HS922

UF UNIVERSITY of FLORIDA
IFAS Extension

Effect of Mechanical Damage to Strawberry Transplants.[1]

John R. Duval, Craig K. Chandler, and Daniel E. Legard[2]

Introduction

Commercial strawberries are propagated asexually by producing daughter plants on stolons originating from a mother plant. Bare-root transplants are produced in open fields where daughter plants remain attached to the mother plant and are allowed to root into the soil. According to Latimer (1998), the goal of transplant production is to produce plants which: 1) withstand the stress of handling, transportation and transplanting, 2) adapt rapidly to the field environment, 3) establish and resume active growth soon after transplanting, and 4) produce acceptable yields without reduction or delay compared to other establishment methods. Water management (Leskovar, 1998), pre-transplant nutrition (Dufault, 1998), transplant size (NeSmith and Duval, 1998; Latimer 1998), transplant age (Vavrina, 1998) and transplant root structure (Nicola, 1998) may all be contributing factors to a transplants success in the fruiting field.

To supply the demand for strawberry plants in Florida, most bare-rooted green-top transplants for winter production are mechanically harvested, using modified potato digging equipment, in high latitude ($> 42^{o}$) or high altitude nurseries in Canada or the Pacific Northwest. A typical harvest operation involves the following procedures; plants are: 1) removed from the soil using digging equipment, 2) placed in large bins using pitchforks, 3) transferred to a packing facility, 4) separated from each other by hand, 5) counted and placed in plastic lined boxes (400 to 600 plants per box) and 6) pre-cooled and shipped to Florida in refrigerated trucks. During harvesting and packing operations, transplant petioles, leaves, and crowns may be crushed and/or broken. Damaged plants are likely to take longer to resume normal growth after establishment in the fruiting field.

Demand for fruit in late fall and early winter creates a lucrative market for Florida strawberry producers. A plant which resumes growth quickly and produces more fruit early in the season is highly desirable for Florida strawberry growers. Earlier plantings are not feasible due to the transplants need to be exposed short day lengths in the nursery to initiate flowering in the fruiting field. Crown size at planting and the effect of chilling temperatures in

1. This document is HS922, one of a series of the Horticultural Sciences Department, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Published June 2003. Reviewed April 2009. Please visit the EDIS Web site at http://edis.ifas.ufl.edu.

2. John R. Duval, assistant professor, Gulf Coast Research and Education Center - Dover; Craig K. Chandler, professor, Gulf Coast Research and Education Center - Dover; Daniel E. Legard, associate professor, Gulf Coast Research and Education Center - Dover, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, Florida 32611.

nursery production fields have shown to influence early season yields of strawberry in Florida (Albregts, 1968; Chandler et al., 1989; Kirschbaum et al., 1998). However, the influence of transplant digging and packing operations on subsequent strawberry fruit yields has not been determined. The purpose of this study was to determine the influence on performance of traditionally harvested transplants (machine dug) in comparison to transplants which do not undergo the rigors of traditional harvesting (hand dug).

Machine-dug vs Hand-dug Transplants

Experiments, conducted at the GCREC-Dover, have shown that the mechanical damage that strawberries receive during digging and packing operations can have a dramatic effect compared to plants that are hand dug and carefully packaged. Minimally damaged (hand dug) transplants outperformed traditionally harvested (machine dug) transplants by as much as 30% for the entire season and by as much as 50% during the "early" part of the season when prices per strawberries are at their highest (Figure 1 & 2). The reason for the higher yield is that hand dug transplants produce a greater number of berries (Figure 3) and not any increase in average fruit size.

Currently, growers in the major production area of Florida are considering transplants grown in standard transplant production trays (plug plants) to increase their early yields. Research to date on plug plants has shown an increase in early marketable yields when compared to typical bare-root transplants (Hochmuth et. al, 2000). Their greater early yield may be at least partially the result of less mechanical damage that plug transplants receive during harvesting, packing, and shipping operations. Plug plants do not undergo mechanical harvesting operations, which limits the amount of damage prior to planting. These transplants are left in trays and packed 50 to 200 plants to a box, whereas a similar size box can contain up to 600 bare root transplants. These less compacted conditions may limit damage during shipping. Although containerized transplants are roughly double the cost of machine dug bare-root plants, the increased production of high value early fruit may offset this cost.

This may justify the conclusion that the mechanical damage a green-top bare-rooted transplant receives during digging, packing and transport from the nursery to the fruiting field affects its performance in Florida fruiting fields. Although effects of digging technique on yield vary from year to year, a reduction in performance, especially early in the season, can have a dramatic effect in terms of monetary returns to growers. Further research examining where and when damage during harvest, packing and shipping occurs and how to minimize it needs to be conducted.

