olsen[1], and Russell Tronstad[2]
[1]School of Plant Sciences, [2]Department of Agricultural Resource Economics, The University of Arizona, Tucson, AZ 85721

Vegetable grafting is a technology, practiced for many years in East Asia and Europe, to overcome soil-borne diseases and pests associated with intensive cultivation. In the U.S., use of grafted seedling technology is still relatively new, with use limited to greenhouse hydroponic tomato for yield enhancement, and in small-scale organic production for disease and pest control. Muskmelon is a major crop grown in Southwestern United States and is a commonly grafted crop in Asia. Researchers as well as conventional open-field producers are interested in using grafted seedlings as an IPM tool to reduce soil fumigants including methyl bromide, but barriers exist that need to be overcome before wider use of grafted seedlings occurs in the U.S. Three commercial trials were conducted in small sections of a producer's field in Wenden, Arizona, using 'Olympic Gold' (*Cucumis melo*) as scion and' Tetsukabuto' (*Cucurbita maxima x Cucurbita moschata*) as rootstock, where muskmelon was conventionally cultivated from seeds in rows with subsurface drip irrigation using Telone for preplant fumigation (6 gallons per acre). Crop management was based on the needs of conventional direct seeded plants, except for additional overhead irrigations made for grafted and non-grafted seedlings to establish them during the first week of transplanting. For fall crop, 2007 trial showed a comparable yield achieved by grafted plants, but 2008 trial showed 28% lower yields by grafted plants, compared to the conventional direct seeded plants. Fall planting occurs in mid-late July when the maximum air and soil temperatures exceed 40°C and 30°C (at 10-cm depth), respectively (AZMET weather station data, 2008). Use of the interspecific squash rootstock exhibited enhanced yields and tolerance to vine-decline when a small-scale preliminary test was conducted with transplanting done in late August 2006. This may suggest that the relatively lower temperatures in August (< 27°C in soil) than July helped establishment of squash rootstock. Use of rootstock tolerant to heat may improve the yields of fall muskmelon production. For spring crop, 2009 trial showed that grafted seedlings flowered earlier and yielded significantly greater by 6-14% than direct-seeded plants or non-grafted plants, expressing the advantage of the interspecific rootstock's high tolerance to low temperature. However, prevailing wind caused damage to young seedlings, losing 38% of grafted seedlings from wind damage one week after transplanting. The typical wind damage was breakage of scion just above the strong graft union. A better hardening process for the grafted plants as well as installing wind protection may improve stand establishment in spring planting. In both fall and spring commercial trials, no soil-borne diseases outbreak were observed. In an experiment conducted in a nematode infested plot at the University of Arizona (Tucson, AZ) in spring 2009, grafted plants achieved 2-4 times greater yields than

did direct seeded or non-grafted plants, with the average nematode galling index 2.1-3.0 (in 0 to 5 scaling) at the end of crop, regardless of plant type (grafted, non-grafted, or direct seeded). This suggests the tolerance of grafted plants to root knot nematode, presumably due to its vigorously developed root system. Axillary and adventitious shoot development from rootstock has been problematic in all trials. This problem could be avoided by improving grafting methods and by better understanding factors inducing rootstock axillary/adventitious shoots. Development of sizable commercial grafting capacity in the U.S. has been slow and the present price of grafted seedlings is unaffordable for open-field growers ($0.60 to $0.75 per plant). As most Southwestern U.S. muskmelon producers do not use transplants, grafted seedling price must be reduced and the field survival rate must be increased significantly to make this technology more economically feasible.

Acknowledgements: This project was funded by USDA Integrated Research, Education, and Extension Competitive Grants Program – Methyl Bromide Transitions (Award Number 2007-51102-03822).