Dissertations

# Use of Flame Cultivation as a Nonchemical Weed Control In Cranberry Cultivation



Katherine M. Ghantous, *University of Massachusetts - Amherst*

Follow



Date of Award
9-2013

Document Type
Open Access Dissertation

Degree Name
Doctor of Philosophy (PhD)

Degree Program
Plant, Soil & Insect Sciences

First Advisor
Hilary A. Sandler

Second Advisor
Wesley R. Autio

Third Advisor
Bethany A. Bradley

Keywords
nonstructural carbohydrates, perennial weeds, root reserves, thermal weeding, torches, woody weeds

Subject Categories
Agriculture | Plant Sciences

Abstract
Cranberry (*Vaccinium macrocarpon* Ait.) is a woody perennial crop that can remain productive for decades. Competition for resources between cranberries and weeds can depress cranberry farm yields, resulting in large annual crop losses. Renewed interest in reducing chemical inputs into cranberry systems has provided the motivation to evaluate methods, such as flame cultivation (FC), as potential nonchemical options for weed control. Also known as thermal weeding, FC exposes plants to brief periods of high temperature that causes the water in the plant tissue to expand rapidly, rupturing plant cells and leading to necrosis. Various FC methods have been used successfully in annual crops as both a preemergence and postemergence weed control, but few scientific reports have been published on the use of FC on perennial weeds in a woody perennial crop system.

Dewberry (*Rubus* spp.), sawbrier (*Smilax glauca*), and common rush (*Juncus effusus)* are cranberry weeds that are difficult to control, spread

quickly and can cause significant crop loss. Flame cultivation may be an effective non-chemical means for controlling these weeds in cranberry systems. FC would ideally be used as a spot treatment for weeds growing in the cranberry canopy, as well as on larger non-production areas where cranberry vines are not as abundant, such as bog edges, ditches, and dikes. Using FC to treat weeds within the cranberry canopy will likely cause localized damage to cranberry plants immediately surrounding the weeds, thus cranberry response to FC is also of interest.

The following experiments were designed to examine the response of weeds and cranberry plants to FC. Perennial plants rely on reserves of nonstructural carbohydrates (NSC) for growth and survival, thus the efficacy of FC treatments to weeds will likely be impacted by the timing and frequency of treatments as they relate to the specific carbohydrate cycles of targeted weeds, such as dewberry. An additional experiment studied the seasonal fluctuations of NSC in dewberry roots. Cranberry growers were also surveyed on their past experiences with FC, as well as their willingness to adopt FC if proven an effective method for controlling weeds.