

# **Development of an Educational Handbook on Fertigation for Grape Growers**

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Following is an outline of the book: For a copy, contact FREP (916) 445-0444

## **OUTLINE FOR “A GROWER’S GUIDE TO VINEYARD FERTIGATION”**

### **I. INTRODUCTION:**

*A. Objectives:*

1. Adequate nutrition for fruit quality and yields
2. Environmentally safe applications of fertilizers
3. Cost effective applications of materials
4. Fertigation system maintenance and effectiveness

### **II. GRAPEVINE NUTRITION: Seasonal uptake, quantities used, tissue and soil concentrations**

*A. Macronutrients:*

1. Nitrogen
2. Potassium
3. Phosphorus
4. Magnesium

*B. Micronutrients:*

1. Zinc
2. Boron
3. Iron
4. Calcium/Sulfur
5. Manganese
6. Others

*C. Determining Nutrient Status*

1. Soil testing
2. Tissue testing
3. Toxicity Issues

### **III. EQUIPMENT NEEDED FOR FERTIGATION:**

- A. *Back flow prevention:*
  - 1. Legal requirements
  - 2. Pressure Vacuum Breaker devices
  - 3. Reduced Pressure Double Check Valves
  
- B. *Pumps and Injectors*
  - 1. Siphon devices
  - 2. Positive Displacement pumps
    - a. Water powered proportioners
    - b. Motor powered injectors
  - 3. Using sprayers and other devices
  
- C. *Equipment layout and design:*
  - 1. Manifolding and valving
  - 2. Monitoring of pressure and materials
  - 3. Tanks and concentrated fertilizer containers

#### **IV. FERTILIZER MATERIALS AND AMENDMENTS:**

- A. *Soluble vs insoluble fertilizers; solutions and suspensions*
- B. *Making up stock solutions and calculations:*
  - 1. Calculating parts per million
  - 2. Calculating percentage solutions
  - 3. Determining rates of pure material from fertilizer analysis
  - 4. Guidelines for mixing stock solutions
- C. *Soluble fertilizers:*
  - 1. Nitrogen: urea, calcium nitrate, CAN-17, ammonium sulfate
  - 2. Phosphorus: phosphoric acid, ammonium phosphate, MAP
  - 3. Potassium : Potassium chloride, potassium nitrate, potassium thiosulfate
  - 4. Micronutrients: chelates vs. soluble materials
- D. *Soil Amendments:*
  - 1. Gypsum
  - 2. Lime
- E. *Organic Fertilizers:*
  - 1. Fish emulsions
  - 2. Hydrolized animal protein
  - 3. Kelp, seaweed products

#### **V. FERTIGATION SYSTEMS OPERATIONS:**

- A. *Water Management and Scheduling*
  
- B. *Water quality issues:*
  - 1. Chemistry, including pH, electroconductivity,

carbonate/bicarbonates, calcium, magnesium, sodium, sulfate, iron:  
What will constitute problem situations.

2. Chemical precipitate clogging: Lime, iron and manganese, others

**C. Injection procedures:**

1. Strategies:

- a. Constant injection, small dosages
- b. Infrequent injections, larger dosages

2. Application:

- a. Mixing
- b. Injecting
- c. Rinsing

**D. Flushing and Chloration:**

- 1. Suspended solids
- 2. Algae
- 3. Slimes and other conditions
- 4. Chlorine
- 5. Acidulation with N-Phuric and other materials
- 6. Other conditioners

**V. Tables:**

A. Vine Spacing and Vines per Acre Chart

B. Useful Conversions

C. Fertilizer reference by nutrient, including formulations, maximum concentrations in water, ease of injection, relative cost, corrosiveness, salt hazard

D. Stock solution guidelines for set fertilizer proportioners

**VI. ILLUSTRATIONS:**

1. Backflow preventers: Reduced pressure double check valve, pressure vacuum breaker

2. Injector pumps: Positive displacement piston type, water driven; positive displacement piston type, electric motor driven; siphon device; sprayer adapted to inject fertilizer; "Solution Master" type ag suspension pumps; commercial liquid fertilizer tanks and solutions.

3. Systems: Diagrams of manifolds including bypasses, valving. Pictures of typical set-ups, including pumps, tanks, backflow prevention systems on wells and surface water sources.