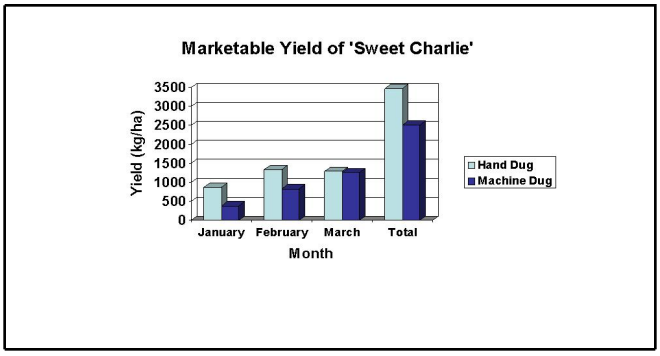

Figure 1. Total marketable yield of 'Sweet Charlie' strawberries was higher when undamaged, hand-dug plants were used.

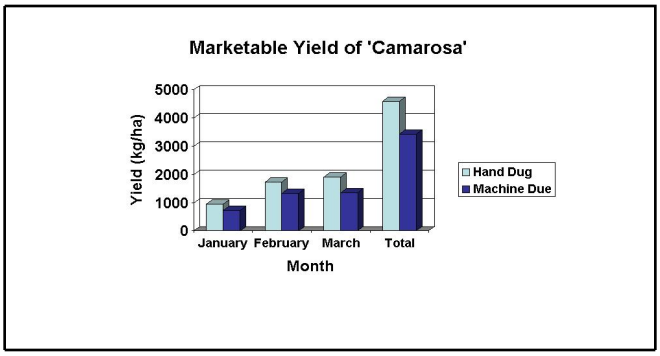

Figure 2. The marketable yield of 'Camarosa' strawberries was higher with undamaged, hand-dug plants.

Literature Cited

Albregts, E.E. 1968. Influence of Plant Size at Transplanting on Strawberry Fruit Yield. Proc. Fla. State Hort. Soc. 81:163-167.

Albregts, E.E. and C.K. Chandler. 1995. Effect of Transplant Source on Strawberry Fruit Production in Florida. Soil Crop Sci. Soc. Florida Proc. 54:80-83

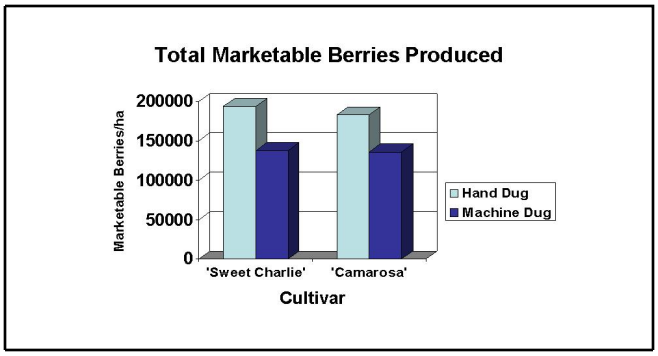

Figure 3. The total marketable yield for berries produced for each variety was higher when undamaged, hand-dug plants were used.

Chandler, C.K., E.E. Albregts, C.M. Howard, and A. Dale. 1989. Influence of Propagation Site on the Fruiting of Three Strawberry Clones Grown in a Florida Winter Production System. Proc. Fla. State Hort. Soc. 102:310-312.

Chandler, C.K., D.E. Legard, D.D. Dunigan, T.E. Crocker, and C.A. Sims. 2000. Strawberry Festival Strawberry. HortScience 35:1366-1367

Dufault, R.J. 1998. Vegetable Transplant Nutrition. HortTechnology 8:515-523.

Hochmuth,G., C. Chandler, C. Stanley, D. Legard, J. Duval, E. Waldo, D. Cantliffe, T. Crocker and E. Bish. 2001. Containerized Transplants for Establishing Strawberry Crops in Florida. HortScience 36:443. (Abstr.)

Kirschbaum, D.S., D.J. Cantliffe, R.L. Darnell, E.B. Bish, and C.K. Chandler. 1998. Propagation Site Latitude Influences Initial Carbohydrate Concentration and Partitioning, Growth, and Fruiting of Sweet Charlie Strawberry Transplants Grown in Florida. Proc. Fla. State Hort. Soc. 111:93-96.

Leskovar, D.I. 1998. Root and Shot Modification by Irrigation. HortTechnology 8:510-514.

Latimer, J.G. 1998. Mechanical Conditioning to Control Height. HortTechnology 8:529-534

Maynard, D.N. and S.M. Olson. 2001. Vegetable Production Guide for Florida. Univ. Fla SP 170.

NeSmith, D.S. and J.R. Duval. 1998 The Effect of Container Size. HortTechnology 8:495-498.

Nicola, S. 1998. Understanding Root Systems to Improve Seedling Quality. HortTechnology. 8:544-549.

SAS Institute. 1999. SAS users guide: Statistics (6th ed.). SAS Inst., Cary, N.C.

Vavrina, C.S. 1998. Transplant Age in Vegetable Crops. HortTechnology 8:550-555.