Factors Affecting Root Initiation by Stem Cuttings
Text Pages: 305 - 318.

Objectives:

1. Be able to describe how nurseries often select plants for propagation and how they maintain easy-to-root characteristics of the stock plants.

2. Be able to describe and summarize factors that can affect the physiological condition of stock plants and which factors ultimately affect root initiation by stem cuttings.

3. Be able to describe and summarize how the types of wood selected and the time of year can affect root initiation by stem cuttings.

4. Be able to describe treatments used on stem cuttings to promote root initiation and be able to explain how stem cuttings are affected.

I. FACTORS AFFECTING ROOT FORMATION ON CUTTINGS

A. Introduction

B. Stock Plant Manipulation

1. Stock plants should be carefully maintained since their

2. Stock plants are often located far away from

3. Nurseries often select easy-to-root species or

   a. If less than 50% of the cuttings

   b. Consecutive generation is

4. Using adult plants can have problems due to

C. Selection of Cutting Material
1. Physiological condition of the stock plants
   a. Physiology (defined) – functions and
   
   b. Carbohydrates -
   
   c. Mineral nutrition
      i. nitrogen -
      
      ii. macronutrients - P and K
      
      iii. zinc -
      
      iv. manganese -
   
   d. Girdling stems of stock plants
   
   e. Etiolation -
      i. reason for using trench or
      
      ii. light may destroy endogenous auxin or
   
   f. Other important concepts involving light manipulation:
      i. etiolation – total
      
      ii. banding – localized
      
      iii. blanching - applying bands
iv. shading – growing stock plants under

2. Juvenility Factor – discussed later

3. Type of Tissue/Wood Selected
   a. The stem or branch varies from succulent
   b. Differences within a species –
   c. Differences between lateral and terminal shoots
   d. Differences between parts of the shoot –
   e. Flowering or vegetative wood –
   f. Retaining a small piece of older wood

4. Presence of a virus

5. Time of year
   a. Season can have a dramatic effect on
   b. Many easy-to-root species can be propagated
   c. Hard-to-root species may root well if
d. Reasons for seasonal rooting of cuttings:
   i. carbohydrates, minerals, or endogenous
   ii. maturity or lack of maturity of

E. Treatments Used On Stem Cuttings

1. 

2. Minerals or nutrients applied -
   a. Nitrogen compounds -
   b. Boron -
   c. Nutrient leaching from misted cuttings
      i. applying mist to cuttings can leach minerals out
      ii. potential problems with applying fertilizer:
         iii. take home message:

3. Wounding
   a. Wounding can be beneficial for cuttings from
   b. Reasons for success with wounding:
i. increased callus production for cells that

ii. endogenous ethylene

iii. more auxin is absorbed

iv. weaken tough

4. Storage
   a. Cuttings can be misted and stored

   b. Type of cutting is important – deciduous hardwood cuttings

   c. Successful storage depends on storage conditions:
      i. high humidity:

      ii. cool temperatures:

      iii. reduce or eliminate

F. Summary
Objectives:

1. Be able to describe and explain how water status of stem cuttings can affect root initiation.
2. Be able to explain the relationship between vapor pressure in stem cuttings and water status.
3. Be able to predict how manipulating vapor pressure in stem cuttings and the air can affect cutting water status.
4. Be able to describe and explain methods used to control water loss by stem cuttings.
5. Be able to describe and explain how temperature and light affect root initiation by stem cuttings.

I. ENVIRONMENTAL MANIPULATION FOR CUTTINGS

A. Introduction

B. Water Relations

1. Most important factor is

2. To maintain turgor of stem cuttings:
   a. The air around the cuttings is
   b. Air temperature is kept in
   c. Light levels need to be high enough for

3. Water status of stem cuttings is balanced between
   a. Leaves on stem cuttings absorb only
b. The base of the cutting

4. Water loss from cuttings is affected by the difference
   a. Which system contains more water vapor,
   b. Pressure flows from high to

5. $V_{leaf}$ can be decreased by:
   a. Reduced leaf temperature
   b. Increase $V_{air}$
   c. Intermittent misting will reduce

C. Methods to Control Water Loss

1. Enclosures - outdoor or indoor
   a. Small structures are sealed to
   b. Plastic covered structures are
   c. Laying plastic directly on
   d. Small poly tents

2. Intermittent mist is used
   a. Water is sprayed against a surface
b. Mist structures can be open or

c. Potential problems for an enclosed mist bed?

d. Enclosed mist structures may keep conditions

3. Fog Systems - actually create a temporary fog by

D. Temperature -

1. If misting is used,

2. Optimum medium temperature is 23 to 27°C (75 to 80°F)

3. Air temperatures should be

4. Why avoid high air temperatures for stem cuttings?

5. Usually basal temperature of stem cuttings is kept slightly

6. Rooting medium temperature should be slightly

E. Light -

1. Irradiance -

   a. Growers will use 30 to 50% shade to
b. As the cuttings get closer to harvest

2. Photoperiod
   a. Definition – length of time (in hours) of light
   b. Stem cuttings from most species form roots better when
   c. Some species are unaffected by photoperiod,

3. Light Quality
   a. Red wavelengths seem to
   b. What plant pigment/message system may be at work?

F. Summary