Available online at www.sciencedirect.com
SCIENCE DIRECT®
Crop Protection 25 (2006) 758–765
Crop Protection
www.elsevier.com/locate/cropro

Reduction of carob moth in 'Deglet Noor' dates using a bunch cleaning tool

Justin E. Nay, Elizabeth A. Boyd, Thomas M. Perring*

Department of Entomology, University of California, Riverside, CA 92521, USA

Received 30 June 2005; received in revised form 6 October 2005; accepted 10 October 2005

Abstract

Abscised date fruit, *Phoenix dactylifera*, become developmental sites for various insect pests when they are trapped in tight date bunches. We developed a 'Deglet Noor' date bunch cleaning tool that, with minimal investment in time and labor, can remove abscised fruit from the bunch. We field tested the cleaning tool at five plots in four Southern California date gardens during the 2004 growing season and four field plots at four date gardens during the 2005 growing season. Over a 5 week sampling interval, after using the date cleaning tool a single time, we found a 53–93% reduction in the number of abscised fruit and a corresponding 52–91% reduction in the number of carob moth, *Ectomyelois ceratoniae*, infested fruit compared to the non-treated area in 2004. In 2005, we found a reduction in abscised fruit that ranged from 73% to 94% and a 67% to 99% reduction in carob moth infested fruit. We provide a list of all materials and instructions to properly construct and use the cleaning tool.

Keywords: Dates; Manual tool construction; Insect pests; Cultural control; Pyralidae; Lepidoptera

1. Introduction

In the United States, commercial date, *Phoenix dactylifera* L., production occurs almost exclusively in the Coachella Valley of Southern California (Riverside Co.). Approximately 2104 ha of bearing dates, of which more than 75% is Deglet Noor variety (Nixon and Carpenter, 1978), grossed an estimated $25.8 million in 2003 (USDA, 2004). The Deglet Noor variety is prone to more than 35% natural fruit abscission in the Coachella Valley during the summer growing season, especially in June (Warner, 1988). Many of these abscised dates drop out of the bunch and fall to the ground, an event referenced to as the 'June drop' (Warner et al., 1990a). We have determined that between 34,000–205,000 fruit per 0.4 ha get trapped amongst the fruit and strands in the bunch and fail to fall to the ground (unpublished data). These fruit remaining in the bunch become developmental sites for four species of nitidulid beetles, and three species of pyralid moth larvae (Warner et al., 1990b).

One of the most economically important pest species is the carob moth, *Ectomyelois ceratoniae* (Zeller), which infests 10–40% of the harvestable crop annually (Farrar, 2000). As many as three carob moth generations can complete development within a single abscised fruit trapped in the date bunch (personal observation), and adult moths emerging from the abscised 'June drop' fruit lay eggs, which will infest the harvestable crop (Nay and Perring, 2005). High mortality of the carob moth occurs in abscised fruit that fall to the ground during the summer because of the extremely high summer temperatures, and predation by at least two native ant species (Nay and Perring, 2005). Currently there is no method for reducing the number of abscised fruit lodged in bunches following June drop. We have developed an inexpensive, manually operated tool for removing the abscised fruit that is stuck in bunches. In this paper, we

*Corresponding author. Tel.: +951 827 4562; fax: +951 827 3086.
E-mail address: thomas.perring@ucr.edu (T.M. Perring).

0261-2194/$ - see front matter © 2005 Elsevier Ltd. All rights reserved.
doi:10.1016/j.cropro.2005.10.010

provide details for making the cleaning tool, and provide data that demonstrate its effectiveness for reducing carob moth densities in the field.

Table 1
Materials and costs for constructing the date bunch cleaning tool

Qty.	Item	Total $[a]
Materials needed		
1	6.4 mm × 61 cm × 92 cm Aluminum (valley) sheet	1.18
2	3.2 cm × 3.2 cm × 2.44 m Drywall corner bead	3.58
13	10-24 × 1.9 cm pan Rounded bolts, washer and 9.5 mm nuts	2.36
10	1.3 cm PVC pipe caps (optional)	3.90
2	5.1 cm hose clamps	2.58
1	4.88 m extendable pole (fiberglass or aluminum)	39.99
1	Roll of duct tape (55 m)	5.99
Tools needed		
1	Spring clamp	
1	Pair of pliers	
1	Pair of tin snips	
1	6.4 mm Metal drill bit	
1	Electric drill (cordless)	
1	9.5 mm Wrench or socket	
1	Flat head screwdriver	
Total	2.5 hours labor	$ 59.58 + tax

[a]Total item cost in USD.

