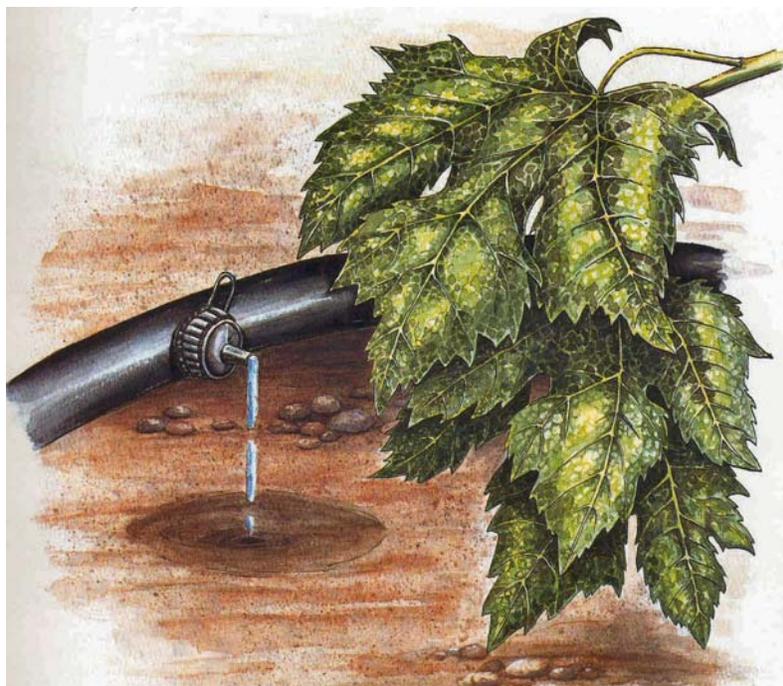


Deficit Irrigation of Quality Winegrapes Using Micro-Irrigation Techniques



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Table of Contents

A. Introduction

- Introduction
- Irrigation Scheduling Concepts
 - The Benefits of Irrigation Scheduling
 - Deficit Threshold Irrigation

B. Soil Water Reservoir

- Soil Water Holding Capacity
 - Soil Texture
 - Soil Structure
- Root Zone Depth
 - Root Distribution
 - Determining the Vineyard's Effective Root Zone

C. Measuring Water Sources

- Soil Moisture Content and Tension
 - Available Soil Moisture
 - Measuring Soil Moisture
 - Soil Sampling
 - Tensiometers
 - Electrical Resistance Blocks
 - Neutron Moisture Meters
 - Dielectric Soil Moisture Sensors
 - Sensor Placement and When to Measure
- Measuring In-season Rainfall
 - In Season Effective Rainfall
- Measuring Irrigation Water
 - Flowmeters
 - Measuring Emitter Discharge

D. Vine Water Deficits Caused by Reduced Soil Water Availability

- Winegrape Water Use
- Vine/Fruit Growth and Development
- Effects of Vine Water Supply on Vine, Fruit and Wine
- Vine Water Deficits Caused by Reduced Soil Water Availability
- Timing of Water Deficits
 - Early Season Deficits
 - Pre-Veraison Deficits
 - Post-Veraison Deficits
 - Post Harvest Deficits

E. Developing a Deficit Irrigation Strategy

- Regulated Deficit Irrigation (RDI)
- Deficit Threshold Irrigation (DTI)
 - Experiences with Deficit Threshold Irrigation
- Selecting an Appropriate Deficit Threshold and RDI
 - Selecting a Deficit Threshold
 - Selecting a Post Threshold RDI %

F. Methods for Determining When to Begin Irrigation

- Visual and Measurements
 - Shoot Growth
 - Shoot Growth Rate
 - Tip Ratings
- Using the Pressure Chamber in Winegrape Irrigation Scheduling
 - When to Sample
 - Factors that Influence Leaf Water Potential
 - Operation and Use of the Pressure Chamber
 - Vine Selection
 - Sample Number
 - Leaf Selection
 - Sample Collection
 - Measurement
 - Problems
 - Reproducibility

G. Developing the Irrigation Schedule

- Defining Mature Vineyard/Site Conditions
- Determining How Much to Apply
 - Estimating Full Potential Water Use
 - Evapotranspiration Reference Values
 - Crop Coefficient (Kc)
 - Calculating Full Potential Water Use with Historical Average Eto
 - Calculating the Water Use Using the Regulated Deficit % (RDI%)
 - Accounting for the Soil Contribution and Effective Rainfall
 - Determining the Weekly Vine Irrigation Volume
 - Adjusting the Schedule for the Current Season's Climate

H. Applying Irrigation Water

- Irrigation Water Units
- Determining the Irrigation Amount

I. Monitoring Vine Performance to Evaluate Strategy

- Post Threshold Midday Leaf Water Potential
- Vegetative Growth
- Yield
- Fruit Quality

Appendix

- Drip System Evaluation Form
- Sample Data Sheet for Drip System Evaluation Form
- Average Weekly Non-Rain Eto, Lodi, CA CIMIS Stations # 42 and #166
- Sample Irrigation Scheduling Worksheet
- Sample Irrigation Scheduling Worksheet for Lodi, CA

A. Introduction

Introduction

The main purpose of controlling the application of irrigation water to winegrapes is to produce high quality fruit. The volume of irrigation water required to produce high quality fruit varies from year to year, depending primarily on the extensiveness of the vine canopy, the soil resources, and climatic conditions of both the previous winter and current season. However, regardless of the exact volume of applied water, the goal is to ensure irrigation produces the desired effect on the vine and fruit. Controlling irrigation application often results in supplying less water than the full potential water requirement of the vineyard. This practice is known as deficit irrigation.