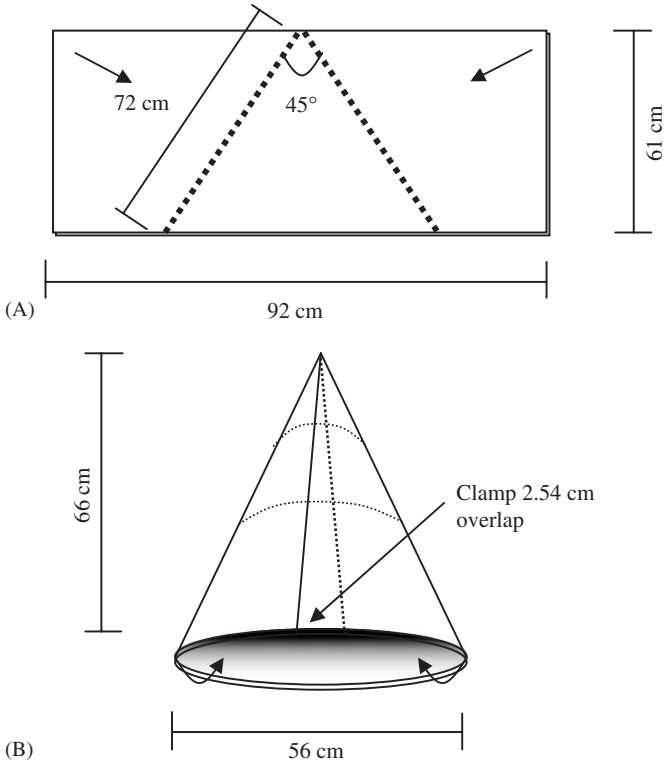

Fig. 1. (A) Formation of the lightweight aluminum cone (B) from a thin sheet of aluminum, held in place with a strong spring clamp on the overlapped edges. Note: Bend or roll the aluminum sheet, do not fold.

2. Materials and methods

2.1. Date bunch cleaning tool construction

We recommend leather gloves and safety goggles be worn while fabricating the tool. A list of materials, material costs, and hand tools required to construct the date bunch cleaning tool is provided in Table 1.

First, form an elongated cone by bending (do not fold) the thin aluminum or galvanized steel sheeting around broken lines from corners (indicated by arrows, Fig. 1A).

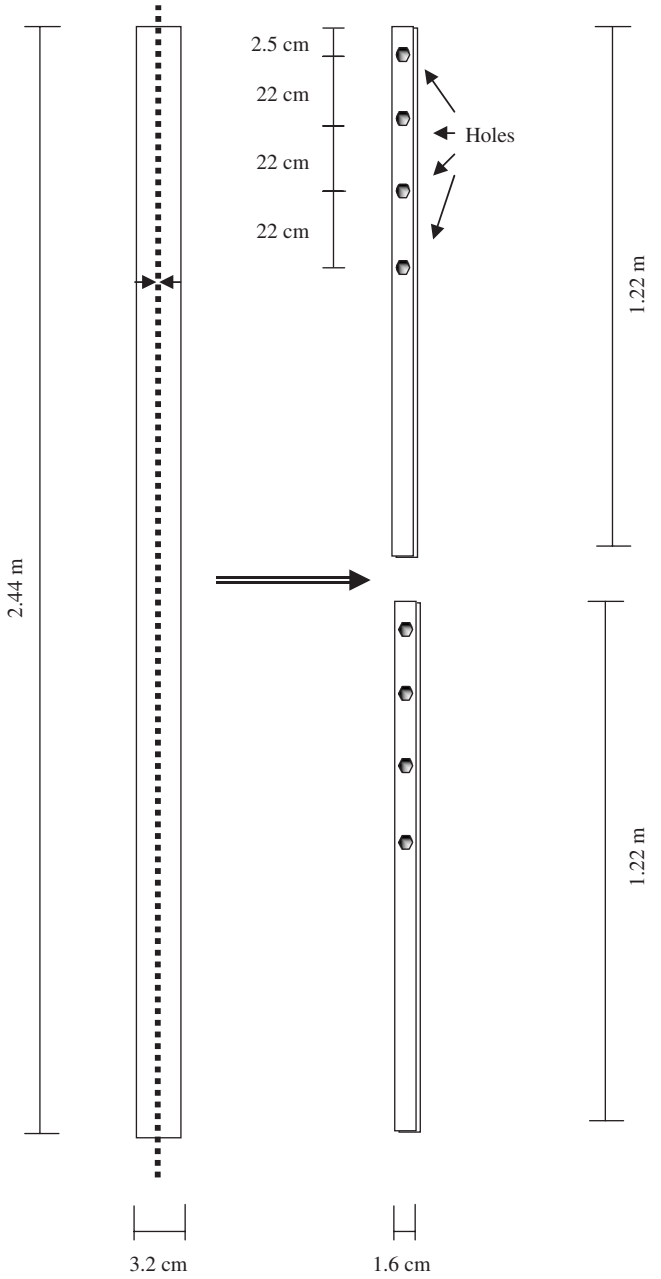

Fig. 2. The second fold down the center of the drywall corner bead, which is then cut in half. Four 6.4 mm holes are drilled equally spaced on the upper portion that coincides to the length of the cone's surface. Upper and lower holes should be drilled approximately 2.5 cm from the corresponding top or bottom of the aluminum cone.