Each vineyard can be very different in location (climate), soil-water capacity, vigor and trellis design. Production goals may also depend on the variety and wine program to which the fruit is destined. Each of these factors exclusive of irrigation can significantly affect both the production level and fruit quality. The first step towards producing high quality fruit is to balance vine vegetative and reproduction structures. This is best done through vineyard design, which includes proper selection of rootstock, variety/clone, planting density, and trellis design for a particular location, soil, and climate. Once planted and the vines are mature irrigation can be used to maximize fruit quality. Unfortunately, even with the best development plans, vegetative growth can be excessive causing reduced fruit quality. In these cases an irrigation strategy utilizing water deficits can be adopted to optimize fruit yield and quality. Deficit irrigation is the management of irrigation, which causes vine water deficits to occur. Various timings and severity of the deficits can be used to achieve specific vineyard objectives.

This publication presents a method of deficit irrigation, which allows growers to determine WHEN to begin irrigation and subsequently to determine HOW MUCH water to apply. It presents some of the effects of deficit irrigation strategies upon the vine and fruit. Growers of quality winegrapes can use the information and experiences herein presented to determine their own irrigation strategy in pursuit of their individual vineyard goal.

Irrigation Scheduling Concepts

When and How Much

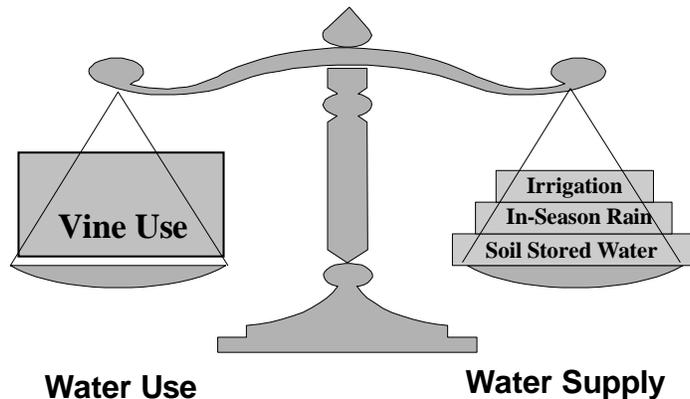
An irrigation-scheduling program should determine when to irrigate and how much water to apply to achieve specific objectives. The objective most often expressed is to have a predictable influence on vine growth, yield, and fruit quality.

Yields of most crops are directly related to the volume of consumed water. Therefore, full potential water use (all the plant can use) is desirable. Maintaining adequate but not excessive soil moisture can successfully accomplish scheduling for these crops for the entire season. Soil moisture monitoring methods or estimates of crop water use is commonly utilized to schedule irrigations. However, the production of quality winegrapes usually requires the use of an irrigation strategy that provides for less than full potential vine water use. Additionally, it may be desirable to use a strategy, which causes water deficits to occur at specific times and of different

deficit severities. This calls for a different scheduling methodology, which can regulate the amount and timing of water deficits.

Water Sources

Vineyards can use water from a variety of sources. These most typically include soil stored moisture, effective in-season rainfall and irrigation. Other water sources can include ground water from shallow or intermittent water tables. All of these sources combine to supply the appropriate quantity of water for optimal vine performance.



The Benefits of Irrigation Scheduling

- Reduced costs (energy and water).
- Control of excess vegetative growth.
- Reduced cost of hedging and multiple leaf removal.
- Reduced disease (bunch rot)
- Increased fruit quality
- Reduced environmental risks (off site and percolation movement)
- Reduced fertilizer losses (deep percolation)

Deficit Threshold Irrigation.

There are many approaches to deficit irrigation in terms of the timing and severities of the water stress the vine experiences. These different approaches include early water stress, a constant reduction in irrigation volumes in relation to full water potential use, or a cutoff of irrigation before harvest just to name a few.

This publication focuses on a method called “Deficit Threshold.” This method was developed from a number of research projects in which the goal was to improve fruit quality and maintain yields. Deficit threshold is a type of regulated deficit irrigation (RDI) where irrigation is withheld until a level of vine water stress is attained then followed by a specific volume of irrigation to allow continued sugar accumulation and preserve canopy cover. This practice controls excessive vegetative growth allowing diffuse light into the fruiting area improving fruit color and character while minimizing yield reductions.